UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 7
11201 Renner Boulevard
Lenexa, Kansas 66219

MAY 2 3 2018

Ms. Jennifer Busard
IAAAP Project Manager (JMIA-OSR)
Iowa Army Ammunition Plant
17571 Highway 79
Middletown, Iowa 52638-5000

Dear Ms. Busard:

The U.S. Environmental Protection Agency has completed the review of the response to comments for the Final Uniform Federal Policy – Quality Assurance Project Plan, or UFP-QAPP, Packet #2. The EPA has no additional comments.

Enclosed are the signed Title and Approval Pages for Operable Units 5, 6, and 7 and the Resource Conservation and Recovery Act areas.

Please update the Federal Facility Agreement schedule to reflect finalization of this UFP-QAPP. If you have questions, please contact me at (913) 551-7868.

Sincerely,

Danny O'Connor
Remedial Project Manager
Federal Facilities and Post Construction Section
Superfund Division

Enclosure

cc: Mr. Dan Cook, Iowa Department of Natural Resources (via email only)
Ms. Kaitlin Nau, PIKA Inc. (via email only)

F I N A L

Site-specific Worksheets for the Compliance Cleanup RCRA Sites, Uniform Federal Policy–Quality Assurance Project Plan for Remedial Investigation at Iowa Army Ammunition Plant, Middletown, Iowa

Contract No. W912QR-12-D-0005,
Delivery Order 0006

Prepared for

U.S. Army Corps of Engineers
Louisville District

600 Dr. Martin Luther King Jr. Place
Louisville, Kentucky 40202-2232

April 2018

Operable Unit Regrouping

An Operable Unit (OU) regrouping strategy is being proposed to facilitate progression of simpler sites to closure, as warranted, and organize those sites not currently managed under the OU structure. Although a recommendation for each OU will be presented in the Remedial Investigation report, the table below summarizes potential future OU for each of the sites that are currently managed under the Resource Conservation and Recovery Act (RCRA). The overall approach was presented to the U.S. Environmental Protection Agency at the Technical Project Planning Meeting #4 on 28 March 2017.

Site ID	Site Name	Potential Proposed Operable Unit
CC-01	Contaminated Clothing Laundry	6 or 10
CC-06	Deactivation Furnace - Groundwater	6 or 10
CC-06	Demolition Area - Groundwater	6 or 10

Title and Approval Page

Project Name and Site Location:	Environmental Services at Iowa Army Ammunition Plant, Middletown, Iowa
Document Title:	*Site-specific Worksheets for the Compliance Cleanup RCRA Sites of the Uniform Federal Policy—Quality Assurance Project Plan for Remedial Investigation at Iowa Army Ammunition Plant, Middletown, Iowa*
Contract Number:	U.S. Army Corps of Engineers (USACE) Contract W912QR-12-D-0005, Delivery Order 0006
Federal Regulatory Agency:	United States Environmental Protection Agency, Region 7 (USEPA)
State Regulatory Agency:	Iowa Department of Natural Resources (IDNR)
Lead Organization:	USACE
Preparer's Contact Information:	CH2M HILL, Inc. (CH2M) 9191 South Jamaica Street Englewood, Colorado Telephone: 970-731-0636 E-mail: doug.scott@ch2m.com
Preparation Date:	April 2018 QAPP will be reviewed annually to ensure that the methods used are current and applicable to the project.
Plans and Reports from Previous Investigations Relevant to this Project:	See References section

Jennifer Busard, IAAAP — Date: 4-25-18
Environmental Restoration Program Manager

Daniel O'Connor, USEPA — Date: 5/23/2018
U.S. Environmental Protection Agency Remedial Project Manager

Nathaniel Peters II, USACE — Date: April 25, 2018
Contracting Officers Representative

Jeffrey Morrison, CH2M — Date: April 24, 2018
Project Manager

for Doug Scott

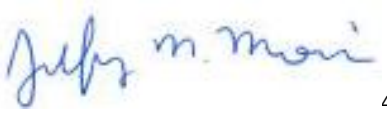
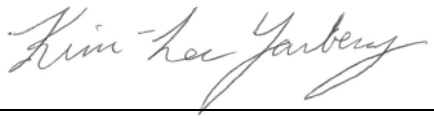
Doug Scott, CH2M — Date: April 24, 2018
Project Chemist

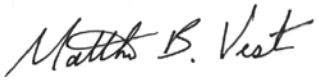
STATEMENT OF INDEPENDENT TECHNICAL REVIEW

Environmental Services at Iowa Army Ammunition Plant
Middletown, Iowa

U.S. ARMY CORPS OF ENGINEERS
LOUISVILLE DISTRICT

The CH2M team has completed the Final submittal of the **Site-specific Worksheets for the Compliance Cleanup RCRA Sites, Uniform Federal Policy–Quality Assurance Project Plan for Remedial Investigation at Iowa Army Ammunition Plant, Middletown, Iowa**. Notice is hereby given that an independent technical review (ITR) has been conducted that is appropriate to the level of risk and complexity inherent in the project, as defined in the Project Management Plan and Contractor Quality Control Plan. During the ITR, compliance with established policy principles and procedures, utilizing justified and valid assumptions, was verified. This included review of assumptions; methods, procedures and material used in analyses; the appropriateness of data used and level of data obtained; and reasonableness of the results including whether the product meets the USACE's needs consistent with the law and existing USACE policy.

CH2M HILL, Inc. Project Manager	**CH2M HILL, Inc. ITR Team Leader**
 4/26/2018	 4/26/2018
Signature Date	Signature Date
Jeffrey Morrison	Kim-Lee Yarberry

Leidos Project Manager	**Leidos ITR Team Leader**
 4/26/2018	 4/26/2018
Signature Date	Signature Date
Matthew Vest	Matthew Bange

Document Control

Project Number: 679172	**Document Date:** April 26, 2018
Document Title: Site-specific Worksheets for the Compliance Cleanup RCRA Sites, Uniform Federal Policy–Quality Assurance Project Plan for Remedial Investigation at Iowa Army Ammunition Plant, Middletown, Iowa	

Document Revisions

Revision No.	Date	Description
0	May 31, 2017	Initial Draft to USEPA
1	December 11, 2017	Draft Final revised per USEPA comments received on August 21, 2017
2	April 26, 2018	Final revised per USEPA comments received on February 28, 2018

Contents

Site-specific Worksheets

Site-specific Worksheets for Compliance Cleanup RCRA Sites

Contaminated Clothing Laundry Worksheet #10: Conceptual Site Model

This worksheet describes the site-specific background and environmental conditions in relation to the conceptual site model (CSM) for groundwater at the Contaminated Clothing Laundry (CCL) site, IAAP-019 (CC-01). Soil at the CCL was remediated according to the Operable Unit 1 (OU1) soil Interim Record of Decision (USEPA, 1998) and final Record of Decision (ROD) (Harza, 1998). Site groundwater is addressed under OU6 and Resource Conservation and Recovery Act (RCRA) (Tetra Tech, 2014). The CSM integrates existing information and assumptions about the physical site conditions, operational history, and characteristics of chemicals of potential concern (COPCs) based on historical reports. The CSM is based on the current understanding of site history and conditions, and will be updated in the future based on information from the proposed groundwater sampling activities.

Background

This background section consists of the site description and operational history.

Site Description

The CCL (Building 500-125) is located on Plant Road A in the west-central portion of IAAAP, approximately 1,000 feet north of the Main Power Plant and west of Line 6 (Figure CCL-10-1). The CCL is in the eastern portion of the Long Creek watershed, bordering the Brush Creek watershed. Building 500-140 is attached to the CCL and serves as a wastewater pretreatment facility.

Operational History

The CCL is active and has been in operation since the 1940s to launder coveralls, underwear, and towels used by production and maintenance personnel. The waste stream originating from the laundry is spent wash water that may have been contaminated from washing items potentially contaminated with explosives (JAYCOR, 1996). Because the clothing was contaminated with explosives, volatile compounds such as dry cleaning fluids were not used to wash the clothing. The waste stream was originally processed by settling of wastes in an outdoor, concrete-lined basin directly east of Building 500-125 (Figure CCL-10-1). Concentrations of Royal Demolition Explosive (RDX) at 2,600 micrograms per liter (µg/L), Hot Melt Explosive at 560 µg/L, 2,4,6-trinitrotoluene at 8.32 µg/L, and 2,4-dinitrotoluene (DNT) at 2.94 µg/L were reported in a process stream sample.

Wash water waste is generated at a rate of approximately 8,000 gallons per day and has been treated at the Main Sewage Treatment Plant since 1982 (JAYCOR, 1996). Historically, wash water was settled in a concrete basin or sump prior to discharge to the sewer system and it is currently pre-treated in the onsite filtering facility. Construction of a new filtering facility (for pretreating explosives-contaminated water) was initiated in 1998 and began operation in 2003. In July 2007, the settling basin (sump) was excavated, and Building 500-140 was expanded over the location of the previous settling basin (Tetra Tech, 2008). Building 500-140 includes a secondary containment and filtration unit for pretreatment of wash water.

Conceptual Site Model

The CSM presented in this section is based on the current understanding of the environmental conditions and regulatory program. This section is organized as follows:

- Environmental site setting
  - Topography and Surface Water
  - Geology and Hydrogeology
- Regulatory framework
- Previous investigations
- Current understanding of nature and extent of contamination

Environmental Site Setting

The following sections describe the physical site-specific characteristics that differ from the installation-wide environmental setting presented in IAAAP Worksheet #10. Previous environmental investigations are summarized below.

Topography and Surface Drainage

The CCL topography is relatively flat, with a gentle slope to the southeast. The ground surface elevations range from approximately 709 to 716 feet above mean sea level. Surface drainage is to the east into a roadside drainage ditch. The drainage ditch is approximately 50 feet east of the site and runs to the south (Figure CCL-10-1). This drainage joins another ephemeral drainages (or tributaries) and discharges to Long Creek approximately 1.2 miles to the south.

Geology and Hydrogeology

The geology at the CCL is composed of silty clay loess, generally present at less than 1-foot thickness, underlain by 35 feet of glacial till composed of primarily lean clay and sandy clay. Beneath till, bedrock is limestone of the upper Warsaw Formation (JAYCOR, 1996; Tetra Tech, 2008).

Groundwater at the site is present in the overburden at depths between 2 and 6 feet below ground surface (bgs) based on topography and measurements from monitoring wells (Tetra Tech, 2014). Groundwater gradients generally range from approximately 0.02 to 0.04 and flow direction is to the east-northeast (Figure CCL-10-1). Based on observed flow conditions and recent groundwater elevations, inflow to the drainage ditch directly downgradient of the CCL is primarily from surface run-off rather than from groundwater discharge. Hydraulic conductivity is estimated at 1×10^{-5} centimeter per second and the groundwater velocity is estimated at 2 feet per year at the site (Tetra Tech, 2014).

Regulatory Framework

The CCL site was added to the facility RCRA permit because of observations of red water discharge to the sump and settling pond (USEPA, 1989). Following the field investigation at the Iowa Army Ammunition Plant (IAAAP), results from the RCRA sites will be reported separately from Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) sites. (See CCL Worksheet #14.) For consistency across the installation, the groundwater contamination beneath the CCL site is being addressed under the OU6 remediation goals established under the CERCLA process, however final site decisions must be addressed under the IAAAP RCRA permit (Tetra Tech, 2012).

Previous Investigations

Investigation work and corrective actions previously conducted at the CCL are summarized in Table CCL-10-1 and discussed below.

Table CCL-10-1. Previous Investigations
UFP-QAPP RI, IAAAP, Middletown, Iowa

Year(s)	Source	Media Investigated	Investigation Summary	Analyses	Results/ Conclusions
1987	*RCRA Facility Assessment* (Ecology and Environment)	SW	Visual Inspection	None	No water discharge other than by discharge weir
1991	*Facility Wide Site Inspection* (JAYCOR)	SD SO	One drainage ditch sediment sample and one soil sample at basin	Ex, M	Metals detected below background concentrations. Explosives detected below screening levels.
1993–1995	*Remedial Investigation* (JAYCOR)	SO	None		Reviewed existing data and found no further characterization necessary
1997	*Draft Report of Action Laundry Pretreatment* (MHC)	SO	23 soil samples prior to construction of effluent pre-treatment system	Ex, M	RDX was detected at concentrations exceeding OU1 remedial goals adjacent to the former sump and the settling basin.
2000	*Baseline Ecological Risk Assessment* (MWH)	SD SW	one sample in drainage dich for water and sediment	Ex, M, S, PAH, PCB, P	No contaminants were detected in surface water or sediments.
2006	*Supplemental Remedial Investigation* (Tetra Tech)	SO	13 soil samples	Ex	No contamination in excess of OU1 remedial goals.
2007	*ICM Report* (Tetra Tech)	SO	excavation confirmation soil samples	Ex	Excavation in 4 phases with confirmation sampling at each phase. 57 yd^3 of soil excavated. Confirmation sample results below OU1 remedial goals.
2008–2014	*RFI for Groundwater at CCL* (Tetra Tech)	GW	Groundwater RI over multiple sample events in temporary wells (abandoned) and permanent wells	Ex, M, Anions, Dissolved Organic Carbon	Explosives compounds detected at concentrations exceeding OU6 remedial goals in overburden groundwater. RDX is the only compound detected in excess of remedial goals in most recent samples.

Analyses:
M = metals
Ex = Explosives
M = metals
PCB = polychlorinated biphenyl
P = pesticides
PAH = polyaromatic hydrocarbons
S = semivolatile organic compounds

Site inspections in 1987 and 1991 determined that no waste was discharged directly to environmental media, rather it was contained within the waste processing structures (Ecology and Environment, 1987; JAYCOR, 1996). No contamination was detected in drainage ditch sediment and surface water samples from 2000 (MWH, 2004). Soil was remediated to meet the remedial objectives defined in the OU1 ROD (Harza, 1998).

After soil removal actions, groundwater was investigated from 2008 to 2014 (Tetra Tech, 2014). Over three phases of work, 19 temporary wells were installed and sampled for explosives and/or metals. Nine of these wells were converted to permanent monitoring wells and the remaining temporary wells were removed. In 2010 the existing wells were sampled for metals and eight additional monitoring wells were added to the network in 2013. The sample data show that RDX was present in groundwater at concentrations that exceed the screening level of 2 micrograms per liter (µg/L). Other explosives (2,4-DNT and 2-nitrotoluene) were infrequently detected and widely dispersed; they also were not detected in the most recent sampling events (July 2014 through January 2015).

A Human Health Risk Assessment was conducted and identified two contaminants of concern (COCs) in groundwater for exposure by industrial workers (Tetra Tech, 2013), RDX and chromium. According to this assessment, chromium was the risk driver for the site. Although total chromium was detected above the RSL for chromium VI (0.031 µg/L), concentrations did not exceed the MCL for total chromium (100 µg/L). The risk assessment used the very conservative assumption that all the detected chromium was chromium VI, which is unlikely given that naturally occurring background chromium is typically trivalent (Tetra Tech, 2008, 2014).

Current Understanding of Nature and Extent of Contamination

This section presents a summary of the potential sources of contamination identified at the CCL and current conditions in site media.

Potential Sources of Contamination

The source of groundwater contamination at the CCL is attributed to contaminated wash water that was discharged from the laundry into a settling basin where wash water leaked or overflowed to the surrounding soil. As the pre-treatment filtering facility (Building 500-140) is in operation, there are no remaining sources of RDX to groundwater.

Surface Water and Sediment

Surface water and sediment contamination was not identified at the site.

Soil

Soil contamination around the former settling basin suggests that wash water leaked or overflowed into the surrounding soil. The contaminated soil around the settling basin was excavated in 2007.

Groundwater

Historical RDX concentrations in groundwater are shown on Figure CCL-10-2; the most recent concentration at each sample location is shown. The figure shows that RDX is no longer present as one large plume, rather is identified in two plumes near the buildings and one isolated exceedance at CCL-TTTW-012 (however this result is from 2011). RDX was not detected in deeper well CCL-TTMW-009 (screened at 30 to 35 feet deep), indicating that vertical migration of RDX is limited, as it was detected to 20 feet bgs. The maximum RDX concentrations were observed in site groundwater in the 2008 and 2009 samples (Table CCL-10-2). Groundwater samples collected in 2013 and 2014 showed generally decreasing RDX concentrations at previously sampled locations with the highest concentration in 2014 reported at CCL-TTMW-001 (3.8 µg/L). RDX above the screening level is delineated at the site. Natural

attenuation parameters indicate that reductive degradation of explosives compounds may be occurring at the site (Tetra Tech, 2014).

Summary and Data Gaps

Based on available information and the discussions presented above, the following conclusions are made regarding the CSM at the CCL:

- Soil has been remediated, and further investigation is not warranted under this OU6 Groundwater QAPP; however, groundwater concentration trends will be evaluated as part of the RI to assess whether soil may be acting as an ongoing source to groundwater.
- Sediment and surface water contamination was not detected.
- Groundwater contamination has been characterized; however, additional sampling is proposed to evaluate speciated chromium concentrations and current concentrations of RDX.

Conceptual Exposure Model

Based on the understanding of site conditions, Figure CCL-10-3 presents the preliminary conceptual exposure model (CEM) to human receptors, as appropriate. The potential exposure scenarios summary table at the bottom of Figure CCL-10-3 shows the exposure media and pathways; COPCs in the indicated media and pathways will be evaluated in the human health risk assessment conducted as part of the RI.

The CEMs included in this UFP-QAPP are preliminary and were developed based on the current understanding of site conditions. However, the preliminary CEMs will be refined as more site-specific information is obtained. Revised CEMs will be provided for review within an interim deliverable prior to completion of the RI.

Data Quality Objectives

Additional groundwater samples will be collected to evaluate nature and extent, and fate and transport of contamination, estimate human health and ecological risk, and recommend a path forward consistent with USEPA guidance (USEPA, 1988). Groundwater samples will also be collected to evaluate whether chromium VI is present in groundwater at the site at concentrations above the USEPA RSL for industrial workers. Data quality objectives (DQOs) are as summarized in Table CCL-11-1. The specific tasks that will be performed are described in CCL Worksheet #14. The rationale behind the steps outlined in Table CCL-11-1 are detailed in CCL Worksheet #17.

Table CCL-10-2. Contaminated Clothing Laundry: 2008–2014 Groundwater Analytical Results—Detected Chemicals

UFP-QAPP RI, IAAAP, Middletown, Iowa

				Location	CCL-TTMW-001		CCL-TTMW-001		CCL-TTMW-002		CCL-TTMW-002		CCL-TTMW-003	
				Sample ID	CCL-TTMW-001-08072014		CCL-TTMW-001-562013		CCL-TTMW-002-07312014		CCL-TTMW-002-4262013		CCL-TTMW-003-08072014	
				Sample Date	8/7/2014		5/6/2013		7/31/2014		4/26/2013		8/7/2014	
Test Group	**CAS**	**Parameter**	**Unit**	**Screening Level***	**10 - 20 ft bgs**		**10 - 20 ft bgs**		**10 - 20 ft bgs**		**10 - 20 ft bgs**		**10 - 20 ft bgs**	
EXPLOSIVES	121-14-2	2,4-Dinitrotoluene	µg/L	0.24	0.19	U	0.19	U	0.19	U	0.19	U	0.19	U
EXPLOSIVES	121-82-4	RDX	µg/L	2	**3.8**		**6.6**		0.19	U	0.19	U	**3.6**	
EXPLOSIVES	13980-04-6	TNX	µg/L	--	--		0.19	U	--		0.19	U	--	
EXPLOSIVES	19406-51-0	4-Amino-2,6-dinitrotoluene	µg/L	39	0.19	U	0.19	U	0.19	U	0.19	U	0.19	U
EXPLOSIVES	2691-41-0	HMX	µg/L	1000	**8.8**		**13.3**		0.19	U	0.19	U	**8.1**	
EXPLOSIVES	5755-27-1	MNX	µg/L	--	--		**0.58**		--		0.19	U	--	
EXPLOSIVES	88-72-2	2-Nitrotoluene	µg/L	0.31	0.19	U	**0.11**	**J**	0.19	U	0.19	U	0.19	U
EXPLOSIVES	98-95-3	Nitrobenzene	µg/L	0.14	0.19	U	0.19	U	0.19	U	0.19	U	0.19	U
EXPLOSIVES	99-99-0	4-Nitrotoluene	µg/L	4.3	0.19	U	0.19	U	0.19	U	0.19	U	0.19	U
EXPLOSIVES	AEC1138	DNX	µg/L	--	--		**0.15**	**J**	--		0.19	U	--	
METALS	7439-89-6	Iron	µg/L	--	--		**110**	**J**	--		--		--	
METALS	7440-22-4	Silver	µg/L	94	--		0.5	U	--		0.5	U	--	
METALS	7440-39-3	Barium	µg/L	2000	--		**95**	**J**	--		**80.2**	**J**	--	
METALS	7440-47-3	Chromium	µg/L	100	--		2	U	--		2	U	--	
METALS	7782-49-2	Selenium	µg/L	50	--		2	U	--		2	U	--	
METALS-DISS	7440-39-3	Barium	µg/L	2000	--		**75.7**	**J**	--		**69.8**	**J**	--	
METALS-DISS	7782-49-2	Selenium	µg/L	50	--		**3.7**	**J**	--		2	U	--	

Notes:

Data flags associated with historical sample results are generally defined as follows: U = Nondetected result.

All other results with a flag (except U) are detections of estimated concentration.

Non-flagged results are unqualified detections

Bold indicates the analyte was detected

Shading indicates the analyte exceeded screening criteria

*Delineation screening level is the MCL. If no MCL is available, the EPA tap water RSL is selected as the delineation screening level.

Source: EPA's Regional Screening Levels (May 2016). Available online: https://www.epa.gov/risk/regional-screening-levels-rsls.

TNX - Hexahydro-1,3,5-trinitroso-1,3,5-triazine

MNX - 1-Nitroso-3,5-dinitro-1,3,5-triazacyclohexane

DNX - Hexahydro-1,3-dinitroso-5-dinitro-1,3,5-triazine

Table CCL-10-2. Contaminated Clothing Laundry: 2008–2014 Groundwater Analytical Results—Detected Chemicals

UFP-QAPP RI, IAAAP, Middletown, Iowa

				Location	CCL-TTMW-003		CCL-TTMW-004		CCL-TTMW-004		CCL-TTMW-005		CCL-TTMW-005	
				Sample ID	CCL-TTMW-003-4262013		CCL-TTMW-004-08122014		CCL-TTMW-004-4262013		CCL-TTMW-005-08182014		CCL-TTMW-005-4262013	
				Sample Date	4/26/2013		8/12/2014		4/26/2013		8/18/2014		4/26/2013	
Test Group	**CAS**	**Parameter**	**Unit**	**Screening Level***	**10 - 20 ft bgs**		**10 - 20 ft bgs**		**10 - 20 ft bgs**		**10 - 20 ft bgs**		**10 - 20 ft bgs**	
EXPLOSIVES	121-14-2	2,4-Dinitrotoluene	µg/L	0.24	0.19	U	0.19	U	0.2	U	0.19	U	0.19	U
EXPLOSIVES	121-82-4	RDX	µg/L	2	**4.8**		**0.37**		0.2	U	0.19	U	0.19	U
EXPLOSIVES	13980-04-6	TNX	µg/L	--	0.19	U	--		0.2	U	--		0.19	U
EXPLOSIVES	19406-51-0	4-Amino-2,6-dinitrotoluene	µg/L	39	0.19	U	0.19	U	0.2	U	0.19	U	0.19	U
EXPLOSIVES	2691-41-0	HMX	µg/L	1000	**8.9**		0.19	U	0.2	U	0.19	U	0.19	U
EXPLOSIVES	5755-27-1	MNX	µg/L	--	**0.34**		--		0.2	U	--		0.19	U
EXPLOSIVES	88-72-2	2-Nitrotoluene	µg/L	0.31	0.19	U	0.19	U	0.2	U	0.19	U	0.19	U
EXPLOSIVES	98-95-3	Nitrobenzene	µg/L	0.14	0.19	U	0.19	U	0.2	U	0.19	U	**0.18**	**J**
EXPLOSIVES	99-99-0	4-Nitrotoluene	µg/L	4.3	0.19	U	0.19	U	0.2	U	0.19	U	0.19	U
EXPLOSIVES	AEC1138	DNX	µg/L	--	0.19	U	--		0.2	U	--		0.19	U
METALS	7439-89-6	Iron	µg/L	--	--		--		--		--		--	
METALS	7440-22-4	Silver	µg/L	94	0.5	U	--		0.5	U	--		**0.5**	**J**
METALS	7440-39-3	Barium	µg/L	2000	**66.5**	**J**	--		**160**	**J**	--		**218**	
METALS	7440-47-3	Chromium	µg/L	100	**2.4**	**J**	--		2	U	--		2	U
METALS	7782-49-2	Selenium	µg/L	50	2	U	--		2	U	--		**2.7**	**J**
METALS-DISS	7440-39-3	Barium	µg/L	2000	**50.6**	**J**	--		**128**	**J**	--		**173**	**J**
METALS-DISS	7782-49-2	Selenium	µg/L	50	2	U	--		2	U	--		2	U

Notes:

Data flags associated with historical sample results are generally defined as follows: U = Nondetected result.

All other results with a flag (except U) are detections of estimated concentration.

Non-flagged results are unqualified detections

Bold indicates the analyte was detected

Shading indicates the analyte exceeded screening criteria

*Delineation screening level is the MCL. If no MCL is available, the EPA tap water RSL is selected as the delineation screening level.

Source: EPA's Regional Screening Levels (May 2016). Available online: https://www.epa.gov/risk/regional-screening-levels-rsls.

TNX - Hexahydro-1,3,5-trinitroso-1,3,5-triazine

MNX - 1-Nitroso-3,5-dinitro-1,3,5-triazacyclohexane

DNX - Hexahydro-1,3-dinitroso-5-dinitro-1,3,5-triazine

Table CCL-10-2. Contaminated Clothing Laundry: 2008–2014 Groundwater Analytical Results—Detected Chemicals

UFP-QAPP RI, IAAAP, Middletown, Iowa

				Location	CCL-TTMW-006		CCL-TTMW-006		CCL-TTMW-006		CCL-TTMW-006		CCL-TTMW-007	
				Sample ID	CCL-TTMW-006-07312014		CCL-TTMW-006-07312014-FD		CCL-TTMW-006-4262013		CCL-TTMW-006-4262013-FD		CCL-TTMW-007-08142014	
				Sample Date	7/31/2014		7/31/2014		4/26/2013		4/26/2013		8/14/2014	
Test Group	**CAS**	**Parameter**	**Unit**	**Screening Level***	**10 - 20 ft bgs**		**10 - 20 ft bgs**		**10 - 20 ft bgs**		**10 - 20 ft bgs**		**10 - 20 ft bgs**	
EXPLOSIVES	121-14-2	2,4-Dinitrotoluene	µg/L	0.24	0.19	U	0.19	U	0.19	U	**0.47**	**J**	0.19	U
EXPLOSIVES	121-82-4	RDX	µg/L	2	0.19	U	0.19	U	0.19	U	0.19	U	**1.2**	
EXPLOSIVES	13980-04-6	TNX	µg/L	--	--		--		0.19	U	0.19	U	--	
EXPLOSIVES	19406-51-0	4-Amino-2,6-dinitrotoluene	µg/L	39	0.19	U	0.19	U	0.19	U	0.19	U	0.19	U
EXPLOSIVES	2691-41-0	HMX	µg/L	1000	0.19	U	0.19	U	0.19	U	0.19	U	**1.1**	
EXPLOSIVES	5755-27-1	MNX	µg/L	--	--		--		0.19	U	0.19	U	--	
EXPLOSIVES	88-72-2	2-Nitrotoluene	µg/L	0.31	0.19	U	0.19	U	0.19	U	**0.87**	**J**	0.19	U
EXPLOSIVES	98-95-3	Nitrobenzene	µg/L	0.14	0.19	U	0.19	U	0.19	U	0.19	U	0.19	U
EXPLOSIVES	99-99-0	4-Nitrotoluene	µg/L	4.3	0.19	U	0.19	U	0.19	U	**0.76**	**J**	0.19	U
EXPLOSIVES	AEC1138	DNX	µg/L	--	--		--		0.19	U	0.19	U	--	
METALS	7439-89-6	Iron	µg/L	--	--		--		--		--		--	
METALS	7440-22-4	Silver	µg/L	94	--		--		0.5	U	0.5	U	--	
METALS	7440-39-3	Barium	µg/L	2000	--		--		**232**		**248**		--	
METALS	7440-47-3	Chromium	µg/L	100	--		--		2	U	2	U	--	
METALS	7782-49-2	Selenium	µg/L	50	--		--		**2.5**	**J**	**2.1**	**J**	--	
METALS-DISS	7440-39-3	Barium	µg/L	2000	--		--		**233**		**244**		--	
METALS-DISS	7782-49-2	Selenium	µg/L	50	--		--		2	U	2	U	--	

Notes:

Data flags associated with historical sample results are generally defined as follows: U = Nondetected result.

All other results with a flag (except U) are detections of estimated concentration.

Non-flagged results are unqualified detections

Bold indicates the analyte was detected

Shading indicates the analyte exceeded screening criteria

*Delineation screening level is the MCL. If no MCL is available, the EPA tap water RSL is selected as the delineation screening level.

Source: EPA's Regional Screening Levels (May 2016). Available online: https://www.epa.gov/risk/regional-screening-levels-rsls.

TNX - Hexahydro-1,3,5-trinitroso-1,3,5-triazine

MNX - 1-Nitroso-3,5-dinitro-1,3,5-triazacyclohexane

DNX - Hexahydro-1,3-dinitroso-5-dinitro-1,3,5-triazine

Table CCL-10-2. Contaminated Clothing Laundry: 2008–2014 Groundwater Analytical Results—Detected Chemicals

UFP-QAPP RI, IAAAP, Middletown, Iowa

				Location	CCL-TTMW-007		CCL-TTMW-008		CCL-TTMW-008		CCL-TTMW-09		CCL-TTTW-006		CCL-TTTW-006R	
				Sample ID	CCL-TTMW-007-6112013		CCL-TTMW-008-08072014		CCL-TTMW-008-4262013		CCL-TTMW-009-01192015		CCL-TTTW-006		CCL-TTTW-006R-012511	
				Sample Date	6/11/2013		8/7/2014		4/26/2013		1/19/2015		5/15/2008		1/25/2011	
Test Group	**CAS**	**Parameter**	**Unit**	**Screening Level***	**10 - 20 ft bgs**		**10 - 20 ft bgs**		**10 - 20 ft bgs**		**30 to 35 ft bgs**		**10 to 20 ft bgs**		**10 to 20 ft bgs**	
EXPLOSIVES	121-14-2	2,4-Dinitrotoluene	µg/L	0.24	0.2	U	0.19	U	**1.7**		0.19	U	0.2	U	0.19	U
EXPLOSIVES	121-82-4	RDX	µg/L	2	**1.6**		0.19	U	0.19	U	0.19	U	**4.8**		**0.68**	
EXPLOSIVES	13980-04-6	TNX	µg/L	--	0.2	U	--		0.19	U	--		--		0.19	U
EXPLOSIVES	19406-51-0	4-Amino-2,6-dinitrotoluene	µg/L	39	0.2	U	0.19	U	0.19	U	0.19	U	**0.13**	**J**	0.19	U
EXPLOSIVES	2691-41-0	HMX	µg/L	1000	**1.3**		0.19	U	0.19	U	0.19	U	**7.2**		**3.7**	**J**
EXPLOSIVES	5755-27-1	MNX	µg/L	--	0.2	U	--		0.38	U	--		--		0.19	U
EXPLOSIVES	88-72-2	2-Nitrotoluene	µg/L	0.31	0.2	U	0.19	U	**1.6**		0.19	U	0.2	U	0.19	U
EXPLOSIVES	98-95-3	Nitrobenzene	µg/L	0.14	0.2	U	0.19	U	0.19	U	0.19	U	0.2	U	0.19	U
EXPLOSIVES	99-99-0	4-Nitrotoluene	µg/L	4.3	0.2	U	0.19	U	**1.6**		0.19	U	0.2	U	0.19	U
EXPLOSIVES	AEC1138	DNX	µg/L	--	0.2	U	--		0.19	U	--		--		0.19	U
METALS	7439-89-6	Iron	µg/L	--	--		--		--		--		--		**1150**	**J**
METALS	7440-22-4	Silver	µg/L	94	0.5	U	--		0.5	U	--		--		--	
METALS	7440-39-3	Barium	µg/L	2000	**196**	**J**	--		**85.4**	**J**	--		--		--	
METALS	7440-47-3	Chromium	µg/L	100	2	U	--		2	U	--		--		--	
METALS	7782-49-2	Selenium	µg/L	50	2	U	--		2	U	--		--		--	
METALS-DISS	7440-39-3	Barium	µg/L	2000	**158**	**J**	--		**80.7**	**J**	--		--		--	
METALS-DISS	7782-49-2	Selenium	µg/L	50	2	U	--		2	U	--		--		--	

Notes:

Data flags associated with historical sample results are generally defined as follows: U = Nondetected result.

All other results with a flag (except U) are detections of estimated concentration.

Non-flagged results are unqualified detections

Bold indicates the analyte was detected

Shading indicates the analyte exceeded screening criteria

*Delineation screening level is the MCL. If no MCL is available, the EPA tap water RSL is selected as the delineation screening level.

Source: EPA's Regional Screening Levels (May 2016). Available online: https://www.epa.gov/risk/regional-screening-levels-rsls.

TNX - Hexahydro-1,3,5-trinitroso-1,3,5-triazine

MNX - 1-Nitroso-3,5-dinitro-1,3,5-triazacyclohexane

DNX - Hexahydro-1,3-dinitroso-5-dinitro-1,3,5-triazine

Table CCL-10-2. Contaminated Clothing Laundry: 2008–2014 Groundwater Analytical Results—Detected Chemicals

UFP-QAPP RI, IAAAP, Middletown, Iowa

				Location	CCL-TTTW-006R		CCL-TTTW-006R		CCL-TTTW-006R		CCL-TTTW-007		CCL-TTTW-007	
				Sample ID	CCL-TTTW-006R-012511-FD		CCL-TTTW-006R-07152009		CCL-TTTW-006R-07152009-FD		CCL-007-GW		CCL-TTTW-007-07152009	
				Sample Date	1/25/2011		7/15/2009		7/15/2009		6/10/2008		7/15/2009	
Test Group	**CAS**	**Parameter**	**Unit**	**Screening Level***	**10 to 20 ft bgs**		**10 to 20 ft bgs**		**10 to 20 ft bgs**		**10 to 20 ft bgs**		**10 to 20 ft bgs**	
EXPLOSIVES	121-14-2	2,4-Dinitrotoluene	µg/L	0.24	0.19	U	0.19	U	0.19	U	0.19	U	0.19	U
EXPLOSIVES	121-82-4	RDX	µg/L	2	**0.74**		**0.75**	**J**	**0.28**	**J**	**1.9**		**0.93**	
EXPLOSIVES	13980-04-6	TNX	µg/L	--	0.19	U	0.19	U	0.19	U	--		0.19	U
EXPLOSIVES	19406-51-0	4-Amino-2,6-dinitrotoluene	µg/L	39	0.19	U	0.19	U	0.19	U	**0.15**	**J**	0.19	U
EXPLOSIVES	2691-41-0	HMX	µg/L	1000	**3**	**J**	**4.3**	**J**	**2.9**	**J**	**10.9**		**6.5**	
EXPLOSIVES	5755-27-1	MNX	µg/L	--	0.19	U	**0.24**		**0.2**		--		**0.11**	**J**
EXPLOSIVES	88-72-2	2-Nitrotoluene	µg/L	0.31	0.19	U	0.19	U	0.19	U	0.19	U	0.19	U
EXPLOSIVES	98-95-3	Nitrobenzene	µg/L	0.14	0.19	U	0.19	U	0.19	U	0.19	U	0.19	U
EXPLOSIVES	99-99-0	4-Nitrotoluene	µg/L	4.3	0.19	U	0.19	U	0.19	U	0.19	U	0.19	U
EXPLOSIVES	AEC1138	DNX	µg/L	--	0.19	U	0.19	U	0.19	U	--		0.19	U
METALS	7439-89-6	Iron	µg/L	--	**619**	**J**	**2340**	**J**	**6280**	**J**	--		23	U
METALS	7440-22-4	Silver	µg/L	94	--		--		--		--		--	
METALS	7440-39-3	Barium	µg/L	2000	--		--		--		--		--	
METALS	7440-47-3	Chromium	µg/L	100	--		--		--		--		--	
METALS	7782-49-2	Selenium	µg/L	50	--		--		--		--		--	
METALS-DISS	7440-39-3	Barium	µg/L	2000	--		--		--		--		--	
METALS-DISS	7782-49-2	Selenium	µg/L	50	--		--		--		--		--	

Notes:

Data flags associated with historical sample results are generally defined as follows: U = Nondetected result.

All other results with a flag (except U) are detections of estimated concentration.

Non-flagged results are unqualified detections

Bold indicates the analyte was detected

Shading indicates the analyte exceeded screening criteria

*Delineation screening level is the MCL. If no MCL is available, the EPA tap water RSL is selected as the delineation screening level.

Source: EPA's Regional Screening Levels (May 2016). Available online: https://www.epa.gov/risk/regional-screening-levels-rsls.

TNX - Hexahydro-1,3,5-trinitroso-1,3,5-triazine

MNX - 1-Nitroso-3,5-dinitro-1,3,5-triazacyclohexane

DNX - Hexahydro-1,3-dinitroso-5-dinitro-1,3,5-triazine

Table CCL-10-2. Contaminated Clothing Laundry: 2008–2014 Groundwater Analytical Results—Detected Chemicals

UFP-QAPP RI, IAAAP, Middletown, Iowa

				Location	CCL-TTTW-008		CCL-TTTW-008		CCL-TTTW-008		CCL-TTTW-009		CCL-TTTW-009		CCL-TTTW-010	
				Sample ID	CCL-008-GW		CCL-TTTW-008-022111		CCL-TTTW-008-07162009		CCL-009-GW		CCL-TTTW-009-07162009		CCL-010-GW	
				Sample Date	6/5/2008		2/21/2011		7/16/2009		6/5/2008		7/16/2009		6/5/2008	
Test Group	**CAS**	**Parameter**	**Unit**	**Screening Level***	**10 to 20 ft bgs**		**10 to 20 ft bgs**		**10 to 20 ft bgs**		**10 to 20 ft bgs**		**10 to 20 ft bgs**		**10 to 20 ft bgs**	
EXPLOSIVES	121-14-2	2,4-Dinitrotoluene	µg/L	0.24	0.19	U	0.19	U	0.19	U	0.19	U	0.2	U	0.19	U
EXPLOSIVES	121-82-4	RDX	µg/L	2	0.19	U	**0.13**	**J**	**7.3**		**8.9**		0.2	U	**20.5**	
EXPLOSIVES	13980-04-6	TNX	µg/L	--	--		**0.31**		0.19	U	--		0.2	U	--	
EXPLOSIVES	19406-51-0	4-Amino-2,6-dinitrotoluene	µg/L	39	0.19	U	0.19	U	0.19	U	0.19	U	0.2	U	**0.16**	**J**
EXPLOSIVES	2691-41-0	HMX	µg/L	1000	**0.94**		**0.79**		**25**		**13**		**0.2**		**19.6**	
EXPLOSIVES	5755-27-1	MNX	µg/L	--	--		0.19	U	**0.37**		--		0.2	U	--	
EXPLOSIVES	88-72-2	2-Nitrotoluene	µg/L	0.31	0.19	U	0.19	U	0.19	U	0.19	U	0.2	U	0.19	U
EXPLOSIVES	98-95-3	Nitrobenzene	µg/L	0.14	0.19	U	0.38	U	0.19	U	0.19	U	0.2	U	0.19	U
EXPLOSIVES	99-99-0	4-Nitrotoluene	µg/L	4.3	0.19	U	0.19	U	0.19	U	0.19	U	0.2	U	0.19	U
EXPLOSIVES	AEC1138	DNX	µg/L	--	--		0.19	U	0.19	U	--		0.2	U	--	
METALS	7439-89-6	Iron	µg/L	--	--		35	U	23	U	--		23	U	--	
METALS	7440-22-4	Silver	µg/L	94	--		--				--		--		--	
METALS	7440-39-3	Barium	µg/L	2000	--		--				--		--		--	
METALS	7440-47-3	Chromium	µg/L	100	--		--				--		--		--	
METALS	7782-49-2	Selenium	µg/L	50	--		--				--		--		--	
METALS-DISS	7440-39-3	Barium	µg/L	2000	--		--				--		--		--	
METALS-DISS	7782-49-2	Selenium	µg/L	50	--		--				--		--		--	

Notes:

Data flags associated with historical sample results are generally defined as follows: U = Nondetected result.

All other results with a flag (except U) are detections of estimated concentration.

Non-flagged results are unqualified detections

Bold indicates the analyte was detected

Shading indicates the analyte exceeded screening criteria

*Delineation screening level is the MCL. If no MCL is available, the EPA tap water RSL is selected as the delineation screening level.

Source: EPA's Regional Screening Levels (May 2016). Available online: https://www.epa.gov/risk/regional-screening-levels-rsls.

TNX - Hexahydro-1,3,5-trinitroso-1,3,5-triazine

MNX - 1-Nitroso-3,5-dinitro-1,3,5-triazacyclohexane

DNX - Hexahydro-1,3-dinitroso-5-dinitro-1,3,5-triazine

Table CCL-10-2. Contaminated Clothing Laundry: 2008–2014 Groundwater Analytical Results—Detected Chemicals

UFP-QAPP RI, IAAAP, Middletown, Iowa

				Location	CCL-TTTW-010		CCL-TTTW-010		CCL-TTTW-011		CCL-TTTW-012		CCL-TTTW-012		CCL-TTTW-013	
				Sample ID	CCL-TTTW-010-021011		CCL-TTTW-010-07162009		CCL-TTTW-011		CCL-TTTW-012-021011		CCL-TTTW-012-07152009		CCL-TTTW-013-020411	
				Sample Date	2/10/2011		7/16/2009		5/15/2008		2/10/2011		7/15/2009		2/4/2011	
Test Group	**CAS**	**Parameter**	**Unit**	**Screening Level***	**10 to 20 ft bgs**		**10 to 20 ft bgs**		**10 to 20 ft bgs**		**10 to 20 ft bgs**		**10 to 20 ft bgs**		**10 to 20 ft bgs**	
EXPLOSIVES	121-14-2	2,4-Dinitrotoluene	µg/L	0.24	0.19	U	0.2	U	0.19	U	0.19	U	0.19	U	0.19	U
EXPLOSIVES	121-82-4	RDX	µg/L	2	**5.5**		0.2	U	**1.9**		**3.1**		**5.6**		**0.68**	
EXPLOSIVES	13980-04-6	TNX	µg/L	--	**0.42**	**J**	0.2	U	--		**0.27**	**J**	**0.13**	**J**	0.19	U
EXPLOSIVES	19406-51-0	4-Amino-2,6-dinitrotoluene	µg/L	39	0.19	U	0.2	U	0.19	U	0.19	U	0.19	U	0.19	U
EXPLOSIVES	2691-41-0	HMX	µg/L	1000	**10.1**		0.2	U	**8.9**		**2.7**		**4.7**		**2.2**	
EXPLOSIVES	5755-27-1	MNX	µg/L	--	**0.42**		0.2	U	--		**0.27**		**0.44**		0.19	U
EXPLOSIVES	88-72-2	2-Nitrotoluene	µg/L	0.31	0.19	U	0.2	U	0.19	U	0.19	U	0.19	U	0.19	U
EXPLOSIVES	98-95-3	Nitrobenzene	µg/L	0.14	0.76	U	0.2	U	0.19	U	0.19	U	0.19	U	0.19	U
EXPLOSIVES	99-99-0	4-Nitrotoluene	µg/L	4.3	0.19	U	0.2	U	0.19	U	0.19	U	0.19	U	0.19	U
EXPLOSIVES	AEC1138	DNX	µg/L	--	0.19	U	0.2	U	--		0.19	U	0.19	U	0.19	U
METALS	7439-89-6	Iron	µg/L	--	300	U	23	U	--		**1170**		**24400**		**1150**	
METALS	7440-22-4	Silver	µg/L	94	--		--		--		--		--		--	
METALS	7440-39-3	Barium	µg/L	2000	--		--		--		--		--		--	
METALS	7440-47-3	Chromium	µg/L	100	--		--		--		--		--		--	
METALS	7782-49-2	Selenium	µg/L	50	--		--		--		--		--		--	
METALS-DISS	7440-39-3	Barium	µg/L	2000	--		--		--		--		--		--	
METALS-DISS	7782-49-2	Selenium	µg/L	50	--		--		--		--		--		--	

Notes:

Data flags associated with historical sample results are generally defined as follows: U = Nondetected result.

All other results with a flag (except U) are detections of estimated concentration.

Non-flagged results are unqualified detections

Bold indicates the analyte was detected

Shading indicates the analyte exceeded screening criteria

*Delineation screening level is the MCL. If no MCL is available, the EPA tap water RSL is selected as the delineation screening level.

Source: EPA's Regional Screening Levels (May 2016). Available online: https://www.epa.gov/risk/regional-screening-levels-rsls.

TNX - Hexahydro-1,3,5-trinitroso-1,3,5-triazine

MNX - 1-Nitroso-3,5-dinitro-1,3,5-triazacyclohexane

DNX - Hexahydro-1,3-dinitroso-5-dinitro-1,3,5-triazine

Table CCL-10-2. Contaminated Clothing Laundry: 2008–2014 Groundwater Analytical Results—Detected Chemicals

UFP-QAPP RI, IAAAP, Middletown, Iowa

				Location	CCL-TTTW-013		CCL-TTTW-014		CCL-TTTW-014		CCL-TTTW-015	CCL-TTTW-015	
				Sample ID	CCL-TTTW-013-07152009		CCL-TTTW-014-022811		CCL-TTTW-014-07162009		CCL-TTTW-015-012811	CCL-TTTW-015-07162009	
				Sample Date	7/15/2009		2/28/2011		7/16/2009		1/28/2011	7/16/2009	
Test Group	**CAS**	**Parameter**	**Unit**	**Screening Level***	**10 to 20 ft bgs**		**10 to 20 ft bgs**		**10 to 20 ft bgs**		**10 to 20 ft bgs**	**10 to 20 ft bgs**	
EXPLOSIVES	121-14-2	2,4-Dinitrotoluene	µg/L	0.24	0.19	U	0.19	U	0.19	U	--	0.2	U
EXPLOSIVES	121-82-4	RDX	µg/L	2	**4.1**		**0.12**	**J**	0.19	U	--	0.2	U
EXPLOSIVES	13980-04-6	TNX	µg/L	--	0.19	U	0.19	U	0.19	U	--	0.2	U
EXPLOSIVES	19406-51-0	4-Amino-2,6-dinitrotoluene	µg/L	39	0.19	U	0.19	U	0.19	U	--	0.2	U
EXPLOSIVES	2691-41-0	HMX	µg/L	1000	**5.7**		**5**		**1.3**		--	0.2	U
EXPLOSIVES	5755-27-1	MNX	µg/L	--	**0.32**		0.19	U	0.19	U	--	0.2	U
EXPLOSIVES	88-72-2	2-Nitrotoluene	µg/L	0.31	0.19	U	0.19	U	0.19	U	--	0.2	U
EXPLOSIVES	98-95-3	Nitrobenzene	µg/L	0.14	0.19	U	0.19	U	0.19	U	--	0.2	U
EXPLOSIVES	99-99-0	4-Nitrotoluene	µg/L	4.3	0.19	U	0.19	U	0.19	U	--	0.2	U
EXPLOSIVES	AEC1138	DNX	µg/L	--	0.19	U	0.19	U	0.19	U	--	0.2	U
METALS	7439-89-6	Iron	µg/L	--	**20800**		**144**	**J**	**65000**		--	**48500**	
METALS	7440-22-4	Silver	µg/L	94	--		--		--		--	--	
METALS	7440-39-3	Barium	µg/L	2000	--		--		--		--	--	
METALS	7440-47-3	Chromium	µg/L	100	--		--		--		--	--	
METALS	7782-49-2	Selenium	µg/L	50	--		--		--		--	--	
METALS-DISS	7440-39-3	Barium	µg/L	2000	--		--		--		--	--	
METALS-DISS	7782-49-2	Selenium	µg/L	50	--		--		--		--	--	

Notes:

Data flags associated with historical sample results are generally defined as follows: U = Nondetected result.

All other results with a flag (except U) are detections of estimated concentration.

Non-flagged results are unqualified detections

Bold indicates the analyte was detected

Shading indicates the analyte exceeded screening criteria

*Delineation screening level is the MCL. If no MCL is available, the EPA tap water RSL is selected as the delineation screening level.

Source: EPA's Regional Screening Levels (May 2016). Available online: https://www.epa.gov/risk/regional-screening-levels-rsls.

TNX - Hexahydro-1,3,5-trinitroso-1,3,5-triazine

MNX - 1-Nitroso-3,5-dinitro-1,3,5-triazacyclohexane

DNX - Hexahydro-1,3-dinitroso-5-dinitro-1,3,5-triazine

Table CCL-10-2. Contaminated Clothing Laundry: 2008–2014 Groundwater Analytical Results—Detected Chemicals

UFP-QAPP RI, IAAAP, Middletown, Iowa

				Location	CCL-TTTW-016		CCL-TTTW-016		CCL-TTTW-017		CCL-TTTW-018		CCL-TTTW-019	
				Sample ID	CCL-TTTW-016-022111		CCL-TTTW-016-07162009		CCL-TTTW-017-022111		CCL-TTTW-018-013111		CCL-TTTW-019-013111	
				Sample Date	2/21/2011		7/16/2009		2/21/2011		1/31/2011		1/31/2011	
Test Group	**CAS**	**Parameter**	**Unit**	**Screening Level***	**10 to 20 ft bgs**		**10 to 20 ft bgs**		**10 to 20 ft bgs**		**10 to 20 ft bgs**		**10 to 20 ft bgs**	
EXPLOSIVES	121-14-2	2,4-Dinitrotoluene	µg/L	0.24	0.19	U	0.2	U	0.19	U	0.19	U	0.19	U
EXPLOSIVES	121-82-4	RDX	µg/L	2	0.19	U	0.2	U	0.19	U	**1.1**		0.19	U
EXPLOSIVES	13980-04-6	TNX	µg/L	--	**1**		0.2	U	0.38	U	0.19	U	0.19	U
EXPLOSIVES	19406-51-0	4-Amino-2,6-dinitrotoluene	µg/L	39	0.19	U	0.2	U	0.19	U	0.19	U	0.19	U
EXPLOSIVES	2691-41-0	HMX	µg/L	1000	**0.82**		0.2	U	0.19	U	0.19	U	**0.14**	**J**
EXPLOSIVES	5755-27-1	MNX	µg/L	--	0.19	U	0.2	U	0.19	U	0.19	U	0.19	U
EXPLOSIVES	88-72-2	2-Nitrotoluene	µg/L	0.31	0.19	U	0.2	U	0.19	U	0.19	U	0.19	U
EXPLOSIVES	98-95-3	Nitrobenzene	µg/L	0.14	**0.31**		0.2	U	0.19	U	0.19	U	0.19	U
EXPLOSIVES	99-99-0	4-Nitrotoluene	µg/L	4.3	0.19	U	0.2	U	0.19	U	0.19	U	0.19	U
EXPLOSIVES	AEC1138	DNX	µg/L	--	0.19	U	0.2	U	0.19	U	0.19	U	0.19	U
METALS	7439-89-6	Iron	µg/L	--	**3410**		**79400**		35	U	**546**		300	U
METALS	7440-22-4	Silver	µg/L	94	--		--		--		--		--	
METALS	7440-39-3	Barium	µg/L	2000	--		--		--		--		--	
METALS	7440-47-3	Chromium	µg/L	100	--		--		--		--		--	
METALS	7782-49-2	Selenium	µg/L	50	--		--		--		--		--	
METALS-DISS	7440-39-3	Barium	µg/L	2000	--		--		--		--		--	
METALS-DISS	7782-49-2	Selenium	µg/L	50	--		--		--		--		--	

Notes:

Data flags associated with historical sample results are generally defined as follows: U = Nondetected result.

All other results with a flag (except U) are detections of estimated concentration.

Non-flagged results are unqualified detections

Bold indicates the analyte was detected

Shading indicates the analyte exceeded screening criteria

*Delineation screening level is the MCL. If no MCL is available, the EPA tap water RSL is selected as the delineation screening level.

Source: EPA's Regional Screening Levels (May 2016). Available online: https://www.epa.gov/risk/regional-screening-levels-rsls.

TNX - Hexahydro-1,3,5-trinitroso-1,3,5-triazine

MNX - 1-Nitroso-3,5-dinitro-1,3,5-triazacyclohexane

DNX - Hexahydro-1,3-dinitroso-5-dinitro-1,3,5-triazine

Table CCL-10-2. Contaminated Clothing Laundry: 2008–2014 Groundwater Analytical Results—Detected Chemicals

UFP-QAPP RI, IAAAP, Middletown, Iowa

				Location	CCL-TTTW-020		CCL-TTTW-021		CCL-TTTW-021		CCL-TTTW-022		CCL-TTTW-023	
				Sample ID	CCL-TTTW-020-020411		CCL-TTTW-021-120414		CCL-TTTW-021-120414-FD		CCL-TTTW-022-120414		CCL-TTTW-023-120414	
				Sample Date	2/4/2011		12/4/2014		12/4/2014		12/4/2014		12/4/2014	
Test Group	**CAS**	**Parameter**	**Unit**	**Screening Level***	**10 to 20 ft bgs**		**10 to 20 ft bgs**		**10 to 20 ft bgs**		**10 to 20 ft bgs**		**10 to 20 ft bgs**	
EXPLOSIVES	121-14-2	2,4-Dinitrotoluene	µg/L	0.24	0.19	U	0.19	U	0.19	U	0.19	U	0.19	U
EXPLOSIVES	121-82-4	RDX	µg/L	2	0.19	U	0.19	U	0.19	U	0.19	U	0.19	U
EXPLOSIVES	13980-04-6	TNX	µg/L	--	0.19	U	--		--		--		--	
EXPLOSIVES	19406-51-0	4-Amino-2,6-dinitrotoluene	µg/L	39	0.19	U	0.19	U	0.19	U	0.19	U	0.19	U
EXPLOSIVES	2691-41-0	HMX	µg/L	1000	0.19	U	0.19	U	0.19	U	0.19	U	0.19	U
EXPLOSIVES	5755-27-1	MNX	µg/L	--	0.19	U	--		--		--		--	
EXPLOSIVES	88-72-2	2-Nitrotoluene	µg/L	0.31	0.19	U	0.19	U	0.19	U	0.19	U	0.19	U
EXPLOSIVES	98-95-3	Nitrobenzene	µg/L	0.14	0.19	U	0.19	U	0.19	U	0.19	U	0.19	U
EXPLOSIVES	99-99-0	4-Nitrotoluene	µg/L	4.3	0.19	U	0.19	U	0.19	U	0.19	U	0.19	U
EXPLOSIVES	AEC1138	DNX	µg/L	--	0.19	U	--		--		--		--	
METALS	7439-89-6	Iron	µg/L	--	**84.1**	**J**	--		--		--		--	
METALS	7440-22-4	Silver	µg/L	94	--		--		--		--		--	
METALS	7440-39-3	Barium	µg/L	2000	--		--		--		--		--	
METALS	7440-47-3	Chromium	µg/L	100	--		--		--		--		--	
METALS	7782-49-2	Selenium	µg/L	50	--		--		--		--		--	
METALS-DISS	7440-39-3	Barium	µg/L	2000	--		--		--		--		--	
METALS-DISS	7782-49-2	Selenium	µg/L	50	--		--		--		--		--	

Notes:

Data flags associated with historical sample results are generally defined as follows: U = Nondetected result.

All other results with a flag (except U) are detections of estimated concentration.

Non-flagged results are unqualified detections

Bold indicates the analyte was detected

Shading indicates the analyte exceeded screening criteria

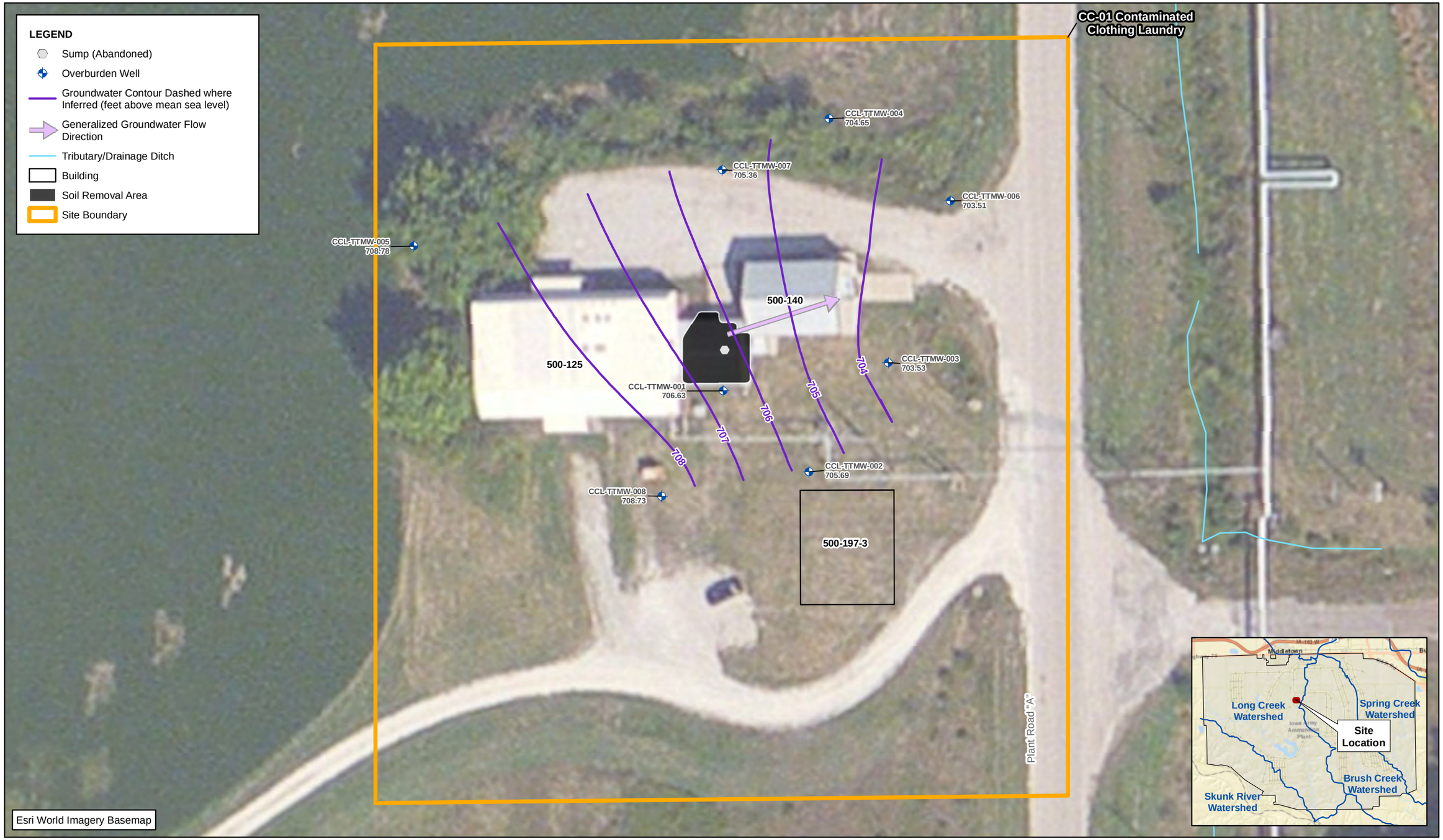
*Delineation screening level is the MCL. If no MCL is available, the EPA tap water RSL is selected as the delineation screening level.

Source: EPA's Regional Screening Levels (May 2016). Available online: https://www.epa.gov/risk/regional-screening-levels-rsls.

TNX - Hexahydro-1,3,5-trinitroso-1,3,5-triazine

MNX - 1-Nitroso-3,5-dinitro-1,3,5-triazacyclohexane

DNX - Hexahydro-1,3-dinitroso-5-dinitro-1,3,5-triazine

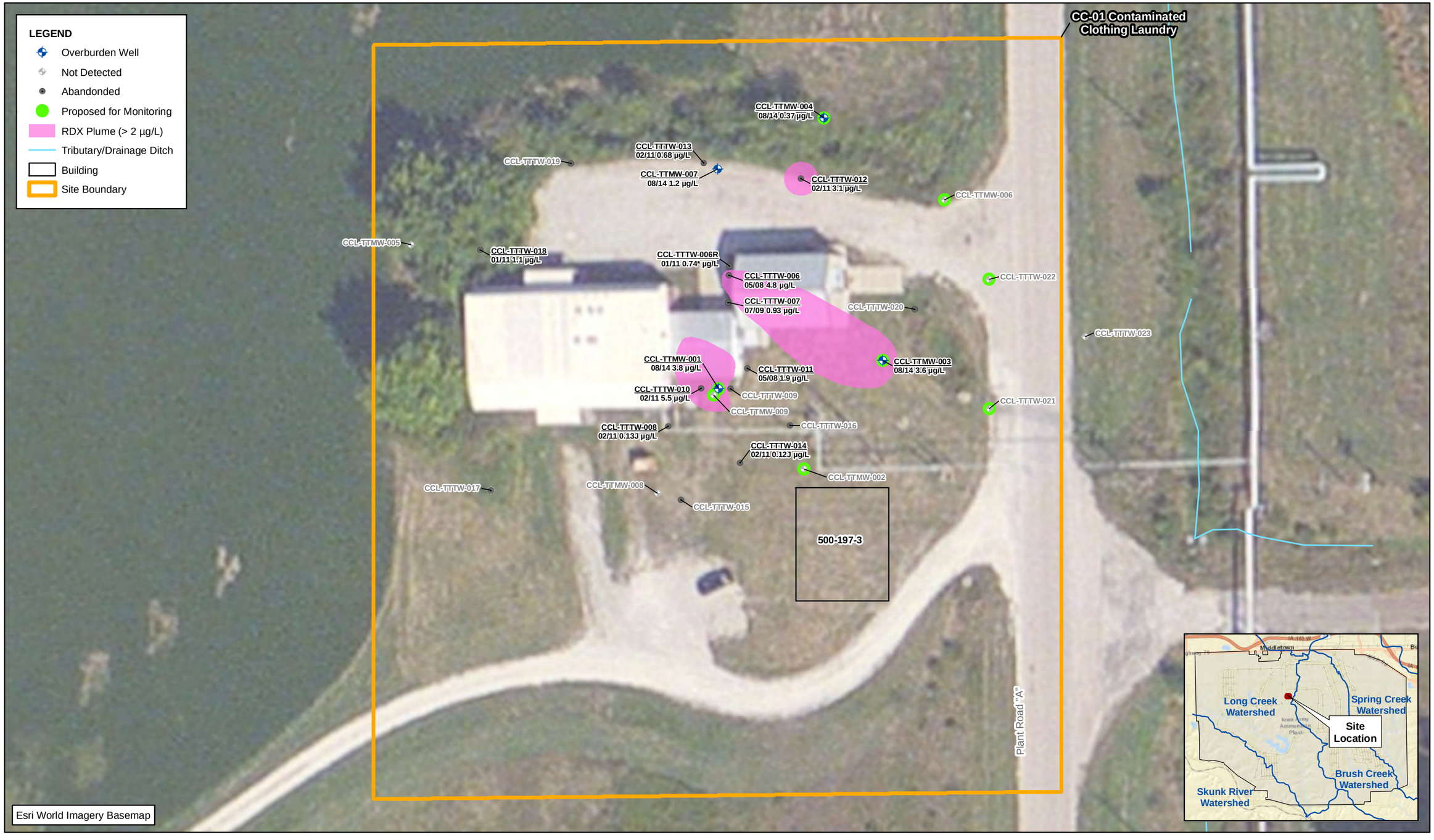


Notes:
1. Groundwater elevations are from May 2015
2. The sump location was approximated based on historical information.

N
0 75
Feet

Figure CCL-10-1
Contaminated Clothing Laundry Site Map with Potentiometric Surface
Iowa Army Ammunition Plant
Middletown, Iowa

SCO R:\ENBG\00_PROJ\U\USACE\IAAAP_679172\MAPFILES\CCL\CCL_SITELAYOUT_B.MXD GTWIGG 4/13/2017 2:05:05 PM



N

0 40

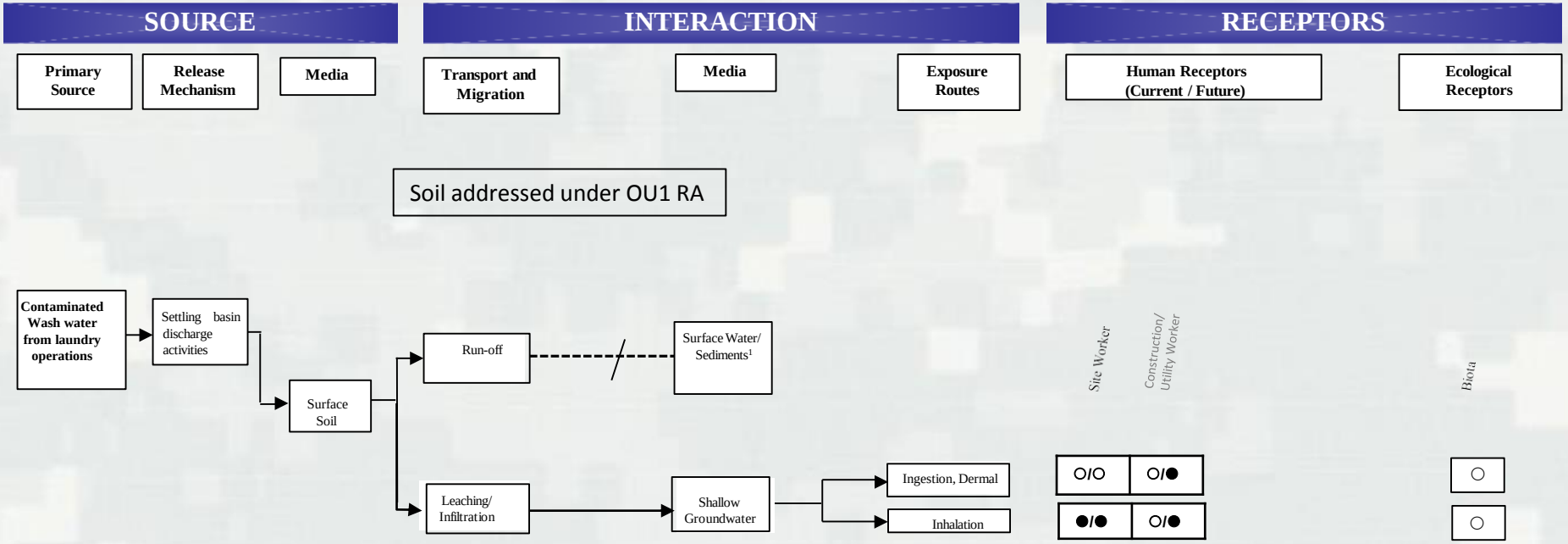
Feet

Notes:
1. Latest concentration is shown.
2. RDX - Royal Demolition Explosive
3. Detected concentrations shown in micrograms per liter (µg/L).
4. At locations where a field duplicate was collected, the higher detected value is shown.

Criteria
RDX = 2 µg/L

Figure CCL-10-2
Contaminated Clothing Laundry Site Map
RDX in Groundwater
Iowa Army Ammunition Plant
Middletown, Iowa

SCO R:\ENBG\00_PROJ\U\USACE\IAAAP_679172\MAPFILES\CCL\CCL_PLUMEMAP_B.MXD AESPEJO 9/18/2017 11:26:38 AM



[1]Nearest surface water tributary is approximately 1 mile away from site.

LEGEND

- Flow-chart continues
- Incomplete Pathway
- ● Potentially Complete Pathway
- ○ Incomplete Pathway
- ▲ Complete but significance unknown

POTENTIAL EXPOSURE SCENARIOS

Receptor	Potential Exposure Activity	Exposure Media / Pathways
Site Worker (industrial)	Grounds maintenance, industrial activities	GW (VI Inh)
Construction/utility worker	Construction or utility activities in trenches	GW (Ing, Derm, Inh)

Figure CCL-10-3
Contaminated Clothing Laundry
Preliminary Conceptual Exposure Model
Iowa Army Ammunition Plant
Middletown, Iowa

Contaminated Clothing Laundry Worksheet #11: Project/Data Quality Objectives

Project DQOs define the type, quantity, and quality of data that are needed to answer specific environmental questions and support proper environmental decisions. The DQOs were developed during the work planning process.

Who Will Use the Data?

U.S. Army Corps of Engineers (USACE), IAAAP, Army Environmental Command, the CH2M team, and other project stakeholders will use the data to support the environmental decisions, as outlined in CCL Worksheets #10, #17, and #18.

What Are the Project Screening Levels?

Concentrations of explosives and chromium VI will be compared with the screening levels to evaluate nature and extent of contamination in groundwater and are discussed in CCL Worksheet #10. The screening levels are described in IAAAP Worksheet #15, and were developed to meet the most stringent laboratory reporting requirement. The use of the screening levels to make decisions about the site is described in Table CCL-11-1.

What Will the Data Be Used for?

As indicated in CCL Worksheet #14, groundwater samples will be collected and analyzed for explosives and chromium VI to supplement the RI objectives, which is to characterize the site.

What Types of Data Are Needed and How "Good" Do the Data Need to Be in Order to Support the Environmental Decision?

The types of data that are needed include definitive level data quality analyzed using a DoD-certified laboratory for the methods and analytes as described in IAAAP Worksheet #15. Definitive-quality data will be screened against the appropriate screening levels and used to support the decisions listed in Table CCL-11-1. The use of these data is not restricted unless there is a quality problem, such as a recurring quality control exceedance or a gross quality control exceedance that would result in rejected data as defined in IAAAP Worksheet #36. The sampling design and rationale are presented in CCL Worksheet #17.

How Many Data Are Needed? Where, When, and How Should They Be Collected and Generated?

Tables provided in IAAAP Worksheet #14 describe the planned field investigation activities. The number and locations of samples needed, and the rationale for placement, are presented in CCL Worksheets #17 and #18.

Who Will Collect and Generate the Data?

The CH2M team will collect the data on behalf of USACE and IAAAP. Samples for analysis will be sent under chain of custody to the TestAmerica Laboratory, which maintains required certifications to meet State of Iowa and DoD requirements, which include National Environmental Laboratory Accreditation Program certification and the DoD ELAP.

How Will the Data Be Reported and Archived?

The data will be reported according to procedures outlined in this UFP-QAPP. Hard copy and/or electronic (such as database management system) data will be stored by CH2M for 5 years after project completion. Project data and reports will be managed by the CH2M team via a CH2M proprietary database system with final data deliverables to the USACE into the Environmental Restoration Information System (ERIS). The final report will become part of the Administrative Record file.

Table CCL-11-1. Data Quality Objectives
UFP-QAPP RI, IAAAP, Middletown, Iowa

Step 1: Problem Statement	Step 2: Decisions to be Made	Step 3: Input to the Decision	Step 4: Study Area Boundaries	Step 5: Decision Rules	Step 6: Acceptable Limits on Decision Error	Step 7: Optimize the Design
Previous groundwater sampling did not speciate between chromium VI and III, resulting in chromium being identified as a COC in the Human Health Risk Assessment (which conservatively assumed all detected chromium was chromium VI). Chromium was not used at the site. Collection of additional groundwater data is needed to characterize the extent of chromium VI if present in groundwater. The explosives (represented by RDX) plume extent has been delineated and concentrations have decreased between 2008/2009 and 2014. Collection of additional groundwater data is needed to evaluate current conditions.	To evaluate chromium VI and explosives in groundwater and potential risk to human health and the environment, the following decisions will need to be made: 1. What quantity and location of samples are required to adequately characterize chromium VI and explosives in groundwater? 2. Is chromium VI or explosives present in groundwater at concentrations greater than respective EPA RSL for industrial worker ingestion? 3. Is the extent of the plume defined for the RI?	Elements to be considered in the decisions include the following: 1. Information and data collected during the previous investigations. 2. Existing historical records of onsite use and releases. 3. The site-specific CSM, such as topography, geology and hydrogeology, nature and extent of contamination, current and historical surface water drainage features, and groundwater flow direction. 4. Site improvements or development history that have occurred after release or sampling. 5. Depth to groundwater measurements and groundwater gradient. 6. Sample locations and depths. 7. Existing and newly collected analytical data.	**Spatial Boundaries***:* The project area is defined vertically and laterally by the existing network of monitoring wells at the site.	***Decision 1–Location of Samples*** The locations of the proposed groundwater samples are based on historical groundwater information and the current understanding of the nature and extent of explosives and chromium VI in groundwater. ***Decision 2 – Evaluate Potential Risk*** If COPCs in groundwater are greater than applicable health-based screening levels, then these chemicals will be incorporated into the baseline risk assessment and a FS will be recommended, if warranted. If COPCs are below screening levels, then no additional actions are warranted, such as an FS.	Judgmental samples will be collected to evaluate groundwater concentrations compared to screening levels. Laboratory analyses will be conducted in accordance with this UFP-QAPP. Analytical chemical data will meet quality expectations for PARCCS, as defined by this UFP-QAPP. The analytical methods will provide the lowest available DLs (DL/LOD/LOQ) that will allow for the data to be compared to screening levels summarized in Appendix B and meet risk assessment objectives. Collection and interpretation of field measurements (e.g., groundwater sample depth and so on) will be conducted in accordance with standard industry practice and as specified in this UFP-QAPP.	To optimize the design, available site-specific data have been reviewed to determine the appropriate quantity and location of samples to be collected. The proposed sample design to address the problem statements is summarized below. Refer to CCL Worksheet #17 for sample design and rationale. 1. Collect one round of groundwater samples from eight existing wells. Samples will be will be analyzed for explosives and speciated chromium. 2. During the groundwater sampling events, measure water quality parameters (turbidity, dissolved oxygen, oxidation-reduction potential, specific conductance, temperature, and pH) to assess subsurface conditions.

See Acronyms and Abbreviations section for abbreviations used in this table.

Contaminated Clothing Laundry Worksheet #14: Project Tasks

Groundwater sampling at the CCL will consist of the following:

- Mobilization
- Monitoring well sampling
- Decontamination
- Demobilization
- Waste management
- Laboratory analysis and data management
- Reporting and ERIS

Mobilization

See IAAAP Worksheet #14.

Monitoring Well Sampling

Eight existing monitoring wells will be sampled (Figure CCL-10-2) for chromium speciation and explosives during one groundwater sampling event. Before sampling the wells, water level measurements will be collected per SOP-11, Water Level Measurements (Appendix A). Groundwater levels will be measured to the nearest 0.01 foot using an electric water level indicator. Water levels will be measured in feet below top of casing.

Water quality parameters will be measured during purging per SOP-06, Field Water Quality Measurements and Calibration, using a flow-through cell and a multiparameter water quality instrument, and recorded on a field form. Recorded field parameters will include pH, temperature, turbidity, and specific conductivity. Low-flow sampling will occur until the measured field parameters have stabilized. Stabilization of field parameters will occur in accordance with the following criteria for three consecutive readings:

- Turbidity within 10 NTU
- pH within 0.1 pH unit
- Specific conductance within 10 percent

Monitoring wells will be inspected for signs of tampering or other damage. Suspected tampering (casing is damaged, lock or cap is missing) will be recorded in the field logbook and on the well sampling form, and be reported to the field team leader (FTL). Monitoring wells that appear to have been tampered with will not be sampled until the FTL has notified the project manager and the path forward has been discussed with the USACE. The following monitoring wells will be sampled for speciated chromium (by EPA SW-846 Method 7199) and explosives during one sampling event (well screen interval is provided in parentheses in feet bgs):

- CCL-TTMW-001 (10.0–20.0)
- CCL-TTMW-002 (10.0–20.0)
- CCL-TTMW-003 (10.0–20.0)
- CCL-TTMW-004 (10.0–20.0)
- CCL-TTMW-006 (10.0–20.0)
- CCL-TTMW-009 (30.0–30.5)

- CCL-TTTW-021 (10.0–20.0)
- CCL-TTTW-022 (10.0–20.0)

Sampling activities will be recorded in the field logbook per SOP-07, Note Taking and Field Log Books, and sampling data on a well sampling form per SOP-14, Groundwater Sampling. Samples will be collected using groundwater low flow purging and sampling techniques as presented in SOP-14 (Appendix A). If a groundwater sample cannot be collected following the SOP methods, the FTL or designee will discuss the path forward with the CH2M team's project manager.

Decontamination

See IAAAP Worksheet #14.

Demobilization

See IAAAP Worksheet #14.

Waste Management

See IAAAP Worksheet #14.

Laboratory Analysis and Data Management

Laboratory Analysis

TestAmerica in Arvada, Colorado, is the primary laboratory and will analyze the groundwater samples for RDX. The speciated chromium analysis will be subcontracted to their St. Louis, MO laboratory. TestAmerica holds a current DoD ELAP certification for the required methods and analytes.

Data Management

See IAAAP Worksheet #14.

Data Review

See IAAAP Worksheet #14.

Data Evaluation and Usability

See IAAAP Worksheet #14.

Baseline Risk Assessment

See IAAAP Worksheet #14. An ecological risk assessment will not be conducted for this site as there are no complete exposure pathways for ecological receptors.

Reporting and ERIS

See IAAAP Worksheet #14.

Contaminated Clothing Laundry Worksheet #17: Sampling Design and Rationale

This worksheet describes the design and rationale for the groundwater sampling activities.

Investigation Design and Rationale

The following subsections describe the proposed groundwater samples to characterize the site.

Rationale for Number and Locations of Samples

The RDX plume at the CCL has been previously delineated, and concentrations appear to have decreased between 2008/2009 and 2014. Therefore, groundwater samples will be collected during one groundwater sampling event to confirm previously identified conditions and assess trends where sufficient data are available (a minimum of four samples), as follows:

- Two existing monitoring wells (CCL-TTMW-001 and CCL-TTMW-003) from within the area of the RDX plume with historical concentrations above the screening level (2 µg/L) will be sampled to evaluate current RDX concentrations.
- One existing deeper well within the plume (CCL-TTMW-009) will be sampled for vertical delineation of the RDX plume.
- Five existing monitoring wells (CCL-TTMW-002, CCL-TTMW-004, CCL-TTMW-006, CCL-TTTW-021, and CCL-TTTW-022) from the outer edges of the RDX plume will be sampled to confirm that RDX is delineated.

Chromium was identified as a COC in the human health risk assessment completed as part of the RFI at the CCL based on the conservative assumption that all the detected chromium was chromium VI. Therefore, speciated chromium samples will also be collected during the groundwater sampling event at the same wells.

Figure CCL-10-2 shows the locations of the monitoring wells.

Contaminated Clothing Laundry Worksheet #18: Sampling Locations and Methods

The following table summarizes the sampling matrix, number of samples to be collected, analytical parameters, and the rationale for sampling location described in CCL Worksheet #17.

Table CCL-18-1. Sample Locations and Sampling SOP Requirements
UFP-QAPP RI, IAAAP, Middletown, Iowa

Matrix	Depth	Analytical Group	Concentration Level	Estimated Number of Samples (Identify FDs)	Sampling SOP Reference	Rationale for Sampling Location
Contaminated Clothing Laundry						
Groundwater	10 to 20 feet except CCL-TTMW-009, which is 30 to 35 feet	Speciated chromium, explosives	Low to moderate	Eight samples [a]	SOP-04 through SOP-11, SOP-14 [b]	Biased locations for determining concentrations of chromium VI, and RDX

See Acronyms and Abbreviations section for abbreviations used in this table.

[a] At a minimum, one FD sample will be collected for every 20 samples per field event, one MS/MSD sample will be collected for every 20 samples per field event, and one equipment blank will be collected for every 20 samples per field event.

[b] SOP-04, Equipment Decontamination Procedures
SOP-05, Organic Vapor Monitoring and Air Monitoring
SOP-06, Field Water Quality Measurements and Calibration
SOP-07, Note Taking and Field Log Books
SOP-08, Site Reconnaissance, Preparation, and Restoration
SOP-09, Packing and Shipping of Environmental Samples
SOP-10, Sample Handling and Custody
SOP-11, Water Level Measurements
SOP-14, Groundwater Sampling

References

Ecology and Environment. 1987. *RCRA Facility Assessment, Final Report for the Iowa Army Ammunition Plant*, *Middletown, Iowa.* April.

Harza. 1998. *Final Record of Decision, Iowa Army Ammunition Plant Soils, Operable Unit #1, Middletown, Iowa*. August.

JAYCOR. 1996. *Revised Draft Final Remedial Investigation Report, Iowa Army Ammunition Plant*. May.

MWH. 2004. *Draft Final Baseline Ecological Risk Assessment, Iowa Army Ammunition Plant (IAAAP), Iowa*. October.

Tetra Tech. 2008. *Interim Corrective Measures Report for Excavations at the Contaminated Waste Processor and Contaminated Clothing Laundry, Iowa Army Ammunition Plant.* December.

Tetra Tech. 2012. *Work Plan for Supplemental Remedial Investigation of Groundwater at Contaminated Clothing Laundry, Iowa Army Ammunition Plant, Middleton, Iowa.* March.

Tetra Tech. 2013. *Human Health Risk Assessment Contaminated Clothing Laundry (CCL) for Groundwater, Iowa Army Ammunition Plant, Middleton, Iowa.* December.

Tetra Tech. 2014. *Draft Final RCRA Facility Investigation Report for Groundwater at Contaminated Clothing Laundry, Iowa Army Ammunition Plant, Middleton, Iowa.* May.

USEPA. 1988. *Guidance for Conducting Remedial Investigations and Feasibility Studies under CERCLA*. Interim final.

USEPA. 1989. *RCRA Hazardous Waste Management Permit, Iowa Army Ammunition Plant, Middletown, Iowa, EPA RCRA# 1A72313820445.* November.

USEPA. 1998. *Interim Soils Action for Operable Unit #1 Record of Decision.* Iowa Army Ammunition Plant, Middletown, Iowa. March 4.

Deactivation Furnace Worksheet #10: Conceptual Site Model

This worksheet describes the site-specific background and environmental conditions in relation to the conceptual site model (CSM) for the Deactivation Furnace (DF) site, IAAP-023 (CC-06). Soil at the DF was remediated according to the Operable Unit (OU) 1 soil Interim Record of Decision (ROD) (USEPA, 1998) and final ROD (Harza, 1998). Site groundwater is addressed under the Resource Conservation and Recovery Act (RCRA). The CSM integrates existing information and working assumptions about the physical site conditions, operational history, characteristics of chemicals of potential concern (COPCs), and pathways of concern based on historical reports. The CSM is based on the current understanding of site history and conditions, and will be updated based on information from the investigation activities.

Background

This background section consists of the site description and operational history.

Site Description

The DF is located in the southwest portion of the Iowa Army Ammunition Plant (IAAAP), southeast of the Demolition Area (DA) (Site IAAP-021) and lies within the Skunk River watershed (Figure DF-10-1). The current furnace structure is present on a concrete pad (Building 900-199-2) and is connected to the compressor House/Bag House (Building 900-31). A Personnel Shelter (Building 900-148-1) was used to protect staff during historical use of the furnace. The DF is currently inactive (JAYCOR, 1994).

Operational History

Based on historical drawings, the DF was put into operation between 1941 and 1952 (Tetra Tech, 2007, 2008). The DF had limited operation since 1971, as it was used only when required and was shut down from late 1980 to May 1983 to allow for the installation of air pollution control equipment. The DF facility was housed within Buildings 900-199-2 and 900-31 which encompassed the feed area and the furnace retort system (Figure DF-10-1). The air pollution control system includes a cyclone filter, baghouse, draft induction fan, and exhaust stack. The current DF was built to replace two smaller historical furnaces, which have since been removed and were present within the same general footprint of Building 900-199-2.

The DF was used to destroy small explosives-loaded components such as detonators, primers, and fuses. These items entered the furnace via a conveyor belt, after which spiral flights moved the items through the retort where residual explosive or propellant compounds were flashed from the metal casings. The thermally treated steel casings were recovered and sold as scrap metal. The materials treated in the furnace were generated from nonspecific plant production lines and included excess and off-specification components. Unsalvageable metal and ash were containerized and stored as hazardous waste due to cadmium. Ash collected from the cyclone and baghouse of the air pollution control system contained arsenic, cadmium, chromium, and lead. The containers with the waste from the unsalvageable metals, burn ash, cyclone, and baghouse were stored in offsite permitted RCRA storage units and analyzed using toxicity characteristic leaching procedure (TCLP). Nonhazardous materials were disposed of onsite at the Inert Disposal Area (JAYCOR, 1994). Hazardous wastes were transported offsite for disposal at U.S. Environmental Protection Agency (USEPA)–approved disposal facilities (JAYCOR, 1996). Building 900-199-2 was closed under the RCRA program in 1995 (PDC Technical Services, 1995).

Conceptual Site Model

The CSM presented in this section is based on the current understanding of the environmental conditions and regulatory program. This section is organized as follows:

- Environmental site setting
  - Topography and surface water
  - Geology and hydrogeology
- Regulatory framework
- Previous investigations
- Current understanding of nature and extent of contamination

Environmental Site Setting

The following sections describe the physical site-specific characteristics that differ from the installation environmental setting presented in IAAAP Worksheet #10. Previous environmental investigations are summarized below.

Topography and Surface Drainage

The DF structure was constructed on a topographic high. The ground surface elevations range from approximately 662 to 683 feet at the site and drop off by 10 to 35 feet to the west and south. The low-lying areas contain ephemeral drainages (Figure DF-10-1).

Surface drainage is to the west and south into ephemeral drainages (or tributaries) incised into loess and glacial till. One of these drainages is shown on Figure DF-10-1. The ephemeral drainages run to Skunk River, approximately one half mile to the southwest.

Geology and Hydrogeology

The overburden stratigraphy of the site includes a thin surface layer of loess (present only in the upper elevation areas) underlain by glacial till. The overburden is underlain by limestone bedrock of the upper Warsaw Formation (JAYCOR, 1996). The loess and much of the till have been incised by the surface drainages. According to information from soil borings at the adjacent DA, IAAP-021 (CC-06), and from DF soil excavations, the overburden thickness is between 8 and 25 feet and composed of sand, silt, and clay (JAYCOR, 1996; Tetra Tech, 2008).

Groundwater at the site is present primarily within the limestone bedrock. Depth to water was measured in May 2015 at 8.60 and 24.05 feet below top of casing at DA-TTMW-054 and DA-TTMW-055, respectively. These values fall within the reported range of historical depths to groundwater. Groundwater flow direction at the site is radially from west to south following topography; however, regardless of groundwater or surface runoff flow direction locally, the ultimate destination is Skunk River (Tetra Tech, 2006). Insufficient data are available to determine if groundwater is discharging to ephemeral streams in the area of the DF.

Regulatory Framework

The DF site is regulated under RCRA. Following the RI/RFI, results from RCRA sites will be reported separately from CERCLA sites. (See Deactivation Furnace Worksheet #14.) The DF, IAAP-023, is grouped with the DA, IAAP-021, under the designation CC-06 due to site proximity. However, the DF is presented separately in this UFP-QAPP because it has achieved no further action (NFA) status for soil contamination, and groundwater contamination at the site has not been demonstrated.

Previous Investigations

Investigations previously conducted at the DF are summarized in Table DF-10-1 and discussed below. The investigations of site soil concluded in 2007 with a remedial action to excavate soil with concentrations of metals exceeding the OU1 ROD remediation goals (RGs).

Table DF-10-1. Previous Investigations
UFP-QAPP RI/RFI, IAAAP, Middletown, Iowa

Year(s)	Source	Media Investigated	Investigation Summary	Analyses [a]	Results/Conclusions
1991	*Facility Wide Preliminary Assessment* (JAYCOR)	Soil	5 samples	V, S, M	Metals contamination detected in soil.
1992–1995	*Remedial Investigation* (JAYCOR)	Soil	12 samples adjacent to DF 33 samples in vicinity	Ex, V, S, M	Metals contamination detected in surface soil near the furnace exit and in low lying drainage areas. Lead, arsenic, and chromium were detected at highest concentrations above screening levels. 16 cubic yards of metals contaminated surface soil were excavated directly adjacent to the building
2007	*Supplemental Remedial Investigation* (Tetra Tech)	Soil	18 samples	M	Samples used to delineate seven excavation areas based on OU1 remediation goals (RGs).
2008	*Draft Remedial Action Report for Excavations at the Deactivation Furnace* (Tetra Tech)	Soil	35 samples	M	Soil metals concentrations screened against OU1 ROD RGs. An additional 753 cubic yards of soil was excavated and 35 confirmation samples were collected from the excavation.

[a] Ex = explosives, M = metals, S = semivolatile organic compounds, V = volatile organic compounds.

The DF site was placed in the installation RCRA permit due to TCLP results from ash wastes, specifically cadmium concentrations (USEPA, 1989; JAYCOR, 1994). Subsequently, several iterations of surface and subsurface characterization and excavations were conducted as summarized in Table DF-10-1. Soil was eventually removed to meet RCRA closure levels and subsequently OU1 RGs as described in the Remedial Actions section below. Excavation confirmation sample locations are presented in Figure DF-10-2. Soil confirmation sample results from excavations demonstrating that contamination was removed to the OU1 RGs are provided in Table DF-10-2.

No groundwater contamination has been indicated from historical sampling. Low concentrations of metals in soil greater than 2 feet bgs and the presence of groundwater deeper than approximately 10 feet bgs indicate that groundwater has likely not been impacted by historical site activities at the DF (Tetra Tech, 2012). However, an evaluation of the historical investigations conducted at the adjacent DA identified a lack of understanding of whether disposal trenches were potentially used at the DF. Similarly, no geophysical surveys have been conducted to evaluate the presence or absence of potential burial trenches.

Remedial Actions

Initial soil remediation for the DF site was performed to meet RCRA closure cleanup goals prior to the establishment of OU1 soil RGs, which were more conservative, and the site was proposed for NFA (PDC

Technical Services, 1995). Soil remedial actions conducted under the RCRA Closure cleanup were approved by USEPA on letter dated May 5, 1995. The letter was prepared in response to the April 10, 1995 RCRA Closure Report (Mason & Hanger-Silas Mason Co., Inc.). However, given the more restrictive RGs established under the OU1 ROD, additional remedial actions were performed to meet the new requirements (Tetra Tech, 2008). Following these soil removal actions, soil remediation at the DF was considered complete (Tetra Tech, 2008). Confirmation samples were analyzed for only arsenic and lead because the extent of soil contamination was delineated within exceedances of these two metals. A Corrective Measures Study (CMS) concluded that NFA was the most appropriate corrective measure alternative for implementation at the DF (Tetra Tech, 2012).

Current Understanding of Nature and Extent of Contamination

This section presents a summary of the potential sources of contamination identified at the DF site and current conditions in site media.

Potential Sources of Contamination

The source of contamination at the DF is attributed to releases of ash during transfer of waste from the furnace into drums and tanks for disposal.

Site historical activities resulted in contamination of soil with metals at concentrations above OU1 RGs at depths up to 2 feet below ground surface (bgs), which was subsequently excavated.

Potential operations at the DF are managed under a RCRA permit (1989) and are not expected to result in releases above RCRA-acceptable levels.

Soil

Arsenic, copper, lead, mercury, and selenium were present at concentrations that exceeded background levels. Mercury and selenium concentrations were reported to be either within or slightly above the range of background concentrations, indicating they are likely naturally occurring and not indicative of contamination at the site (Tetra Tech, 2009). They also were not identified as COPCs based on results of the TCLP analyses. The distribution of arsenic, copper, and lead indicates that soil contamination occurred in isolated areas to depths of only 2 feet bgs, above the water table. The 2007 excavation of metals-contaminated soil at the DF was performed in accordance with the remedial action objectives established in the OU1 ROD. Soil was excavated at seven areas shown on Figure DF-10-1 to meet OU1 RGs (Tetra Tech, 2009). Soil excavation confirmation sample locations are shown in Figure DF-10-2, and analytical results are presented in Table DF-10-2.

Sediment and Surface Water

Stormwater flow during rain events may transport surface contaminants, but the lack of perennial streams, relatively low solubility of site COPCs, and thickness of vegetation near the site indicate the transport distances are likely to be small. Potential impact to the Skunk River watershed and the potential need for additional sediment or surface water sampling will be conducted as part of the proposed watersheds OU.

Groundwater

Soil concentrations of metals below the OU1 RGs at depths greater than 2 feet bgs and the presence of groundwater typically deeper than 10 feet bgs at the site indicate that groundwater has likely not been impacted by historical site activities. Also, since the site has been managed under RCRA since 1989, no releases are anticipated to have occurred accept under acceptable levels that met permit requirements. The CMS concluded that NFA was warranted at the DF (Tetra Tech, 2012).

However, because DA-TTMW-055 (Figure DF-10-1) was installed at the DF to support delineation of the DA plume, groundwater data from this well were reviewed. Historical data from this well indicate that only barium (2007) was detected in groundwater, and only at concentrations below screening levels (Table DF-10-3). Barium was also reported in an associated laboratory blank. Groundwater is not impacted, supporting the recommendations in the CMS.

Summary and Data Gaps

Soil was characterized and successfully remediated. Sediment, surface water, and groundwater contamination was not indicated at the site. Although groundwater contamination has not been identified at the site, a geophysical investigation was never conducted to evaluate the presence or absence of potential historical burial trenches. Because, another well will be installed in this area to support delineation of the DA, it will be analyzed for metals to support completion of the supplemental investigation in case burial trenches are identified from the proposed geophysical survey.

Conceptual Exposure Model

Based on the understanding of site conditions, Figure DF-10-4 presents the preliminary conceptual exposure model (CEM) for human and ecological receptors. The potential exposure scenarios summary table at the bottom of Figure DF-10-4 shows the exposure media and pathways; COPCs in the indicated media and pathways will be evaluated in the human health and ecological risk assessments. Future industrial site workers include both potential indoor and outdoor site work. No future residential use of this site is proposed due to historical munitions activities precluding transfer of the site for unrestricted use.

The CEMs included in this UFP-QAPP are preliminary and were developed based on the current understanding of site conditions. However, the preliminary CEMs will be refined, as more site-specific information is obtained. Revised CEMs will be provided for review within an interim deliverable prior to completion of the RI/RFI.

Data Quality Objectives

The investigation will be performed to evaluate whether trenches are buried at the DF, estimate human health and ecological risk, and recommend a path forward consistent with USEPA guidance (USEPA, 1988). Data quality objectives (DQOs) are as summarized in Table DF-11-1. The specific tasks that will be performed are described in Deactivation Furnace Worksheet #14. The rationale behind the steps outlined in Table DF-11-1 are presented in detail in Deactivation Furnace Worksheet #17.

Table DF-10-2. Deactivation Furnace: Remedial Action Excavation Soil Confirmation Samples

UFP-QAPP RI/RFI, IAAAP, Middletown, Iowa

			Location	DF-E01-CSEW-P1	DF-E01-CSFL-P1	DF-E01-CSNW-P1	DF-E01-CSSW-P1	DF-E01-CSWW-P1	DF-E01-CSWW-P1	DF-E02-CSEW-P1	DF-E02-CSFL-P1	DF-E02-CSNW-P1	DF-E02-CSSW-P1	DF-E02-CSWW-P1
			Sample ID	DF-E01-CSEW-P1	DF-E01-CSFL-P1	DF-E01-CSNW-P1	DF-E01-CSSW-P1	DF-E01-CSWW-P1	DF-E01-CSWW-P1-FD	DF-E02-CSEW-P1	DF-E02-CSFL-P1	DF-E02-CSNW-P1	DF-E02-CSSW-P1	DF-E02-CSWW-P1
			Sample Date	10/5/2007	10/5/2007	10/5/2007	10/5/2007	10/5/2007	10/5/2007	10/5/2007	10/5/2007	10/5/2007	10/5/2007	10/5/2007
CAS	Parameter	Unit	OU-1 ROD RG											
7439-92-1	Lead	mg/kg	1000	**19.1**	**15.8**	**9.6**	**9.2**	**8.8**	**8.9**	-	-	-	-	-
7440-38-2	Arsenic	mg/kg	30	**6.2**	**7.8**	**6.9**	**4**	**4.6**	**4.6**	**6.6**	**5.8**	**6.2**	**9.5**	**6.7**

			Location	DF-E03-CSEW-P1	DF-E03-CSFL-P1	DF-E03-CSNW-P1	DF-E03-CSSW-P1	DF-E03-CSWW-P1	DF-E04-CSEW-P1	DF-E04-CSFL-P1	DF-E04-CSNW-P1	DF-E04-CSSW-P1	DF-E04-CSWW-P1	DF-E05-CSEW-P1
			Sample ID	DF-E03-CSEW-P1	DF-E03-CSFL-P1	DF-E03-CSNW-P1	DF-E03-CSSW-P1	DF-E03-CSWW-P1	DF-E04-CSEW-P1	DF-E04-CSFL-P1	DF-E04-CSNW-P1	DF-E04-CSSW-P1	DF-E04-CSWW-P1	DF-E05-CSEW-P1
			Sample Date	10/5/2007	10/5/2007	10/5/2007	10/5/2007	10/5/2007	10/5/2007	10/5/2007	10/5/2007	10/5/2007	10/5/2007	10/5/2007
CAS	Parameter	Unit	OU-1 ROD RG											
7439-92-1	Lead	mg/kg	1000	-	-	-	-	-	**122**	**11.6**	**68**	**27.6**	**532**	-
7440-38-2	Arsenic	mg/kg	30	**4**	**4.3**	**5.1**	**5.2**	**2.9**	-	-	-	-	-	**9.7**

			Location	DF-E05-CSFL-P1	DF-E05-CSNW-P1	DF-E05-CSSW-P1	DF-E05-CSWW-P1	DF-E06-CSEW-P1	DF-E06-CSFL-P1	DF-E06-CSNW-P1	DF-E06-CSSW-P1	DF-E06-CSWW-P1	DF-E07-CSEW-P1	DF-E07-CSFL-P1
			Sample ID	DF-E05-CSFL-P1	DF-E05-CSNW-P1	DF-E05-CSSW-P1	DF-E05-CSWW-P1	DF-E06-CSEW-P1	DF-E06-CSFL-P1	DF-E06-CSNW-P1	DF-E06-CSSW-P1	DF-E06-CSWW-P1	DF-E07-CSEW-P1	DF-E07-CSFL-P1
			Sample Date	10/5/2007	10/5/2007	10/5/2007	10/5/2007	10/5/2007	10/5/2007	10/5/2007	10/5/2007	10/5/2007	10/5/2007	10/5/2007
CAS	Parameter	Unit	OU-1 ROD RG											
7439-92-1	Lead	mg/kg	1000	-	-	-	-	-	-	-	-	-	-	-
7440-38-2	Arsenic	mg/kg	30	**7.5**	**9.9**	**8**	**10.2**	**5.1**	**8.1**	**6.8**	**5.1**	**6.3**	**5.3**	**9.8**

			Location	DF-E07-CSFL-P1	DF-E07-CSNW-P1	DF-E07-CSSW-P1	DF-E07-CSWW-P1
			Sample ID	DF-E07-CSFL-P1-FD	DF-E07-CSNW-P1	DF-E07-CSSW-P1	DF-E07-CSWW-P1
			Sample Date	10/5/2007	10/5/2007	10/5/2007	10/5/2007
CAS	Parameter	Unit	OU-1 ROD RG				
7439-92-1	Lead	mg/kg	1000	-	-	-	-
7440-38-2	Arsenic	mg/kg	30	**7.5**	**6.6**	**8**	**6.7**

Notes:

Bold indicates the analyte was detected

- = indicates analyte was not detected above the quantitation limit

Table DF-10-3. Deactivation Furnace: Groundwater Analytical Results—Metals

UFP-QAPP RI/RFI, IAAAP, Middletown, Iowa

				Location	DA-TTMW-054	DA-TTMW-055
				Sample ID	DA-TTMW-054-GW	DA-TTMW-055-GW
				Screen Interval	8.2-18.2	23.2-38.2
				Sample Date	10/10/2007	10/11/2007
Test Group	**CAS**	**Parameter**	**Unit**	**Screening Level***		
METALS	7440-38-2	Arsenic	µg/L	10[a]	3.7 U	3.7 U
METALS	7440-39-3	Barium	µg/L	2,000[b]	**52.3 B**	**21.7 B**
METALS	7440-48-4	Cobalt	µg/L	6[b]	1 U	1 U
METALS	7439-92-1	Lead	µg/L	15	2.1 U	2.1 U

Notes:

Bold indicates the analyte was detected.

Shading indicates the analyte exceeded screening criteria.

*Maximum Contaminant Level (MCL). If no MCL is available, the greater of the Health Advisory Level (HAL) and the tap water Regional Screening Level (RSL) is selected.

Source: United States Environmental Protection Agency's (EPA's) RSLs (May 2016). Available online: https://www.epa.gov/risk/regional-screening-levels-rsls.

Source: EPA's MCLs and HALs (April 2012). Available online: https://www.epa.gov/dwstandardsregulations/drinking-water-contaminant-human-health-effects-information#dw-standards.

[a] MCL = Maximum Contaminant Level

[b] RSL = Regional Screening Level

B = The analyte was positively identified in both the sample and the associated laboratory method blank.

U = The analyte was analyzed for, but was not detected above the reported sample quantitation limit.

µg/L = micrograms per liter

CAS = Chemical Abstracts Service

ID = identification number

The screen intervals of DA-TTMW-054 and DA-TTMW-055 are 8.2-18.2 ft and 23.2-38.2 ft below ground surface, respectively.

N

0 50

Feet

Figure DF-10-1
Deactivation Furnace Site Map
Iowa Army Ammunition Plant
Middletown, Iowa

ch2m.

SCO R:\ENBG\00_PROJ\U\USACE\IAAAP_679172\MAPFILES\FURNACE\FURNACE_SITELAYOUT_B.MXD RANHORN 2/6/2017 6:11:37 PM

Figure DF-10-2
Deactivation Furnace
Confirmation Soil Sampling Results
Iowa Army Ammunition Plant Middletown, Iowa

ch2m

SCO K:\USACE\679172\MAPFILES\FURNACE\FURNACE_SOILLOCS_B.MXD RANHORN 12/14/2016 9:59:20 AM

Note:
1. Grey station ID indicates RDX, arsenic, and lead were not detected at that location.

N

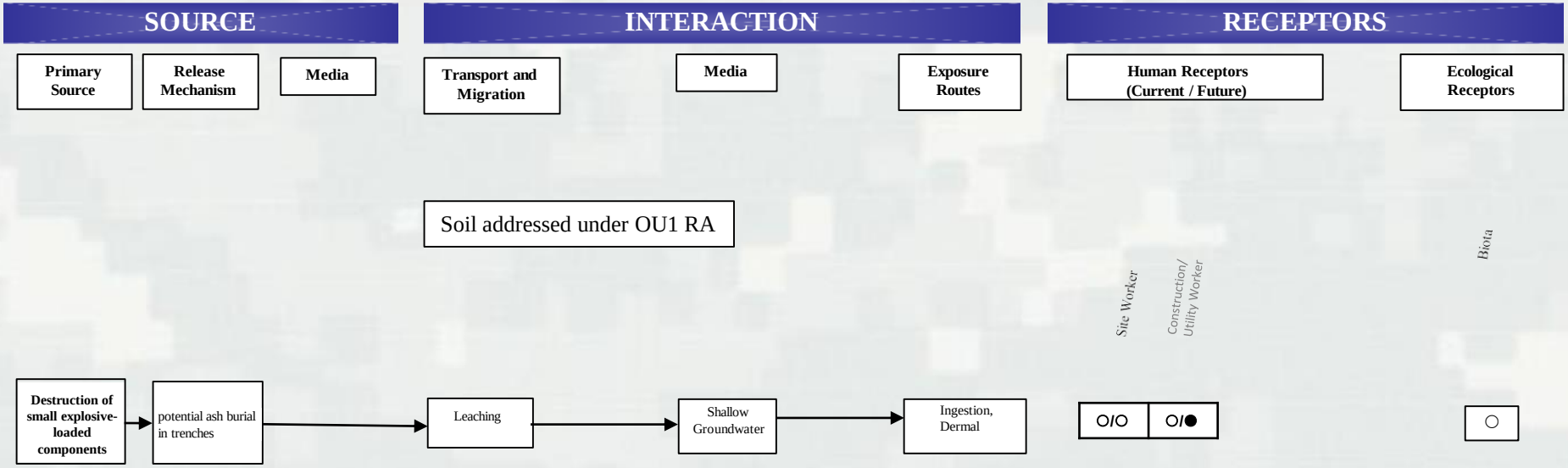
0 40

Feet

Figure DF-10-3
Historical and Proposed Groundwater Monitoring Locations
Iowa Army Ammunition Plant
Middletown, Iowa

ch2m

DEN R:\ENBG\00_PROJ\U\USACE\IAAAP_679172\MAPFILES\FURNACE\FURNACE_PLUMEMAP_B.MXD AESPEJO 9/21/2017 5:08:43 PM



POTENTIAL EXPOSURE SCENARIOS

LEGEND

← Flow-chart continues

● Potentially Complete Pathway

○ Incomplete Pathway

Receptor	Potential Exposure Activity	Exposure Media / Pathways
Site Worker (industrial)	Grounds maintenance, industrial activities	GW (none)
Construction/utility worker	Construction or utility activities in trenches	GW (Ing, Derm)
Aquatic/semi-aquatic biota	Indigenous biota present within waterbodies and birds and mammals foraging	GW (none)

Figure DF-10-4
Deactivation Furnace
Preliminary Conceptual Exposure Model
Iowa Army Ammunition Plant
Middletown, Iowa

Deactivation Furnace Worksheet #11: Project/Data Quality Objectives

Project DQOs define the type, quantity, and quality of data that are needed to answer specific environmental questions and support proper environmental decisions. The DQOs were developed during the work planning process.

Who Will Use the Data?

U.S. Army Corps of Engineers (USACE), IAAAP, Army Environmental Command, the CH2M team, and other project stakeholders will use the data to support the environmental decisions, as outlined in Deactivation Furnace Worksheets #10, #17, and #18.

What Are the Project Screening Levels?

Concentrations of total RCRA metals and explosives in groundwater will be compared to screening levels to evaluate nature and extent of potential contamination in groundwater from the DA and are discussed in Deactivation Furnace Worksheet #10. The screening levels described in IAAAP Worksheet #15 were developed to meet the most stringent laboratory reporting requirement and therefore are not used for evaluating nature and extent. Use of the screening levels to make decisions about the site is described in Table DF-11-1.

What Will the Data Be Used for?

As indicated in site specific Worksheet #14, groundwater samples will be collected and analyzed for RCRA metals (total) and explosives to support delineation of the plume from the DA and potential metals from trenches, if identified.

What Types of Data Are Needed and How "Good" Do the Data Need to Be in Order to Support the Environmental Decision?

The types of data that are needed include geophysical survey results and definitive level data quality analyzed using a DoD-certified laboratory for the methods and analytes as described in IAAAP Worksheet #15. Definitive-quality data will be screened against the appropriate screening levels and used to support the decisions listed in Table DF-11-1. The use of these data is not restricted, unless there is a quality problem, such as a recurring quality control exceedance or a gross quality control exceedance that would result in rejected data as defined in IAAAP Worksheet #36. The sampling design and rationale are presented in Deactivation Furnace Worksheet #17.

How Many Data Are Needed? Where, When, and How Should They Be Collected and Generated?

Tables provided in Deactivation Furnace Worksheet #14 describe the planned field investigation activities. The number and locations of samples needed, and the rationale for placement, are presented in Deactivation Furnace Worksheets #17 and #18.

Who Will Collect and Generate the Data?

The CH2M team will collect the data on behalf of USACE and IAAAP. Samples for analysis will be sent under chain of custody to the TestAmerica Laboratory, which maintains required certifications to meet State of Iowa and DoD requirements, which include National Environmental Laboratory Accreditation Program certification and the DoD ELAP.

How Will the Data Be Reported and Archived?

The data will be reported according to procedures outlined in this UFP-QAPP. Hard copy and/or electronic (such as database management system) data will be stored by CH2M for 5 years after project completion. Project data and reports will be managed by CH2M via a CH2M proprietary database system with final data deliverables to the USACE into The Environmental Restoration Information System (ERIS). The final investigation report will become part of the Administrative Record file.

Table DF-11-1. Data Quality Objectives
UFP-QAPP RI/RFI, IAAAP, Middletown, Iowa

Step 1: Problem Statement	Step 2: Decisions to be Made	Step 3: Input to the Decision	Step 4: Study Area Boundaries	Step 5: Decision Rules	Step 6: Acceptable Limits on Decision Error	Step 7: Optimize the Design
The presence or absence of potential historical disposal trenches has not been confirmed. The plume from the DA is potentially not delineated at the DF. If historical trenches are identified, a downgradient well is needed to confirm that groundwater has not been impacted Total metals and explosives analytical data are needed to evaluate risk to human health and the environment.	To evaluate whether burial trenches are present, groundwater from the DA is migrating to the site, and potential risk to human health and the environment, the following decisions will need to be made: 1. What quantity and location of samples are required to adequately assess bedrock groundwater contamination? 2. Are RCRA metals or explosives concentrations in groundwater above screening levels? Do site-related chemicals in groundwater pose potential unacceptable risk to human health and the environment? 3. Were trenches historically used for disposal?	Elements to be considered in the decisions include the following: 1. Information and data collected during previous investigations. 2. Existing historical records of onsite use and releases. 3. The site-specific CSM, such as topography, geology and hydrogeology, nature and extent of contamination, current and historical surface water drainage features, and groundwater flow direction. 4. Site improvements, development history, or removal actions that have occurred after releases or sampling. 5. Expected volume or mass of potential release. 6. Availability and capabilities of drilling equipment. 7. Field observations and measurements from sampling activities. 8. Evaluation of lithology based on soil cuttings. 9. Depth to groundwater measurements and groundwater gradient. 10. Sample locations and depths. 11. Existing and newly collected analytical data. 12. Results of the geophysical investigation.	**Spatial Boundaries**: A geophysical survey will be conducted around the existing building within the site boundary. One bedrock monitoring well will be installed downgradient of both the DF and southern RDX plume of the adjacent DA and used to define the extent of contamination at the DA and support delineation of potential releases from burial trenches, if identified. The new well will be installed so that the screened interval is present in the uppermost saturated bedrock aquifer (assumed to be 20–30 feet bgs). Existing monitoring well DA-TTMW-055, 100 feet northwest of the DF, will be sampled to confirm existing data.	***Decision 1—Location of Samples*** The geophysical survey will span the lateral extent of the site boundaries (shown in DF-10-1), excluding areas with mature forest or engineered structures. Transects will be placed at 10-foot intervals and extend to 5 feet bgs. The location of the proposed bedrock monitoring well is based on historical groundwater information and the current understanding of groundwater flow direction. The location is also based on accessibility, existing records of site use and potential releases, topography, and using professional judgement to place sample locations. Analytical groundwater results will be compared to the screening levels to evaluate if the plumes have been adequately delineated and to assess potential risk. If the nature and extent of the contamination are not adequately delineated, then the stakeholders will be engaged to determine if further investigation is warranted. ***Decision 2—Evaluate Potential Risk*** If burial trenches are identified and metal concentrations in groundwater at the DF are greater than applicable screening levels during this investigation, then these chemicals will be incorporated into the baseline risk assessment. If concentrations of RCRA metals and explosives are below screening levels, then the RI/RFI will be complete.	Judgmental samples will be collected to evaluate groundwater concentrations compared to screening levels. Professional judgment using information from the CSM is used to select sample locations. Laboratory analyses will be conducted in accordance with this UFP-QAPP. Analytical chemical data will meet quality expectations for PARCCS, as defined by this UFP-QAPP. The analytical methods will provide the lowest available DLs (DL/LOD/LOQ) that will allow for the data to be compared to screening levels summarized in Appendix B and meet risk assessment objectives. Collection and interpretation of field measurements (groundwater sample depth and so on) will be conducted in accordance with standard industry practice and as specified in this UFP-QAPP.	To optimize the design, available site-specific data will be reviewed to evaluate the appropriate quantity and location of samples to be collected and proposed transects for the geophysical survey. The proposed sample design to address the problem statements is summarized below. Refer to Deactivation Furnace Worksheet #17 for sample design and rationale. 1. The geophysical methods will be selected to identify the difference between native geology and buried ash. 2. One bedrock monitoring well will be installed downgradient of the site. 3. Confirmation sampling will be performed from the nearest existing monitoring well, DA-TTMW-055, and the new well. 4. During the groundwater sampling event, water quality parameters (turbidity, dissolved oxygen, oxidation-reduction potential, specific conductance, temperature, and pH) will be measured to assess subsurface conditions.

See Acronyms and Abbreviations section for abbreviations used in this table.

Deactivation Furnace Worksheet #14: Project Tasks

The RI/RFI at the DF will consist of the following:

- Mobilization
- Utility clearance
- Geophysical Survey
- Monitoring well installation, development, and sampling
- Surveying
- Decontamination
- Demobilization
- Waste management
- Laboratory analysis and data management
- Baseline risk assessment
- Reporting and ERIS

Mobilization

See IAAAP Worksheet #14.

Utility clearance

See IAAAP Worksheet #14.

Geophysical Survey

The geophysical survey is designed to identify disturbed soil consistent with trenches filled with ash and other debris generated from historical DF operations. Disturbed soil near excavation areas or previous construction activities to will not be indicative of historic trenching. The proposed geophysical investigation method is ground penetrating radar (GPR). Electromagnetic surveys are not sufficient to meet data quality objectives, as they will not identify disturbed soil at depth and data will be degraded by interference from large metallic structures present on site. The results of the GPR survey will be documented with images preserved along the survey, GPS locations of transects, and interpretations of the results.

Prior to mobilization, available lithologic and excavation data at the DF will be reviewed to evaluate the potential presence and location of possible trenches. The GPR survey will be performed across the DF site boundaries. Transects across the DF site will be performed on soil and lightly vegetated surfaces. No geophysical measurements will be collected in mature forest or on engineered structures. Transects will be mapped with a GPS unit and placed at approximately 10-foot intervals. GPR equipment will be selected to detect soil excavations to depths of approximately 6 feet consistently across the survey area. A GSSI Model SIR-3000 with GPS antenna or comparable GPR equipment will be used.

Monitoring Well Installation, Development, and Sampling

Due to the potential for burial trenches at the DF, and to support the DA plume delineation, one new monitoring well will be installed under this investigation (Figure DF-10-3). Soil boring for the new monitoring well will be advanced using air rotary methods to approximately 30 feet bgs to bedrock, so that the screened interval will be installed in the uppermost saturated bedrock aquifer material. Samples for lithologic logging purposes only will be collected from rock core or cuttings, as described in SOP-18, Soil Boring Logging (Appendix A). Soil samples collected from the boring or from soil cuttings will be logged using the Unified Soil Classification System in accordance with American Society for Testing and Materials (ASTM) D2488 (visual-manual method for field description). The boring log will differentiate between overburden and bedrock and include observations on soil type/rock type, grain-size distribution, changes in lithology, stained soil or chemical odor, soil moisture, and total depth of boring per SOP-18, Soil Boring Logging (Appendix A). A CH2M field team member will observe and record soil descriptions.

The final siting of the proposed monitoring well will be determined based onsite conditions. Steep drainages, unstable ground conditions, site security fencing, and trees which cannot be removed may present access obstacles at downgradient locations. The final location may be adjusted to allow for access for a drill rig and for subsequent monitoring.

The monitoring well will be constructed in accordance with the EM-1110-1-4000 (USACE, 1998) and State of Iowa regulations, as described in SOP-01, Monitoring Well Installation and Development (Appendix A). The monitoring well will consist of a 2-inch-nominal-diameter Schedule 40 PVC screen and riser. The monitoring well screen will be machine-slotted PVC, 0.010 inch, and 10 feet long. In accordance with IAC 567 Chapter 49, the diameter of the borehole must be 3 inches larger than the outside diameter of the riser pipe and screen. A certified-clean 20/40 silica sand or equivalent filter pack will be placed around the annular space of the well screen from the bottom of the boring extending to a depth of 2 feet above the top of the screen. A 3- to 5-foot bentonite layer will be placed above the top of the sand pack. If the bentonite seal is located above the unsaturated zone, the bentonite chips will be hydrated using potable water. After the bentonite is hydrated, a cement-bentonite grout will be placed in the remaining annular space. The monitoring well will be completed with a flush-mount or stick-up well protector and surrounded by bollards (for stick-up wells only). A locking watertight cap will be placed on the PVC pipe (if completed as a flush-mount well) or on the stick-up well protector (if completed as an aboveground well), and the well designation will be marked on the well.

The newly installed monitoring well will be allowed to sit for at least 24 hours prior to development. Development equipment will be cleaned before use at each location. Development and decontamination water will be temporarily stored in labeled 55-gallon drums or the equivalent pending characterization and staged onsite. Water quality parameters will be measured during development. Alternating periods of pumping and surging will occur until the measured field parameters have stabilized, per SOP-01, Monitoring Well Installation and Development (Appendix A).

The monitoring well will be inspected for signs of tampering or other damage. Suspected tampering (casing is damaged, lock or cap is missing) will be recorded in the field log book, in accordance with SOP-07, Note Taking and Field Log Books (Appendix A), and on the well sampling form, and be reported to the field team leader (FTL). Monitoring wells that appear to have been tampered with will not be sampled until the FTL has notified the project manager to discuss the path forward with the USACE.

Sampling of the proposed and existing wells to achieve the DQO will be performed in a single coordinated mobilization with the proposed Demolition Area investigation activities. Sampling from newly installed well will take place no sooner than 48 hours after well development has been completed and after water levels have reached equilibrium following well development. Static depth to

groundwater measurements will be recorded in accordance with SOP-11, Water Level Measurements (Appendix A), at the existing and newly installed monitoring wells before each groundwater sampling event. Groundwater levels will be measured to the nearest 0.01 foot using an electric water level indicator. Water levels will be measured in feet below top of casing. Groundwater elevation data from the existing wells and the proposed wells will be used to evaluate groundwater flow direction.

Groundwater samples will be collected from one existing well and the one proposed well for laboratory analysis of RCRA metals (total) and explosives (reference Worksheet #15 for test method). Sampling activities will be recorded in the field logbook, in accordance with SOP-07, Note Taking and Field Log Books (Appendix A), and sampling data on a well sampling form. Samples will be collected using groundwater low flow purging and sampling techniques as presented in SOP-14, Groundwater Sampling (Appendix A). Depth-to-groundwater measurements, temperature, pH, turbidity, dissolved oxygen, oxidation-reduction potential, and specific conductance measurements will be recorded before and during purging each well. If a groundwater sample cannot be collected following the SOP methods, the FTL or designee will discuss the path forward with CH2M's project manager.

Surveying

The location and elevation of each newly installed well will be surveyed by an Iowa-licensed surveyor.

See IAAAP Worksheet #14.

Decontamination

See IAAAP Worksheet #14.

Demobilization

See IAAAP Worksheet #14.

Waste Management

See IAAAP Worksheet #14.

Laboratory Analysis and Data Management

Laboratory Analysis

TestAmerica in Arvada, Colorado, is the primary laboratory and will analyze the groundwater samples for parameters. There will be no quality assurance split samples collected for this project effort. TestAmerica holds current DoD Environmental Laboratory Accreditation Program (ELAP) certification for the required methods and analytes. The laboratory analyses will be performed in accordance with the analytical methods, this UFP-QAPP, and the Laboratory SOPs as defined in Worksheet #23 (Analytical SOPs).

Data Management

See IAAAP Worksheet #14.

Data Review

See IAAAP Worksheet #14.

Data Evaluation and Usability

See IAAAP Worksheet #14.

Baseline Risk Assessment

See IAAAP Worksheet #14.

Reporting and ERIS

See IAAAP Worksheet #14.

Deactivation Furnace Worksheet #17: Sampling Design and Rationale

This worksheet describes the design and rationale for the RI/RFI activities.

Investigation Design and Rationale

The following subsections describe the proposed wells and groundwater samples to characterize the site.

Rationale for Numbers and Locations of Samples

An evaluation of the historical investigations conducted at the adjacent DA identified a lack of understanding of whether disposal trenches were potentially used at the DF. To conduct the geophysical survey, both north-south and east-west trending transects will be used. Transects will be approximately 18 to 24 inches in width and will be placed on 10-foot-center spacing. The lateral coverage of the GPR survey will be limited by presence of dense vegetation, buildings, and steep slopes. The depth of the GPR survey will be to 6 feet bgs. Given that the locations of the transects will be dependent on site features and type of equipment used, locations will not be pre-selected on a figure, but rather will be evaluated in the field.

No groundwater contamination has been attributed to the DF. Groundwater monitoring results from the existing bedrock monitoring location DA-TTMW-055 has not indicated impacts to groundwater to date. NFA has been recommended at the DF. In the case that burial trenches are identified from the geophysical survey, data from the proposed well may be used to support the CSM and complete a Remedial Investigation/RCRA Facility Investigation report. The proposed investigation at the DF will be as follows:

- One bedrock monitoring well will be installed downgradient of the site to support delineation of the DA plume and confirm whether NFA is still appropriate for groundwater if burial trenches are identified at the site (Table DF-17-1).
- Groundwater samples will be collected from the new well and from existing monitoring well DA-TTMW-055 (screened from 20.86 to 35.86 feet bgs) to assess whether groundwater impacts are present above screening levels (Table DF-17-1).

One round of groundwater sampling will be conducted at the proposed well and the existing well. Groundwater samples will be analyzed for total RCRA metals and explosives and compared to screening levels. Figure DF-10-3 shows the approximate location of the proposed new well and groundwater sample locations.

Deactivation Furnace Worksheet #18: Sampling Locations and Methods

The following table summarizes the sampling matrix, number of samples to be collected, analytical parameters, and the rationale for sampling location described in Worksheet #17 (Sampling Design and Rationale).

Table DF-18-1. Sample Locations and Sampling SOP Requirements
UFP-QAPP RI/RFI, IAAAP, Middletown, Iowa

Matrix	Depth	Analytical Group	Concentration Level	Estimated Number of Samples (Identify FDs)	Sampling SOP Reference [b]	Rationale for Sampling Location
Deactivation Furnace						
Groundwater	Bedrock (~20 to 30 feet bgs)	Explosives, RCRA Metals (total)	Low to moderate	Two samples [a]	SOP-01 through SOP-08, SOP-11, SOP-17, and SOP-18	Bias locations to supplement existing data and assess downgradient conditions Collect additional groundwater data to refine the CSM and for risk assessment purposes.

See Acronyms and Abbreviations section for abbreviations used in this table.

[a] At a minimum, one FD sample will be collected for every 20 samples per field event, one MS/MSD sample will be collected for every 20 samples per field event, and one equipment blank will be collected for every 20 samples per field event.

[b] SOP-01, Monitoring Well Installation and Development
SOP-02, Geographic Land Surveying
SOP-03, Global Positioning Satellite System Surveying
SOP-04, Equipment Decontamination Procedures
SOP-05, Organic Vapor Monitoring and Air Monitoring
SOP-06, Field Water Quality Measurements and Calibration
SOP-07, Note Taking and Field Log Books
SOP-08, Site Reconnaissance, Preparation, and Restoration
SOP-11, Water Level Measurements
SOP-17, Utility Clearance for Intrusive Operations
SOP-18, Soil Boring Logging

References

Harza. 1998. *Final Record of Decision, Iowa Army Ammunition Plant Soils, Operable Unit #1, Middletown, Iowa.* August.

JAYCOR. 1994. *Preliminary Assessments for the 43 Iowa Army Ammunition Plant Sites.* October.

JAYCOR. 1996. *Revised Draft Final Remedial Investigation Report, Iowa Army Ammunition Plant*. May.

PDC Technical Services. 1995. *RCRA Closure Report, Deactivation Furnace, Iowa Army Ammunition Plant, Middletown, Iowa*.

Tetra Tech. 2006. *Final Comprehensive (Brush Creek, Spring Creek, Long Creek, and Skunk River) Watersheds Evaluation and Supplemental Data Collection Work Plan*. December.

Tetra Tech. 2007. *Draft Final Remedial Action Work Plan for Excavations at the Deactivation Furnace for Iowa Army Ammunition Plant, Middletown, Iowa*. October 2007.

Tetra Tech. 2008. *Draft Remedial Action Report for Excavations at the Deactivation Furnace for Iowa Army Ammunition Plant, Middletown, Iowa*. July.

Tetra Tech. 2009. *Supplemental Remedial Investigation Report for Five Compliance-Related Cleanup Sites for Iowa Army Ammunition Plant, Middletown, Iowa*. July.

Tetra Tech. 2012. *Corrective Measures Study for Five Compliance-Related Cleanup Sites (Deactivation Furnace, Contaminated Waste Processor, Main Sewage Treatment Plant Drying Beds, Flyash Landfill, and Line 3a Sewage Treatment Plant) for Iowa Army Ammunition Plant, Middletown, Iowa*. May.

USACE. 1998. *Monitoring Well Design, Installation, and Documentation at Hazardous, Toxic, and Radioactive Waste Sites*. EM 1110-1-4000. November.

USEPA. 1988. *Guidance for Conducting Remedial Investigations and Feasibility Studies under CERCLA*. Interim final.

USEPA. 1989. *RCRA Hazardous Waste Management Permit, Iowa Army Ammunition Plant, Middletown, Iowa, EPA RCRA# 1A72313820445.* November.

USEPA. 1998. *Interim Soils Action for Operable Unit #1 Record of Decision.* Iowa Army Ammunition Plant, Middletown, Iowa. March 4.

Demolition Area Worksheet #10: Conceptual Site Model

This worksheet describes the site-specific background and environmental conditions in relation to the conceptual site model (CSM) for groundwater at the Demolition Area (DA) site, IAAP-021 (CC-06). Soil investigations and interim remedial actions have been performed at the DA; however, due to the active nature of the site, final soil assessments will be performed after inactivation of the site and after munitions explosive hazards have been addressed. DA site groundwater is addressed under Operable Unit (OU) 6 and the facility emergency basis Resource Conservation and Recovery Act (RCRA) Subpart X interim status permit. The CSM integrates existing information and assumptions about the physical site conditions, operational history, and characteristics of chemicals of potential concern (COPCs) based on historical reports. The CSM presented in this Worksheet is based on the current understanding of site history and conditions, and will be updated in the future based on the information from the supplemental RCRA facility investigation (RFI) activities.

Background

This background section consists of the site description and operational history.

Site Description

The DA is an approximately 23-acre site in the southwest portion of the installation (Figure DA-10-1); it is an active site used for emergency open burn and open detonation of rejected ammunition. The open detonation area comprises an open field with six shallow detonation pits. The open burn area consists of an access road to an open field where a burn pan can be placed. In addition, earth-covered, poured-concrete waste storage structures are present at the site. The DA is located at the topographic high near the boundary of the Skunk River and Long Creek watersheds (Figure DA-10-1).

Operational History

The DA has been in use since the early 1940s for open detonation of ammunition and since 1997 for open burn operations. The documented open detonation practice consisted of construction of detonation pits to a depth of approximately 6 feet, placement and detonation of ordnance, and site maintenance. Debris and unexploded ordnance (UXO) were periodically cleared from detonation pits. Detonation pits were backfilled when they were no longer usable, or during breaks in scheduled demilitarization activities. Additional pits were constructed as needed. Open burning was performed in open-top metal containers (pans) with solid or liquid propellants (Tetra Tech, 2005).

Metals and residues that remain after a detonation or burning episode are collected as part of site maintenance. If residual explosives were suspected, waste was thermally treated onsite or at the adjacent Deactivation Furnace (IAAP-023/CC-06) to remove any remaining explosive constituents. Metal scrap was then sold as salvage material. Since 1981, this area has been used on an emergency-only basis requiring approval by the State of Iowa to open-burn propellants in pans that have faulty stabilizers or to open-detonate ammunition rounds that become armed during the assembly process (Tetra Tech, 2012). Munitions of explosive concern (MEC) were investigated, removed, and destroyed at the DA previously; however, residual MEC and munitions constituents may be present at the site (Tetra Tech, 2008).

The earth-covered, poured-concrete bunker Buildings 900-194-8, 900-145-7, 900-189-1, and 900-198-1 (Figure DA-10-1) were used for storage of the following (Terracon, 2000):

- Munitions prior to demilitarization
- Explosive components used to initiate and control detonations
- Ash from waste incineration and open burning
- Reactive wastes
- Listed hazardous wastes from explosives operations

However, only Building 900-194-8 included hazardous waste management activities and was included on the RCRA (Part B) permit. This building was clean-closed in 2000 (Terracon, 2000).

Conceptual Site Model

The CSM presented in this section is based on the current understanding of the environmental conditions and regulatory program. This section is organized as follows:

- Environmental site setting
  - Topography and surface water
  - Geology and hydrogeology
- Regulatory framework
- Previous investigations
- Remedial actions
- Current understanding of nature and extent of contamination

Environmental Site Setting

The following sections describe the physical site-specific characteristics that differ from the installation environmental setting presented in Iowa Army Ammunition Plant (IAAAP) Worksheet #10. Previous environmental investigations are summarized below.

Topography and Surface Drainage

The topography at the DA is relatively flat with steeply incised drainages to the southeast, south, and west. The DA facilities and the access road are located on the upper elevations, and the drainage ravines are present downgradient and cut between the DA and the adjacent DF site (Figure DA-10-1). Surface elevations within the DA site range from 693 to 705 feet above mean sea level (amsl). The drainage between the DA and DF slopes steeply to the southwest to elevations below 650 feet amsl. Drainages to the west and south of the DA flow west and south, respectively, with slopes noted at up to 10 percent grades.

Surface water is not present within the DA boundaries, but is present directly downgradient of the site. Ephemeral drainages (sometimes referred to as tributaries or drainage ditches) which have incised into loess and glacial till channel surface runoff for the DA and DF sites (Figure DA-10-1). All drainage flows to the Skunk River located approximately 0.5 mile (2,500 feet) southwest of the site.

Geology and Hydrogeology

The stratigraphy of the site includes a thin surface layer of loess (present only in the upper elevation areas) underlain by glacial till and limestone of the upper Warsaw Formation bedrock (JAYCOR, 1996). The loess and much of the till has been incised by surface drainages directly west and south of the DA. According to information from soil boring logs, the overburden thickness is between 5 and 25 feet and composed of sand, silt, and clay (JAYCOR, 1996; Tetra Tech, 2005, 2012). The underlying limestone

bedrock is composed predominantly of cherty carbonates interbedded with minor amounts of shale (Tetra Tech, 2009). An evaluation of the bedrock groundwater geochemistry indicated that deposits of calcium and magnesium in shallow, weathered bedrock are likely slowing and retarding downward (vertical) groundwater flow.

Groundwater at the site is present primarily within the limestone bedrock and in the interface between bedrock and overburden. Seasonal groundwater elevation fluctuations of up to 7 feet may saturate the overburden in the summer months (Tetra Tech, 2009). Depth to water is between 1 and 32 feet below ground surface (bgs) based on topography and measurements from monitoring wells (Tetra Tech, 2009). Based on observed flow conditions, recent groundwater elevations, and observed plume migration, groundwater flows primarily toward incised drainage valleys.

Groundwater flow is directed towards topographic lows to the south and west and generally follows topography. Hydraulic gradients range from 0.01 to 0.04 foot per foot. Gradient values are smaller on the flat upper elevations and increase towards the drainages (Figure DA-10-1). Hydraulic conductivity values have not been calculated for this site.

Groundwater/Surface Water Interaction

There is a potential for discharge of groundwater to intermittent streams during periods when the groundwater table rises based on depth to groundwater measurements of less than 1 foot recorded at wells near the headwaters of the intermittent stream located between the DA and the DF and the stream draining due west of the DA (Figure DA-10-1). The greatest potential for groundwater discharge is anticipated to occur during the months of highest rainfall (May through July). Discussion with IAAAP employees in July 2017 indicated that seeps have been identified in the drainages at and downgradient of this site. This will be further investigated as discussed in the Summary and Data Gaps section.

Regulatory Framework

The DA site is regulated under RCRA. Following the proposed field investigation, results from the RCRA sites will be reported separately from CERCLA sites. (See Demolition Area Worksheet #14.) The DA, IAAP-021, is grouped with the Deactivation Furnace, IAAP-023, under the designation CC-06 under CERCLA due to site proximity. The DA is presented separately in this Unified Federal Policy–Quality Assurance Project Plan (UFP-QAPP) because it is an active site, which will impact the RFI, Corrective Measures Study, and risk assessment assumptions (both current and future).

The DA was included in the facility's application for an emergency basis RCRA permit for open demolition and subsequently permitted for open burning operations (American Ordnance, 2006). In 2004, the U.S. Department of the Army and the U. S. Environmental Protection Agency (USEPA) agreed to a Resolution of Dispute, which allowed for remedial activities to be performed at five RCRA sites under the Compliance-related Cleanup Program (Tetra Tech, 2005). Since this agreement, soil, sediment, surface water, and groundwater investigations have progressed within the active DA boundary and at downgradient locations beyond the site fencing.

Indian burial mounds have been identified immediately south of the DA. This area is protected in accordance with the statutes set forth under Chapter 263B of the Iowa Code, which prohibits the defilement of Indian burial grounds.

Previous Investigations

Investigation work previously conducted at the DA is summarized in Table DA-10-1 and discussed below.

Table DA-10-1. Previous Investigations
UFP-QAPP RI/RFI, IAAAP, Middletown, Iowa

Year(s)	Source	Media Investigated	Investigation Summary	Analyses [a]	Results/Conclusions
1981	*Preliminary Assessment* (ERG)	SO	Install soil borings	Ex, M	Explosives and lead contamination was detected in shallow soil.
		GW	Install/sample overburden well G-9 and bedrock wells G-10 and G-11	Ex, M	Explosives detected below screening levels in bedrock well G-11.
1985	*Midwest Site Confirmatory Survey* (Dames & More)	GW	Sample overburden well G-9 and bedrock wells G-10, G-11, DA-01, and DA-02	Ex, V, S	Explosives and VOCs were detected in bedrock groundwater. VOC contamination was not identified in subsequent samples.
1987	*RCRA Facility Assessment* (Ecology and Environment)	GW	Sample overburden well G-9 and bedrock wells G-10, G-11, DA-01, and DA-02	Ex, V, M	Explosives were detected in bedrock groundwater. VOCs not detected.
1991	*Facility Wide Site Inspection* (JAYCOR)	SO	Collect 8 samples	Ex, V, S, M	Explosives and metals detected above screening levels.
		GW	Sample 2 bedrock wells	Ex, V, S, M	Explosives detected above screening levels.
1992–1995	*Remedial Investigation* (JAYCOR)	SO	Collect 21 samples	Ex, V, S, M	Metals detected above screening levels. Explosives detected below screening levels.
		SW	Collect 2 samples from intermittent stream and Skunk River	Ex, V, S, M	No explosives were detected in surface water or sediment above screening levels. Metals were detected in sediment samples from the intermittent stream. VOC and SVOC detections were attributed to laboratory and field contamination and were not used at the site.
		SD	Collect 3 samples from intermittent stream and Skunk River	Ex, V, S, M	
		GW	Install/sample 2 bedrock wells, JAW-01 and -02. Sample existing overburden well G-9 and bedrock well DA-2	Ex, V, S,	Explosives and metals were detected above screening levels in bedrock wells. VOC detections were not identified in subsequent sampling.

Table DA-10-1. Previous Investigations
UFP-QAPP RI/RFI, IAAAP, Middletown, Iowa

Year(s)	Source	Media Investigated	Investigation Summary	Analyses [a]	Results/Conclusions
2007–2008	*Draft Final Digital Geophysical Mapping Report* (Tetra Tech) *Demolition Area Phase III Soil Sample and Phase III Groundwater Letter Reports* (Army)	SO	Collect over 200 soil samples from 43 borings	Ex, M	Explosives were detected above RGs in 1 sample. Metals were detected in soil with no hot spots identified.
		SW	Collect 18 samples from intermittent streams	Ex	Explosives were detected below screening levels in surface water.
		SD	Collect 3 samples from intermittent stream	Ex	No detections were reported in sediment.
		GW	Install and sample 9 bedrock wells	Ex, M,	RDX detected above screening levels at multiple downgradient wells.
2009–2014	Periodic monitoring, treatability testing (Tetra Tech unpublished)	SO	Collect core samples for bench test	Ex, M, TT	Minimal explosives detected in soil cores.
		GW	Install 7 bedrock and 6 injection wells	Ex, M, TT	Groundwater results indicate short-term reduction of RDX as a result of treatability studies.

[a] Ex = explosives, M = metals, S = semivolatile organic compounds, TT = treatability parameter, V = volatile organic, compounds, RDX = Royal Demolition Explosive

Impacts to soil, sediment, surface water, and groundwater at the DA have been investigated since 1981, as summarized in Table DA-10-1. Results of the investigations are presented in Preliminary Assessment (PA), Site Investigations (SI), RFI, geophysical munitions investigations, and groundwater monitoring reports. Available documents were reviewed, and the results and conclusion were used to develop the current understanding of nature and extent of contamination by media. Tables DA-10-2 through DA-10-4 summarize the historical sample results (detected compounds only).

Remedial Actions

Treatability studies and an evaluation of natural attenuation have been performed at the site at the areas shown on Figure DA-10-1. Both bench-scale and pilot-scale field implementation was conducted to determine if injection of reactive agents are a suitable remedy for the groundwater contamination. The bench-scale results were used to inform the pilot-scale designs. The studies evaluated natural attenuation by conducting three monitoring events at existing wells as a preliminary comparison to the evaluated active remedy studies. An enhanced bioremediation study added a carbon substrate (sodium acetate) to promote biodegradation of RDX. Iron-mediated abiotic degradation was evaluated by first evaluating whether sufficient iron is present in situ to stimulate abiotic reactions and to add ferrous sulfate if a minimum RDX to iron ratio of 1:1000 was not present. Subsequently, sodium sulfite was proposed to induce reducing conditions (Tetra Tech, 2012). An alkaline hydrolysis study was conducted by injecting sodium hydroxide into two wells to increase pH, thereby forming hydroxyl ions that can substitute the nitro and methyl groups in nitroaromatic compounds.

Surface clearance of unexploded ordnance (UXO) and munitions debris have been performed periodically at the site. UXO has been unearthed at the site during previous investigations and munition

response actions and UXO hazards remain at the site (Tetra Tech, 2005). Soil remedial actions were conducted as an interim action, as documented in Section 2.5 and Table 1 of the OU1 ROD (Harza, 1998).

Current Understanding of Nature and Extent of Contamination

This section presents a summary of the potential sources of contamination identified at the DA and current conditions in site media.

Potential Sources of Contamination

The source of contamination at the DA is attributed to

- Releases of explosives residues
- Ash from historical open detonation and open burning operations

Soil

Metals and explosive compounds have been detected in shallow soil at concentrations exceeding OU1 Remediation Goals (RGs). Royal demolition explosive (RDX), 2,4,6-trinitrotoluene, and 1-nitrotoluene were detected above RGs in 9 of 245 samples analyzed for explosives. Arsenic, barium, cadmium, chromium, lead, mercury, and selenium were detected above RGs in numerous samples across the site; however, their distribution did not indicate a hot spot. Removal of MEC was performed historically; however, surface and subsurface UXO hazards remain at the site due to residuals left in place after the geophysical investigation and potentially as a result of ongoing detonation activities at the active site (Tetra Tech, 2008, 2012).

The nature and extent of COPCs in soil has been evaluated, and risk to soil was calculated as part of the RI (JAYCOR, 1996). The human health risk assessment will address media impacts in the DA resulting from historical site releases using the RI data set. As is typical at active RCRA facilities, ongoing operations are conducted under a RCRA permit and are not expected to result in further impact above acceptable levels. However, when facility operations are terminated at some point in the future, the site will undergo closure, and site-wide characterization and risk assessment will be performed. Therefore, no changes to the approach are proposed.

Sediment and Surface Water

Sample results from surface water and sediment do not indicate that contaminants are present at concentrations exceeding screening levels (Figure DA-10-2; Table DA-10-2; Table DA-10-3). However, the CSM at the DA is that groundwater is migrating laterally to incised drainages and seeping out of the exposed bedrock. The potential for seeps will be investigated and sampled where identified.

Ecological risk will be assessed by watershed rather than by site, as such further evaluation of potential impacts and the potential need for additional sediment or surface water sampling will be conducted as part of the proposed Skunk River and Long Creek watershed OUs.

Groundwater

Bedrock groundwater is impacted by COPCs downgradient of the site. Sources of groundwater contamination were not discernable from soil characterization data because soil exceedances were not localized to one area that could be qualified as a source. The primary contaminants present in bedrock groundwater are RDX and its degradation products, and metals (Figure DA-10-3, Table DA-10-4). Explosives detected at concentrations exceeding screening levels includes RDX, 2,4-dinitrotoluene, 2-nitrotoluene, and nitrobenzene. Lead is the primary metal detected above the screening level. Lead and explosives exceedances are generally present within the RDX bedrock plume (Table DA-10-4). Other metals (barium, cadmium, chromium, and mercury), nitrate, and organic compounds, bis(2-

ethylhexyl)phthalate and chloroform, were detected sporadically above screening levels. Hexavalent chromium detections have not been repeated and are not congruous with the other sample results for total and dissolved chromium.

Polycyclic aromatic hydrocarbons (PAHs), compounds that are common byproducts of open burning, have been analyzed at six shallow groundwater wells (DA-01, DA-02, G-9, G-10, JAW-01, and JAW-02) in 1992, 1993, and 1995. The specific PAH compounds analyzed included: acenaphthylene, anthracene, Benzo[a]anthracene, Benzo[a]pyrene, Benzo[ghi]perylene, benzo[b]fluoranthene, benzo[k]fluoranthene, chrysene, dibenz[ah]anthracene, fluoranthene, fluorene, indeno[1,2,3-C,D]pyrene, naphthalene, phenanthrene, and pyrene. These constituents from each sampling event were not detected and therefore are not considered a site COPC.

Two RDX plumes are present in bedrock groundwater at the site. One plume is in the southern half of the site migrating downgradient following topography. The western plume is migrating west from the site. Both plumes extend beyond the existing well field to the south and west (Figure DA-10-3). Therefore, three additional bedrock wells are proposed to delineate explosives in groundwater downgradient of the plumes. To evaluate the potential for vertical migration, boring logs and available groundwater geochemical data were reviewed. The evaluation indicates that deposits of calcium and magnesium in shallow, weathered bedrock are likely slowing and retarding downward (vertical) groundwater flow, causing the migration of groundwater across the site into drainage ditches (Tetra Tech, 2012).

Because wells cannot be installed downgradient of the site due to UXO concerns, presence of Indian burial mounds, and steep topography (Figure DA-10-3), only one well is proposed, adjacent to DA-TTMW-054 as this location has already been cleared and is accessible. This well will be installed to evaluate whether fractures are healing with depth and to confirm vertical delineation. Seep sampling is also proposed along the intermittent streams to the south of the DA to confirm the CSM that groundwater is migrating laterally and discharging in drainages.

Summary and Data Gaps

Historical data do not indicate contamination in surface water and sediment at concentrations exceeding screening levels; however, migration of groundwater and discharge as seeps in drainages downgradient of the site has not been investigated previously. A field reconnaissance is proposed to evaluate whether seeps are present and, if identified, their locations will be recorded using GPS, and the water will be sampled. Soil investigations indicate low-level impacts across a large area of surface and subsurface overburden that has likely contributed to groundwater contamination.

The downgradient extent of the two plumes at the site is not delineated, in addition, current concentrations of RDX are needed to quantify the amount of rebound that may have occurred from treatability testing; therefore, the wells shown on Figure DA-10-3 are proposed for sampling and analysis of explosives. New monitoring wells are proposed for installation, including a nested well pair with one well screened at the first groundwater-bearing zone for lateral delineation, as discussed above, and one well screened 20 feet below the first encountered water table for vertical delineation. One additional monitoring well will be installed adjacent to DA-TTMW-054 to a total depth of approximately 48 feet bgs (30 feet below the screened interval of the existing well) to evaluate vertical extent of constituents and assess potential lithologic changes in the degree of bedrock fracturing and potential fracture healing with depth. A proposed well at the Deactivation Furnace will also be sampled and used to supplement the DA assessment. To evaluate historical metal exceedances and the significance of metal concentrations with respect to background, samples will also be analyzed for total RCRA metals. Seeps, if identified, will be sampled in the drainage areas for analysis of explosives.

Conceptual Exposure Model

Based on the understanding of site conditions, Figure DA-10-4 presents the preliminary conceptual exposure model (CEM) for human and ecological receptors, respectively. The potential exposure scenarios summary table at the bottom of Figure DA-10-4 shows the exposure media and pathways; COPCs in the indicated media and pathways will be evaluated in the human health and ecological risk assessments. Future industrial site workers include both potential indoor and outdoor site work. No future residential use of this site is proposed due to historical munitions activities precluding transfer of the site for unrestricted use.

The CEMs included in this UFP-QAPP are preliminary and were developed based on the current understanding of site conditions. However, the preliminary CEMs will be refined, as more site-specific information is obtained. Revised CEMs will be provided for review within an interim deliverable prior to completion of the RFI.

Data Quality Objectives

The RI/RFI will be performed to evaluate the extent of contamination, estimate human health and ecological risk, and recommend a path forward consistent with USEPA guidance. Data quality objectives (DQOs) are as summarized in Table DA-11-1. The specific tasks that will be performed during the RI/RFI are described in Demolition Area Worksheet #14. The rationale behind the steps outlined in Table DA-11-1 are presented in detail in Demolition Area Worksheet #17.

Table DA-10-2. Demolition Area: Surface Water Detects

UFP-QAPP RI/RFI, IAAAP, Middletown, Iowa

				Location	7P1		DA-TTSW/SD-005		DA-TTSW/SD-018		DA-TTSW-001		DA-TTSW-001		DA-TTSW-002		DA-TTSW-003		DA-TTSW-004		DA-TTSW-006	
				Sample ID	7P1-19970602-WS		DA-TTSW/SD-005-WS		DA-TTSW/SD-018-WS		DA-TTSW-001-WS		DA-TTSW-001-WS-FD		DA-TTSW-002-WS		DA-TTSW-003-WS		DA-TTSW-004-WS		DA-TTSW-006-WS	
				Sample Date	6/2/1997		4/6/2008		4/6/2008		4/7/2008		4/7/2008		4/7/2008		4/7/2008		4/6/2008		4/6/2008	
Test Group	**CAS**	**Parameter**	**Unit**	**Screening Level***																		
EXPLOSIVES	118-96-7	2,4,6-Trinitrotoluene	µg/L	1,060	0.00001	U	0.19	U	0.2	U	0.19	U	0.19	U	0.2	U	0.2	U	0.19	U	0.19	U
EXPLOSIVES	121-82-4	RDX	µg/L	649	0.00001	U	0.19	U	0.2	U	0.19	U	0.19	U	0.2	U	0.2	U	0.19	U	**0.9**	
EXPLOSIVES	2691-41-0	HMX	µg/L	2,050,000	0.00001	U	0.19	U	0.2	U	0.19	U	0.19	U	0.2	U	0.2	U	0.19	U	**0.32**	
METALS	7429-90-5	Aluminum	µg/L	18,900,000	0.01	U	--		--		--		--		--		--		--		--	
METALS	7439-95-4	Magnesium	µg/L	NC	0.01	U	--		--		--		--		--		--		--		--	
METALS	7439-96-5	Manganese	µg/L	26,900	0.01	U	--		--		--		--		--		--		--		--	
METALS	7440-09-7	Potassium	µg/L	NC	0.01	U	--		--		--		--		--		--		--		--	
METALS	7440-23-5	Sodium	µg/L	NC	0.01	U	--		--		--		--		--		--		--		--	
METALS	7440-38-2	Arsenic	µg/L	44.2	**0.67**		--		--		--		--		--		--		--		--	
METALS	7440-39-3	Barium	µg/L	386,000	**59**		--		--		--		--		--		--		--		--	
METALS	7440-50-8	Copper	µg/L	1,000**	0.01	U	--		--		--		--		--		--		--		--	
METALS	7440-62-2	Vanadium	µg/L	3,700	0.01	U	--		--		--		--		--		--		--		--	
METALS	7440-66-6	Zinc	µg/L	26,000**	0.01	U	--		--		--		--		--		--		--		--	
METALS	7440-70-2	Calcium	µg/L	NC	0.01	U	--		--		--		--		--		--		--		--	
METALS-DISS	7429-90-5	Aluminum	µg/L	18,900,000	--		--		--		--		--		--		--		--		--	
METALS-DISS	7439-92-1	Lead	µg/L	NC	--		--		--		--		--		--		--		--		--	
METALS-DISS	7439-95-4	Magnesium	µg/L	NC	--		--		--		--		--		--		--		--		--	
METALS-DISS	7439-96-5	Manganese	µg/L	26,900	--		--		--		--		--		--		--		--		--	
METALS-DISS	7440-02-0	Nickel	µg/L	4,600**	--		--		--		--		--		--		--		--		--	
METALS-DISS	7440-09-7	Potassium	µg/L	NC	--		--		--		--		--		--		--		--		--	
METALS-DISS	7440-23-5	Sodium	µg/L	NC	--		--		--		--		--		--		--		--		--	
METALS-DISS	7440-38-2	Arsenic	µg/L	44.2	--		--		--		--		--		--		--		--		--	
METALS-DISS	7440-39-3	Barium	µg/L	386,000	--		--		--		--		--		--		--		--		--	
METALS-DISS	7440-62-2	Vanadium	µg/L	3,700	--		--		--		--		--		--		--		--		--	
METALS-DISS	7440-66-6	Zinc	µg/L	26,000**	--		--		--		--		--		--		--		--		--	
METALS-DISS	7440-70-2	Calcium	µg/L	NC	--		--		--		--		--		--		--		--		--	
METALS-DISS	7782-49-2	Selenium	µg/L	4,200**	--		--		--		--		--		--		--		--		--	

Notes:

J = The analyte was positively identified: the associated numerical value is the approximate concentration of the analyte in the sample.

U = The analyte was analyzed for, but was not detected above the reported sample quantitation limit.

UJ = The analyte was analyzed for, but was not detected above the reported sample quantitation limit. Result should be considered estimated.

Bold indicates the analyte was detected

Shading indicates the analyte exceeded screening criteria

*Surface Water RSLs were calculated using the RSL Calculator (May 2016), based on a recreational scenario and assuming an exposure frequency of 26 days/year. Final surface water screening level is the lower value of the Iowa Surface Water Quality Standard and the surface water RSL. The Action Level is used for Lead.

** Iowa Ambient Water Quality Standard (Fish Consumption) is used

See Acronyms and Abbreviations for any abbreviations used in this table.

Table DA-10-2. Demolition Area: Surface Water Detects

UFP-QAPP RI/RFI, IAAAP, Middletown, Iowa

				Location	DA-TTSW-007		DA-TTSW-007		DA-TTSW-008		DA-TTSW-009		DA-TTSW-010		DA-TTSW-011		DA-TTSW-014		DA-TTSW-015		DA-TTSW-016	
				Sample ID	DA-TTSW-007-WS		DA-TTSW-007-WS-FD		DA-TTSW-008-WS		DA-TTSW-009-WS		DA-TTSW-010-WS		DA-TTSW-011-WS		DA-TTSW-014-WS		DA-TTSW-015-WS		DA-TTSW-016-WS	
				Sample Date	4/6/2008		4/6/2008		4/7/2008		4/7/2008		4/7/2008		4/7/2008		4/6/2008		4/6/2008		4/6/2008	
Test Group	**CAS**	**Parameter**	**Unit**	**Screening Level***																		
EXPLOSIVES	118-96-7	2,4,6-Trinitrotoluene	µg/L	1,060	**0.16**	J	**0.15**	J	0.19	U	0.19	U	0.19	U	0.19	U	0.19	U	0.2	U	0.2	U
EXPLOSIVES	121-82-4	RDX	µg/L	649	**1.5**		**1.5**		0.19	U	0.19	U	0.19	U	0.19	U	**0.42**		0.2	U	0.2	U
EXPLOSIVES	2691-41-0	HMX	µg/L	2,050,000	**0.13**	J	**0.14**	J	0.19	U	0.19	U	0.19	U	0.19	U	0.19	U	0.2	U	0.2	U
METALS	7429-90-5	Aluminum	µg/L	18,900,000	--		--		--		--		--		--		--		--		--	
METALS	7439-95-4	Magnesium	µg/L	NC	--		--		--		--		--		--		--		--		--	
METALS	7439-96-5	Manganese	µg/L	26,900	--		--		--		--		--		--		--		--		--	
METALS	7440-09-7	Potassium	µg/L	NC	--		--		--		--		--		--		--		--		--	
METALS	7440-23-5	Sodium	µg/L	NC	--		--		--		--		--		--		--		--		--	
METALS	7440-38-2	Arsenic	µg/L	44.2	--		--		--		--		--		--		--		--		--	
METALS	7440-39-3	Barium	µg/L	386,000	--		--		--		--		--		--		--		--		--	
METALS	7440-50-8	Copper	µg/L	1,000**	--		--		--		--		--		--		--		--		--	
METALS	7440-62-2	Vanadium	µg/L	3,700	--		--		--		--		--		--		--		--		--	
METALS	7440-66-6	Zinc	µg/L	26,000**	--		--		--		--		--		--		--		--		--	
METALS	7440-70-2	Calcium	µg/L	NC	--		--		--		--		--		--		--		--		--	
METALS-DISS	7429-90-5	Aluminum	µg/L	18,900,000	--		--		--		--		--		--		--		--		--	
METALS-DISS	7439-92-1	Lead	µg/L	NC	--		--		--		--		--		--		--		--		--	
METALS-DISS	7439-95-4	Magnesium	µg/L	NC	--		--		--		--		--		--		--		--		--	
METALS-DISS	7439-96-5	Manganese	µg/L	26,900	--		--		--		--		--		--		--		--		--	
METALS-DISS	7440-02-0	Nickel	µg/L	4,600**	--		--		--		--		--		--		--		--		--	
METALS-DISS	7440-09-7	Potassium	µg/L	NC	--		--		--		--		--		--		--		--		--	
METALS-DISS	7440-23-5	Sodium	µg/L	NC	--		--		--		--		--		--		--		--		--	
METALS-DISS	7440-38-2	Arsenic	µg/L	44.2	--		--		--		--		--		--		--		--		--	
METALS-DISS	7440-39-3	Barium	µg/L	386,000	--		--		--		--		--		--		--		--		--	
METALS-DISS	7440-62-2	Vanadium	µg/L	3,700	--		--		--		--		--		--		--		--		--	
METALS-DISS	7440-66-6	Zinc	µg/L	26,000**	--		--		--		--		--		--		--		--		--	
METALS-DISS	7440-70-2	Calcium	µg/L	NC	--		--		--		--		--		--		--		--		--	
METALS-DISS	7782-49-2	Selenium	µg/L	4,200**	--		--		--		--		--		--		--		--		--	

Notes:

J = The analyte was positively identified: the associated numerical value is the approximate concentration of the analyte in the sample.

U = The analyte was analyzed for, but was not detected above the reported sample quantitation limit.

UJ = The analyte was analyzed for, but was not detected above the reported sample quantitation limit. Result should be considered estimated.

Bold indicates the analyte was detected

Shading indicates the analyte exceeded screening criteria

*Surface Water RSLs were calculated using the RSL Calculator (May 2016), based on a recreational scenario and assuming an exposure frequency of 26 days/year. Final surface water screening level is the lower value of the Iowa Surface Water Quality Standard and the surface water RSL. The Action Level is used for Lead.

** Iowa Ambient Water Quality Standard (Fish Consumption) is used

See Acronyms and Abbreviations for any abbreviations used in this table.

Table DA-10-2. Demolition Area: Surface Water Detects

UFP-QAPP RI/RFI, IAAAP, Middletown, Iowa

				Location	DA-TTSW-017		SRT02-H		SRT02-H	
				Sample ID	DA-TTSW-017-WS		SRT02-H-20000525		SRT02-H-20000927	
				Sample Date	4/6/2008		5/25/2000		9/27/2000	
Test Group	**CAS**	**Parameter**	**Unit**	**Screening Level***						
EXPLOSIVES	118-96-7	2,4,6-Trinitrotoluene	µg/L	1,060	0.19	U	0.16	U	0.16	U
EXPLOSIVES	121-82-4	RDX	µg/L	649	0.19	U	0.16	U	0.16	U
EXPLOSIVES	2691-41-0	HMX	µg/L	2,050,000	0.19	U	0.39	U	0.39	U
METALS	7429-90-5	Aluminum	µg/L	18,900,000	--		**114**	**J**	**61.8**	**J**
METALS	7439-95-4	Magnesium	µg/L	NC	--		**30500**		**26400**	**J**
METALS	7439-96-5	Manganese	µg/L	26,900	--		**123**		**49.6**	**J**
METALS	7440-09-7	Potassium	µg/L	NC	--		**1510**		**3230**	
METALS	7440-23-5	Sodium	µg/L	NC	--		**6200**		**5950**	**J**
METALS	7440-38-2	Arsenic	µg/L	44.2	--		**4.5**	**J**	2.2	U
METALS	7440-39-3	Barium	µg/L	386,000	--		**78.5**		**77.1**	**J**
METALS	7440-50-8	Copper	µg/L	1,000**	--		2.6	U	**1.6**	**J**
METALS	7440-62-2	Vanadium	µg/L	3,700	--		1.5	U	**5.1**	
METALS	7440-66-6	Zinc	µg/L	26,000**	--		**4.2**	**J**	**6**	**J**
METALS	7440-70-2	Calcium	µg/L	NC	--		**81700**		**77400**	**J**
METALS-DISS	7429-90-5	Aluminum	µg/L	18,900,000	--		72.7	U	**21.2**	**J**
METALS-DISS	7439-92-1	Lead	µg/L	NC	--		**3**	**J**	1.3	U
METALS-DISS	7439-95-4	Magnesium	µg/L	NC	--		**31000**		**25700**	**J**
METALS-DISS	7439-96-5	Manganese	µg/L	26,900	--		**61.3**		0.6	UJ
METALS-DISS	7440-02-0	Nickel	µg/L	4,600**	--		**2.2**	**J**	1	U
METALS-DISS	7440-09-7	Potassium	µg/L	NC	--		**1590**		**3080**	
METALS-DISS	7440-23-5	Sodium	µg/L	NC	--		**5390**		**4870**	**J**
METALS-DISS	7440-38-2	Arsenic	µg/L	44.2	--		4.4	U	**2.5**	**J**
METALS-DISS	7440-39-3	Barium	µg/L	386,000	--		**74.2**		**74.3**	**J**
METALS-DISS	7440-62-2	Vanadium	µg/L	3,700	--		1.5	U	**3.5**	**J**
METALS-DISS	7440-66-6	Zinc	µg/L	26,000**	--		**13.6**		**1**	**J**
METALS-DISS	7440-70-2	Calcium	µg/L	NC	--		**88000**		**75300**	**J**
METALS-DISS	7782-49-2	Selenium	µg/L	4,200**	--		**4.5**	**J**	**6.3**	

Notes:

J = The analyte was positively identified: the associated numerical value is the approximate concentration of the analyte in the sample.

U = The analyte was analyzed for, but was not detected above the reported sample quantitation limit.

UJ = The analyte was analyzed for, but was not detected above the reported sample quantitation limit. Result should be considered estimated.

Bold indicates the analyte was detected

Shading indicates the analyte exceeded screening criteria

*Surface Water RSLs were calculated using the RSL Calculator (May 2016), based on a recreational scenario and assuming an exposure frequency of 26 days/year. Final surface water screening level is the lower value of the Iowa Surface Water Quality Standard and the surface water RSL. The Action Level is used for Lead.

** Iowa Ambient Water Quality Standard (Fish Consumption) is used

See Acronyms and Abbreviations for any abbreviations used in this table.

Table DA-10-3. Demolition Area: Sediment Detects

UFP-QAPP RI/RFI, IAAAP, Middletown, Iowa

				Location	7P1		RBWSD91		RBWSD91		RBWSD92		SRT02-H	
				Sample ID	7P1-19970602-SD		RBWSD91-19920818-SD		RBWSD91-19920819-SD		RBWSD92-19920818-SD		SRT02-H-20000928-SD	
				Sample Date	6/2/1997		8/18/1992		8/19/1992		8/18/1992		9/28/2000	
Test Group	CAS	Parameter	Unit	Sediment RSL (HQ=1) May 2016*										
VOLATILES	75-69-4	Trichlorofluoromethane	mg/kg	1,230	0.00000001	U	**0.009**		0.0059	U	**0.0068**			
METALS	7429-90-5	Aluminum	mg/kg	112,000,000	0.00000001	U	**8020**		**7990**		**5150**		**2920**	
METALS	7439-89-6	Iron	mg/kg	78,600,000	0.00000001	U	**21500**		**18200**		**23700**		**7460**	
METALS	7439-92-1	Lead	mg/kg	--	**0.03**		**15**		**7.9**		**13**		**6.3**	
METALS	7439-95-4	Magnesium	mg/kg	--	0.00000001	U	**11700**		**1670**		**1420**		**2260**	
METALS	7439-96-5	Manganese	mg/kg	--	0.00000001	U	**991**		**800**		**1350**		**238**	
METALS	7440-02-0	Nickel	mg/kg	2,250,000	0.00000001	U	**26.6**		**19.8**		**33.7**		**7.1**	
METALS	7440-09-7	Potassium	mg/kg	--	0.00000001	U	**1290**		**759**		**476**		**402**	
METALS	7440-22-4	Silver	mg/kg	562,000	**0.0012**		0.58	U	0.58	U	0.58	U	0.06	U
METALS	7440-23-5	Sodium	mg/kg	--	0.00000001	U	**314**		**235**		**186**		**418**	**J**
METALS	7440-38-2	Arsenic	mg/kg	--	**0.02**		**8.01**		**3.94**		**8.03**		**6.3**	
METALS	7440-39-3	Barium	mg/kg	--	**0.34**		**106**		**133**		**141**		**35.8**	
METALS	7440-41-7	Beryllium	mg/kg	225,000			**1.22**		**1.42**		**1.66**		**0.24**	**J**
METALS	7440-43-9	Cadmium	mg/kg	41,800	**0.00081**		0.7	U	0.7	U	0.7	U	**0.08**	**J**
METALS	7440-47-3	Chromium	mg/kg	393	**0.01**		**14**		**13.9**		**13.2**		**5.7**	
METALS	7440-48-4	Cobalt	mg/kg	33,700	0.00000001	U	**10.6**		**8.29**		**12.1**		**4.1**	
METALS	7440-50-8	Copper	mg/kg	4,490,000	0.00000001	U	**9.8**		**12.2**		**10**		**4.7**	
METALS	7440-62-2	Vanadium	mg/kg	566,000	0.00000001	U	**23.3**		**28.8**		**26.9**		**10**	
METALS	7440-66-6	Zinc	mg/kg	33,700,000	0.00000001	U	**44.1**		**40.5**		**71.4**		**24.5**	
METALS	7440-70-2	Calcium	mg/kg	--	0.00000001	U	**23400**		**2800**		**9220**		**5600**	
METALS	7782-49-2	Selenium	mg/kg	562,000	0.00000001	U	**1.16**		0.25	U	**0.66**		0.4	UJ

Notes:

U = The analyte was analyzed for, but was not detected above the reported sample quantitation limit.

UJ = The analyte was analyzed for, but was not detected above the reported sample quantitation limit. The result should be considered estimated.

Bold indicates the analyte was detected

Shading indicates the analyte exceeded screening criteria

* Sediment RSLs were calculated using the RSL Calculator (May 2016), based on a recreational scenario and assuming an exposure frequency of 26 days/year.

Table DA-10-4. Demolition Area: Groundwater Detects

UFP-QAPP RI/RFI, IAAAP, Middletown, Iowa

Test Group	CAS	Parameter	Unit	Screening Level*	Location	DA-01		DA-01		DA-01		DA-01		DA-01		DA-01		DA-01		DA-01		DA-01		DA-01		DA-01		DA-01		DA-01		DA-01		DA-01		DA-02		DA-02		DA-02		DA-02		DA-02		DA-02	
					Sample ID	DA-01-041695		DA-01-081094		DA-01-19851001		DA-01-19870625		DA-01-19950425		DA-01-19950503		DA-01-19960803		DA-01-19970619		DA-01-19970826		DA-01-20010605		DA-01-20020612		DA-01-20040615		DA-01-200906		DA-1-344977		DA-1-355046		DA-02-041695		DA-02-051600		DA-02-080994		DA-02-19851002		DA-02-19870625		DA-02-19910823	
					Sample Date	4/16/1995		8/10/1994		10/1/1985		6/25/1987		4/25/1995		5/3/1995		8/3/1996		6/19/1997		8/26/1997		6/5/2001		6/12/2002		6/15/2004		6/10/2009		10/5/1995		12/13/1995		4/16/1995		5/16/2000		8/9/1994		10/2/1985		6/25/1987		8/23/1991	
EXPLOSIVES	118-96-7	2,4,6-Trinitrotoluene	µg/L	2.5	2	U	2	U	1.9	U	--		0.63	U	0.63	U	0.07	U	**0.19**		0.16	U	1.2	U	0.7	U	0.49	U	0.19	U	--		0.21	U	2	U	0.18	U	2	U	1.9	U	--		0.78	
EXPLOSIVES	121-14-2	2,4-Dinitrotoluene	µg/L	0.24	2	U	2	U	0.56	U	--		4.5	UN	0.06	U	0.09	U	0.09	U	0.12	U	1.2	U	0.7	U	0.49	U	0.19	U	--		0.11	U	2	U	0.18	U	2	U	0.56	U	--		0.6	
EXPLOSIVES	121-82-4	RDX	µg/L	2	**2.1**		2	U	7	U	--		**5.28**		**14.4**		**2.4**		**7.24**		**2.5**		**5.6**		**5.2**		**2.8**		**0.7**		--		**0.66**		**7.9**		**7.3**		2	U	7	U	--		**7.04**	
EXPLOSIVES	13980-04-6	Hexahydro-1,3,5-trinitroso-1,3,5-triazine/ TNX	µg/L	--	--		--		--		--		--		--		--		--		--		--		--		--		**1.3**		--		--		--		--		--		--		--		--	
EXPLOSIVES	2691-41-0	HMX	µg/L	1000	2	U	2	U	23	U	--		1.21	U	1.21	U	**4.4**		**1.28**		**1.4**		**0.91**	**J**	0.7	U	**0.76**		**0.22**		--		0.07	U	2	U	**0.88**		2	U	23	U	--		1.3	
EXPLOSIVES	479-45-8	Tetryl	µg/L	39	--		--		5.6	U	--		1.56	U	1.56	U	0.07	U	0.16	U	0.16	U	1.2	U	0.7	U	0.49	U	0.19	U	--		0.25	U	--		0.36	U	--		5.6	U	--		0.66	
EXPLOSIVES	5755-27-1	1-Nitroso-3,5-dinitro-1,3,5-triazacyclohexane/ MNX	µg/L	--	--		--		--		--		--		--		--		--		--		1.5	U	0.87	U	**0.5**		**0.19**		--		--		--		--		--		--		--		--	
EXPLOSIVES	606-20-2	2,6-Dinitrotoluene	µg/L	0.049	2	U	2	U	1.2	U	--		0.79	UN	0.07	U	0.11	U	0.15	U	0.18	U	1.2	U	0.7	U	0.49	U	0.19	U	--		0.17	U	2	U	0.36	U	2	U	1.2	U	--		0.55	
EXPLOSIVES	88-72-2	2-Nitrotoluene	µg/L	0.31	2	U	2	U	--		--		--		--		0.17	U	0.17	U	0.31	U	1.2	U	0.7	U	0.49	U	0.19	U	--		0.2	U	2	U	0.36	U	2	U	--		--		--	
EXPLOSIVES	98-95-3	Nitrobenzene	µg/L	0.14	2	U	2	U	--		--		0.64	U	0.64	U	0.06	U	0.07	U	0.16	U	1.2	U	0.7	U	0.49	U	0.19	U	--		0.19	U	2	U	0.18	U	2	U	--		--		1.13	
EXPLOSIVES	99-35-4	1,3,5-Trinitrobenzene	µg/L	590	2	U	2	U	1.4	U	--		0.44	U	0.44	U	0.07	U	**0.22**		0.11	U	1.2	U	0.7	U	0.49	U	0.19	U	--		0.07	U	2	U	0.18	U	2	U	1.4	U	--		0.56	
EXPLOSIVES	99-65-0	1,3-Dinitrobenzene	µg/L	2	2	U	2	U	2.3	U	--		0.61	U	0.61	U	0.05	U	0.09	U	0.13	U	1.2	U	0.7	U	0.49	U	0.19	U	--		0.09	U	2	U	0.18	U	2	U	2.3	U	--		0.61	
EXPLOSIVES	99-99-0	4-Nitrotoluene	µg/L	4.3	2	U	2	U	--		--		--		--		--		--		--		1.2	U	0.7	U	0.49	U	0.19	U	--		--		2	U	0.91	U	2	U	--		--		--	
EXPLOSIVES	AEC1138	Hexahydro-1,3-dinitroso-5-dinitro-1,3,5-triazine/ DNX	µg/L	--	--		--		--		--		--		--		--		--		--		--		--		--		**0.16**	**J**	--		--		--		--		--		--		--		--	
SEMIVOLATILES	105-60-2	Caprolactam	µg/L	--	--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--	
SEMIVOLATILES	117-81-7	Bis(2-ethylhexyl) phthalate	µg/L	6	--		--		--		--		4.8	UN	--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--	
VOLATILES	108-88-3	Toluene	µg/L	1000	--		--		--		1	U	0.5	U	--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		100	
VOLATILES	109-99-9	Diethylene oxide / Tetrahydrofuran / Tetramethylene oxide	µg/L	--	--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--	
VOLATILES	67-64-1	Acetone	µg/L	14000	--		--		--		--		13	U	--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		800	
VOLATILES	67-66-3	Chloroform	µg/L	0.22	--		--		**7440**		**11**		0.5	U	--		--		--		--		--		--		--		--		--		--		--		--		--		--		**701**		9.9	U	100	
VOLATILES	75-09-2	Methylene chloride	µg/L	5	--		--		6.9	U	4.8	U	**3.1**		--		--		--		--		--		--		--		--		--		--		--		--		--		--		6.9	U	5	U	100	
VOLATILES	76-13-1	1,1,2-Trichloro-1,2,2-trifluoroethane (Freon 113)	µg/L	--	--		--		--		--		**5000**		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--	
ORGANICS	120-92-3	Cyclopentanone	µg/L	--	--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--	
ORGANICS	593-49-7	Heptacosane	µg/L	--	--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--	
ORGANICS	629-99-2	Pentacosane	µg/L	--	--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--	
ORGANICS	630-01-3	Hexacosane	µg/L	--	--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--	
ORGANICS	630-03-5	Nonacosane	µg/L	--	--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--	
ORGANICS	95-16-9	Benzothiazole	µg/L	--	--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--	
ORGANICS	AEC499	Octacosane	µg/L	--	--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--	
METALS	18540-29-9	Hexavalent chromium	µg/L	0.035	--		--		10	U	--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		**10**		--		--	
METALS	7429-90-5	Aluminum	µg/L	--	**40**		50	U	--		--		**367**		--		--		--		--		--		--		--		--		--		--		--		30	U	--		**160**		--		--		--	
METALS	7439-89-6	Iron	µg/L	--	**70**		**280**		--		--		**1870**		--		--		--		--		--		--		--		--		--		--		--		10	U	--		**100**		--		--		--	
METALS	7439-92-1	Lead	µg/L	15	1	U	1	U	9.6	U	--		1.26	U	--		0.13	U	**9.15**		0.13	U	10	U	10	U	10	U	--		0.3	U	--		1	U	**3**	**J**	1	U	9.6	U	--		4.47	
METALS	7439-95-4	Magnesium	µg/L	--	**44300**		**52000**		--		--		**42700**		--		--		--		--		**48800**						--				--		**52800**		**47400**		**44000**		--		--		--	
METALS	7439-96-5	Manganese	µg/L	--	**73**		**280**		--		--		**112**		--		**137**		--		--		--						--		**136.6**		--		5	U			10	U	--		--		--	
METALS	7439-97-6	Mercury	µg/L	2	0.2	U	0.2	U	0.85	U	--		0.24	U	--		0.02	U	0.02	U	0.02	U	0.21	U	0.2	U	0.2	U	--		0.1	U	--		0.2	U	0.1	U	0.2	U	0.85	U	--		0.1	
METALS	7440-02-0	Nickel	µg/L	--	10	U	20	U	--		--		34.3	U	--		**33.3**		--		--		--						--		**10**		--		10	U			20	U	--		--		--	
METALS	7440-09-7	Potassium	µg/L	--	**500**		1000	U	--		--		375	U	--		--		--		--		--						--				--		**600**				1000	U	--		--		--	
METALS	7440-22-4	Silver	µg/L	94	--		--		0.5	U	--		4.6	U	--		0.32	U	32	U	0.32	U	10	U	10	U	10	U	--		0.3	U	--		--		2.8	U			0.5	U	--		10	
METALS	7440-23-5	Sodium	µg/L	--	**28700**		**33000**		--		--		**28800**		--		--		--		--		**27500**						--				--		**23700**		**21600**		**26000**		--		--		--	
METALS	7440-36-0	Antimony	µg/L	--	2	U	1	U	--		--		38	U	--		0.1	U	--		--		--						--		**2.4**		--		2	U			1	U	--		--		--	
METALS	7440-38-2	Arsenic	µg/L	10	1	U	1	U	9	U	--		2.54	U	--		0.76	U	76	U	0.76	U	10	U	10	U	20	U	--		5	U	--		1	U	2.4	U	1	U	9	U	--		2.35	
METALS	7440-39-3	Barium	µg/L	2000	**80**		**100**		--		--		**80.6**		--		**83**		**883**		**98**		**108**	**J**	**82.2**	**J**	**118**	**J**	--		**97**		--		**92**		**91.4**		**100**		--		--		**106**	
METALS	7440-43-9	Cadmium	µg/L	5	3	U	5	U	3.7	U	--		4.01	U	--		0.48	U	48	U	0.48	U	**1.1**	**J**	5	U	5	U	--		2	U	--		3	U	0.4	U	5	U	3.7	U	--		6.78	
METALS	7440-47-3	Chromium	µg/L	100	10	U	10	U	**5**		--		6.02	UN	--		**27.3**		23	U	**37**		5	U	10	U	10	U	--		**1.6**		--		10	U	**3.4**	**J**	10	U	5	U	--		16.8	
METALS	7440-48-4	Cobalt	µg/L	--	10	U	20	U	--		--		25	U	--		--		--		--		--		--		--		--		--		--		10	U			20	U	--		--		--	
METALS	7440-50-8	Copper	µg/L	--	10	U	10	U	**1**	U	--		8.09	U	--		**1.91**		--		--		--		--		--		--		**2**	U	--		10	U			10	U	**3**		--		18.8	
METALS	7440-62-2	Vanadium	µg/L	--	5	U	10	U	--		--		11	U	--		**7.62**		--		--		--		--		--		--		**0.5**		--		5	U			10	U	--		--		--	
METALS	7440-66-6	Zinc	µg/L	--	10	U	10	U	100	U	--		21.1	U	--		--		--		--		--		--		--		--		--		--		10	U			**20**		100	U	--		**267**	
METALS	7440-70-2	Calcium	µg/L	--	**97600**		**109000**		--		--		**95000**		--		--		--		--		**106000**		--		--		--		--		--		**96400**		**88300**		**97000**		--		--		--	
METALS	7782-49-2	Selenium	µg/L	50	1	U	1	U	3	U	--		3.02	U	--		**7.39**		120	U	1.2	U	**2.7**	**J**	**1.6**	**J**	10	U	--		10	U	--		1	U	2.6	U	**1**		**3**		--		2.53	
METALS-DISS	7439-89-6	Iron	µg/L	--	--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--	
METALS-DISS	7439-95-4	Magnesium	µg/L	--	--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--	
METALS-DISS	7439-96-5	Manganese	µg/L	--	--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--	
METALS-DISS	7440-02-0	Nickel	µg/L	--	--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--	
METALS-DISS	7440-09-7	Potassium	µg/L	--	--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--	
METALS-DISS	7440-23-5	Sodium	µg/L	--	--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--	
METALS-DISS	7440-39-3	Barium	µg/L	2000	--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--	
METALS-DISS	7440-70-2	Calcium	µg/L	--	--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--	
METALS-DISS	7782-49-2	Selenium	µg/L	50	--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--	
RADIOCHEMISTRY	12587-46-1	Alpha gross	PCI/L	--	--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		**2.5**		--		--		--		--	
RADIOCHEMISTRY	12587-47-2	Beta gross	PCI/L	--	--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		**2.62**		--		--		--		--	

Notes:

J = The analyte was positively identified: the associated numerical value is the approximate concentration of the analyte in the sample.

U = The analyte was analyzed for, but was not detected above the reported sample quantitation limit.

Bold indicates the analyte was detected

Shading indicates the analyte exceeded screening criteria

*Delineation screening level for RDX is the HAL. For all other analytes it is the MCL. If no MCL is available, the EPA tap water RSL is selected as the delineation screening level.

See Acronyms and Abbreviations for any abbreviations used in this table.
Source: EPA's Regional Screening Levels (May 2016). Available online: https://www.epa.gov/risk/regional-screening-levels-rsls.

Table DA-10-4. Demolition Area: Groundwater Detects

UFP-QAPP RI/RFI, IAAAP, Middletown, Iowa

				Location		DA-02		DA-02		DA-02		DA-02		DA-02		DA-02		DA-02		DA-02		DA-02		DA-02		DA-02		DA-02		DA-02		DA-02		DA-02		DA-TTIW-001		DA-TTIW-002	
				Sample ID		DA-02-19921023		DA-02-19930519		DA-02-19950503		DA-02-19960803		DA-02-19970619		DA-02-19970826		DA-02-20001020		DA-02-20010606		DA-02-20020612		DA-02-20031117		DA-02-TR01		DA-02-TR02		DA-02-TR03		DA-02-TR04		DA-02-TR05		DA-02-TR05-A		DA-2-200906		DA-2-344975		DA-2-355046		DA-TTIW-001-TR01		DA-TTIW-002-TR01	
				Sample Date		10/23/1992		5/19/1993		5/3/1995		8/3/1996		6/19/1997		8/26/1997		10/20/2000		6/6/2001		6/12/2002		11/17/2003		8/17/2012		10/29/2012		4/4/2013		7/18/2013		12/11/2013		12/12/2013		6/13/2009		10/3/1995		12/13/1995		8/9/2012		8/10/2012	
Test Group	**CAS**	**Parameter**	**Unit**	**Screening Level***																																							
EXPLOSIVES	118-96-7	2,4,6-Trinitrotoluene	µg/L	2.5	U	0.63	U	0.63	U	--		0.07	U	0.16	U	0.16	U	0.62	U	1.7	U	0.53	U	1.1	U	0.19	U	0.19	U	0.19	U	0.19	U	--		0.19	U	0.19	U	--		0.21	U	0.2	U	0.19	U
EXPLOSIVES	121-14-2	2,4-Dinitrotoluene	µg/L	0.24	U	4.5	U	4.5	U	4.5	U	0.09	U	0.09	U	0.12	U	0.62	U	1.7	U	0.53	U	1.1	U	0.19	U	0.19	U	0.19	U	0.19	U	--		0.19	U	0.19	U	--		0.11	U	0.2	U	0.19	U
EXPLOSIVES	121-82-4	RDX	µg/L	2		**6.32**		**16.1**		--		**8.6**		**10.8**		**8.5**		**6.3**		**9.5**		**11**		**4.3**		**11.5**		**7.2**		**8.7**		**7.1**		--		**6**		**9**		--		**6.8**		**8**		**2.3**	
EXPLOSIVES	13980-04-6	Hexahydro-1,3,5-trinitroso-1,3,5-triazine/ TNX	µg/L	--		--		--		--		--		--		--		--		--		--		0.19	U	0.19	U	0.19	U	0.19	U	--		0.19	R	0.19	U	--		--		0.2	U	0.19	U
EXPLOSIVES	2691-41-0	HMX	µg/L	1000	U	1.21	U	**1.32**		--		**0.84**		**1.15**		**0.99**		**0.8**		**1.4**	**J**	**1.6**	**J**	1.1	U	**1.1**		0.76	U	**1.3**		**1.1**		--		**0.76**		**1.4**		--		**0.68**		**0.4**		**0.1**	**J**
EXPLOSIVES	479-45-8	Tetryl	µg/L	39	U	2.49	U	1.56	U	--		0.07	U	0.16	U	0.16	U	0.62	U	1.7	U	0.53	U	1.1	U	0.19	U	0.19	U	0.19	U	0.19	U	--		0.19	U	0.19	U	--		0.25	U	0.2	U	0.19	U
EXPLOSIVES	5755-27-1	1-Nitroso-3,5-dinitro-1,3,5-triazacyclohexane/ MNX	µg/L	--		--		--		--		--		--		--		0.62	U	2.1	U	**0.56**	**J**	1.1	U	**0.39**		0.38	U	**0.38**		0.38	U	--		**0.19**	**J**	**0.43**		--		--		**0.37**		0.19	U
EXPLOSIVES	606-20-2	2,6-Dinitrotoluene	µg/L	0.049	U	0.79	U	0.79	U	0.79	U	0.11	U	0.15	U	0.18	U	0.62	U	1.7	U	0.53	U	1.1	U	0.19	U	0.19	U	0.19	U	0.19	U	--		0.19	U	0.19	U	--		0.17	U	0.2	U	0.19	U
EXPLOSIVES	88-72-2	2-Nitrotoluene	µg/L	0.31		--		--		--		0.17	U	0.17	U	0.31	U	0.62	U	1.7	U	0.53	U	1.1	U	0.19	U	0.19	U	0.19	U	0.19	U	--		0.19	U	0.19	U	--		0.2	U	0.2	U	0.19	U
EXPLOSIVES	98-95-3	Nitrobenzene	µg/L	0.14	U	0.64	U	0.64	U	0.5	U	0.06	U	0.07	U	0.16	U	0.62	U	1.7	U	0.53	U	1.1	U	0.19	U	0.19	U	0.19	U	0.19	U	--		0.19	U	0.19	U	--		0.19	U	0.2	U	0.19	U
EXPLOSIVES	99-35-4	1,3,5-Trinitrobenzene	µg/L	590	U	0.44	U	0.44	U	--		0.07	U	**0.22**		**0.15**		**0.08**	**J**	1.7	U	0.53	U	1.1	U	0.19	U	0.19	U	0.19	U	0.19	U	--		0.19	U	0.19	U	--		0.07	U	0.2	U	0.19	U
EXPLOSIVES	99-65-0	1,3-Dinitrobenzene	µg/L	2	U	0.61	U	0.61	U	--		0.05	U	0.09	U	0.13	U	0.62	U	1.7	U	0.53	U	1.1	U	0.19	U	0.19	U	0.19	U	0.19	U	--		0.19	U	0.19	U	--		**0.18**		0.2	U	0.19	U
EXPLOSIVES	99-99-0	4-Nitrotoluene	µg/L	4.3		--		--		--		--		--		--		0.62	U	1.7	U	0.53	U	1.1	U	0.19	U	0.19	U	0.19	U	0.19	U	--		0.19	U	0.19	U	--		--		0.2	U	0.19	U
EXPLOSIVES	AEC1138	Hexahydro-1,3-dinitroso-5-dinitro-1,3,5-triazine/ DNX	µg/L	--		--		--		--		--		--		--		--		--		--		--		0.19	U	0.19	U	0.19	U	0.19	U	--		0.19	U	0.19	U	--		--		0.2	U	0.19	U
SEMIVOLATILES	105-60-2	Caprolactam	µg/L	--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--	
SEMIVOLATILES	117-81-7	Bis(2-ethylhexyl) phthalate	µg/L	6		4.8	U	4.8	U	**39**		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--	
VOLATILES	108-88-3	Toluene	µg/L	1000	U	--		**0.71**		0.5	U	--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--	
VOLATILES	109-99-9	Diethylene oxide / Tetrahydrofuran / Tetramethylene oxide	µg/L	--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--	
VOLATILES	67-64-1	Acetone	µg/L	14000	U	--		**78**		13	U	--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--	
VOLATILES	67-66-3	Chloroform	µg/L	0.22	U	--		0.5	U	0.5	U	--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--	
VOLATILES	75-09-2	Methylene chloride	µg/L	5	U	--		2.3	U	2.3	U	--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--	
VOLATILES	76-13-1	1,1,2-Trichloro-1,2,2-trifluoroethane (Freon 113)	µg/L	--		--		--		**40**		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--	
ORGANICS	120-92-3	Cyclopentanone	µg/L	--		--		**9**		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--	
ORGANICS	593-49-7	Heptacosane	µg/L	--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--	
ORGANICS	629-99-2	Pentacosane	µg/L	--		--		--		**6**		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--	
ORGANICS	630-01-3	Hexacosane	µg/L	--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--	
ORGANICS	630-03-5	Nonacosane	µg/L	--		--		--		**5**		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--	
ORGANICS	95-16-9	Benzothiazole	µg/L	--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--	
ORGANICS	AEC499	Octacosane	µg/L	--		--		--		**7**		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--	
METALS	18540-29-9	Hexavalent chromium	µg/L	0.035		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--	
METALS	7429-90-5	Aluminum	µg/L	--		**2580**		--		**196**		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--	
METALS	7439-89-6	Iron	µg/L	--		**13500**		--		**453**		--		--		--		--		--		--		--		**50.3**	**J**	29	U	**170**	**J**	29	U	29	U	--		--		--		--		--		--		--		--	
METALS	7439-92-1	Lead	µg/L	15	U	**35**		**1.84**		1.26	U	0.13	U	**164**		0.13	U	10	U	10	U	10	U	10	U	--		--		--		--		--		--		--		--		--		0.3	U	--		--		--	
METALS	7439-95-4	Magnesium	µg/L	--		**38100**		--		**49900**		--		--		--		**35300**		**45400**		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--	
METALS	7439-96-5	Manganese	µg/L	--		**738**		--		**20.5**		0.33	U	--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		**0.3**		--		--		--	
METALS	7439-97-6	Mercury	µg/L	2	U	0.24	U	0.24	U	0.24	U	0.02	U	0.02	U	0.02	U	0.21	U	0.21	U	0.2	U	**5.2**		--		--		--		--		--		--		--		--		--		0.1	U	--		--		--	
METALS	7440-02-0	Nickel	µg/L	--	U	34.3	U	--		34.3	U	**30.5**		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		**8**		--		--		--	
METALS	7440-09-7	Potassium	µg/L	--		375	U	--		**460**		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--	
METALS	7440-22-4	Silver	µg/L	94	U	4.6	U	--		4.6	U	0.32	U	32	U	0.32	U	10	U	10	U	10	U	10	U	--		--		--		--		--		--		--		--		--		0.3	U	--		--		--	
METALS	7440-23-5	Sodium	µg/L	--		**22900**		--		**25200**		--		--		--		**17600**		**16300**		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--	
METALS	7440-36-0	Antimony	µg/L	--	U	38	U	--		38	U	0.1	U	--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		**1.5**		--		--	
METALS	7440-38-2	Arsenic	µg/L	10	U	**7.68**		2.54	UN	2.54	U	0.76	U	76	U	0.76	U	10	U	10	U	10	U	10	U	--		--		--		--		--		--		--		--		--		5	U	--		--	
METALS	7440-39-3	Barium	µg/L	2000		**139**		--		**84.6**		**75.6**		**877**		**94**		**86.5**	**J**	**99.2**	**J**	**68**	**J**	**93.2**	**J**	--		--		--		--		--		--		--		--		--		**84**		--		--	
METALS	7440-43-9	Cadmium	µg/L	5	U	4.01	U	--		4.01	U	0.48	U	48	U	0.48	U	5	U	**0.7**	**J**	5	U	5	U	--		--		--		--		--		--		--		--		--		2	U	--		--	
METALS	7440-47-3	Chromium	µg/L	100	U	6.02	U	--		6.02	U	**21.8**		23	U	**28**		**0.4**	**J**	10	U	10	U	10	U	--		--		--		--		--		--		--		--		--		**3.8**		--		--	
METALS	7440-48-4	Cobalt	µg/L	--		**36.4**		--		25	U	--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--	
METALS	7440-50-8	Copper	µg/L	--	U	**8.86**		--		8.09	U	**1.78**		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		2	U	--		--	
METALS	7440-62-2	Vanadium	µg/L	--		11	U	--		11	U	**5.94**		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		**1.1**		--		--	
METALS	7440-66-6	Zinc	µg/L	--		**23.2**		--		21.1	U	--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--	
METALS	7440-70-2	Calcium	µg/L	--		**105000**		--		**97300**		--		--		--		**79500**		**89400**		--		--		--		--		--		--		--		--		--		--		--		--		--		--	
METALS	7782-49-2	Selenium	µg/L	50	U	3.02	U	3.02	U	3.02	U	**2.7**		120	U	**1.5**		10	U	**2.1**	**J**	10	U	10	U	--		--		--		--		--		--		--		--		--		10	U	--		--	
METALS-DISS	7439-89-6	Iron	µg/L	--		--		--		--		--		--		--		--		--		--		--		35	U	29	U	29	U	29	U	29	U	--		--		--		--		--		--		--	
METALS-DISS	7439-95-4	Magnesium	µg/L	--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--	
METALS-DISS	7439-96-5	Manganese	µg/L	--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--	
METALS-DISS	7440-02-0	Nickel	µg/L	--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--	
METALS-DISS	7440-09-7	Potassium	µg/L	--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--	
METALS-DISS	7440-23-5	Sodium	µg/L	--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--	
METALS-DISS	7440-39-3	Barium	µg/L	2000		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--	
METALS-DISS	7440-70-2	Calcium	µg/L	--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--	
METALS-DISS	7782-49-2	Selenium	µg/L	50		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--	
RADIOCHEMISTRY	12587-46-1	Alpha gross	PCI/L	--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--	
RADIOCHEMISTRY	12587-47-2	Beta gross	PCI/L	--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--	

Notes:

J = The analyte was positively identified: the associated numerical value is the approximate concentration of the analyte in the sample.

U = The analyte was analyzed for, but was not detected above the reported sample quantitation limit.

Bold indicates the analyte was detected

Shading indicates the analyte exceeded screening criteria

*Delineation screening level for RDX is the HAL. For all other analytes it is the MCL. If no MCL is available, the EPA tap water RSL is selected as the delineation screening level.

See Acronyms and Abbreviations for any abbreviations used in this table.
Source: EPA's Regional Screening Levels (May 2016). Available online: https://www.epa.gov/risk/regional-screening-levels-rsls.

Table DA-10-4. Demolition Area: Groundwater Detects

UFP-QAPP RI/RFI, IAAAP, Middletown, Iowa

				Location	DA-TTIW-003		DA-TTIW-004		DA-TTIW-005		DA-TTIW-006		DA-TTMW-001		DA-TTMW-001		DA-TTMW-021		DA-TTMW-021		DA-TTMW-021		DA-TTMW-051		DA-TTMW-051		DA-TTMW-051		DA-TTMW-051		DA-TTMW-051		DA-TTMW-051		DA-TTMW-051	
				Sample ID	DA-TTIW-003-TR01		DA-TTIW-004-TR01		DA-TTIW-005-TR01		DA-TTIW-006-TR01		DA-TTMW-001-200906		DA-TTMW-001-GW		DA-TTMW-021-200906		DA-TTMW-021-FD-200906		DA-TTMW-021-GW		DA-TTMW-051-200906		DA-TTMW-051-GW		DA-TTMW-051-TR01		DA-TTMW-051-TR02		DA-TTMW-051-TR03		DA-TTMW-051-TR04		DA-TTMW-051-TR05	
				Sample Date	8/12/2012		8/12/2012		8/12/2012		8/12/2012		6/15/2009		10/11/2007		6/15/2009		6/15/2009		10/12/2007		6/9/2009		10/9/2007		8/24/2012		11/2/2012		4/5/2013		7/26/2013		12/17/2013	
Test Group	**CAS**	**Parameter**	**Unit**	**Screening Level***																																
EXPLOSIVES	118-96-7	2,4,6-Trinitrotoluene	µg/L	2.5	0.19	U	0.19	U	0.19	U	0.19	U	0.19	U	0.2	U	0.19	U	0.19	U	0.2	U	0.19	U	0.2	U	0.19	U	0.19	U	0.2	U	0.19	U	0.19	U
EXPLOSIVES	121-14-2	2,4-Dinitrotoluene	µg/L	0.24	0.19	U	0.19	U	0.19	U	0.19	U	0.19	U	0.2	U	0.19	U	0.19	U	0.2	U	0.19	U	0.2	U	0.19	U	0.19	U	0.2	U	0.19	U	0.19	U
EXPLOSIVES	121-82-4	RDX	µg/L	2	**8.4**		**7**		**12.4**		**4.2**		0.19	U	0.2	U	**0.7**	**J**	**0.69**	**J**	**0.72**		**5.5**		**15.5**		**12**		**18.5**		**3.3**		**12.6**		**16.7**	
EXPLOSIVES	13980-04-6	Hexahydro-1,3,5-trinitroso-1,3,5-triazine/ TNX	µg/L	--	0.19	U	0.19	U	**0.13**	**J**	0.19	U	**1.1**		--		0.19	U	0.19	U	--		**0.4**		--		**1.1**		**1.5**		0.2	U	**0.99**		**0.82**	
EXPLOSIVES	2691-41-0	HMX	µg/L	1000	**0.74**		**0.59**		**1.4**		**0.38**		**0.11**	**J**	0.2	U	**0.11**	**J**	**0.1**	**J**	0.2	U	**0.62**		**1.4**		**0.78**		**1.5**		**0.36**		**1.5**		**1.2**	
EXPLOSIVES	479-45-8	Tetryl	µg/L	39	0.19	U	0.19	U	0.19	U	0.19	U	0.19	U	0.2	U	0.19	U	0.19	U	0.2	U	0.19	U	0.2	U	0.19	U	0.19	U	0.2	U	0.19	U	0.19	U
EXPLOSIVES	5755-27-1	1-Nitroso-3,5-dinitro-1,3,5-triazacyclohexane/ MNX	µg/L	--	**0.21**		**0.16**	**J**	**0.43**		0.19	U	0.19	U	--		0.19	U	0.19	U	--		**0.64**		--		0.19	U	**0.85**		**0.47**		**0.6**		**0.66**	
EXPLOSIVES	606-20-2	2,6-Dinitrotoluene	µg/L	0.049	0.19	U	0.19	U	0.19	U	0.19	U	0.19	U	0.2	U	0.19	U	0.19	U	0.2	U	0.19	U	0.2	U	0.19	U	0.19	U	0.2	U	0.19	U	0.19	U
EXPLOSIVES	88-72-2	2-Nitrotoluene	µg/L	0.31	0.19	U	0.19	U	0.19	U	0.19	U	0.19	U	0.2	U	0.19	U	0.19	U	0.2	U	0.19	U	0.2	U	0.19	U	0.19	U	0.2	U	0.19	U	0.19	U
EXPLOSIVES	98-95-3	Nitrobenzene	µg/L	0.14	0.19	U	0.19	U	0.19	U	0.19	U	0.19	U	0.2	U	0.19	U	0.19	U	0.2	U	0.19	U	0.2	U	0.19	U	0.19	U	0.2	U	0.19	U	0.19	U
EXPLOSIVES	99-35-4	1,3,5-Trinitrobenzene	µg/L	590	0.19	U	0.19	U	0.19	U	0.19	U	0.19	U	0.2	U	0.19	U	0.19	U	0.2	U	0.19	U	0.2	U	0.19	U	0.19	U	0.2	U	0.19	U	0.19	U
EXPLOSIVES	99-65-0	1,3-Dinitrobenzene	µg/L	2	0.19	U	0.19	U	0.19	U	0.19	U	0.19	U	0.2	U	0.19	U	0.19	U	0.2	U	0.19	U	0.2	U	0.19	U	0.19	U	0.2	U	0.19	U	0.19	U
EXPLOSIVES	99-99-0	4-Nitrotoluene	µg/L	4.3	0.19	U	0.19	U	0.19	U	0.19	U	0.19	U	0.2	U	0.19	U	0.19	U	0.2	U	0.19	U	0.2	U	0.19	U	0.19	U	0.2	U	0.19	U	0.19	U
EXPLOSIVES	AEC1138	Hexahydro-1,3-dinitroso-5-dinitro-1,3,5-triazine/ DNX	µg/L	--	0.19	U	0.19	U	0.19	U	0.19	U	0.19	U			0.19	U	0.19	U	--		**0.13**	**J**	--		**0.23**		**0.23**		0.2	U	**0.3**		**0.2**	
SEMIVOLATILES	105-60-2	Caprolactam	µg/L	--	--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--	
SEMIVOLATILES	117-81-7	Bis(2-ethylhexyl) phthalate	µg/L	6	--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--	
VOLATILES	108-88-3	Toluene	µg/L	1000	--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--	
VOLATILES	109-99-9	Diethylene oxide / Tetrahydrofuran / Tetramethylene oxide	µg/L	--	--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--	
VOLATILES	67-64-1	Acetone	µg/L	14000	--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--	
VOLATILES	67-66-3	Chloroform	µg/L	0.22	--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--	
VOLATILES	75-09-2	Methylene chloride	µg/L	5	--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--	
VOLATILES	76-13-1	1,1,2-Trichloro-1,2,2-trifluoroethane (Freon 113)	µg/L	--	--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--	
ORGANICS	120-92-3	Cyclopentanone	µg/L	--	--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--	
ORGANICS	593-49-7	Heptacosane	µg/L	--	--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--	
ORGANICS	629-99-2	Pentacosane	µg/L	--	--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--	
ORGANICS	630-01-3	Hexacosane	µg/L	--	--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--	
ORGANICS	630-03-5	Nonacosane	µg/L	--	--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--	
ORGANICS	95-16-9	Benzothiazole	µg/L	--	--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--	
ORGANICS	AEC499	Octacosane	µg/L	--	--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--	
METALS	18540-29-9	Hexavalent chromium	µg/L	0.035	--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--	
METALS	7429-90-5	Aluminum	µg/L	--	--		--		--		--		--		**165**	**J**	--		--		**132**	**J**	--		79	U	--		--		--		--		--	
METALS	7439-89-6	Iron	µg/L	--	--		--		--		--		--		**184**	**J**	--		--		**158**	**J**	--		132	U	**88.9**	**J**	**71.2**	**J**	29	U	29	U	17	U
METALS	7439-92-1	Lead	µg/L	15	--		--		--		--		--		2.1	U	--		--		2.1	U	--		**2.3**	**J**	--		--		--		--		--	
METALS	7439-95-4	Magnesium	µg/L	--	--		--		--		--		--		**22300**		--		--		**40100**		--		**51200**		--		--		--		--		--	
METALS	7439-96-5	Manganese	µg/L	--	--		--		--		--		--		**68.8**		--		--		**43.4**		--		**38.4**		--		--		--		--		--	
METALS	7439-97-6	Mercury	µg/L	2	--		--		--		--		--		0.11	U	--		--		0.11	U	--		0.11	U	--		--		--		--		--	
METALS	7440-02-0	Nickel	µg/L	--	--		--		--		--		--		**3**	**J**	--		--		**1.2**	**J**	--		1	U	--		--		--		--		--	
METALS	7440-09-7	Potassium	µg/L	--	--		--		--		--		--		**628**	**J**	--		--		**728**	**J**	--		**829**	**J**	--		--		--		--		--	
METALS	7440-22-4	Silver	µg/L	94	--		--		--		--		--		0.77	U	--		--		0.77	U	--		1	U	--		--		--		--		--	
METALS	7440-23-5	Sodium	µg/L	--	--		--		--		--		--		**15500**	**J**	--		--		**12300**	**J**	--		**21300**		--		--		--		--		--	
METALS	7440-36-0	Antimony	µg/L	--	--		--		--		--		--		3.3	U	--		--		3.3	U	--		3.3	U	--		--		--		--		--	
METALS	7440-38-2	Arsenic	µg/L	10	--		--		--		--		--		3.7	U	--		--		3.7	U	--		3.7	U	--		--		--		--		--	
METALS	7440-39-3	Barium	µg/L	2000	--		--		--		--		--		**149**	**J**	--		--		**174**	**J**	--		**80.7**	**J**	--		--		--		--		--	
METALS	7440-43-9	Cadmium	µg/L	5	--		--		--		--		--		1	U	--		--		1	U	--		1	U	--		--		--		--		--	
METALS	7440-47-3	Chromium	µg/L	100	--		--		--		--		--		**4**	**J**	--		--		0.92	U	--		0.92	U	--		--		--		--		--	
METALS	7440-48-4	Cobalt	µg/L	--	--		--		--		--		--		1	U	--		--		1	U	--		1	U	--		--		--		--		--	
METALS	7440-50-8	Copper	µg/L	--	--		--		--		--		--		1.2	U	--		--		1.2	U	--		1.2	U	--		--		--		--		--	
METALS	7440-62-2	Vanadium	µg/L	--	--		--		--		--		--		**1.2**	**J**	--		--		1.1	U	--		1.1	U	--		--		--		--		--	
METALS	7440-66-6	Zinc	µg/L	--	--		--		--		--		--		10.3	U	--		--		9.8	U	--		5	U	--		--		--		--		--	
METALS	7440-70-2	Calcium	µg/L	--	--		--		--		--		--		**65700**		--		--		**76300**		--		**118000**		--		--		--		--		--	
METALS	7782-49-2	Selenium	µg/L	50	--		--		--		--		--		**5**	**J**	--		--		**4.8**	**J**	--		**5.4**	**J**	--		--		--		--		--	
METALS-DISS	7439-89-6	Iron	µg/L	--	--		--		--		--		--		--		--		--		--		--		--											
METALS-DISS	7439-95-4	Magnesium	µg/L	--	--		--		--		--		--		--		--		--		--		--		--											
METALS-DISS	7439-96-5	Manganese	µg/L	--	--		--		--		--		--		--		--		--		--		--		--											
METALS-DISS	7440-02-0	Nickel	µg/L	--	--		--		--		--		--		--		--		--		--		--		--											
METALS-DISS	7440-09-7	Potassium	µg/L	--	--		--		--		--		--		--		--		--		--		--		--											
METALS-DISS	7440-23-5	Sodium	µg/L	--	--		--		--		--		--		--		--		--		--		--		--											
METALS-DISS	7440-39-3	Barium	µg/L	2000	--		--		--		--		--		--		--		--		--		--		--											
METALS-DISS	7440-70-2	Calcium	µg/L	--	--		--		--		--		--		--		--		--		--		--		--											
METALS-DISS	7782-49-2	Selenium	µg/L	50	--		--		--		--		--		--		--		--		--		--		--											
RADIOCHEMISTRY	12587-46-1	Alpha gross	PCI/L	--	--		--		--		--		--		--		--		--		--		--		--											
RADIOCHEMISTRY	12587-47-2	Beta gross	PCI/L	--	--		--		--		--		--		--		--		--		--		--		--											

Notes:

J = The analyte was positively identified: the associated numerical value is the approximate concentration of the analyte in the sample.

U = The analyte was analyzed for, but was not detected above the reported sample quantitation limit.

Bold indicates the analyte was detected

Shading indicates the analyte exceeded screening criteria

*Delineation screening level for RDX is the HAL. For all other analytes it is the MCL. If no MCL is available, the EPA tap water RSL is selected as the delineation screening level.

See Acronyms and Abbreviations for any abbreviations used in this table.
Source: EPA's Regional Screening Levels (May 2016). Available online: https://www.epa.gov/risk/regional-screening-levels-rsls.

Table DA-10-4. Demolition Area: Groundwater Detects

UFP-QAPP RI/RFI, IAAAP, Middletown, Iowa

				Location	DA-TTMW-052		DA-TTMW-052		DA-TTMW-052		DA-TTMW-054		DA-TTMW-054		DA-TTMW-054		DA-TTMW-055		DA-TTMW-055		DA-TTMW-056		DA-TTMW-056		DA-TTMW-056		DA-TTMW-056		DA-TTMW-056		DA-TTMW-056		DA-TTMW-056		DA-TTMW-056	
				Sample ID	DA-TTMW-052-200906		DA-TTMW-052-GW		DA-TTMW-052-TR05		DA-TTMW-054-20090616		DA-TTMW-054-GW		DA-TTMW-054-TR05		DA-TTMW-055-200906		DA-TTMW-055-GW		DA-TTMW-056-200906		DA-TTMW-056-FD-200906		DA-TTMW-056-GW		DA-TTMW-056-GW-FD		DA-TTMW-056-TR01		DA-TTMW-056-TR01-FD		DA-TTMW-056-TR02		DA-TTMW-056-TR03	
				Sample Date	6/12/2009		10/12/2007		12/19/2013		6/16/2009		10/10/2007		12/17/2013		6/14/2009		10/11/2007		6/13/2009		6/13/2009		10/10/2007		10/10/2007		8/20/2012		8/20/2012		11/8/2012		3/29/2013	
Test Group	**CAS**	**Parameter**	**Unit**	**Screening Level***																																
EXPLOSIVES	118-96-7	2,4,6-Trinitrotoluene	µg/L	2.5	0.19	U	0.2	U	0.19	U	0.19	U	0.2	U	0.2	U	0.19	U	0.19	U	0.19	U	0.19	U	0.2	U	0.19	U	0.19	U	0.19	U	0.19	U	0.19	U
EXPLOSIVES	121-14-2	2,4-Dinitrotoluene	µg/L	0.24	0.19	U	0.2	U	0.19	U	0.19	U	0.2	U	0.2	U	0.19	U	0.19	U	0.19	U	0.19	U	0.2	U	0.19	U	0.19	U	0.19	U	0.19	U	0.19	U
EXPLOSIVES	121-82-4	RDX	µg/L	2	**0.44**		**0.81**		**0.67**		**0.78**		**13.1**		**16**		0.19	U	0.19	U	**9.2**	**J**	**5.7**	**J**	**14.9**		**15**		**12.8**		**12.5**		**10.5**		**2.5**	
EXPLOSIVES	13980-04-6	Hexahydro-1,3,5-trinitroso-1,3,5-triazine/ TNX	µg/L	--	0.19	U	--		0.19	U	**0.11**	**J**	--		**0.19**	**J**	0.19	U	--		**0.11**	**J**	**0.15**	**J**	--		--		0.19	U	0.19	U	0.19	U	0.19	U
EXPLOSIVES	2691-41-0	HMX	µg/L	1000	0.19	U	0.2	U	0.19	U	**0.22**		**0.82**		**0.83**		0.19	U	0.19	U	**1.6**		**1.6**		**1**		**1**		**1.3**		**1.3**		**1.2**		**1.1**	
EXPLOSIVES	479-45-8	Tetryl	µg/L	39	0.19	U	0.2	U	0.19	U	0.19	U	0.2	U	0.2	U	0.19	U	0.19	U	0.19	U	0.19	U	0.2	U	0.19	U	0.19	U	0.19	U	0.19	U	0.19	U
EXPLOSIVES	5755-27-1	1-Nitroso-3,5-dinitro-1,3,5-triazacyclohexane/ MNX	µg/L	--	0.19	U	--		**0.12**	**J**	**0.098**	**J**	--		**0.48**		0.19	U	--		**0.44**		**0.33**		--		--		**0.34**		**0.37**		**0.27**		0.19	U
EXPLOSIVES	606-20-2	2,6-Dinitrotoluene	µg/L	0.049	0.19	U	0.2	U	0.19	U	0.19	U	0.2	U	0.2	U	0.19	U	0.19	U	0.19	U	0.19	U	0.2	U	0.19	U	0.19	U	0.19	U	0.19	U	0.19	U
EXPLOSIVES	88-72-2	2-Nitrotoluene	µg/L	0.31	0.19	U	0.2	U	0.19	U	0.19	U	0.2	U	0.2	U	0.19	U	0.19	U	0.19	U	0.19	U	0.2	U	0.19	U	0.19	U	0.19	U	0.19	U	0.19	U
EXPLOSIVES	98-95-3	Nitrobenzene	µg/L	0.14	0.19	U	0.2	U	0.19	U	0.19	U	0.2	U	0.2	U	0.19	U	0.19	U	0.19	U	0.19	U	0.2	U	0.19	U	0.19	U	0.19	U	0.19	U	0.19	U
EXPLOSIVES	99-35-4	1,3,5-Trinitrobenzene	µg/L	590	0.19	U	0.2	U	0.19	U	0.19	U	0.2	U	0.2	U	0.19	U	0.19	U	0.19	U	0.19	U	0.2	U	0.19	U	0.19	U	0.19	U	0.19	U	0.19	U
EXPLOSIVES	99-65-0	1,3-Dinitrobenzene	µg/L	2	0.19	U	0.2	U	0.19	U	0.19	U	0.2	U	0.2	U	0.19	U	0.19	U	0.19	U	0.19	U	0.2	U	0.19	U	0.19	U	0.19	U	0.19	U	0.19	U
EXPLOSIVES	99-99-0	4-Nitrotoluene	µg/L	4.3	0.19	U	0.2	U	0.19	U	0.19	U	0.2	U	0.2	U	0.19	U	0.19	U	0.19	U	0.19	U	0.2	U	0.19	U	0.19	U	0.19	U	0.19	U	0.19	U
EXPLOSIVES	AEC1138	Hexahydro-1,3-dinitroso-5-dinitro-1,3,5-triazine/ DNX	µg/L	--	0.19	U			0.19	U	0.19	U			**0.12**	**J**	0.19	U			0.19	U	0.19	U	--		--		0.19	U	0.19	U	0.19	U	0.19	U
SEMIVOLATILES	105-60-2	Caprolactam	µg/L	--	--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--	
SEMIVOLATILES	117-81-7	Bis(2-ethylhexyl) phthalate	µg/L	6	--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--	
VOLATILES	108-88-3	Toluene	µg/L	1000	--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--	
VOLATILES	109-99-9	Diethylene oxide / Tetrahydrofuran / Tetramethylene oxide	µg/L	--	--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--	
VOLATILES	67-64-1	Acetone	µg/L	14000	--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--	
VOLATILES	67-66-3	Chloroform	µg/L	0.22	--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--	
VOLATILES	75-09-2	Methylene chloride	µg/L	5	--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--	
VOLATILES	76-13-1	1,1,2-Trichloro-1,2,2-trifluoroethane (Freon 113)	µg/L	--	--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--	
ORGANICS	120-92-3	Cyclopentanone	µg/L	--	--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--	
ORGANICS	593-49-7	Heptacosane	µg/L	--	--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--	
ORGANICS	629-99-2	Pentacosane	µg/L	--	--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--	
ORGANICS	630-01-3	Hexacosane	µg/L	--	--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--	
ORGANICS	630-03-5	Nonacosane	µg/L	--	--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--	
ORGANICS	95-16-9	Benzothiazole	µg/L	--	--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--	
ORGANICS	AEC499	Octacosane	µg/L	--	--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--	
METALS	18540-29-9	Hexavalent chromium	µg/L	0.035	--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--	
METALS	7429-90-5	Aluminum	µg/L	--	--		79	U	--		--		79	U	--		--		79	U	--		--		79	U	79	U	**67.9**	**J**	**52.7**	**J**	**977**		**506**	
METALS	7439-89-6	Iron	µg/L	--	--		**85.6**	**J**	--		--		15	U	--		--		15	U	--		--		55.7	U	61.4	U	**202**	**J**	**117**	**J**	**2930**		**1330**	
METALS	7439-92-1	Lead	µg/L	15	--		2.1	U	--		--		2.1	U	--		--		2.1	U	--		--		2.1	U	2.1	U	1	U	1	U	1.1	U	1.1	
METALS	7439-95-4	Magnesium	µg/L	--	--		**26400**		--		--		**44500**		--		--		**48900**		--		--		**53700**		**55400**		**57800**		**56900**		**57900**		**31500**	
METALS	7439-96-5	Manganese	µg/L	--	--		**16.7**		--		--		**6.4**	**J**	--		--		**6.5**	**J**	--		--		**15.4**		**16.5**		**30.9**		**27.8**		**376**		**224**	
METALS	7439-97-6	Mercury	µg/L	2	--		0.11	U	--		--		0.11	U	--		--		0.11	U	--		--		0.11	U	0.11	U	0.05	U	0.05	U	**0.066**	**J**	0.03	
METALS	7440-02-0	Nickel	µg/L	--	--		**1.4**	**J**	--		--		1	U	--		--		**6.9**	**J**	--		--		1	U	1	U	2	U	2	U	**1.6**	**J**	**1.7**	
METALS	7440-09-7	Potassium	µg/L	--	--		**1180**	**J**	--		--		**611**	**J**	--		--		**699**	**J**	--		--		**632**	**J**	**667**	**J**	**941**	**J**	**751**	**J**	**2690**	**J**	**809**	
METALS	7440-22-4	Silver	µg/L	94	--		0.77	U	--		--		0.82	U	--		--		0.77	U	--		--		0.95	U	1.1	U	1	U	1	U	0.5	U	0.5	
METALS	7440-23-5	Sodium	µg/L	--	--		**18000**	**J**	--		--		**21600**		--		--		**17000**		--		--		**24900**		**25600**		**32300**		**32100**		**185000**		**25400**	
METALS	7440-36-0	Antimony	µg/L	--	--		3.3	U	--		--		3.3	U	--		--		3.3	U	--		--		3.3	U	3.3	U	2	U	2	U	1.3	U	1.3	
METALS	7440-38-2	Arsenic	µg/L	10	--		3.7	U	--		--		3.7	U	--		--		3.7	U	--		--		3.7	U	3.7	U	2	U	2	U	2.5	U	2.5	
METALS	7440-39-3	Barium	µg/L	2000	--		**48.1**	**J**	--		--		**52.3**	**J**	--		--		**21.7**	**J**	--		--		**60.1**	**J**	**62.2**	**J**	**72.2**	**J**	**72.4**	**J**	**59.7**	**J**	**84**	
METALS	7440-43-9	Cadmium	µg/L	5	--		1	U	--		--		**6**		--		--		1	U	--		--		1	U	1	U	1	U	1	U	0.5	U	0.5	
METALS	7440-47-3	Chromium	µg/L	100	--		**1.1**	**J**	--		--		0.92	U	--		--		0.92	U	--		--		0.92	U	0.92	U	1	U	1	U	**2.5**	**J**	**3.4**	
METALS	7440-48-4	Cobalt	µg/L	--	--		1	U	--		--		1	U	--		--		1	U	--		--		1	U	1	U	1	U	1	U	**1.1**	**J**	0.5	
METALS	7440-50-8	Copper	µg/L	--	--		1.2	U	--		--		1.2	U	--		--		1.2	U	--		--		1.2	U	1.2	U	2	U	2	U	**6.8**	**J**	2.4	
METALS	7440-62-2	Vanadium	µg/L	--	--		1.1	U	--		--		1.1	U	--		--		1.1	U	--		--		1.1	U	1.1	U	1	U	1	U	**3**	**J**	**2.3**	
METALS	7440-66-6	Zinc	µg/L	--	--		5	U	--		--		5	U	--		--		5	U	--		--		5	U	5	U	**27.6**		**27.6**		**103**		**64.6**	
METALS	7440-70-2	Calcium	µg/L	--	--		**78000**		--		--		**103000**		--		--		**58300**		--		--		**68100**		**70100**		**76200**		**75300**		**81100**		**87100**	
METALS	7782-49-2	Selenium	µg/L	50	--		4	U	--		--		4	U	--		--		**4.8**	**J**	--		--		**4**	**J**	4	U	2	U	2	U	2	U	2	
METALS-DISS	7439-89-6	Iron	µg/L	--	--		15	U	--		--		--		--		--		--		--		--		--		--		--		--		--		--		--	
METALS-DISS	7439-95-4	Magnesium	µg/L	--	--		**26000**		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--	
METALS-DISS	7439-96-5	Manganese	µg/L	--	--		**16.5**		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--	
METALS-DISS	7440-02-0	Nickel	µg/L	--	--		**1.1**	**J**	--		--		--		--		--		--		--		--		--		--		--		--		--		--		--	
METALS-DISS	7440-09-7	Potassium	µg/L	--	--		**1230**	**J**	--		--		--		--		--		--		--		--		--		--		--		--		--		--		--	
METALS-DISS	7440-23-5	Sodium	µg/L	--	--		**18000**	**J**	--		--		--		--		--		--		--		--		--		--		--		--		--		--		--	
METALS-DISS	7440-39-3	Barium	µg/L	2000	--		**51.3**	**J**	--		--		--		--		--		--		--		--		--		--		--		--		--		--		--	
METALS-DISS	7440-70-2	Calcium	µg/L	--	--		**75300**		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--	
METALS-DISS	7782-49-2	Selenium	µg/L	50	--		**4.9**	**J**	--		--		--		--		--		--		--		--		--		--		--		--		--		--		--	
RADIOCHEMISTRY	12587-46-1	Alpha gross	PCI/L	--	--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--	
RADIOCHEMISTRY	12587-47-2	Beta gross	PCI/L	--	--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--	

Notes:

J = The analyte was positively identified: the associated numerical value is the approximate concentration of the analyte in the sample.

U = The analyte was analyzed for, but was not detected above the reported sample quantitation limit.

Bold indicates the analyte was detected

Shading indicates the analyte exceeded screening criteria

*Delineation screening level for RDX is the HAL. For all other analytes it is the MCL. If no MCL is available, the EPA tap water RSL is selected as the delineation screening level.

See Acronyms and Abbreviations for any abbreviations used in this table.
Source: EPA's Regional Screening Levels (May 2016). Available online: https://www.epa.gov/risk/regional-screening-levels-rsls.

Table DA-10-4. Demolition Area: Groundwater Detects

UFP-QAPP RI/RFI, IAAAP, Middletown, Iowa

				Location		DA-TTMW-056		DA-TTMW-056		DA-TTMW-056		DA-TTMW-056		DA-TTMW-057		DA-TTMW-057		DA-TTMW-058		DA-TTMW-058		DA-TTMW-059		DA-TTMW-059		DA-TTMW-059		DA-TTMW-059		DA-TTMW-059		DA-TTMW-059		DA-TTMW-059	
				Sample ID		DA-TTMW-056-TR03-FD		DA-TTMW-056-TR04		DA-TTMW-056-TR04-FD		DA-TTMW-056-TR05		DA-TTMW-057-200906		DA-TTMW-057-GW		DA-TTMW-058-070709		DA-TTMW-058-GW		DA-TTMW-059-070709		DA-TTMW-059-20090619		DA-TTMW-059-TR01		DA-TTMW-059-TR02		DA-TTMW-059-TR03		DA-TTMW-059-TR04		DA-TTMW-059-TR05	
				Sample Date		3/29/2013		7/25/2013		7/25/2013		12/11/2013		6/15/2009		10/10/2007		7/7/2009		10/8/2007		7/7/2009		6/19/2009		8/21/2012		11/2/2012		4/5/2013		7/24/2013		12/16/2013	
Test Group	**CAS**	**Parameter**	**Unit**	**Screening Level***																															
EXPLOSIVES	118-96-7	2,4,6-Trinitrotoluene	µg/L	2.5	U	0.19	U	0.19	U	0.19	U	0.2	U	0.19	U	0.19	U	0.19	U	0.19	U	0.19	U	0.19	U	0.19	U	0.19	U	0.19	U	0.19	U	0.19	U
EXPLOSIVES	121-14-2	2,4-Dinitrotoluene	µg/L	0.24	U	0.19	U	0.19	U	0.19	U	0.2	U	0.19	U	0.19	U	0.19	U	0.19	U	0.19	U	0.19	U	0.19	U	0.19	U	0.19	U	0.19	U	0.19	U
EXPLOSIVES	121-82-4	RDX	µg/L	2		**2.5**		**4.2**		**4.2**		**7.5**		0.19	U	0.19	U	0.19	U	0.19	U	**9.5**		**8.1**		**19.5**		**15.5**		**15.3**		**18**		**10.2**	
EXPLOSIVES	13980-04-6	Hexahydro-1,3,5-trinitroso-1,3,5-triazine/ TNX	µg/L	--	U	0.19	U	0.19	U	0.19	U	0.2	U	0.19	U	--		0.19	U	--		**0.086**	**J**	**0.085**	**J**	**0.44**		**0.26**		0.19	U	**0.27**		**0.099**	**J**
EXPLOSIVES	2691-41-0	HMX	µg/L	1000		**1.2**		**1.4**		**1.5**		**1.2**		0.19	U	0.19	U	0.19	U	0.19	U	**0.56**		**0.52**		**1.6**		**1.2**		**0.96**		**1.7**		**0.76**	
EXPLOSIVES	479-45-8	Tetryl	µg/L	39	U	0.19	U	0.19	U	0.19	U	0.2	U	0.19	U	0.19	U	0.19	U	0.19	U	0.19	U	0.19	U	0.19	U	0.19	U	0.19	U	**0.26**		0.19	U
EXPLOSIVES	5755-27-1	1-Nitroso-3,5-dinitro-1,3,5-triazacyclohexane/ MNX	µg/L	--	U	0.19	U	**0.28**		0.38	U	**0.17**	**J**	0.19	U	--		0.19	U	--		**0.28**		**0.25**		**0.62**		**0.34**		**0.36**		0.57	U	**0.21**	
EXPLOSIVES	606-20-2	2,6-Dinitrotoluene	µg/L	0.049	U	0.19	U	0.19	U	0.19	U	0.2	U	0.19	U	0.19	U	0.19	U	0.19	U	0.19	U	0.19	U	0.19	U	0.19	U	0.19	U	0.19	U	0.19	U
EXPLOSIVES	88-72-2	2-Nitrotoluene	µg/L	0.31	U	0.19	U	0.19	U	0.19	U	0.2	U	0.19	U	0.19	U	0.19	U	0.19	U	0.19	U	0.19	U	0.19	U	0.19	U	0.19	U	0.19	U	0.19	U
EXPLOSIVES	98-95-3	Nitrobenzene	µg/L	0.14	U	0.19	U	0.19	U	0.19	U	0.2	U	0.19	U	0.19	U	0.19	U	0.19	U	0.19	U	0.19	U	0.19	U	0.19	U	0.19	U	0.19	U	0.19	U
EXPLOSIVES	99-35-4	1,3,5-Trinitrobenzene	µg/L	590	U	0.19	U	0.19	U	0.19	U	0.2	U	0.19	U	0.19	U	0.19	U	0.19	U	0.19	U	0.19	U	0.19	U	0.19	U	0.19	U	0.19	U	0.19	U
EXPLOSIVES	99-65-0	1,3-Dinitrobenzene	µg/L	2	U	0.19	U	0.19	U	0.19	U	0.2	U	0.19	U	0.19	U	0.19	U	0.19	U	0.19	U	0.19	U	0.19	U	0.19	U	0.19	U	0.19	U	0.19	U
EXPLOSIVES	99-99-0	4-Nitrotoluene	µg/L	4.3	U	0.19	U	0.19	U	0.19	U	0.2	U	0.19	U	0.19	U	0.19	U	0.19	U	0.19	U	0.19	U	0.19	U	0.19	U	0.19	U	0.19	U	0.19	U
EXPLOSIVES	AEC1138	Hexahydro-1,3-dinitroso-5-dinitro-1,3,5-triazine/ DNX	µg/L	--	U	0.19	U	0.19	U	0.19	U	0.2	U	0.19	U			0.19	U			0.19	U	0.19	U	0.19	U	0.19	U	0.19	U	0.19	U	0.19	U
SEMIVOLATILES	105-60-2	Caprolactam	µg/L	--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--	
SEMIVOLATILES	117-81-7	Bis(2-ethylhexyl) phthalate	µg/L	6		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--	
VOLATILES	108-88-3	Toluene	µg/L	1000		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--	
VOLATILES	109-99-9	Diethylene oxide / Tetrahydrofuran / Tetramethylene oxide	µg/L	--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--	
VOLATILES	67-64-1	Acetone	µg/L	14000		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--	
VOLATILES	67-66-3	Chloroform	µg/L	0.22		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--	
VOLATILES	75-09-2	Methylene chloride	µg/L	5		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--	
VOLATILES	76-13-1	1,1,2-Trichloro-1,2,2-trifluoroethane (Freon 113)	µg/L	--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--	
ORGANICS	120-92-3	Cyclopentanone	µg/L	--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--	
ORGANICS	593-49-7	Heptacosane	µg/L	--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--	
ORGANICS	629-99-2	Pentacosane	µg/L	--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--	
ORGANICS	630-01-3	Hexacosane	µg/L	--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--	
ORGANICS	630-03-5	Nonacosane	µg/L	--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--	
ORGANICS	95-16-9	Benzothiazole	µg/L	--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--	
ORGANICS	AEC499	Octacosane	µg/L	--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--	
METALS	18540-29-9	Hexavalent chromium	µg/L	0.035		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--	
METALS	7429-90-5	Aluminum	µg/L	--		**303**	**J**	62.2	U	**437**	**J**	**219**				**972**		--		79	U	--		--		--		--		--		--		--	
METALS	7439-89-6	Iron	µg/L	--		**638**	**J**	**166**	**J**	**495**	**J**	**313**				**1560**		--		**25.6**	**J**	--		--		**224**	**J**	**254**	**J**	**763**		29	U	17	U
METALS	7439-92-1	Lead	µg/L	15	U	1.6	U	1.1	U	1.1	U	1.1	U	--		2.1	U	--		2.1	U	--		--		--		--		--		--		--		--	
METALS	7439-95-4	Magnesium	µg/L	--		**25700**		**27400**		**29900**		**28400**		--		**41200**		--		**27600**		--		--		--		--		--		--		--		--	
METALS	7439-96-5	Manganese	µg/L	--		**157**	**J**	**27.7**	**J**	**70.5**	**J**	**69.6**		--		**91.6**		--		**25.7**		--		--		--		--		--		--		--		--	
METALS	7439-97-6	Mercury	µg/L	2	U	0.03	U	0.03	U	0.03	U	0.03	U	--		0.11	U	--		0.11	U	--		--		--		--		--		--		--		--	
METALS	7440-02-0	Nickel	µg/L	--	**J**	**1.4**	**J**	**1**	**J**	**0.8**	**J**	**1.6**	**J**	--		**1.1**	**J**	--		**2.1**	**J**	--		--		--		--		--		--		--		--	
METALS	7440-09-7	Potassium	µg/L	--	**J**	**704**	**J**	1220	U	1500	U	**1080**	**J**	--		**1180**	**J**	--		**662**	**J**	--		--		--		--		--		--		--		--	
METALS	7440-22-4	Silver	µg/L	94	U	0.5	U	0.5	U	0.5	U	0.5	U	--		0.97	U	--		0.77	U	--		--		--		--		--		--		--		--	
METALS	7440-23-5	Sodium	µg/L	--		**20700**		**38800**		**37600**		**110000**		--		**10100**		--		**17700**		--		--		--		--		--		--		--		--	
METALS	7440-36-0	Antimony	µg/L	--	U	1.3	U	1.3	U	1.3	U	1.3	U	--		3.3	U	--		3.3	U	--		--		--		--		--		--		--		--	
METALS	7440-38-2	Arsenic	µg/L	10	U	2.5	U	2.5	U	2.5	U	2.5	U	--		3.7	U	--		3.7	U	--		--		--		--		--		--		--		--	
METALS	7440-39-3	Barium	µg/L	2000	**J**	**80.1**	**J**	**81.5**	**J**	**88.5**	**J**	**40.2**	**J**	--		**45.9**	**J**	--		**152**	**J**	--		--		--		--		--		--		--		--	
METALS	7440-43-9	Cadmium	µg/L	5	U	0.5	U	0.5	U	0.5	U	0.5	U	--		1	U	--		1	U	--		--		--		--		--		--		--		--	
METALS	7440-47-3	Chromium	µg/L	100	**J**	2	U	2	U	**4.2**	**J**	2	U	--		**1.4**	**J**	--		0.92	U	--		--		--		--		--		--		--		--	
METALS	7440-48-4	Cobalt	µg/L	--	U	0.5	U	0.5	U	0.5	U	0.5	U	--		1	U	--		1	U	--		--		--		--		--		--		--		--	
METALS	7440-50-8	Copper	µg/L	--	U	1.8	U	**1.6**	**J**	**1.8**	**J**	**1.2**	**J**	--		1.2	U	--		1.2	U	--		--		--		--		--		--		--		--	
METALS	7440-62-2	Vanadium	µg/L	--	**J**	**1.5**	**J**	1	U	**1.8**	**J**	1	U	--		**3.1**	**J**	--		**1.1**	**J**	--		--		--		--		--		--		--		--	
METALS	7440-66-6	Zinc	µg/L	--		**47.2**		14.5	U	**25.4**	**J**	**27.7**		--		**8.8**	**J**	--		5	U	--		--		--		--		--		--		--		--	
METALS	7440-70-2	Calcium	µg/L	--		**72000**		**64300**		**70300**		**28800**		--		**74200**		--		**75200**		--		--		--		--		--		--		--		--	
METALS	7782-49-2	Selenium	µg/L	50	U	2	U	2	U	2	U	2	U	--		4	U	--		4	U	--		--		--		--		--		--		--		--	
METALS-DISS	7439-89-6	Iron	µg/L	--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--	
METALS-DISS	7439-95-4	Magnesium	µg/L	--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--	
METALS-DISS	7439-96-5	Manganese	µg/L	--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--	
METALS-DISS	7440-02-0	Nickel	µg/L	--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--	
METALS-DISS	7440-09-7	Potassium	µg/L	--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--	
METALS-DISS	7440-23-5	Sodium	µg/L	--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--	
METALS-DISS	7440-39-3	Barium	µg/L	2000		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--	
METALS-DISS	7440-70-2	Calcium	µg/L	--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--	
METALS-DISS	7782-49-2	Selenium	µg/L	50		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--	
RADIOCHEMISTRY	12587-46-1	Alpha gross	PCI/L	--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--	
RADIOCHEMISTRY	12587-47-2	Beta gross	PCI/L	--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--	

Notes:

J = The analyte was positively identified: the associated numerical value is the approximate concentration of the analyte in the sample.

U = The analyte was analyzed for, but was not detected above the reported sample quantitation limit.

Bold indicates the analyte was detected

Shading indicates the analyte exceeded screening criteria

*Delineation screening level for RDX is the HAL. For all other analytes it is the MCL. If no MCL is available, the EPA tap water RSL is selected as the delineation screening level.

See Acronyms and Abbreviations for any abbreviations used in this table.
Source: EPA's Regional Screening Levels (May 2016). Available online: https://www.epa.gov/risk/regional-screening-levels-rsls.

Table DA-10-4. Demolition Area: Groundwater Detects

UFP-QAPP RI/RFI, IAAAP, Middletown, Iowa

				Location	DA-TTMW-060		DA-TTMW-060		DA-TTMW-060		DA-TTMW-060		DA-TTMW-060		DA-TTMW-061		DA-TTMW-061		DA-TTMW-061		DA-TTMW-061		DA-TTMW-061		DA-TTMW-061		DA-TTMW-062		DA-TTMW-062		DA-TTMW-062		DA-TTMW-062		DA-TTMW-062	
				Sample ID	DA-TTMW-060-TR01		DA-TTMW-060-TR02		DA-TTMW-060-TR03		DA-TTMW-060-TR04		DA-TTMW-060-TR05		DA-TTMW-061-TR01		DA-TTMW-061-TR02		DA-TTMW-061-TR03		DA-TTMW-061-TR04		DA-TTMW-061-TR05		DA-TTMW-061-TR05-FD		DA-TTMW-062-TR01		DA-TTMW-062-TR02		DA-TTMW-062-TR02-FD		DA-TTMW-062-TR03		DA-TTMW-062-TR04	
				Sample Date	8/20/2012		11/1/2012		4/3/2013		7/24/2013		12/10/2013		8/20/2012		10/30/2012		4/3/2013		7/18/2013		12/11/2013		12/11/2013		8/17/2012		11/5/2012		11/5/2012		3/27/2013		7/22/2013	
Test Group	**CAS**	**Parameter**	**Unit**	**Screening Level***																														
EXPLOSIVES	118-96-7	2,4,6-Trinitrotoluene	µg/L	2.5	0.19	U	0.19	U	0.19	U	0.19	U	0.2	U	0.19	U	0.19	U	0.19	U	0.19	U	0.19	U	0.2	U	0.19	U	0.19	U	0.19	U	0.19	U	0.19	U
EXPLOSIVES	121-14-2	2,4-Dinitrotoluene	µg/L	0.24	0.19	U	0.19	U	0.19	U	0.19	U	0.2	U	0.19	U	0.19	U	0.19	U	0.19	U	0.19	U	0.2	U	0.19	U	0.19	U	0.19	U	0.19	U	0.19	U
EXPLOSIVES	121-82-4	RDX	µg/L	2	**1.5**		**1.2**		**1.2**		**1**		**1.3**		**9.9**		**6.5**		**4.4**		**5.7**		**5.3**		**5.3**		**7.6**		**4.3**		**4.1**		**4.6**		**5.6**	
EXPLOSIVES	13980-04-6	Hexahydro-1,3,5-trinitroso-1,3,5-triazine/ TNX	µg/L	--	0.19	U	0.19	U	0.19	U	0.19	U	0.2	U	0.19	U	0.19	U	0.19	U	0.19	U	0.19	U	0.2	U	0.19	U	0.19	U	0.19	U	0.19	U	0.19	U
EXPLOSIVES	2691-41-0	HMX	µg/L	1000	**0.25**		0.19	U	0.38	U	**0.3**		**0.16**	**J**	**0.97**		0.76	U	**0.56**		**0.5**		**0.61**		**0.62**		**0.59**		0.57	U	0.57	U	**0.69**		**0.7**	
EXPLOSIVES	479-45-8	Tetryl	µg/L	39	0.19	U	0.19	U	0.19	U	0.19	U	0.2	U	0.19	U	0.19	U	0.19	U	0.19	U	0.19	U	0.2	U	0.19	U	0.19	U	0.19	U	0.19	U	0.19	U
EXPLOSIVES	5755-27-1	1-Nitroso-3,5-dinitro-1,3,5-triazacyclohexane/ MNX	µg/L	--	0.19	U	0.19	U	0.19	U	0.19	U	0.2	U	**0.34**		0.19	U	0.19	U	0.19	U	**0.14**	**J**	**0.16**	**J**	**0.32**		0.19	U	0.19	U	0.19	U	0.38	U
EXPLOSIVES	606-20-2	2,6-Dinitrotoluene	µg/L	0.049	0.19	U	0.19	U	0.19	U	0.19	U	0.2	U	0.19	U	0.19	U	0.19	U	0.19	U	0.19	U	0.2	U	0.19	U	0.19	U	0.19	U	0.19	U	0.19	U
EXPLOSIVES	88-72-2	2-Nitrotoluene	µg/L	0.31	0.19	U	0.19	U	0.19	U	0.19	U	0.2	U	0.19	U	0.19	U	0.19	U	0.19	U	0.19	U	0.2	U	0.19	U	0.19	U	0.19	U	0.19	U	0.19	U
EXPLOSIVES	98-95-3	Nitrobenzene	µg/L	0.14	0.19	U	0.19	U	0.19	U	0.19	U	0.2	U	0.19	U	0.19	U	0.19	U	0.19	U	0.19	U	0.2	U	0.19	U	0.19	U	0.19	U	0.19	U	0.19	U
EXPLOSIVES	99-35-4	1,3,5-Trinitrobenzene	µg/L	590	0.19	U	0.19	U	0.19	U	0.19	U	0.2	U	0.19	U	0.19	U	0.19	U	0.19	U	0.19	U	0.2	U	0.19	U	0.19	U	0.19	U	0.19	U	0.19	U
EXPLOSIVES	99-65-0	1,3-Dinitrobenzene	µg/L	2	0.19	U	0.19	U	0.19	U	0.19	U	0.2	U	0.19	U	0.19	U	0.19	U	0.19	U	0.19	U	0.2	U	0.19	U	0.19	U	0.19	U	0.19	U	0.19	U
EXPLOSIVES	99-99-0	4-Nitrotoluene	µg/L	4.3	0.19	U	0.19	U	0.19	U	0.19	U	0.2	U	0.19	U	0.19	U	0.19	U	0.19	U	0.19	U	0.2	U	0.19	U	0.19	U	0.19	U	0.19	U	0.19	U
EXPLOSIVES	AEC1138	Hexahydro-1,3-dinitroso-5-dinitro-1,3,5-triazine/ DNX	µg/L	--	0.19	U	0.19	U	0.19	U	0.19	U	0.2	U	0.19	U	0.19	U	0.19	U	0.19	U	0.19	U	0.2	U	0.19	U	0.19	U	0.19	U	0.19	U	0.19	U
SEMIVOLATILES	105-60-2	Caprolactam	µg/L	--	--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--	
SEMIVOLATILES	117-81-7	Bis(2-ethylhexyl) phthalate	µg/L	6	--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--	
VOLATILES	108-88-3	Toluene	µg/L	1000	--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--	
VOLATILES	109-99-9	Diethylene oxide / Tetrahydrofuran / Tetramethylene oxide	µg/L	--	--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--	
VOLATILES	67-64-1	Acetone	µg/L	14000	--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--	
VOLATILES	67-66-3	Chloroform	µg/L	0.22	--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--	
VOLATILES	75-09-2	Methylene chloride	µg/L	5	--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--	
VOLATILES	76-13-1	1,1,2-Trichloro-1,2,2-trifluoroethane (Freon 113)	µg/L	--	--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--	
ORGANICS	120-92-3	Cyclopentanone	µg/L	--	--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--	
ORGANICS	593-49-7	Heptacosane	µg/L	--	--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--	
ORGANICS	629-99-2	Pentacosane	µg/L	--	--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--	
ORGANICS	630-01-3	Hexacosane	µg/L	--	--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--	
ORGANICS	630-03-5	Nonacosane	µg/L	--	--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--	
ORGANICS	95-16-9	Benzothiazole	µg/L	--	--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--	
ORGANICS	AEC499	Octacosane	µg/L	--	--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--	
METALS	18540-29-9	Hexavalent chromium	µg/L	0.035	--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--	
METALS	7429-90-5	Aluminum	µg/L	--	--		--		--		--		--		--		--		--		--		--		--		**27.5**	**J**	15	U	15	U	15	U	15	U
METALS	7439-89-6	Iron	µg/L	--	35	U	29	U	29	U	29	U	29	U	35	U	29	U	**3130**		29	U	29	U	29	U	35	U	29	U	29	U	29	U	29	U
METALS	7439-92-1	Lead	µg/L	15	--		--		--		--		--		--		--		--		--		--		--		1	U	1.1	U	1.1	U	1.1	U	1.1	U
METALS	7439-95-4	Magnesium	µg/L	--	--		--		--		--		--		--		--		--		--		--		--		**81000**		**84400**		**85600**		**74800**		**76400**	
METALS	7439-96-5	Manganese	µg/L	--	--		--		--		--		--		--		--		--		--		--		--		**7**	**J**	**1.2**	**J**	**1.4**	**J**	0.7	U	0.7	U
METALS	7439-97-6	Mercury	µg/L	2	--		--		--		--		--		--		--		--		--		--		--		0.05	U	0.03	U	0.03	U	0.03	U	0.03	U
METALS	7440-02-0	Nickel	µg/L	--	--		--		--		--		--		--		--		--		--		--		--		2	U	0.5	U	0.5	U	0.6	U	**0.6**	**J**
METALS	7440-09-7	Potassium	µg/L	--	--		--		--		--		--		--		--		--		--		--		--		**1590**	**J**	**1370**	**J**	**1330**	**J**	**1260**	**J**	**1190**	**J**
METALS	7440-22-4	Silver	µg/L	94	--		--		--		--		--		--		--		--		--		--		--		1	U	0.5	U	0.5	U	0.5	U	0.5	U
METALS	7440-23-5	Sodium	µg/L	--	--		--		--		--		--		--		--		--		--		--		--		**47600**		**43000**		**43200**		**39200**		**41000**	
METALS	7440-36-0	Antimony	µg/L	--	--		--		--		--		--		--		--		--		--		--		--		2	U	1.3	U	1.3	U	1.3	U	1.3	U
METALS	7440-38-2	Arsenic	µg/L	10	--		--		--		--		--		--		--		--		--		--		--		2	U	2.5	U	2.5	U	2.5	U	2.5	U
METALS	7440-39-3	Barium	µg/L	2000	--		--		--		--		--		--		--		--		--		--		--		**47.7**	**J**	**34.3**	**J**	**33.9**	**J**	**30.5**	**J**	**33.5**	**J**
METALS	7440-43-9	Cadmium	µg/L	5	--		--		--		--		--		--		--		--		--		--		--		1	U	0.5	U	0.5	U	0.5	U	0.5	U
METALS	7440-47-3	Chromium	µg/L	100	--		--		--		--		--		--		--		--		--		--		--		1	U	2	U	2	U	2	U	2	U
METALS	7440-48-4	Cobalt	µg/L	--	--		--		--		--		--		--		--		--		--		--		--		1	U	0.5	U	0.5	U	0.5	U	0.5	U
METALS	7440-50-8	Copper	µg/L	--	--		--		--		--		--		--		--		--		--		--		--		2	U	1	U	1	U	1	U	1	U
METALS	7440-62-2	Vanadium	µg/L	--	--		--		--		--		--		--		--		--		--		--		--		1	U	1	U	1	U	1	U	1	U
METALS	7440-66-6	Zinc	µg/L	--	--		--		--		--		--		--		--		--		--		--		--		5	U	**10**	**J**	**9.7**	**J**	5	U	5	U
METALS	7440-70-2	Calcium	µg/L	--	--		--		--		--		--		--		--		--		--		--		--		**66500**		**65200**		**64900**		**61100**		**63800**	
METALS	7782-49-2	Selenium	µg/L	50	--		--		--		--		--		--		--		--		--		--		--		2	U	2	U	2	U	2	U	2	U
METALS-DISS	7439-89-6	Iron	µg/L	--	--		--		--		--		--		35	U	29	U	**49.4**	**J**	29	U	29	U	29	U	--		--		--		--		--	
METALS-DISS	7439-95-4	Magnesium	µg/L	--	--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--	
METALS-DISS	7439-96-5	Manganese	µg/L	--	--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--	
METALS-DISS	7440-02-0	Nickel	µg/L	--	--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--	
METALS-DISS	7440-09-7	Potassium	µg/L	--	--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--	
METALS-DISS	7440-23-5	Sodium	µg/L	--	--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--	
METALS-DISS	7440-39-3	Barium	µg/L	2000	--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--	
METALS-DISS	7440-70-2	Calcium	µg/L	--	--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--	
METALS-DISS	7782-49-2	Selenium	µg/L	50	--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--	
RADIOCHEMISTRY	12587-46-1	Alpha gross	PCI/L	--	--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--	
RADIOCHEMISTRY	12587-47-2	Beta gross	PCI/L	--	--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--	

Notes:

J = The analyte was positively identified: the associated numerical value is the approximate concentration of the analyte in the sample.

U = The analyte was analyzed for, but was not detected above the reported sample quantitation limit.

Bold indicates the analyte was detected

Shading indicates the analyte exceeded screening criteria

*Delineation screening level for RDX is the HAL. For all other analytes it is the MCL. If no MCL is available, the EPA tap water RSL is selected as the delineation screening level.

See Acronyms and Abbreviations for any abbreviations used in this table.
Source: EPA's Regional Screening Levels (May 2016). Available online: https://www.epa.gov/risk/regional-screening-levels-rsls.

Table DA-10-4. Demolition Area: Groundwater Detects

UFP-QAPP RI/RFI, IAAAP, Middletown, Iowa

				Location	DA-TTMW-062		DA-TTMW-063		DA-TTMW-063		DA-TTMW-063		DA-TTMW-063		DA-TTMW-063		DA-TTMW-064		DA-TTMW-064		DA-TTMW-064		DA-TTMW-064		DA-TTMW-064		DA-TTMW-065		DA-TTMW-065		DA-TTMW-065		DA-TTMW-065	
				Sample ID	DA-TTMW-062-TR05		DA-TTMW-063-TR01		DA-TTMW-063-TR02		DA-TTMW-063-TR03		DA-TTMW-063-TR04		DA-TTMW-063-TR05		DA-TTMW-064-TR01		DA-TTMW-064-TR02		DA-TTMW-064-TR03		DA-TTMW-064-TR04		DA-TTMW-064-TR05		DA-TTMW-064-TR05-A		DA-TTMW-065-TR01		DA-TTMW-065-TR02		DA-TTMW-065-TR03		DA-TTMW-065-TR04	
				Sample Date	12/12/2013		8/10/2012		10/31/2012		4/3/2013		7/23/2013		12/12/2013		8/17/2012		10/30/2012		4/5/2013		7/22/2013		12/11/2013		12/12/2013		8/17/2012		11/7/2012		3/29/2013		7/26/2013	
Test Group	**CAS**	**Parameter**	**Unit**	**Screening Level***																														
EXPLOSIVES	118-96-7	2,4,6-Trinitrotoluene	µg/L	2.5	0.2	U	0.19	U	0.19	U	0.19	U	0.19	U	0.19	U	0.19	U	0.19	U	0.19	U	0.19	U	--		0.19	U	0.19	U	0.19	U	0.19	U	0.19	U
EXPLOSIVES	121-14-2	2,4-Dinitrotoluene	µg/L	0.24	0.2	U	0.19	U	0.19	U	0.19	U	0.19	U	0.19	U	0.19	U	**0.083**	**J**	0.19	U	0.19	U	--		0.19	U	0.19	U	0.19	U	0.19	U	0.19	U
EXPLOSIVES	121-82-4	RDX	µg/L	2	**3.5**		**5.1**		**2.9**		**0.6**		**0.99**		0.19	U	**14.1**		**6.9**		**5.5**		**8.8**		--		**5.5**		**10**		**9**		**9.3**		**13.1**	
EXPLOSIVES	13980-04-6	Hexahydro-1,3,5-trinitroso-1,3,5-triazine/ TNX	µg/L	--	0.2	R	0.19	U	0.19	U	0.19	U	0.19	U	0.19	R	0.19	U	0.19	U	0.19	U	0.19	U	--		0.19	R	**0.35**		0.19	U	0.38	U	**0.65**	
EXPLOSIVES	2691-41-0	HMX	µg/L	1000	**0.46**		**0.31**		0.38	U	0.19	U	1.1	U	0.19	U	**1.5**		0.95	U	**0.93**		**0.89**		--		**0.71**		**0.72**		0.57	U	**0.62**		**1.6**	
EXPLOSIVES	479-45-8	Tetryl	µg/L	39	0.2	U	0.19	U	0.19	U	0.19	U	0.19	U	0.19	U	0.19	U	0.19	U	0.19	U	0.19	U	--		0.19	U	0.19	U	0.19	U	0.19	U	0.19	U
EXPLOSIVES	5755-27-1	1-Nitroso-3,5-dinitro-1,3,5-triazacyclohexane/ MNX	µg/L	--	0.2	U	**0.21**		0.57	U	0.19	U	**0.17**	**J**	0.19	U	**0.51**		0.38	U	**0.22**		0.38	U	--		**0.18**	**J**	**0.52**		0.38	U	**0.42**		**0.66**	
EXPLOSIVES	606-20-2	2,6-Dinitrotoluene	µg/L	0.049	0.2	U	0.19	U	0.19	U	0.19	U	0.19	U	0.19	U	0.19	U	0.19	U	0.19	U	0.19	U	--		0.19	U	0.19	U	0.19	U	0.19	U	0.19	U
EXPLOSIVES	88-72-2	2-Nitrotoluene	µg/L	0.31	0.2	U	0.19	U	0.19	U	0.19	U	0.19	U	0.19	U	0.19	U	**0.18**	**J**	0.19	U	0.19	U	--		0.19	U	0.19	U	0.19	U	0.19	U	0.19	U
EXPLOSIVES	98-95-3	Nitrobenzene	µg/L	0.14	0.2	U	0.19	U	0.19	U	0.19	U	0.19	U	0.19	U	0.19	U	0.19	U	0.19	U	0.19	U	--		0.19	U	0.19	U	0.19	U	0.19	U	0.19	U
EXPLOSIVES	99-35-4	1,3,5-Trinitrobenzene	µg/L	590	0.2	U	0.19	U	0.19	U	0.19	U	0.19	U	0.19	U	0.19	U	0.19	U	0.19	U	0.19	U	--		0.19	U	0.19	U	0.19	U	0.19	U	0.19	U
EXPLOSIVES	99-65-0	1,3-Dinitrobenzene	µg/L	2	0.2	U	0.19	U	0.19	U	0.19	U	0.19	U	0.19	U	0.19	U	0.19	U	0.19	U	0.19	U	--		0.19	U	0.19	U	0.19	U	0.19	U	0.19	U
EXPLOSIVES	99-99-0	4-Nitrotoluene	µg/L	4.3	0.2	U	0.19	U	0.19	U	0.19	U	0.19	U	0.19	U	0.19	U	**0.27**		0.19	U	0.19	U	--		0.19	U	0.19	U	0.19	U	0.19	U	0.19	U
EXPLOSIVES	AEC1138	Hexahydro-1,3-dinitroso-5-dinitro-1,3,5-triazine/ DNX	µg/L	--	0.2	U	0.19	U	0.19	U	0.19	U	0.19	U	0.19	U	0.19	U	0.19	U	0.19	U	0.19	U	--		0.19	U	**0.17**	**J**	0.19	U	**0.21**		**0.38**	
SEMIVOLATILES	105-60-2	Caprolactam	µg/L	--	--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--	
SEMIVOLATILES	117-81-7	Bis(2-ethylhexyl) phthalate	µg/L	6	--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--	
VOLATILES	108-88-3	Toluene	µg/L	1000	--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--	
VOLATILES	109-99-9	Diethylene oxide / Tetrahydrofuran / Tetramethylene oxide	µg/L	--	--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--	
VOLATILES	67-64-1	Acetone	µg/L	14000	--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--	
VOLATILES	67-66-3	Chloroform	µg/L	0.22	--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--	
VOLATILES	75-09-2	Methylene chloride	µg/L	5	--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--	
VOLATILES	76-13-1	1,1,2-Trichloro-1,2,2-trifluoroethane (Freon 113)	µg/L	--	--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--	
ORGANICS	120-92-3	Cyclopentanone	µg/L	--	--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--	
ORGANICS	593-49-7	Heptacosane	µg/L	--	--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--	
ORGANICS	629-99-2	Pentacosane	µg/L	--	--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--	
ORGANICS	630-01-3	Hexacosane	µg/L	--	--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--	
ORGANICS	630-03-5	Nonacosane	µg/L	--	--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--	
ORGANICS	95-16-9	Benzothiazole	µg/L	--	--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--	
ORGANICS	AEC499	Octacosane	µg/L	--	--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--	
METALS	18540-29-9	Hexavalent chromium	µg/L	0.035	--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--	
METALS	7429-90-5	Aluminum	µg/L	--	**15.3**	**J**	--		--		--		--		--		--		--		--		--		--		--		25	U	**19.6**	**J**	18.6	U	15	U
METALS	7439-89-6	Iron	µg/L	--	29	U	35	U	**147**	**J**	**6910**		**5840**		**7290**		35	U	29	U	**128**	**J**	**35.2**	**J**	**50.4**	**J**	--		35	U	29	U	29	U	29	U
METALS	7439-92-1	Lead	µg/L	15	1.1	U	--		--		--		--		--		--		--		--		--		--		--		1	U	1.1	U	1.1	U	1.1	U
METALS	7439-95-4	Magnesium	µg/L	--	**79800**		--		--		--		--		--		--		--		--		--		--		--		**111000**		**106000**		**93900**		**86000**	
METALS	7439-96-5	Manganese	µg/L	--	0.7	U	--		--		--		--		--		--		--		--		--		--		--		**20.8**		**5.1**	**J**	4.2	U	**0.9**	**J**
METALS	7439-97-6	Mercury	µg/L	2	0.03	U	--		--		--		--		--		--		--		--		--		--		--		0.05	U	0.03	U	0.03	U	0.03	U
METALS	7440-02-0	Nickel	µg/L	--	0.5	U	--		--		--		--		--		--		--		--		--		--		--		2	U	0.5	U	0.5	U	0.5	U
METALS	7440-09-7	Potassium	µg/L	--	**1310**	**J**	--		--		--		--		--		--		--		--		--		--		--		**1730**	**J**	**1510**	**J**	**1550**	**J**	**1410**	**J**
METALS	7440-22-4	Silver	µg/L	94	0.5	U	--		--		--		--		--		--		--		--		--		--		--		1	U	0.5	U	0.5	U	0.5	U
METALS	7440-23-5	Sodium	µg/L	--	**42300**		--		--		--		--		--		--		--		--		--		--		--		**50900**		**44600**		**53900**		**52000**	
METALS	7440-36-0	Antimony	µg/L	--	1.3	U	--		--		--		--		--		--		--		--		--		--		--		2	U	1.3	U	1.3	U	1.3	U
METALS	7440-38-2	Arsenic	µg/L	10	2.5	U	--		--		--		--		--		--		--		--		--		--		--		2	U	2.5	U	2.5	U	2.5	U
METALS	7440-39-3	Barium	µg/L	2000	**31.2**	**J**	--		--		--		--		--		--		--		--		--		--		--		**52.4**	**J**	**32.5**	**J**	**33**	**J**	**33.3**	**J**
METALS	7440-43-9	Cadmium	µg/L	5	0.5	U	--		--		--		--		--		--		--		--		--		--		--		1	U	0.5	U	0.5	U	0.5	U
METALS	7440-47-3	Chromium	µg/L	100	2	U	--		--		--		--		--		--		--		--		--		--		--		1	U	2	U	2	U	2	U
METALS	7440-48-4	Cobalt	µg/L	--	0.5	U	--		--		--		--		--		--		--		--		--		--		--		1	U	0.5	U	0.5	U	0.5	U
METALS	7440-50-8	Copper	µg/L	--	1	U	--		--		--		--		--		--		--		--		--		--		--		2	U	1	U	1	U	1	U
METALS	7440-62-2	Vanadium	µg/L	--	1	U	--		--		--		--		--		--		--		--		--		--		--		1	U	1	U	1	U	1	U
METALS	7440-66-6	Zinc	µg/L	--	5	U	--		--		--		--		--		--		--		--		--		--		--		5	U	**7.3**	**J**	5	U	5	U
METALS	7440-70-2	Calcium	µg/L	--	**61700**		--		--		--		--		--		--		--		--		--		--		--		**66100**		**59500**		**62500**		**64700**	
METALS	7782-49-2	Selenium	µg/L	50	2	U	--		--		--		--		--		--		--		--		--		--		--		**6.6**	**J**	**3.4**	**J**	**4**	**J**	**2.9**	**J**
METALS-DISS	7439-89-6	Iron	µg/L	--	--		--		--		--		--		--		35	U	29	U	**42.9**	**J**	29	U	29	U	--		--		--		--		--		--	
METALS-DISS	7439-95-4	Magnesium	µg/L	--	--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--	
METALS-DISS	7439-96-5	Manganese	µg/L	--	--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--	
METALS-DISS	7440-02-0	Nickel	µg/L	--	--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--	
METALS-DISS	7440-09-7	Potassium	µg/L	--	--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--	
METALS-DISS	7440-23-5	Sodium	µg/L	--	--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--	
METALS-DISS	7440-39-3	Barium	µg/L	2000	--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--	
METALS-DISS	7440-70-2	Calcium	µg/L	--	--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--	
METALS-DISS	7782-49-2	Selenium	µg/L	50	--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--	
RADIOCHEMISTRY	12587-46-1	Alpha gross	PCI/L	--	--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--	
RADIOCHEMISTRY	12587-47-2	Beta gross	PCI/L	--	--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--	

Notes:

J = The analyte was positively identified: the associated numerical value is the approximate concentration of the analyte in the sample.

U = The analyte was analyzed for, but was not detected above the reported sample quantitation limit.

Bold indicates the analyte was detected

Shading indicates the analyte exceeded screening criteria

*Delineation screening level for RDX is the HAL. For all other analytes it is the MCL. If no MCL is available, the EPA tap water RSL is selected as the delineation screening level.

See Acronyms and Abbreviations for any abbreviations used in this table.
Source: EPA's Regional Screening Levels (May 2016). Available online: https://www.epa.gov/risk/regional-screening-levels-rsls.

Table DA-10-4. Demolition Area: Groundwater Detects

UFP-QAPP RI/RFI, IAAAP, Middletown, Iowa

Test Group	CAS	Parameter	Unit	Screening Level*	Location	DA-TTMW-065		DA-TTSB-086		DA-TTSB-087		DA-TTSB-088		DA-TTSB-089		DA-TTSB-090		DA-TTSB-091		G-10		G-10		G-10		G-10		G-10		G-10		G-10		G-10		G-10		G-10	
					Sample ID	DA-TTMW-065-TR05		DA-TTSB-86A-01312011		DA-TTSB-87A-01312011		DA-TTSB-88-01312011		DA-TTSB-89-01312011		DA-TTSB-90-01312011		DA-TTSB-91-01312011		DA-G-10-001-GW		G-10-042195		G-10-082294		G-10-19810703		G-10-19851002		G-10-19851010		G-10-19870624		G-10-19950503		G-10-19960803		G-10-19970619		G-10-19970826	
					Sample Date	12/17/2013		1/31/2011		1/31/2011		1/31/2011		1/31/2011		1/31/2011		1/31/2011		10/11/2007		4/21/1995		8/22/1994		7/3/1981		10/2/1985		10/10/1985		6/24/1987		5/3/1995		8/3/1996		6/19/1997		8/26/1997	
EXPLOSIVES	118-96-7	2,4,6-Trinitrotoluene	µg/L	2.5	0.2	U	0.35	U	0.35	U	0.35	U	0.35	U	0.35	U	0.35	U	0.2	U	2	U	2	U	3.6	U	1.9	U	--		--		0.63	U	0.07	U	**0.22**		0.16	U
EXPLOSIVES	121-14-2	2,4-Dinitrotoluene	µg/L	0.24	0.2	U	0.35	U	0.35	U	0.35	U	0.35	U	0.35	U	0.35	U	0.2	U	2	U	2	U	1.6	U	0.56	U	--		--		9	U	0.09	U	0.09	U	0.12	U
EXPLOSIVES	121-82-4	RDX	µg/L	2	**7.7**		0.5	U	0.5	U	**2.5**		0.5	U	**1.6**	X	**3.3**		**13.9**		**10**		2	U	6.4	U	**12.7**		--		--		**11.8**		**11**		0.33	U	**6.2**	
EXPLOSIVES	13980-04-6	Hexahydro-1,3,5-trinitroso-1,3,5-triazine/ TNX	µg/L	--	0.2	U	--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--	
EXPLOSIVES	2691-41-0	HMX	µg/L	1000	**0.58**		0.5	U	0.5	U	**1.1**		0.5	U	0.5	U	0.5	U	**0.95**		2	U	2	U			23	U	--		--		1.21	U	**0.96**		**0.52**		**0.7**	
EXPLOSIVES	479-45-8	Tetryl	µg/L	39	0.2	U	0.35	U	0.35	U	0.35	U	0.35	U	0.35	U	0.35	U	0.2	U	--		--		2.9	U	5.6	U	--		--		1.56	U	0.07	U	0.16	U	0.16	U
EXPLOSIVES	5755-27-1	1-Nitroso-3,5-dinitro-1,3,5-triazacyclohexane/ MNX	µg/L	--	0.4	U	--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--	
EXPLOSIVES	606-20-2	2,6-Dinitrotoluene	µg/L	0.049	0.2	U	0.35	U	0.35	U	0.35	U	0.35	U	0.35	U	0.35	U	0.2	U	2	U	2	U	5.7	U	1.2	U	--		--		2	U	0.11	U	0.15	U	0.18	U
EXPLOSIVES	88-72-2	2-Nitrotoluene	µg/L	0.31	0.2	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.2	U	2	U	2	U	--		--		--		--		--		0.17	U	0.17	U	0.31	U
EXPLOSIVES	98-95-3	Nitrobenzene	µg/L	0.14	0.2	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.2	U	2	U	2	U	--		--		--		--		1	U	0.06	U	0.07	U	0.16	U
EXPLOSIVES	99-35-4	1,3,5-Trinitrobenzene	µg/L	590	0.2	U	0.35	U	0.35	U	0.35	U	0.35	U	0.35	U	0.35	U	0.2	U	2	U	2	U	2	U	1.4	U	--		--		0.44	U	0.07	U	0.08	U	**0.14**	
EXPLOSIVES	99-65-0	1,3-Dinitrobenzene	µg/L	2	0.2	U	0.35	U	0.35	U	0.35	U	0.35	U	0.35	U	0.35	U	0.2	U	2	U	2	U	3.2	U	2.3	U	--		--		0.61	U	0.05	U	0.09	U	0.13	U
EXPLOSIVES	99-99-0	4-Nitrotoluene	µg/L	4.3	0.2	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.2	U	2	U	2	U	--		--		--		--		--		--		--		--	
EXPLOSIVES	AEC1138	Hexahydro-1,3-dinitroso-5-dinitro-1,3,5-triazine/ DNX	µg/L	--	0.2	U	--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--	
SEMIVOLATILES	105-60-2	Caprolactam	µg/L	--	--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--	
SEMIVOLATILES	117-81-7	Bis(2-ethylhexyl) phthalate	µg/L	6	--		--		--		--		--		--		--		--		--		--		--		--		--		--		**70**		--		--		--	
VOLATILES	108-88-3	Toluene	µg/L	1000	--		--		--		--		--		--		--		--		--		--		--		--		--		--		0.5	U	--		--		--	
VOLATILES	109-99-9	Diethylene oxide / Tetrahydrofuran / Tetramethylene oxide	µg/L	--	--		--		--		--		--		--		--		--		--		--		**300**		--		--		--		--		--		--		--	
VOLATILES	67-64-1	Acetone	µg/L	14000	--		--		--		--		--		--		--		--		--		--		--		--		--		--		13	U	--		--		--	
VOLATILES	67-66-3	Chloroform	µg/L	0.22	--		--		--		--		--		--		--		--		--		--		--		**83.5**		--		9.9	U	0.5	U	--		--		--	
VOLATILES	75-09-2	Methylene chloride	µg/L	5	--		--		--		--		--		--		--		--		--		--		--		6.9	U	--		5	U	**2.7**		--		--		--	
VOLATILES	76-13-1	1,1,2-Trichloro-1,2,2-trifluoroethane (Freon 113)	µg/L	--	--		--		--		--		--		--		--		--		--		--		**400**		--		--		--		**200**		--		--		--	
ORGANICS	120-92-3	Cyclopentanone	µg/L	--	--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--	
ORGANICS	593-49-7	Heptacosane	µg/L	--	--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--	
ORGANICS	629-99-2	Pentacosane	µg/L	--	--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--	
ORGANICS	630-01-3	Hexacosane	µg/L	--	--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--	
ORGANICS	630-03-5	Nonacosane	µg/L	--	--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--	
ORGANICS	95-16-9	Benzothiazole	µg/L	--	--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--	
ORGANICS	AEC499	Octacosane	µg/L	--	--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--	
METALS	18540-29-9	Hexavalent chromium	µg/L	0.035	--		--		--		--		--		--		--		--		--		--		--		**10**		--		--		--		--		--		--	
METALS	7429-90-5	Aluminum	µg/L	--	15	U	--		--		--		--		--		--		**105**	**J**	30	U	50	U	--		--		--		--		**4670**		--		--		--	
METALS	7439-89-6	Iron	µg/L	--	17	U	--		--		--		--		--		--		97.1	U	**20**		20	U	--		--		--		--		**10400**		--		--		--	
METALS	7439-92-1	Lead	µg/L	15	1.1	U	--		--		--		--		--		--		2.1	U	1	U	1	U	**11**		9.6	U	--		--		**2.28**		0.13	U	**98**		0.13	U
METALS	7439-95-4	Magnesium	µg/L	--	**94700**		--		--		--		--		--		--		**53400**		**58100**		**56000**		--		--		--		--		**56500**		--		--		--	
METALS	7439-96-5	Manganese	µg/L	--	**1.3**	**J**	--		--		--		--		--		--		**6.5**	**J**	5	U	10	U	--		--		--		--		**334**		**1.13**		--		--	
METALS	7439-97-6	Mercury	µg/L	2	**3.3**		--		--		--		--		--		--		0.11	U	0.2	U	0.2	U	--		--		0.85	U	--		0.24	U	0.02	U	0.02	U	0.02	U
METALS	7440-02-0	Nickel	µg/L	--	0.5	U	--		--		--		--		--		--		1	U	10	U	20	U	--		--		--		--		34.3	U	**30**		--		--	
METALS	7440-09-7	Potassium	µg/L	--	**1450**	**J**	--		--		--		--		--		--		**1360**	**J**	**1600**		**2000**		--		--		--		--		**2510**		--		--		--	
METALS	7440-22-4	Silver	µg/L	94	0.77	U	--		--		--		--		--		--		0.91	U					--		0.5	U	--		--		4.6	U	0.32	U	32	U	0.32	U
METALS	7440-23-5	Sodium	µg/L	--	**47400**		--		--		--		--		--		--		**24500**		**31100**		**32000**		--		--		--		--		**28700**		--		--		--	
METALS	7440-36-0	Antimony	µg/L	--	2.3	U	--		--		--		--		--		--		3.3	U	2	U	1	U	--		--		--		--		38	U	0.1	U	--		--	
METALS	7440-38-2	Arsenic	µg/L	10	2.4	U	--		--		--		--		--		--		3.7	U	1	U	1	U	--		9	U	--		--		2.54	U	0.76	U	76	U	0.76	U
METALS	7440-39-3	Barium	µg/L	2000	**29.9**	**J**	--		--		--		--		--		--		**63.8**	**J**	**66**		**60**		**2700**		--		--		--		**76.2**		**66.7**		**651**		**59**	
METALS	7440-43-9	Cadmium	µg/L	5	0.5	U	--		--		--		--		--		--		1	U	3	U	5	U	**17**		3.7	U	--		--		4.01	U	0.48	U	48	U	0.48	U
METALS	7440-47-3	Chromium	µg/L	100	2	U	--		--		--		--		--		--		0.92	U	10	U	10	U	4.9	U	**6**		--		--		**7.87**		**23.8**		23	U	**22**	
METALS	7440-48-4	Cobalt	µg/L	--	0.5	U	--		--		--		--		--		--		1	U	10	U	20	U			--		--		--		25	U	--		--		--	
METALS	7440-50-8	Copper	µg/L	--	1	U	--		--		--		--		--		--		1.2	U	10	U	10	U	**17**		**1**		--		--		8.09	U	**2.81**		--		--	
METALS	7440-62-2	Vanadium	µg/L	--	0.5	U	--		--		--		--		--		--		1.1	U	5	U	10	U	--		--		--		--		11	U	**6.78**		--		--	
METALS	7440-66-6	Zinc	µg/L	--	3	U	--		--		--		--		--		--		5	U	10	U	**10**		**400**		100	U	--		--		**27.3**		--		--		--	
METALS	7440-70-2	Calcium	µg/L	--	**59200**		--		--		--		--		--		--		**81400**		**84000**		**90000**		--		--		--		--		**94600**		--		--		--	
METALS	7782-49-2	Selenium	µg/L	50	3.2	U	--		--		--		--		--		--		4	U	**2**		1	U	--		**4**		--		--		3.02	U	**5.56**		120	U	1.2	U
METALS-DISS	7439-89-6	Iron	µg/L	--	--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--	
METALS-DISS	7439-95-4	Magnesium	µg/L	--	--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--	
METALS-DISS	7439-96-5	Manganese	µg/L	--	--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--	
METALS-DISS	7440-02-0	Nickel	µg/L	--	--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--	
METALS-DISS	7440-09-7	Potassium	µg/L	--	--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--	
METALS-DISS	7440-23-5	Sodium	µg/L	--	--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--	
METALS-DISS	7440-39-3	Barium	µg/L	2000	--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--	
METALS-DISS	7440-70-2	Calcium	µg/L	--	--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--	
METALS-DISS	7782-49-2	Selenium	µg/L	50	--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--	
RADIOCHEMISTRY	12587-46-1	Alpha gross	PCI/L	--	--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--	
RADIOCHEMISTRY	12587-47-2	Beta gross	PCI/L	--	--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--	

Notes:

J = The analyte was positively identified: the associated numerical value is the approximate concentration of the analyte in the sample.

U = The analyte was analyzed for, but was not detected above the reported sample quantitation limit.

Bold indicates the analyte was detected

Shading indicates the analyte exceeded screening criteria

*Delineation screening level for RDX is the HAL. For all other analytes it is the MCL. If no MCL is available, the EPA tap water RSL is selected as the delineation screening level.

See Acronyms and Abbreviations for any abbreviations used in this table.
Source: EPA's Regional Screening Levels (May 2016). Available online: https://www.epa.gov/risk/regional-screening-levels-rsls.

Table DA-10-4. Demolition Area: Groundwater Detects

UFP-QAPP RI/RFI, IAAAP, Middletown, Iowa

				Location	G-10		G-10		G-10		G-10		G-10		G-10		G-10		G-11		G-11		G-11		G-11		G-11		G-11		G-11		G-11		G-11		G-11		G-11	
				Sample ID	G-10-20010606		G-10-20020613		G-10-20040615		G-10-200906		G-10-344976		G-10-355041		G-10-TR05		D007-051600		G-11-042195		G-11-051600		G-11-080994		G-11-080994-FD		G-11-19810703		G-11-19870624		G-11-19960803		G-11-19970619		G-11-20010607		G-11-20020613		G-11-20040615		G-11-200906		G-11-344976		G-11-355041	
				Sample Date	6/6/2001		6/13/2002		6/15/2004		6/13/2009		10/4/1995		12/8/1995		12/19/2013		5/16/2000		4/21/1995		5/16/2000		8/9/1994		8/9/1994		7/3/1981		6/24/1987		8/3/1996		6/19/1997		6/7/2001		6/13/2002		6/15/2004		6/15/2009		10/4/1995		12/8/1995	
Test Group	**CAS**	**Parameter**	**Unit**	**Screening Level***																																								
EXPLOSIVES	118-96-7	2,4,6-Trinitrotoluene	µg/L	2.5	0.53	U	1.3	U	0.49	U	0.19	U	--		0.21	U	0.19	U	0.16	U	2	U	0.16	U	2	U	--		3.6	U	--		0.07	U	**0.2**		0.96	U	1.2	U	0.48	U	--		--		0.21	U
EXPLOSIVES	121-14-2	2,4-Dinitrotoluene	µg/L	0.24	0.53	U	1.3	U	0.49	U	0.19	U	--		0.11	U	0.19	U	0.16	U	2	U	0.16	U	2	U	--		1.6	U	--		0.09	U	0.09	U	0.96	U	1.2	U	0.48	U	--		--		0.11	U
EXPLOSIVES	121-82-4	RDX	µg/L	2	**2.5**		**5.1**		**5.2**		**0.48**		--		**11**		**12.8**		**6.6**		2	U	**5.9**		2	U	--		**18**		--		**11**		**10.9**		**1**		**2.6**	**J**	**3.1**		--		--		**14**	
EXPLOSIVES	13980-04-6	Hexahydro-1,3,5-trinitroso-1,3,5-triazine/ TNX	µg/L	--	--		--		--		0.19	U	--		--		0.19	U	--		--		--		--		--		--		--		--		--		--		--		--		--		--	
EXPLOSIVES	2691-41-0	HMX	µg/L	1000	**0.31**	**J**	1.3	U	**0.48**	**J**	**0.19**		--		**1.3**		**1.1**		**0.97**		2	U	**0.5**		2	U	--		--		--		**0.51**		**0.49**		0.96	U	1.2	U	0.48	U	--		--		**0.87**	
EXPLOSIVES	479-45-8	Tetryl	µg/L	39	0.53	U	1.3	U	0.49	U	0.19	U	--		0.25	U	0.19	U	0.31	U	--		0.31	U	--		--		2.9	U	--		0.07	U	0.16	U	0.96	U	1.2	U	0.48	U	--		--		0.25	U
EXPLOSIVES	5755-27-1	1-Nitroso-3,5-dinitro-1,3,5-triazacyclohexane/ MNX	µg/L	--	0.66	U	1.6	U	0.49	U	0.19	U	--		--		**0.31**		--		--		--		--		--		--		--		--		--		1.2	U	1.5	U	0.48	U	--		--		--	
EXPLOSIVES	606-20-2	2,6-Dinitrotoluene	µg/L	0.049	0.53	U	1.3	U	0.49	U	0.19	U	--		0.17	U	0.19	U	0.31	U	2	U	0.31	U	2	U	--		5.7	U	--		0.11	U	0.15	U	0.96	U	1.2	U	0.48	U	--		--		0.17	U
EXPLOSIVES	88-72-2	2-Nitrotoluene	µg/L	0.31	0.53	U	1.3	U	0.49	U	0.19	U	--		0.2	U	0.19	U	0.31	U	2	U	0.31	U	2	U	--		--		--		0.17	U	0.17	U	0.96	U	1.2	U	0.48	U	--		--		0.2	U
EXPLOSIVES	98-95-3	Nitrobenzene	µg/L	0.14	0.53	U	1.3	U	0.49	U	0.19	U	--		0.19	U	0.19	U	0.16	U	2	U	0.16	U	2	U	--		--		--		0.06	U	0.07	U	0.96	U	1.2	U	0.48	U	--		--		0.19	U
EXPLOSIVES	99-35-4	1,3,5-Trinitrobenzene	µg/L	590	0.53	U	1.3	U	0.49	U	0.19	U	--		0.07	U	0.19	U	0.16	U	2	U	0.16	U	2	U	--		2	U	--		0.07	U	**0.14**		0.96	U	1.2	U	0.48	U	--		--		0.07	U
EXPLOSIVES	99-65-0	1,3-Dinitrobenzene	µg/L	2	0.53	U	1.3	U	0.49	U	0.19	U	--		0.09	U	0.19	U	0.16	U	2	U	0.16	U	2	U	--		3.2	U	--		0.05	U	0.09	U	0.96	U	1.2	U	0.48	U	--		--		0.09	U
EXPLOSIVES	99-99-0	4-Nitrotoluene	µg/L	4.3	0.53	U	1.3	U	0.49	U	0.19	U	--		--		0.19	U	0.78	U	2	U	0.78	U	2	U	--		--		--		--		--		0.96	U	1.2	U	0.48	U	--		--		--	
EXPLOSIVES	AEC1138	Hexahydro-1,3-dinitroso-5-dinitro-1,3,5-triazine/ DNX	µg/L	--	--		--		--		0.19	U	--		--		0.19	U	--		--		--		--		--		--		--		--		--		--		--		--		--		--		--	
SEMIVOLATILES	105-60-2	Caprolactam	µg/L	--	--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--	
SEMIVOLATILES	117-81-7	Bis(2-ethylhexyl) phthalate	µg/L	6	--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--	
VOLATILES	108-88-3	Toluene	µg/L	1000	--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--	
VOLATILES	109-99-9	Diethylene oxide / Tetrahydrofuran / Tetramethylene oxide	µg/L	--	--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--	
VOLATILES	67-64-1	Acetone	µg/L	14000	--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--	
VOLATILES	67-66-3	Chloroform	µg/L	0.22	--		--		--		--		--		--		--		--		--		--		--		--		--		9.9	U	--		--		--		--		--		--		--		--	
VOLATILES	75-09-2	Methylene chloride	µg/L	5	--		--		--		--		--		--		--		--		--		--		--		--		--		5	U	--		--		--		--		--		--		--		--	
VOLATILES	76-13-1	1,1,2-Trichloro-1,2,2-trifluoroethane (Freon 113)	µg/L	--	--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--	
ORGANICS	120-92-3	Cyclopentanone	µg/L	--	--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--	
ORGANICS	593-49-7	Heptacosane	µg/L	--	--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--	
ORGANICS	629-99-2	Pentacosane	µg/L	--	--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--	
ORGANICS	630-01-3	Hexacosane	µg/L	--	--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--	
ORGANICS	630-03-5	Nonacosane	µg/L	--	--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--	
ORGANICS	95-16-9	Benzothiazole	µg/L	--	--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--	
ORGANICS	AEC499	Octacosane	µg/L	--	--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--	
METALS	18540-29-9	Hexavalent chromium	µg/L	0.035	--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--	
METALS	7429-90-5	Aluminum	µg/L	--	--		--		--		--		--		--		--		--		30	U	--		**160**		**160**		--		--		--		--		--		--		--		--		--		--	
METALS	7439-89-6	Iron	µg/L	--	--		--		--		--		--		--		--		--		**30**		--		**100**		**100**		--		--		--		--		--		--		--		--		--		--	
METALS	7439-92-1	Lead	µg/L	15	10	U	10	U	10	U	--		0.3	U	--		--		**3.7**	**J**	1	U	1.7	U	1	U	1	U	--		--		0.13	U	**110**		**2**	**J**	10	U	10	U	--		0.3	U	--	
METALS	7439-95-4	Magnesium	µg/L	--	**36600**		--		--		--		--		--		--		--		**23700**		**27000**		**11000**		**26000**		--		--		--		--		--		**12500**		--		--		--		--		--	
METALS	7439-96-5	Manganese	µg/L	--	--		--		--		--		**6.7**		--		--		--		**88**		--		**20**		10	U	--		--		0.33	U	--		--		--		--		--		--		**0.4**		--	
METALS	7439-97-6	Mercury	µg/L	2	0.21	U	0.2	U	0.2	U	--		0.1	U	--		--		0.1	U	0.2	U	0.1	U	0.2	U	0.2	U	--		--		0.02	U	0.02	U	0.21	U	0.2	U	0.2	U	--		0.1	U	--	
METALS	7440-02-0	Nickel	µg/L	--	--		--		--		--		**8**		--		--		--		10	U	--		20	U	20	U	--		--		**23.8**		--		--		--		--		--		**7**		--	
METALS	7440-09-7	Potassium	µg/L	--	--		--		--		--		--		--		--		--		**600**		--		1000	U	1000	U	--		--		--		--		--		--		--		--		--		--	
METALS	7440-22-4	Silver	µg/L	94	**0.3**	**J**	10	U	10	U	--		0.3	U	--		--		2.8	U	--		0.5	U	--		--		--		--		0.32	U	32	U	10	U	10	U	10	U	--		0.3	U	--	
METALS	7440-23-5	Sodium	µg/L	--	--		--		--		--		--		--		--		--		**12300**		**18500**		**15000**		**23000**		--		--		--		--		**7330**		--		--		--		--		--	
METALS	7440-36-0	Antimony	µg/L	--	--		--		--		--		**5**		--		--		--		2	U	--		1	U	1	U	--		--		0.1	U	--		--		--		--		--		**3.4**		--	
METALS	7440-38-2	Arsenic	µg/L	10	10	U	10	U	**3.8**	**J**	--		5	U	--		--		2.4	U	1	U	2.5	U	1	U	1	U	--		--		0.76	U	76	U	10	U	10	U	**5.2**	**J**	--		5	U	--	
METALS	7440-39-3	Barium	µg/L	2000	**77.7**	**J**	**72.4**	**J**	**72.9**	**J**	--		**68**		--		--		**152**		**71**		**51**		**60**		**40**		--		--		**56.7**		**577**		**90.2**	**J**	**87.7**	**J**	**116**	**J**	--		**61**		--	
METALS	7440-43-9	Cadmium	µg/L	5	**2.6**	**J**	5	U	5	U	--		2	U	--		--		0.4	U	3	U	0.3	U	5	U	5	U	--		--		0.48	U	48	U	5	U	5	U	5	U	--		2	U	--	
METALS	7440-47-3	Chromium	µg/L	100	**0.6**	**J**	10	U	10	U	--		**3.7**		--		--		1.8	U	10	U	2.5	U	10	U	10	U	--		--		**18.8**		23	U	**0.5**	**J**	10	U	10	U	--		**6.3**		--	
METALS	7440-48-4	Cobalt	µg/L	--	--		--		--		--		--		--		--		--		10	U	--		20	U	20	U	--		--		--		--		--		--		--		--		--		--	
METALS	7440-50-8	Copper	µg/L	--	--		--		--		--		2	U	--		--		--		10	U	--		10	U	10	U	--		--		**1.67**		--		--		--		--		--		**2**	U	--	
METALS	7440-62-2	Vanadium	µg/L	--	--		--		--		--		**1.2**		--		--		--		5	U	--		10	U	10	U	--		--		**5.57**		--		--		--		--		--		**2.3**		--	
METALS	7440-66-6	Zinc	µg/L	--	--		--		--		--		--		--		--		--		**20**		--		**20**		10	U	--		--		--		--		--		--		--		--		--		--	
METALS	7440-70-2	Calcium	µg/L	--	**83400**		--		--		--		--		--		--		--		**101000**		**68000**		**31000**		**69000**		--		--		--		--		**66900**		--		--		--		--		--	
METALS	7782-49-2	Selenium	µg/L	50	**2**	**J**	10	U	10	U	--		10	U	--		--		**2.9**	**J**	1	U	**3.9**		1	U	**1**		--		--		**7.1**		120	U	10	U	10	U	10	U	--		10	U	--	
METALS-DISS	7439-89-6	Iron	µg/L	--	--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--	
METALS-DISS	7439-95-4	Magnesium	µg/L	--	--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--	
METALS-DISS	7439-96-5	Manganese	µg/L	--	--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--	
METALS-DISS	7440-02-0	Nickel	µg/L	--	--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--	
METALS-DISS	7440-09-7	Potassium	µg/L	--	--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--	
METALS-DISS	7440-23-5	Sodium	µg/L	--	--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--	
METALS-DISS	7440-39-3	Barium	µg/L	2000	--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--	
METALS-DISS	7440-70-2	Calcium	µg/L	--	--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--	
METALS-DISS	7782-49-2	Selenium	µg/L	50	--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--	
RADIOCHEMISTRY	12587-46-1	Alpha gross	PCI/L	--	--		--		--		--		--		--		--		--		--		**1**		--		--		--		--		--		--		--		--		--		--		--		--	
RADIOCHEMISTRY	12587-47-2	Beta gross	PCI/L	--	--		--		--		--		--		--		--		--		--		**1.9**		--		--		--		--		--		--		--		--		--		--		--		--	

Notes:

J = The analyte was positively identified: the associated numerical value is the approximate concentration of the analyte in the sample.

U = The analyte was analyzed for, but was not detected above the reported sample quantitation limit.

Bold indicates the analyte was detected

Shading indicates the analyte exceeded screening criteria

*Delineation screening level for RDX is the HAL. For all other analytes it is the MCL. If no MCL is available, the EPA tap water RSL is selected as the delineation screening level.

See Acronyms and Abbreviations for any abbreviations used in this table.
Source: EPA's Regional Screening Levels (May 2016). Available online: https://www.epa.gov/risk/regional-screening-levels-rsls.

Table DA-10-4. Demolition Area: Groundwater Detects

UFP-QAPP RI/RFI, IAAAP, Middletown, Iowa

				Location	G-9		G-9	
				Sample ID	D008-051600		G-09-041595	
				Sample Date	5/16/2000		4/15/1995	
Test Group	**CAS**	**Parameter**	**Unit**	**Screening Level***				
EXPLOSIVES	118-96-7	2,4,6-Trinitrotoluene	µg/L	2.5	0.16	U	2	U
EXPLOSIVES	121-14-2	2,4-Dinitrotoluene	µg/L	0.24	0.16	U	2	U
EXPLOSIVES	121-82-4	RDX	µg/L	2	**0.79**		2	U
EXPLOSIVES	13980-04-6	Hexahydro-1,3,5-trinitroso-1,3,5-triazine/ TNX	µg/L	--	--		--	
EXPLOSIVES	2691-41-0	HMX	µg/L	1000	0.39	U	2	U
EXPLOSIVES	479-45-8	Tetryl	µg/L	39	0.31	U	--	
EXPLOSIVES	5755-27-1	1-Nitroso-3,5-dinitro-1,3,5-triazacyclohexane/ MNX	µg/L	--	--		--	
EXPLOSIVES	606-20-2	2,6-Dinitrotoluene	µg/L	0.049	0.31	U	2	U
EXPLOSIVES	88-72-2	2-Nitrotoluene	µg/L	0.31	0.31	U	2	U
EXPLOSIVES	98-95-3	Nitrobenzene	µg/L	0.14	0.16	U	2	U
EXPLOSIVES	99-35-4	1,3,5-Trinitrobenzene	µg/L	590	0.16	U	2	U
EXPLOSIVES	99-65-0	1,3-Dinitrobenzene	µg/L	2	0.16	U	2	U
EXPLOSIVES	99-99-0	4-Nitrotoluene	µg/L	4.3	0.78	U	2	U
EXPLOSIVES	AEC1138	Hexahydro-1,3-dinitroso-5-dinitro-1,3,5-triazine/ DNX	µg/L	--	--		--	
SEMIVOLATILES	105-60-2	Caprolactam	µg/L	--	--		--	
SEMIVOLATILES	117-81-7	Bis(2-ethylhexyl) phthalate	µg/L	6	--		--	
VOLATILES	108-88-3	Toluene	µg/L	1000	--		--	
VOLATILES	109-99-9	Diethylene oxide / Tetrahydrofuran / Tetramethylene oxide	µg/L	--	--		--	
VOLATILES	67-64-1	Acetone	µg/L	14000	--		--	
VOLATILES	67-66-3	Chloroform	µg/L	0.22	--		--	
VOLATILES	75-09-2	Methylene chloride	µg/L	5	--		--	
VOLATILES	76-13-1	1,1,2-Trichloro-1,2,2-trifluoroethane (Freon 113)	µg/L	--	--		--	
ORGANICS	120-92-3	Cyclopentanone	µg/L	--	--		--	
ORGANICS	593-49-7	Heptacosane	µg/L	--	--		--	
ORGANICS	629-99-2	Pentacosane	µg/L	--	--		--	
ORGANICS	630-01-3	Hexacosane	µg/L	--	--		--	
ORGANICS	630-03-5	Nonacosane	µg/L	--	--		--	
ORGANICS	95-16-9	Benzothiazole	µg/L	--	--		--	
ORGANICS	AEC499	Octacosane	µg/L	--	--		--	
METALS	18540-29-9	Hexavalent chromium	µg/L	0.035	--		--	
METALS	7429-90-5	Aluminum	µg/L	--	--		**70**	
METALS	7439-89-6	Iron	µg/L	--	--		10	U
METALS	7439-92-1	Lead	µg/L	15	1.7	U	1	U
METALS	7439-95-4	Magnesium	µg/L	--	--		**32600**	
METALS	7439-96-5	Manganese	µg/L	--	--		5	U
METALS	7439-97-6	Mercury	µg/L	2	0.1	U	0.2	U
METALS	7440-02-0	Nickel	µg/L	--	--		10	U
METALS	7440-09-7	Potassium	µg/L	--	--		**500**	
METALS	7440-22-4	Silver	µg/L	94	0.5	U	--	
METALS	7440-23-5	Sodium	µg/L	--	--		**29100**	
METALS	7440-36-0	Antimony	µg/L	--	--		2	U
METALS	7440-38-2	Arsenic	µg/L	10	2.5	U	1	U
METALS	7440-39-3	Barium	µg/L	2000	**186**		**161**	
METALS	7440-43-9	Cadmium	µg/L	5	0.3	U	3	U
METALS	7440-47-3	Chromium	µg/L	100	2.5	U	10	U
METALS	7440-48-4	Cobalt	µg/L	--	--		10	U
METALS	7440-50-8	Copper	µg/L	--	--		10	U
METALS	7440-62-2	Vanadium	µg/L	--	--		5	U
METALS	7440-66-6	Zinc	µg/L	--	--		**10**	
METALS	7440-70-2	Calcium	µg/L	--	--		**86300**	
METALS	7782-49-2	Selenium	µg/L	50	**8.1**		**3**	
METALS-DISS	7439-89-6	Iron	µg/L	--	--		--	
METALS-DISS	7439-95-4	Magnesium	µg/L	--	--		--	
METALS-DISS	7439-96-5	Manganese	µg/L	--	--		--	
METALS-DISS	7440-02-0	Nickel	µg/L	--	--		--	
METALS-DISS	7440-09-7	Potassium	µg/L	--	--		--	
METALS-DISS	7440-23-5	Sodium	µg/L	--	--		--	
METALS-DISS	7440-39-3	Barium	µg/L	2000	--		--	
METALS-DISS	7440-70-2	Calcium	µg/L	--	--		--	
METALS-DISS	7782-49-2	Selenium	µg/L	50	--		--	
RADIOCHEMISTRY	12587-46-1	Alpha gross	PCI/L	--	--		--	
RADIOCHEMISTRY	12587-47-2	Beta gross	PCI/L	--	--		--	

Notes:

J = The analyte was positively identified: the associated numerical value is the approximate concentration of the analyte in the sample.

U = The analyte was analyzed for, but was not detected above the reported sample quantitation limit.

Bold indicates the analyte was detected

Shading indicates the analyte exceeded screening criteria

*Delineation screening level for RDX is the HAL. For all other analytes it is the MCL. If no MCL is available, the EPA tap water RSL is selected as the delineation screening level.

See Acronyms and Abbreviations for any abbreviations used in this table.
Source: EPA's Regional Screening Levels (May 2016). Available online: https://www.epa.gov/risk/regional-screening-levels-rsls.

Table DA-10-4. Demolition Area: Groundwater Detects

UFP-QAPP RI/RFI, IAAAP, Middletown, Iowa

Test Group	CAS	Parameter	Unit	Screening Level*	Location	Sample ID	Sample Date	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q
					G-9	G-09-081094	8/10/1994			G-9	G-09-19970826	8/26/1997		G-9	G-09-19970826-FD	8/26/1997		G-9	G-9-051600	5/16/2000		G-9	G-9-070709	7/7/2009		G-9	G9-123699	12/16/1999		G-9	G-9-19810703	7/3/1981		G-9	G-9-19851003	10/3/1985		G-9	G-9-19870624	6/24/1987	
EXPLOSIVES	118-96-7	2,4,6-Trinitrotoluene	µg/L	2.5			1.1			1.5			0.16	U	0.19	U	0.04	U	3.6	U	1.9	U	--																	
EXPLOSIVES	121-14-2	2,4-Dinitrotoluene	µg/L	0.24			0.12	U	0.12	U	0.16	U	0.19	U	0.05	U	1.6	U	0.56	U	--																	
EXPLOSIVES	121-82-4	RDX	µg/L	2			0.94			1.3			0.69		0.19	U	1		6.4	U	7	U	--															
EXPLOSIVES	13980-04-6	Hexahydro-1,3,5-trinitroso-1,3,5-triazine/ TNX	µg/L	--			--			--			--		0.19	U	--		--		--		--															
EXPLOSIVES	2691-41-0	HMX	µg/L	1000			0.24			0.36			0.39	U	0.19	U	0.26	U	--		23	U	--															
EXPLOSIVES	479-45-8	Tetryl	µg/L	39			0.16	U	0.16	U	0.31	U	0.19	U	0.03	U	2.9	U	5.6	U	--																	
EXPLOSIVES	5755-27-1	1-Nitroso-3,5-dinitro-1,3,5-triazacyclohexane/ MNX	µg/L	--			--			--			--		0.19	U	--		--		--		--															
EXPLOSIVES	606-20-2	2,6-Dinitrotoluene	µg/L	0.049			0.18	U	0.18	U	0.31	U	0.19	U	0.05	U	5.7	U	1.2	U	--																	
EXPLOSIVES	88-72-2	2-Nitrotoluene	µg/L	0.31			0.31	U	0.31	U	0.31	U	0.19	U	0.06	U	--		--		--		--															
EXPLOSIVES	98-95-3	Nitrobenzene	µg/L	0.14			0.16	U	0.16	U	0.16	U	0.19	U	0.06	U	--		--		--		--															
EXPLOSIVES	99-35-4	1,3,5-Trinitrobenzene	µg/L	590			0.11	U	0.11	U	0.16	U	0.19	U	0.03	U	2	U	1.4	U	--																	
EXPLOSIVES	99-65-0	1,3-Dinitrobenzene	µg/L	2			0.13	U	0.13	U	0.16	U	0.19	U	0.02	U	3.2	U	2.3	U	--																	
EXPLOSIVES	99-99-0	4-Nitrotoluene	µg/L	4.3			--			--			0.78	U	0.19	U	0.06	U	--		--		--															
EXPLOSIVES	AEC1138	Hexahydro-1,3-dinitroso-5-dinitro-1,3,5-triazine/ DNX	µg/L	--			--			--			--		0.19	U	--		--		--		--															
SEMIVOLATILES	105-60-2	Caprolactam	µg/L	--			--			--			--		--		--		--		--		--															
SEMIVOLATILES	117-81-7	Bis(2-ethylhexyl) phthalate	µg/L	6			--			--			--		--		--		--		--		--															
VOLATILES	108-88-3	Toluene	µg/L	1000			--			--			--		--		--		--		--		--															
VOLATILES	109-99-9	Diethylene oxide / Tetrahydrofuran / Tetramethylene oxide	µg/L	--			--			--			--		--		--		--		--		--															
VOLATILES	67-64-1	Acetone	µg/L	14000			--			--			--		--		--		--		--		--															
VOLATILES	67-66-3	Chloroform	µg/L	0.22			--			--			--		--		--		--		188		9.9	U														
VOLATILES	75-09-2	Methylene chloride	µg/L	5			--			--			--		--		--		--		6.9	U	5	U														
VOLATILES	76-13-1	1,1,2-Trichloro-1,2,2-trifluoroethane (Freon 113)	µg/L	--			--			--			--		--		--		--		--		--															
ORGANICS	120-92-3	Cyclopentanone	µg/L	--			--			--			--		--		--		--		--		--															
ORGANICS	593-49-7	Heptacosane	µg/L	--			--			--			--		--		--		--		--		--															
ORGANICS	629-99-2	Pentacosane	µg/L	--			--			--			--		--		--		--		--		--															
ORGANICS	630-01-3	Hexacosane	µg/L	--			--			--			--		--		--		--		--		--															
ORGANICS	630-03-5	Nonacosane	µg/L	--			--			--			--		--		--		--		--		--															
ORGANICS	95-16-9	Benzothiazole	µg/L	--			--			--			--		--		--		--		--		--															
ORGANICS	AEC499	Octacosane	µg/L	--			--			--			--		--		--		--		--		--															
METALS	18540-29-9	Hexavalent chromium	µg/L	0.035			--			--			--		--		--		--		10	U	--															
METALS	7429-90-5	Aluminum	µg/L	--		50	--	U		--			--		--		--		--		--		--															
METALS	7439-89-6	Iron	µg/L	--		20	--	U		--			--		--		--		--		--		--															
METALS	7439-92-1	Lead	µg/L	15		1	0.13	U	0.13	U	1.7	U	--		1.4	U	--		9.6	U	--																	
METALS	7439-95-4	Magnesium	µg/L	--		**40000**	--			--			--		--		--		--		--		--															
METALS	7439-96-5	Manganese	µg/L	--		10	--	U		--			--		--		--		--		--		--															
METALS	7439-97-6	Mercury	µg/L	2		0.2	0.02	U	0.02	U	0.02	U	0.1	U	--		0.07	U	--		0.85	U	--															
METALS	7440-02-0	Nickel	µg/L	--		20	--	U		--			--		--				--		--		--															
METALS	7440-09-7	Potassium	µg/L	--		1000	--	U		--			--		--		--		--		--		--															
METALS	7440-22-4	Silver	µg/L	94		--	0.32	U	0.32	U	0.5	U	--		1.1	U	--		0.5	U	--																	
METALS	7440-23-5	Sodium	µg/L	--		**43000**	--			--			--		--		--		--		--		--															
METALS	7440-36-0	Antimony	µg/L	--		1	--	U		--			--		--		--		--		--		--															
METALS	7440-38-2	Arsenic	µg/L	10		1	0.76	U	0.76	U	2.5	U	--		2.7	U	--		9	U	--																	
METALS	7440-39-3	Barium	µg/L	2000		**180**	**184**			**164**			**194**		--		**179**		--		--		--															
METALS	7440-43-9	Cadmium	µg/L	5		5	0.48	U	0.48	U	0.3	U	--		0.64	U	--		3.7	U	--																	
METALS	7440-47-3	Chromium	µg/L	100		10	**22**			**18**			**2.7**	J	--		**1.5**		--		--		--															
METALS	7440-48-4	Cobalt	µg/L	--		20	--	U		--			--		--		--		--		--		--															
METALS	7440-50-8	Copper	µg/L	--		10	--	U		--			--		--		--		--		1	U	--															
METALS	7440-62-2	Vanadium	µg/L	--		10	--	U		--			--		--		--		--		--		--															
METALS	7440-66-6	Zinc	µg/L	--		**10**	--			--			--		--		--		--		100	U	--															
METALS	7440-70-2	Calcium	µg/L	--		**97000**	--			--			--		--		--		--		--		--															
METALS	7782-49-2	Selenium	µg/L	50		1	**3.4**			**1.8**			**6.3**		--		**3**		--		3	U	--															
METALS-DISS	7439-89-6	Iron	µg/L	--		--	--			--			--		--		--		--		--		--															
METALS-DISS	7439-95-4	Magnesium	µg/L	--		--	--			--			--		--		--		--		--		--															
METALS-DISS	7439-96-5	Manganese	µg/L	--		--	--			--			--		--		--		--		--		--															
METALS-DISS	7440-02-0	Nickel	µg/L	--		--	--			--			--		--		--		--		--		--															
METALS-DISS	7440-09-7	Potassium	µg/L	--		--	--			--			--		--		--		--		--		--															
METALS-DISS	7440-23-5	Sodium	µg/L	--		--	--			--			--		--		--		--		--		--															
METALS-DISS	7440-39-3	Barium	µg/L	2000		--	--			--			--		--		--		--		--		--															
METALS-DISS	7440-70-2	Calcium	µg/L	--		--	--			--			--		--		--		--		--		--															
METALS-DISS	7782-49-2	Selenium	µg/L	50		--	--			--			--		--		--		--		--		--															
RADIOCHEMISTRY	12587-46-1	Alpha gross	PCI/L	--		--	--			--			--		--		**3.06**		--		--		--															
RADIOCHEMISTRY	12587-47-2	Beta gross	PCI/L	--		--	--			--			--		--		**2.21**		--		--		--															

Test Group	CAS	Parameter	Unit	Screening Level*	Location	Sample ID	Sample Date	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q
					G-9	G-9-19910823	8/23/1991			G-9	G-9-19921023	10/23/1992		G-9	G-9-19930519	5/19/1993		G-9	G-9-19950505	5/5/1995		G-9	G-9-19960803	8/3/1996		G-9	G-9-19960803-FD	8/3/1996		G-9	G-9-19970619	6/19/1997		G-9	G-9-19970619-FD	6/19/1997		G-9	G-9-20001021	10/21/2000	
EXPLOSIVES	118-96-7	2,4,6-Trinitrotoluene	µg/L	2.5			0.78	U		0.63	U	0.63	U		0.63	U	0.63	U		0.07	U	0.07	U		**0.43**		**0.45**		0.92	U	1.1	U	0.99	U	0.96	U	--	
EXPLOSIVES	121-14-2	2,4-Dinitrotoluene	µg/L	0.24			**5.52**			4.5	U	4.5	U		4.5	U	4.5	U		0.09	U	0.09	U		0.09	U	0.09	U	0.92	U	1.1	U	0.99	U	0.96	U	--	
EXPLOSIVES	121-82-4	RDX	µg/L	2			**2.3**			**1.41**		**1.66**			**1.51**		**1.3**			**1.3**		**1.18**			**1.25**		**0.96**		**1**	**J**	**1.4**	**J**	**0.95**	**J**	--	
EXPLOSIVES	13980-04-6	Hexahydro-1,3,5-trinitroso-1,3,5-triazine/ TNX	µg/L	--			--			--		--			--		--			--		--			--		--		--		--		--		--		--	
EXPLOSIVES	2691-41-0	HMX	µg/L	1000			1.3	U		1.21	U	1.21	U		1.21	U	1.21	U		0.12	U	0.12	U		**0.31**		**0.32**		0.92	U	1.1	U	0.99	U	0.96	U	--	
EXPLOSIVES	479-45-8	Tetryl	µg/L	39			0.66	U		2.49	U	1.56	U		1.56	U	1.56	U		0.07	U	0.07	U		0.16	U	0.16	U	0.92	U	1.1	U	0.99	U	0.96	U	--	
EXPLOSIVES	5755-27-1	1-Nitroso-3,5-dinitro-1,3,5-triazacyclohexane/ MNX	µg/L	--			--			--		--			--		--			--		--			--		--		0.92	U	1.4	U	1.2	U	0.96	U	--	
EXPLOSIVES	606-20-2	2,6-Dinitrotoluene	µg/L	0.049			**0.55**	**J**		0.79	U	0.79	U		0.79	U	0.79	U		0.11	U	0.11	U		0.15	U	0.15	U	0.92	U	1.1	U	0.99	U	0.96	U	--	
EXPLOSIVES	88-72-2	2-Nitrotoluene	µg/L	0.31			--			--		--			--		--			0.17	U	0.17	U		0.17	U	0.17	U	0.92	U	1.1	U	0.99	U	0.96	U	--	
EXPLOSIVES	98-95-3	Nitrobenzene	µg/L	0.14			1.13	U		0.64	U	0.64	U		0.64	U	0.64	U		0.06	U	0.06	U		0.07	U	0.07	U	0.92	U	1.1	U	0.99	U	0.96	U	--	
EXPLOSIVES	99-35-4	1,3,5-Trinitrobenzene	µg/L	590			0.56	U		0.44	U	0.44	U		0.44	U	0.44	U		0.07	U	0.07	U		0.08	U	0.08	U	0.92	U	1.1	U	0.99	U	0.96	U	--	
EXPLOSIVES	99-65-0	1,3-Dinitrobenzene	µg/L	2			0.61	U		0.61	U	0.61	U		0.61	U	0.61	U		0.05	U	0.05	U		0.09	U	0.09	U	0.92	U	1.1	U	0.99	U	0.96	U	--	
EXPLOSIVES	99-99-0	4-Nitrotoluene	µg/L	4.3			--			--		--			--		--			--		--			--		--		0.92	U	1.1	U	0.99	U	0.96	U	--	
EXPLOSIVES	AEC1138	Hexahydro-1,3-dinitroso-5-dinitro-1,3,5-triazine/ DNX	µg/L	--			--			--		--			--		--			--		--			--		--		--		--		--		--		--	
SEMIVOLATILES	105-60-2	Caprolactam	µg/L	--			--			**400**		--			--		--			--		--			--		--		--		--		--		--		--	
SEMIVOLATILES	117-81-7	Bis(2-ethylhexyl) phthalate	µg/L	6			--			4.8	U	4.8	U		**5.6**		--			--		--			--		--		--		--		--		--		--	
VOLATILES	108-88-3	Toluene	µg/L	1000			5	U		--		0.5	U		0.5	U	--			--		--			--		--		--		--		--		--		--	
VOLATILES	109-99-9	Diethylene oxide / Tetrahydrofuran / Tetramethylene oxide	µg/L	--			--			--		--			--		--			--		--			--		--		--		--		--		--		--	
VOLATILES	67-64-1	Acetone	µg/L	14000			40	U		--		13	U		13	U	--			--		--			--		--		--		--		--		--		--	
VOLATILES	67-66-3	Chloroform	µg/L	0.22			5	U		--		0.5	U		0.5	U	--			--		--			--		--		--		--		--		--		--	
VOLATILES	75-09-2	Methylene chloride	µg/L	5			5	U		--		2.3	U		**2.6**		--			--		--			--		--		--		--		--		--		--	
VOLATILES	76-13-1	1,1,2-Trichloro-1,2,2-trifluoroethane (Freon 113)	µg/L	--			--			--		**50**			**50**		--			--		--			--		--		--		--		--		--		--	
ORGANICS	120-92-3	Cyclopentanone	µg/L	--			--			--		**30**			--		--			--		--			--		--		--		--		--		--		--	
ORGANICS	593-49-7	Heptacosane	µg/L	--			--			--		--			**30**		--			--		--			--		--		--		--		--		--		--	
ORGANICS	629-99-2	Pentacosane	µg/L	--			--			--		--			**9**		--			--		--			--		--		--		--		--		--		--	
ORGANICS	630-01-3	Hexacosane	µg/L	--			--			--		--			**20**		--			--		--			--		--		--		--		--		--		--	
ORGANICS	630-03-5	Nonacosane	µg/L	--			--			--		--			**50**		--			--		--			--		--		--		--		--		--		--	
ORGANICS	95-16-9	Benzothiazole	µg/L	--			--			**7**		--			--		--			--		--			--		--		--		--		--		--		--	
ORGANICS	AEC499	Octacosane	µg/L	--			--			--		--			**60**		--			--		--			--		--		--		--		--		--		--	
METALS	18540-29-9	Hexavalent chromium	µg/L	0.035			--			--		--			--		--			--		--			--		--		--		--		--		--		--	
METALS	7429-90-5	Aluminum	µg/L	--			--			**1840**		--			**202**		--			--		--			--		--		--		--		--		--		--	
METALS	7439-89-6	Iron	µg/L	--			--			**3510**		--			**305**		--			--		--			--		--		--		--		--		--		--	
METALS	7439-92-1	Lead	µg/L	15			4.47	U		**3.9**		**2.6**		UN	2.54	U	1.26	U		0.13	U	0.13	U		**80.2**		**57.8**		10	U	10	U	10	U	10	U	0.3	U
METALS	7439-95-4	Magnesium	µg/L	--			--			**30100**		--			**31300**		--			--		--			--		--		**29900**		**32900**		--		--		--	
METALS	7439-96-5	Manganese	µg/L	--			--			**98.1**		--			**5.1**		0.33	U		0.33	U	--			--		--		--		--		--		--		**0.4**	
METALS	7439-97-6	Mercury	µg/L	2			0.1	U		0.24	U	0.24	U		0.24	U	0.02	U		0.02	U	**0.04**			**0.03**		0.21	U	0.21	U	0.2	U	0.2	U	0.1	U	
METALS	7440-02-0	Nickel	µg/L	--			32.1	U		34.3	U	--			34.3	U	**30.1**			**28.2**		--			--		--		--		--		--		**7**		
METALS	7440-09-7	Potassium	µg/L	--			--			375	U	--			375	U	--			--		--			--		--		--		--		--		--		--	
METALS	7440-22-4	Silver	µg/L	94			10	U		4.6	U	--			4.6	U	0.32	U		0.32	U	32	U		32	U	10	U	10	U	10	U	10	U	0.3	U
METALS	7440-23-5	Sodium	µg/L	--			--			**26400**		--			**28400**		--			--		--			--		**23100**		**25100**		--		--		--		
METALS	7440-36-0	Antimony	µg/L	--			60	U		38	U	--			38	U	**0.21**			**0.23**		--			--		--		--		--		--		**3.1**		
METALS	7440-38-2	Arsenic	µg/L	10			**3.43**			2.54	U	2.54	U	UN	2.54	U	0.76	U		0.76	U	76	U		76	U	10	U	10	U	10	U	10	U	5	U	
METALS	7440-39-3	Barium	µg/L	2000			**197**			**166**		--			**154**		**165**			**161**		33	U		33	U	**166**	**J**	**195**	**J**	**158**	**J**	**169**	**J**	**177**	
METALS	7440-43-9	Cadmium	µg/L	5			6.78	U		4.01	U	--			4.01	U	0.48	U		0.48	U	48	U		48	U	5	U	**0.7**	**J**	5	U	5	U	2	U
METALS	7440-47-3	Chromium	µg/L	100			16.8	U		6.02	U	--			6.02	U	**23.3**			**23.2**		23	U		23	U	**0.9**	**J**	**0.9**	**J**	10	U	**1.3**	**J**	**4.2**	
METALS	7440-48-4	Cobalt	µg/L	--			--			25	U	--			25	U	--			--		--			--		--		--		--		--		--		--	
METALS	7440-50-8	Copper	µg/L	--			18.8	U		8.09	U	--			8.09	U	**2.27**			**1.98**		--			--		--		--		--		--		2	U
METALS	7440-62-2	Vanadium	µg/L	--			--			11	U	--			11	U	**6.57**			**6.88**		--			--		--		--		--		--		**1.9**		
METALS	7440-66-6	Zinc	µg/L	--			**381**			**159**		--			21.1	U	--			--		--			--		--		--		--		--		--		--	
METALS	7440-70-2	Calcium	µg/L	--			--			**84200**		--			**84100**		--			--		--			--		**79500**		**84000**		--		--		--		
METALS	7782-49-2	Selenium	µg/L	50			2.53	U		3.02	U	3.02	U		3.02	U	**7.76**			**8.47**		120	U		120	U	**10**	**J**	**7**	**J**	**3.6**	**J**	**5.7**	**J**	10	U
METALS-DISS	7439-89-6	Iron	µg/L	--			--			--		--			--		--			--		--			--		--		--		--		--		--		--	
METALS-DISS	7439-95-4	Magnesium	µg/L	--			--			--		--			--		--			--		--			--		--		--		--		--		--		--	
METALS-DISS	7439-96-5	Manganese	µg/L	--			--			--		--			--		--			--		--			--		--		--		--		--		--		--	
METALS-DISS	7440-02-0	Nickel	µg/L	--			--			--		--			--		--			--		--			--		--		--		--		--		--		--	
METALS-DISS	7440-09-7	Potassium	µg/L	--			--			--		--			--		--			--		--			--		--		--		--		--		--		--	
METALS-DISS	7440-23-5	Sodium	µg/L	--			--			--		--			--		--			--		--			--		--		--		--		--		--		--	
METALS-DISS	7440-39-3	Barium	µg/L	2000			--			--		--			--		--			--		--			--		--		--		--		--		--		--	
METALS-DISS	7440-70-2	Calcium	µg/L	--			--			--		--			--		--			--		--			--		--		--		--		--		--		--	
METALS-DISS	7782-49-2	Selenium	µg/L	50			--			--		--			--		--			--		--			--		--		--		--		--		--		--	
RADIOCHEMISTRY	12587-46-1	Alpha gross	PCI/L	--			--			--		--			--		--			--		--			--		--		--		--		--		--		--	
RADIOCHEMISTRY	12587-47-2	Beta gross	PCI/L	--			--			--		--			--		--			--		--			--		--		--		--		--		--		--	

Notes:

J = The analyte was positively identified: the associated numerical value is the approximate concentration of the analyte in the sample.

U = The analyte was analyzed for, but was not detected above the reported sample quantitation limit.

Bold indicates the analyte was detected

Shading indicates the analyte exceeded screening criteria

*Delineation screening level for RDX is the HAL. For all other analytes it is the MCL. If no MCL is available, the EPA tap water RSL is selected as the delineation screening level.

See Acronyms and Abbreviations for any abbreviations used in this table.
Source: EPA's Regional Screening Levels (May 2016). Available online: https://www.epa.gov/risk/regional-screening-levels-rsls.

Table DA-10-4. Demolition Area: Groundwater Detects

UFP-QAPP RI/RFI, IAAAP, Middletown, Iowa

				Location	G-9		G-9		JAW-01		JAW-01		JAW-01		JAW-01		JAW-01		JAW-01		JAW-01		JAW-01		JAW-01		JAW-01		JAW-01		JAW-01		JAW-01		JAW-01		JAW-02	
				Sample ID	G-9-355041		G-9-TR05		JAW-01-041695		JAW01-051600		JAW-01-081094		JAW01-121799		JAW-01-19930519		JAW-01-19950426		JAW-01-19960803		JAW-01-19970619		JAW-01-19970826		JAW-01-20001021		JAW-01-20010605		JAW-01-20020612		JAW-01-20031118		JAW-01-200906		JAW-01-TR05		JAW-1-344976		JAW-1-355046		JAW-02-042195	
				Sample Date	12/8/1995		12/18/2013		4/16/1995		5/16/2000		8/10/1994		12/17/1999		5/19/1993		4/26/1995		8/3/1996		6/19/1997		8/26/1997		10/21/2000		6/5/2001		6/12/2002		11/18/2003		6/10/2009		12/18/2013		10/4/1995		12/13/1995		4/21/1995	
Test Group	**CAS**	**Parameter**	**Unit**	**Screening Level***																																				
EXPLOSIVES	118-96-7	2,4,6-Trinitrotoluene	µg/L	2.5	0.21	U	0.19	U	2	U	0.16	U	2	U	0.21	U	0.63	U	0.63	U	0.07	U	0.16	U	0.16	U	1.3	U	0.48	U	1	U	1.4	U	0.19	U	0.19	U	--		0.21	U	2	U
EXPLOSIVES	121-14-2	2,4-Dinitrotoluene	µg/L	0.24	0.11	U	0.19	U	2	U	0.16	U	2	U	**0.05**		4.5	U	4.5	UN	0.09	U	0.09	U	0.12	U	1.3	U	0.48	U	1	U	1.4	U	0.19	U	0.19	U	--		0.11	U	2	U
EXPLOSIVES	121-82-4	RDX	µg/L	2	**1.3**		**0.27**		**2.6**		**5.7**		2	U	**1.4**		**5.93**		**5.92**		**6.4**		**6.08**		**6.6**		**6.5**		**5.3**		**6.2**		**8.8**		**2.2**		**2**		--		**5.2**		2	U
EXPLOSIVES	13980-04-6	Hexahydro-1,3,5-trinitroso-1,3,5-triazine/ TNX	µg/L	--	--		0.19	U	--		--		--		--		--		--		--		--		--		--		--		--		**0.67**		0.19	U	--		--		--	
EXPLOSIVES	2691-41-0	HMX	µg/L	1000	0.07	U	0.19	U	2	U	**0.8**		2	U	0.27	U	1.21	U	1.21	U	**0.9**		**0.7**		**0.96**		**0.81**		**0.54**		1	U	**1.3**	**J**	**0.35**		0.19	U	--		**0.57**		2	U
EXPLOSIVES	479-45-8	Tetryl	µg/L	39	0.25	U	0.19	U	--		0.31	U	--		0.03	U	1.56	U	1.56	U	0.07	U	0.16	U	0.16	U	1.3	U	0.48	U	1	U	1.4	U	0.19	U	0.19	U	--		0.25	U	--	
EXPLOSIVES	5755-27-1	1-Nitroso-3,5-dinitro-1,3,5-triazacyclohexane/ MNX	µg/L	--	--		0.19	U	--		--		--		--		--		--		--		--		--		1.3	U	**0.31**	**J**	1.3	U	1.4	U	**0.17**	**J**	**0.2**		--		--		--	
EXPLOSIVES	606-20-2	2,6-Dinitrotoluene	µg/L	0.049	0.17	U	0.19	U	2	U	0.31	U	2	U	0.05	U	0.79	U	0.79	UN	0.11	U	0.15	U	0.18	U	1.3	U	0.48	U	1	U	1.4	U	0.19	U	0.19	U	--		0.17	U	2	U
EXPLOSIVES	88-72-2	2-Nitrotoluene	µg/L	0.31	0.2	U	0.19	U	2	U	0.31	U	2	U	0.06	U	--		--		0.17	U	0.17	U	0.31	U	1.3	U	0.48	U	1	U	1.4	U	0.19	U	0.19	U	--		0.2	U	2	U
EXPLOSIVES	98-95-3	Nitrobenzene	µg/L	0.14	0.19	U	0.19	U	2	U	0.16	U	2	U	0.06	U	0.64	U	0.64	U	0.06	U	0.07	U	0.16	U	1.3	U	0.48	U	1	U	1.4	U	0.19	U	0.19	U	--		0.19	U	2	U
EXPLOSIVES	99-35-4	1,3,5-Trinitrobenzene	µg/L	590	0.07	U	0.19	U	2	U	0.16	U	2	U	0.03	U	0.44	U	0.44	U	0.07	U	**0.17**		**0.16**		1.3	U	0.48	U	1	U	1.4	U	0.19	U	0.19	U	--		0.07	U	2	U
EXPLOSIVES	99-65-0	1,3-Dinitrobenzene	µg/L	2	0.09	U	0.19	U	2	U	0.16	U	2	U	0.02	U	0.61	U	0.61	U	0.05	U	0.09	U	0.13	U	1.3	U	0.48	U	1	U	1.4	U	0.19	U	0.19	U	--		0.09	U	2	U
EXPLOSIVES	99-99-0	4-Nitrotoluene	µg/L	4.3	--		0.19	U	2	U	0.78	U	2	U	0.06	U	--		--		--		--		--		1.3	U	0.48	U	1	U	1.4	U	0.19	U	0.19	U	--		--		2	U
EXPLOSIVES	AEC1138	Hexahydro-1,3-dinitroso-5-dinitro-1,3,5-triazine/ DNX	µg/L	--	--		0.19	U	--		--		--		--		--		--		--		--		--		--		--		--		--		**0.051**	**J**	0.19	U	--		--		--	
SEMIVOLATILES	105-60-2	Caprolactam	µg/L	--	--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--	
SEMIVOLATILES	117-81-7	Bis(2-ethylhexyl) phthalate	µg/L	6	--		--		--		--		--		--		4.8	U	**6.9**	**N**	--		--		--		--		--		--		--		--		--		--		--		--		--	
VOLATILES	108-88-3	Toluene	µg/L	1000	--		--		--		--		--		--		20	U	0.5	U	--		--		--		--		--		--		--		--		--		--		--		--		--	
VOLATILES	109-99-9	Diethylene oxide / Tetrahydrofuran / Tetramethylene oxide	µg/L	--	--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--	
VOLATILES	67-64-1	Acetone	µg/L	14000	--		--		--		--		--		--		**180**		13	U	--		--		--		--		--		--		--		--		--		--		--		--		--	
VOLATILES	67-66-3	Chloroform	µg/L	0.22	--		--		--		--		--		--		20	U	0.5	U	--		--		--		--		--		--		--		--		--		--		--		--		--	
VOLATILES	75-09-2	Methylene chloride	µg/L	5	--		--		--		--		--		--		100	U	2.3	U	--		--		--		--		--		--		--		--		--		--		--		--		--	
VOLATILES	76-13-1	1,1,2-Trichloro-1,2,2-trifluoroethane (Freon 113)	µg/L	--	--		--		--		--		--		--		**10000**		**5000**		--		--		--		--		--		--		--		--		--		--		--		--		--	
ORGANICS	120-92-3	Cyclopentanone	µg/L	--	--		--		--		--		--		--		**20**		--		--		--		--		--		--		--		--		--		--		--		--		--		--	
ORGANICS	593-49-7	Heptacosane	µg/L	--	--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--	
ORGANICS	629-99-2	Pentacosane	µg/L	--	--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--	
ORGANICS	630-01-3	Hexacosane	µg/L	--	--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--	
ORGANICS	630-03-5	Nonacosane	µg/L	--	--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--	
ORGANICS	95-16-9	Benzothiazole	µg/L	--	--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--	
ORGANICS	AEC499	Octacosane	µg/L	--	--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--	
METALS	18540-29-9	Hexavalent chromium	µg/L	0.035	--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--	
METALS	7429-90-5	Aluminum	µg/L	--	--		--		30	U	--		50	U	--		--		**9730**		--		--		--		--		--		--		--		--		--		--		--		--		30	U
METALS	7439-89-6	Iron	µg/L	--	--		--		10	U	--		20	U	--		--		**10500**		--		--		--		--		--		--		--		--		--		--		--		--		**20**	
METALS	7439-92-1	Lead	µg/L	15	--		--		1	U	**3.4**	**J**	1	U	1.4	U	**3.58**		**7.27**		0.13	U	**194**		0.13	U	10	U	10	U	10	U	--		--		--		0.3	U	--		--		1	U
METALS	7439-95-4	Magnesium	µg/L	--	--		--		**48000**		--		**51000**		--		--		**51800**		--		--		--		**41200**		**45300**		--		--		--		--		--		--		**53200**	
METALS	7439-96-5	Manganese	µg/L	--	--		--		**27**		--		**230**		--		--		**1090**		**5.54**		--		--		--		--		--		--		--		--		**5.6**		--		**10**			
METALS	7439-97-6	Mercury	µg/L	2	--		--		0.2	U	0.1	U	0.2	U	0.06	U	0.24	U	--		0.02	U	0.02	U	0.02	U	0.21	U	0.21	U	0.2	U	--		--		--		0.1	U	--		0.2	U
METALS	7440-02-0	Nickel	µg/L	--	--		--		10	U	--		**20**		--		--		34.3	U	**31**		--		--		--				--		--		--		--		**9**		--		10	U
METALS	7440-09-7	Potassium	µg/L	--	--		--		**600**		--		**2000**		--		--		**3230**		--		--		--		--		--		--		--		--		--		--		--		**2100**			
METALS	7440-22-4	Silver	µg/L	94	--		--				2.8	U			1.1	U	--		4.6	U	0.32	U	32	U	0.32	U	10	U	10	U	10	U	--		--		--		0.3	U	--		--	
METALS	7440-23-5	Sodium	µg/L	--	--		--		**35500**		--		**53000**		--		--		**42600**		--		--		--		--		**21700**		**50700**		--		--		--		--		--		--		**45400**	
METALS	7440-36-0	Antimony	µg/L	--	--		--		2	U	--		1	U	--		--		38	U	0.1	U	--		--		--		--		--		--		--		--		--		**2.9**		--		2	U
METALS	7440-38-2	Arsenic	µg/L	10	--		--		1	U	2.4	U	1	U	2.7	U	2.54	UN	**7.89**		0.76	U	76	U	0.76	U	10	U	**4.1**	**J**	10	U	--		--		--		**8.8**		--		1	U
METALS	7440-39-3	Barium	µg/L	2000	--		--		**91**		**145**		**130**		**129**		--		**194**		**92.1**		33	U	**153**		**113**	**J**	**141**	**J**	**96.2**	**J**	--		--		--		**105**		--		**176**	
METALS	7440-43-9	Cadmium	µg/L	5	--		--		3	U	0.4	U	5	U	0.64	U	--		4.01	U	0.48	U	**61.7**		0.48	U	5	U	5	U	5	U	--		--		--		2	U	--		**5**	
METALS	7440-47-3	Chromium	µg/L	100	--		--		10	U	1.8	U	10	U	**2.1**		--		**16.5**	**N**	**27.6**		23	U	**31**		**0.3**	**J**	**0.4**	**J**	10	U	--		--		--		**12.4**		--		10	U
METALS	7440-48-4	Cobalt	µg/L	--	--		--		10	U	--		20	U	--		--		25	U	--		--		--		--		--		--		--		--		--		--		--		--		10	U
METALS	7440-50-8	Copper	µg/L	--	--		--		10	U	--		10	U	--		--		**9.21**		**2.3**		--		--		--		--		--		--		--		--		--		2	U	--		10	U
METALS	7440-62-2	Vanadium	µg/L	--	--		--		5	U	--		10	U	--		--		**16.4**		**7.68**		--		--		--		--		--		--		--		--		--		**4**		--		5	U
METALS	7440-66-6	Zinc	µg/L	--	--		--		10	U	--		**20**		--		--		**41.4**		--		--		--		--		--		--		--		--		--		--		--		--		10	U
METALS	7440-70-2	Calcium	µg/L	--	--		--		**96200**		--		**122000**		--		--		**215000**		--		--		--		**77100**		**117000**		--		--		--		--		--		--		**163000**	
METALS	7782-49-2	Selenium	µg/L	50	--		--		1	U	2.6	U	1	U	2.9	U	3.02	U	3.02	U	**6.15**		120	U	1.2	U	10	U	10	U	**1.7**	**J**	--		--		--		10	U	--		1	U
METALS-DISS	7439-89-6	Iron	µg/L	--	--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--	
METALS-DISS	7439-95-4	Magnesium	µg/L	--	--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--	
METALS-DISS	7439-96-5	Manganese	µg/L	--	--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--	
METALS-DISS	7440-02-0	Nickel	µg/L	--	--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--	
METALS-DISS	7440-09-7	Potassium	µg/L	--	--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--	
METALS-DISS	7440-23-5	Sodium	µg/L	--	--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--	
METALS-DISS	7440-39-3	Barium	µg/L	2000	--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--	
METALS-DISS	7440-70-2	Calcium	µg/L	--	--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--	
METALS-DISS	7782-49-2	Selenium	µg/L	50	--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--	
RADIOCHEMISTRY	12587-46-1	Alpha gross	PCI/L	--	--		--		--		--		--		**2.86**		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--	
RADIOCHEMISTRY	12587-47-2	Beta gross	PCI/L	--	--		--		--		--		--		**2.76**		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--	

Notes:

J = The analyte was positively identified: the associated numerical value is the approximate concentration of the analyte in the sample.

U = The analyte was analyzed for, but was not detected above the reported sample quantitation limit.

Bold indicates the analyte was detected

Shading indicates the analyte exceeded screening criteria

*Delineation screening level for RDX is the HAL. For all other analytes it is the MCL. If no MCL is available, the EPA tap water RSL is selected as the delineation screening level.

See Acronyms and Abbreviations for any abbreviations used in this table.
Source: EPA's Regional Screening Levels (May 2016). Available online: https://www.epa.gov/risk/regional-screening-levels-rsls.

Table DA-10-4. Demolition Area: Groundwater Detects

UFP-QAPP RI/RFI, IAAAP, Middletown, Iowa

				Location	JAW-02		JAW-02		JAW-02		JAW-02		JAW-02		JAW-02		JAW-02		JAW-02		JAW-02		JAW-02		JAW-02		JAW-02		JAW-02		JAW-02		JAW-02		JAW-02	
				Sample ID	JAW-02-080994		JAW-02-19930519		JAW-02-19950426		JAW-02-19950503		JAW-02-19960803		JAW-02-19970619		JAW-02-19970826		JAW-02-20010606		JAW-02-20020613		JAW-02-20040615		JAW-02-TR01		JAW-02-TR02		JAW-02-TR03		JAW-02-TR04		JAW-02-TR05		JAW-02-TR05-A		JAW-2-200906		JAW-2-344977		JAW-2-355041	
				Sample Date	8/9/1994		5/19/1993		4/26/1995		5/3/1995		8/3/1996		6/19/1997		8/26/1997		6/6/2001		6/13/2002		6/15/2004		8/17/2012		11/2/2012		4/3/2013		7/25/2013		12/12/2013		12/13/2013		6/13/2009		10/5/1995		12/8/1995	
Test Group	**CAS**	**Parameter**	**Unit**	**Screening Level***																																				
EXPLOSIVES	118-96-7	2,4,6-Trinitrotoluene	µg/L	2.5	2	U	0.63	U	--		0.63	U	0.07	U	**0.28**		0.16	U	0.86	U	0.33	U	0.48	U	0.19	U	0.19	U	0.19	U	0.19	U	--		0.2	U	0.19	U	--		0.21	U
EXPLOSIVES	121-14-2	2,4-Dinitrotoluene	µg/L	0.24	2	U	4.5	U	--		4.5	U	0.09	U	0.09	U	0.12	U	0.86	U	0.33	U	0.48	U	0.19	U	0.19	U	0.19	U	0.19	U	--		0.2	U	0.19	U	--		0.11	U
EXPLOSIVES	121-82-4	RDX	µg/L	2	2	U	1.17	U	--		**2.12**		**1**		**1.51**		**1.5**		**1.6**		**2.5**		**3**		**4.1**		**3.1**		**2.1**		**0.49**		--		**0.12**	**J**	**5.9**		--		**2.6**	
EXPLOSIVES	13980-04-6	Hexahydro-1,3,5-trinitroso-1,3,5-triazine/ TNX	µg/L	--	--		--		--		--		--		--		--		--		--		--		0.19	U	**0.19**		0.19	U	**0.16**	**J**	--		0.2	R	**0.4**		--		--	
EXPLOSIVES	2691-41-0	HMX	µg/L	1000	2	U	1.21	U	--		1.21	U	**0.68**		**1.19**		0.16	U	0.86	U	0.33	U	0.48	U	0.19	U	0.19	U	0.19	U	0.19	U	--		0.2	U	0.19	U	--		0.07	U
EXPLOSIVES	479-45-8	Tetryl	µg/L	39	--		1.56	U	--		1.56	U	0.07	U	0.16	U	0.16	U	0.86	U	0.33	U	0.48	U	0.19	U	0.19	U	0.19	U	0.19	U	--		0.2	U	0.19	U	--		0.25	U
EXPLOSIVES	5755-27-1	1-Nitroso-3,5-dinitro-1,3,5-triazacyclohexane/ MNX	µg/L	--	--		--		--		--		--		--		--		1.1	U	**0.31**	**J**	**0.34**	**J**	**0.43**		**0.37**		0.57	U	0.38	U	--		0.2	U	**0.77**		--		--	
EXPLOSIVES	606-20-2	2,6-Dinitrotoluene	µg/L	0.049	2	U	0.79	U	--		0.79	U	0.11	U	0.15	U	0.18	U	0.86	U	0.33	U	0.48	U	0.19	U	0.19	U	0.19	U	0.19	U	--		0.2	U	0.19	U	--		0.17	U
EXPLOSIVES	88-72-2	2-Nitrotoluene	µg/L	0.31	2	U	--		--		--		0.17	U	0.17	U	0.31	U	0.86	U	0.33	U	0.48	U	0.19	U	0.19	U	0.19	U	0.19	U	--		0.2	U	0.19	U	--		0.2	U
EXPLOSIVES	98-95-3	Nitrobenzene	µg/L	0.14	2	U	0.64	U	--		0.64	U	0.06	U	0.07	U	0.16	U	0.86	U	0.33	U	0.48	U	0.19	U	0.19	U	0.19	U	**0.15**	**J**	--		**0.32**		0.19	U	--		0.19	U
EXPLOSIVES	99-35-4	1,3,5-Trinitrobenzene	µg/L	590	2	U	0.44	U	--		0.44	U	0.07	U	**0.12**		**0.15**		0.86	U	0.33	U	0.48	U	0.19	U	0.19	U	0.19	U	0.19	U	--		0.2	U	0.19	U	--		0.07	U
EXPLOSIVES	99-65-0	1,3-Dinitrobenzene	µg/L	2	2	U	0.61	U	--		0.61	U	0.05	U	0.09	U	**0.14**		0.86	U	0.33	U	0.48	U	0.19	U	0.19	U	0.19	U	0.19	U	--		0.2	U	0.19	U	--		0.09	U
EXPLOSIVES	99-99-0	4-Nitrotoluene	µg/L	4.3	2	U	--		--		--		--		--		--		0.86	U	0.33	U	0.48	U	0.19	U	0.19	U	0.19	U	0.19	U	--		0.2	U	0.19	U	--		--	
EXPLOSIVES	AEC1138	Hexahydro-1,3-dinitroso-5-dinitro-1,3,5-triazine/ DNX	µg/L	--	--		--		--		--		--		--		--		--		--		--		**0.11**	**J**	**0.11**	**J**	0.19	U	**0.091**	**J**	--		0.2	U	**0.2**		--		--	
SEMIVOLATILES	105-60-2	Caprolactam	µg/L	--	--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--	
SEMIVOLATILES	117-81-7	Bis(2-ethylhexyl) phthalate	µg/L	6	--		4.8	U	--		4.8	U	--		--		--		--		--		--		--		--		--		--		--		--		--		--		--	
VOLATILES	108-88-3	Toluene	µg/L	1000	--		0.5	U	--		0.5	U	--		--		--		--		--		--		--		--		--		--		--		--		--		--		--	
VOLATILES	109-99-9	Diethylene oxide / Tetrahydrofuran / Tetramethylene oxide	µg/L	--	--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--	
VOLATILES	67-64-1	Acetone	µg/L	14000	--		13	U	--		13	U	--		--		--		--		--		--		--		--		--		--		--		--		--		--		--	
VOLATILES	67-66-3	Chloroform	µg/L	0.22	--		0.5	U	--		0.5	U	--		--		--		--		--		--		--		--		--		--		--		--		--		--		--	
VOLATILES	75-09-2	Methylene chloride	µg/L	5	--		2.3	U	--		**2.5**		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--	
VOLATILES	76-13-1	1,1,2-Trichloro-1,2,2-trifluoroethane (Freon 113)	µg/L	--	--		--		--		**7**		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--	
ORGANICS	120-92-3	Cyclopentanone	µg/L	--	--		**70**		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--	
ORGANICS	593-49-7	Heptacosane	µg/L	--	--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--	
ORGANICS	629-99-2	Pentacosane	µg/L	--	--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--	
ORGANICS	630-01-3	Hexacosane	µg/L	--	--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--	
ORGANICS	630-03-5	Nonacosane	µg/L	--	--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--	
ORGANICS	95-16-9	Benzothiazole	µg/L	--	--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--	
ORGANICS	AEC499	Octacosane	µg/L	--	--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--	
METALS	18540-29-9	Hexavalent chromium	µg/L	0.035	--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--	
METALS	7429-90-5	Aluminum	µg/L	--	50	U	--		--		**35100**		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--	
METALS	7439-89-6	Iron	µg/L	--	20	U	--		--		**30900**		--		--		--		--		--		--		**5550**		**29.9**	**J**	**8500**		**6740**		**7780**		--		--		--		--		--	
METALS	7439-92-1	Lead	µg/L	15	1	U	**7.05**		--		**12.3**		0.13	U	**69**		0.13	U	10	U	10	U	10	U	--		--		--		--		--		--		--		--		--		0.3	U	--	
METALS	7439-95-4	Magnesium	µg/L	--	**56000**		--		--		**64700**		--		--		--		**53300**		--		--		--		--		--		--		--		--		--		--		--		--	
METALS	7439-96-5	Manganese	µg/L	--	**30**		--		--		**1280**		**3.65**		--		--		--		--		--		--		--		--		--		--		--		--		--		**1.6**		--	
METALS	7439-97-6	Mercury	µg/L	2	0.2	U	0.24	U	0.24	U	0.24	U	0.02	U	0.02	U	--		0.21	U	0.2	U	0.2	U	--		--		--		--		--		--		--		--		0.1	U	--	
METALS	7440-02-0	Nickel	µg/L	--	20	U	--		--		**70.6**		**55.6**		--		--		--		--		--		--		--		--		--		--		--		--		--		--		**16**		--	
METALS	7440-09-7	Potassium	µg/L	--	**2000**		--		--		**14100**		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--	
METALS	7440-22-4	Silver	µg/L	94	--		--		--		4.6	U	0.32	U	32	U	0.32	U	10	U	10	U	10	U	--		--		--		--		--		--		--		--		0.3	U	--	
METALS	7440-23-5	Sodium	µg/L	--	**48000**		--		--		**49400**		--		--		--		**43200**		--		--		--		--		--		--		--		--		--		--		--		--	
METALS	7440-36-0	Antimony	µg/L	--	1	U	--		--		38	U	0.1	U	--		--		--		--		--		--		--		--		--		--		--		--		--		**2.9**		--	
METALS	7440-38-2	Arsenic	µg/L	10	1	U	2.54	UN	--		**5.22**		0.76	U	76	U	0.76	U	10	U	10	U	10	U	20	U	--		--		--		--		--		--		--		5	U	--	
METALS	7440-39-3	Barium	µg/L	2000	**180**		--		--		**351**		**164**		33	U	**170**		**191**	**J**	**139**	**J**	**168**	**J**	--		--		--		--		--		--		--		--		**178**		--	
METALS	7440-43-9	Cadmium	µg/L	5	5	U	--		--		4.01	U	0.48	U	48	U	0.48	U	**0.7**	**J**	5	U	5	U	--		--		--		--		--		--		--		--		2	U	--	
METALS	7440-47-3	Chromium	µg/L	100	10	U	--		--		**65.8**		**40**		23	U	**40**		10	U	10	U	10	U	--		--		--		--		--		--		--		--		**17.2**		--	
METALS	7440-48-4	Cobalt	µg/L	--	20	U	--		--		25	U	--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--	
METALS	7440-50-8	Copper	µg/L	--	10	U	--		--		**25.4**		**3.29**		--		--		--		--		--		--		--		--		--		--		--		--		--		2	U	--	
METALS	7440-62-2	Vanadium	µg/L	--	10	U	--		--		**88.3**		**11.6**		--		--		--		--		--		--		--		--		--		--		--		--		--		**5.4**		--	
METALS	7440-66-6	Zinc	µg/L	--	10	U	--		--		**75.9**		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--	
METALS	7440-70-2	Calcium	µg/L	--	**152000**		--		--		**418000**		--		--		--		**148000**		--		--		--		--		--		--		--		--		--		--		--		--	
METALS	7782-49-2	Selenium	µg/L	50	1	U	3.02	U	--		3.02	U	**14.1**		120	U	1.2	U	10	U	10	U	10	U	--		--		--		--		--		--		--		--		10	U	--	
METALS-DISS	7439-89-6	Iron	µg/L	--	--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--	
METALS-DISS	7439-95-4	Magnesium	µg/L	--	--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--	
METALS-DISS	7439-96-5	Manganese	µg/L	--	--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--	
METALS-DISS	7440-02-0	Nickel	µg/L	--	--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--	
METALS-DISS	7440-09-7	Potassium	µg/L	--	--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--	
METALS-DISS	7440-23-5	Sodium	µg/L	--	--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--	
METALS-DISS	7440-39-3	Barium	µg/L	2000	--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--	
METALS-DISS	7440-70-2	Calcium	µg/L	--	--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--	
METALS-DISS	7782-49-2	Selenium	µg/L	50	--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--	
RADIOCHEMISTRY	12587-46-1	Alpha gross	PCI/L	--	--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--	
RADIOCHEMISTRY	12587-47-2	Beta gross	PCI/L	--	--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--		--	

Notes:

J = The analyte was positively identified: the associated numerical value is the approximate concentration of the analyte in the sample.

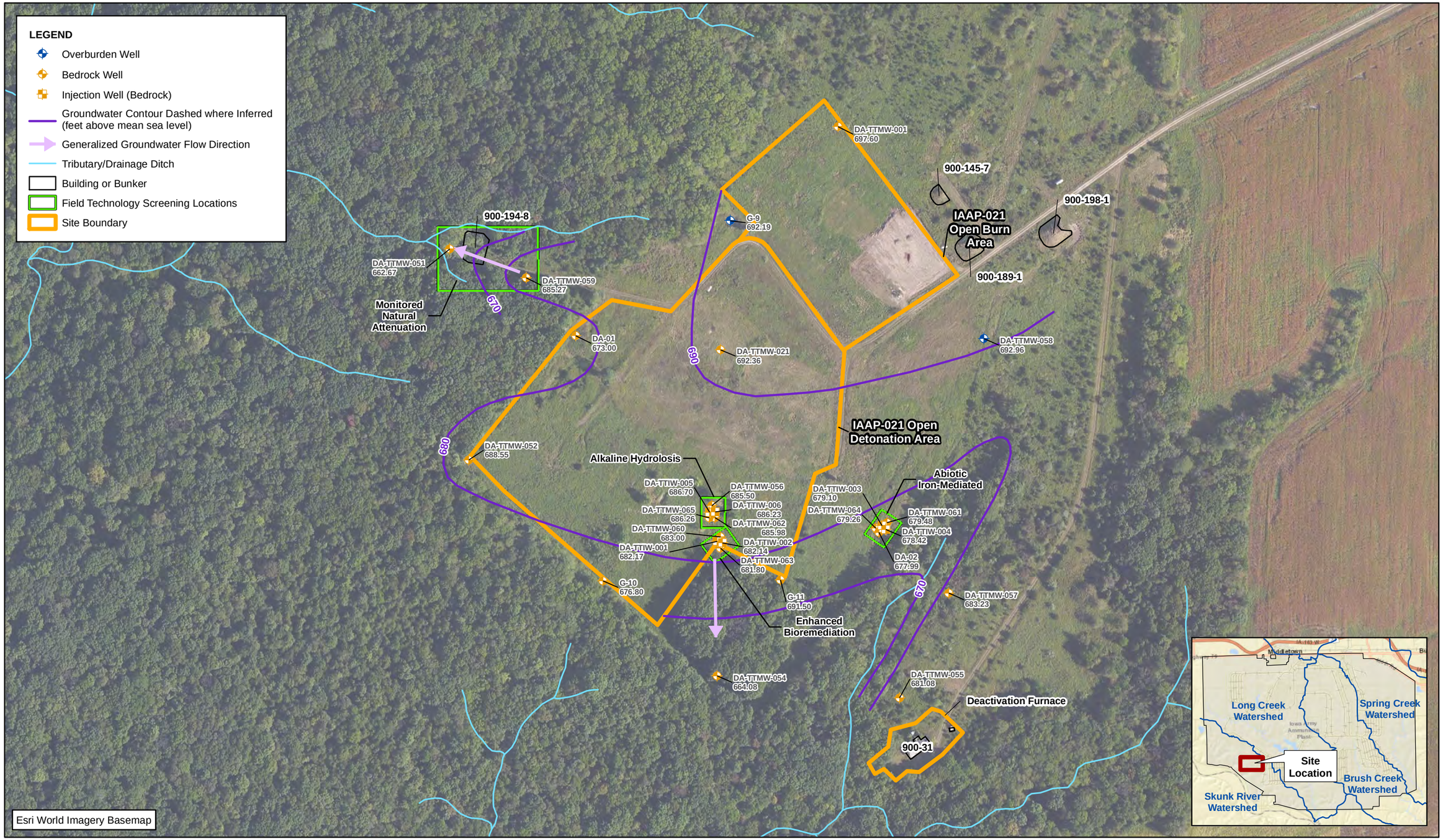
U = The analyte was analyzed for, but was not detected above the reported sample quantitation limit.

Bold indicates the analyte was detected

Shading indicates the analyte exceeded screening criteria

*Delineation screening level for RDX is the HAL. For all other analytes it is the MCL. If no MCL is available, the EPA tap water RSL is selected as the delineation screening level.

See Acronyms and Abbreviations for any abbreviations used in this table.
Source: EPA's Regional Screening Levels (May 2016). Available online: https://www.epa.gov/risk/regional-screening-levels-rsls.



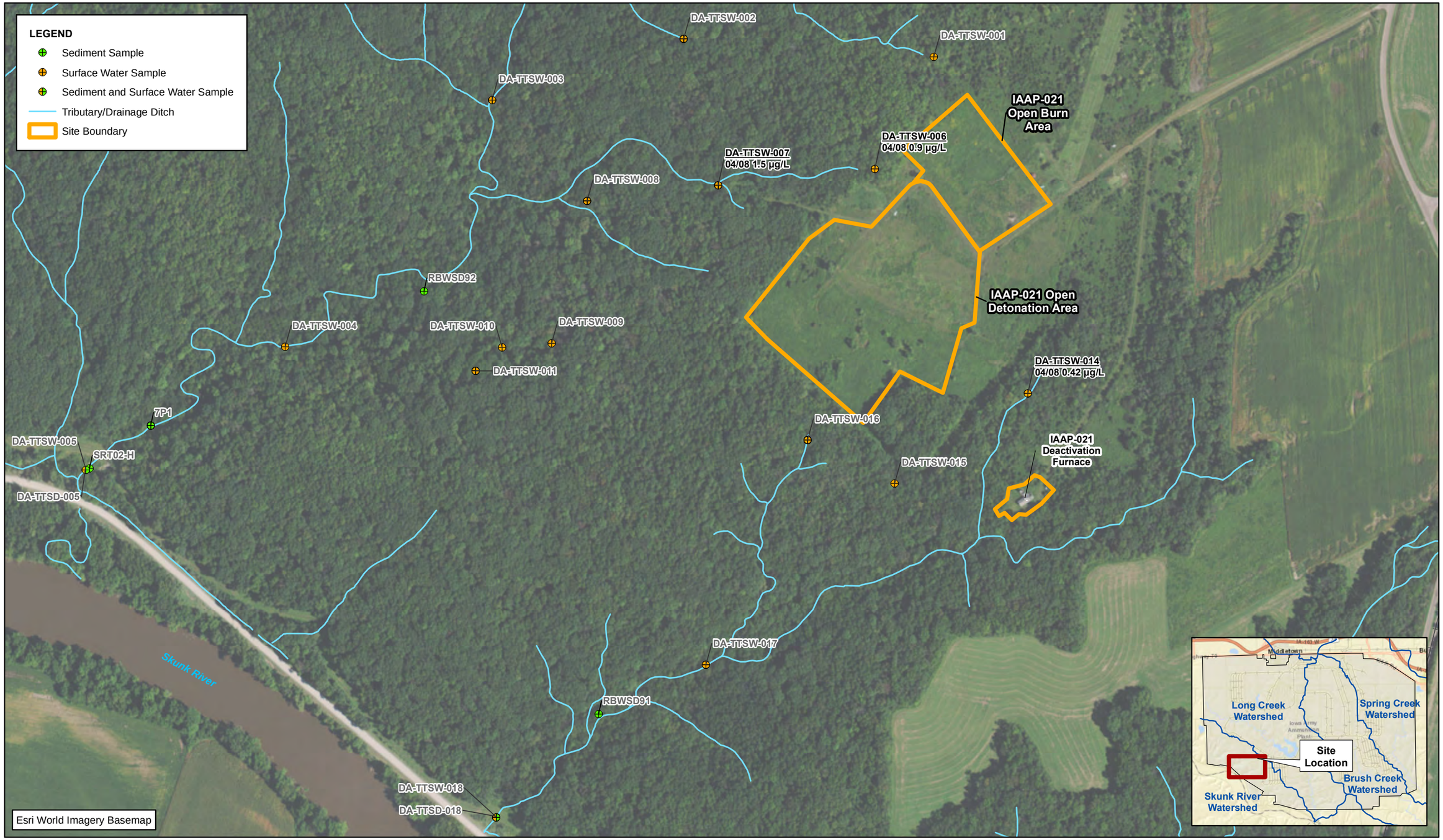
Notes:
1. Groundwater elevations are from May 2015.
2. Anomalous elevation at G-11 not contoured.

N
0 200
Feet

Figure DA-10-1
Demolition Area Site Map with Potentiometric Surface
Iowa Army Ammunition Plant
Middletown, Iowa

ch2m

DEN R:\ENBG\00_PROJ\U\USACE\IAAAP_679172\MAPFILES\DEMOAREA\DEMOAREA_SITELAYOUT_B.MXD AESPEJO 9/26/2017 12:54:44 PM

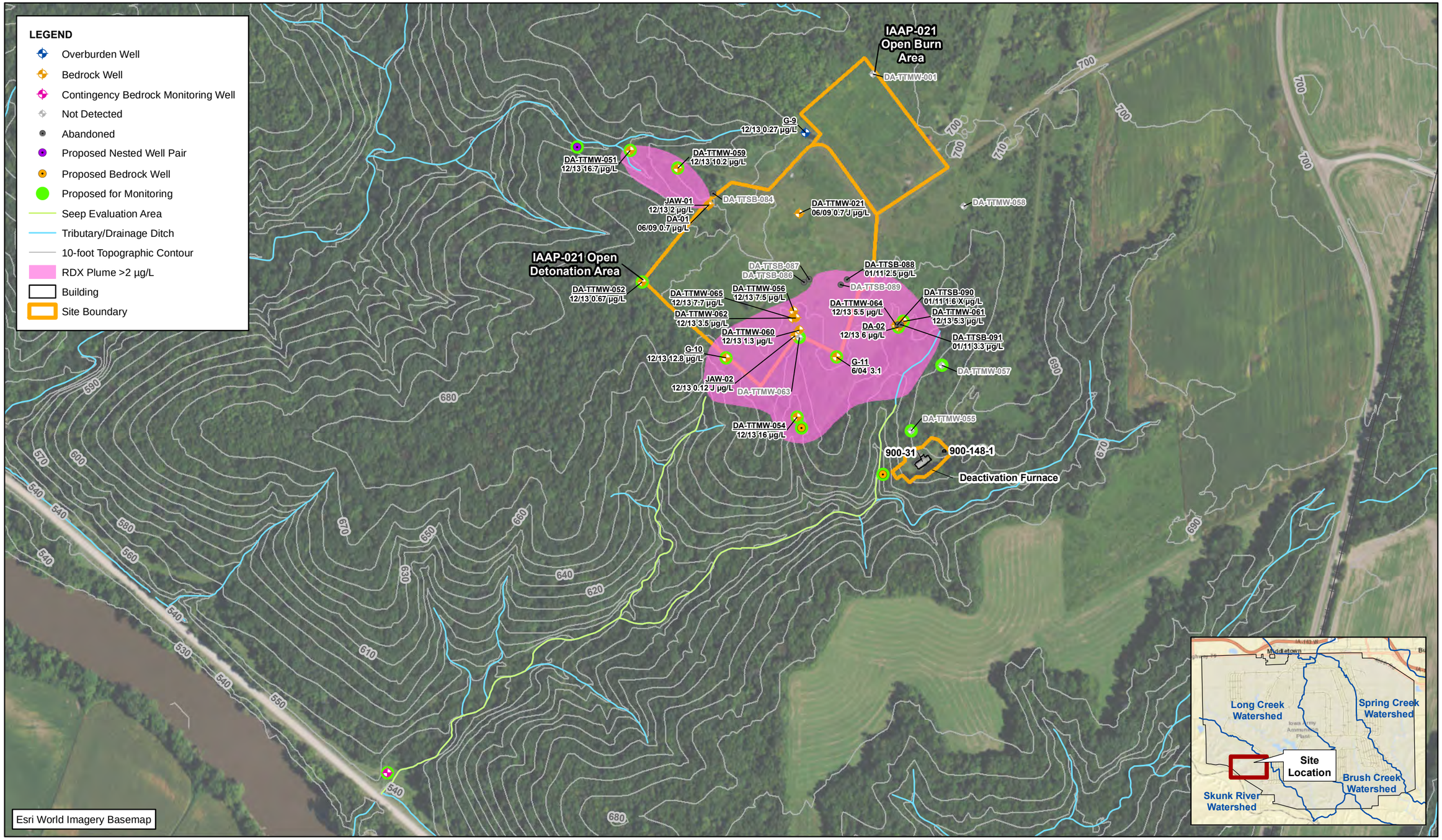


Notes:
1. Latest concentration is shown.
2. RDX - Royal Demolition Explosive
3. Surface water results presented in micrograms per liter (µg/L)
4. Grey station IDs indicate RDX was not detected at that location.

N
0 400
Feet

Figure DA-10-2
Demolition Area Sediment and Surface Water Sample Locations with RDX Concentrations
Iowa Army Ammunition Plant
Middletown, Iowa

SCO R:\ENBG\00_PROJ\U\USACE\IAAAP_679172\MAPFILES\DEMOAREA\DEMOAREA_SEDSW_B.MXD GTWIGG 2/6/2017 5:43:36 PM



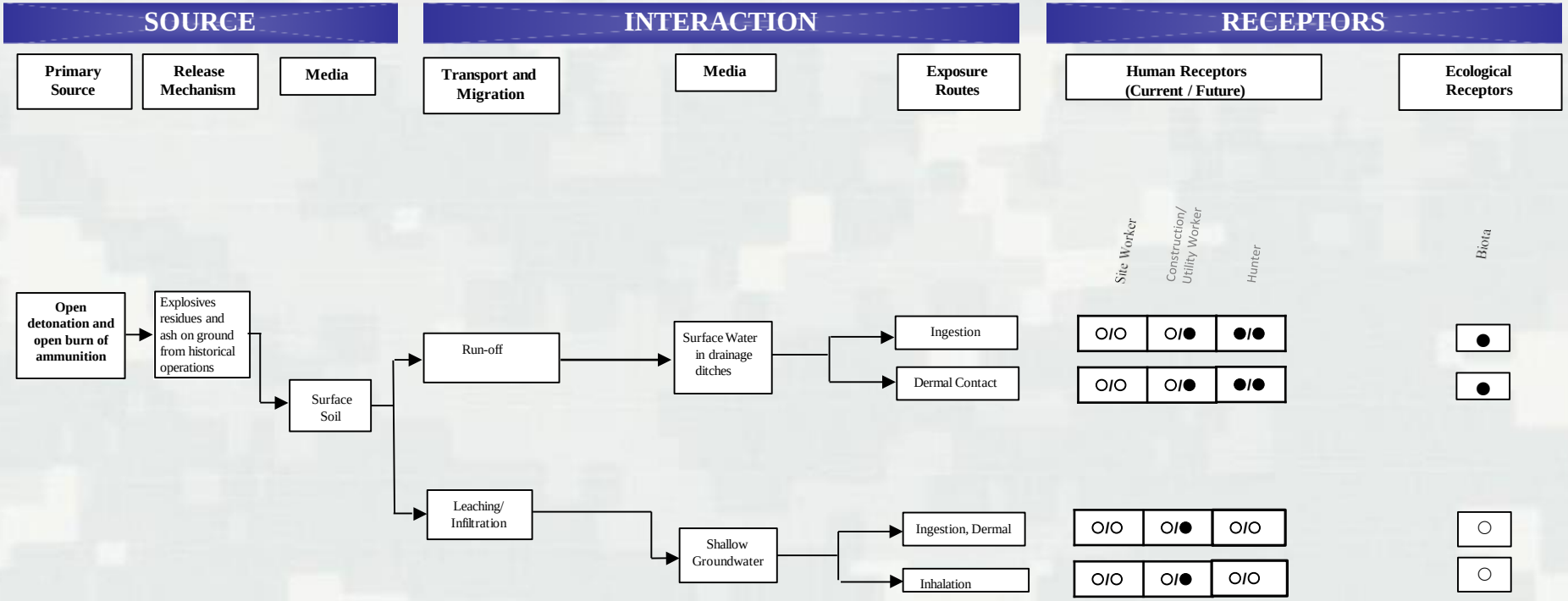
Notes:
1. Latest concentration at each well is shown.
2. RDX - Royal Demolition Explosive
3. Detected concentrations shown in micrograms per liter (µg/L).
4. At locations where a field duplicate was collected, the higher detected value is shown.
5. Grey station ID indicates RDX was not detected at that location.

Criterion
RDX = 2 µg/L

N
0 400
Feet

Figure DA-10-3
Demolition Area RDX Plume
Iowa Army Ammunition Plant
Middletown, Iowa

ch2m:



POTENTIAL EXPOSURE SCENARIOS

LEGEND

- ← Flow-chart continues
- ● Potentially Complete Pathway
- ○ Incomplete Pathway

Receptor	Potential Exposure Activity	Exposure Media / Pathways
Site Worker (industrial)	Grounds maintenance, industrial activities	GW (none)
Construction/utility worker	Construction or utility activities in trenches	GW (Ing, Derm, Inh), SW (Ing, Derm)
Hunter	Trapping or bow hunting	SW (Ing, Derm)
Aquatic/semi-aquatic biota	Indigenous biota present within waterbodies and birds and mammals foraging	GW (none), SW (Ing, Derm), Biota (Ing)

Figure DA-10-4
Demolition Area Preliminary Conceptual Exposure Model
Iowa Army Ammunition Plant
Middletown, Iowa

Demolition Area Worksheet #11: Project/Data Quality Objectives

Project DQOs define the type, quantity, and quality of data that are needed to answer specific environmental questions and support proper environmental decisions. The DQOs were developed during the work planning process.

Who Will Use the Data?

U.S. Army Corps of Engineers (USACE), IAAAP, Army Environmental Command, the CH2M team, and other project stakeholders will use the data to support the environmental decisions, as outlined in Demolition Area Worksheets #10, #17, and #18.

What Are the Project Screening Levels?

Concentrations of explosives and total RCRA metals in groundwater and explosives in seep water will be compared to screening levels to evaluate the nature and extent of contamination in groundwater as discussed in Demolition Area Worksheet #10. The screening levels described in IAAAP Worksheet #15 were developed to meet the most stringent laboratory reporting requirement and therefore are not used for evaluating nature and extent. Use of the screening levels to make decisions about the site is described in Table DA-11-1.

What Will the Data Be Used for?

As indicated in Demolition Area Worksheet #14, groundwater samples will be collected and analyzed for explosives and total RCRA metals and seep water, if identified, will be collected and analyzed for explosives to evaluate the RFI objective, which is to characterize the site.

What Types of Data Are Needed and How "Good" Do the Data Need to Be in Order to Support the Environmental Decision?

The types of data that are needed for the RFI include definitive level data quality analyzed using a Department of Defense (DoD)–certified laboratory for the methods and analytes as described in IAAAP Worksheet #15. Definitive-quality data will be screened against the appropriate screening levels and used to support the decisions listed in Table DA-11-1. The use of these data is not restricted, unless there is a quality problem, such as a recurring quality control exceedance or a gross quality control exceedance that would result in rejected data as defined in IAAAP Worksheet #36. The sampling design and rationale are presented in Demolition Area Worksheet #17.

How Many Data Are Needed? Where, When, and How Should They Be Collected and Generated?

Tables provided in Demolition Area Worksheet #14 describe the planned field investigation activities. The number and locations of samples needed, and the rationale for placement, are presented in Demolition Area Worksheets #17 and #18.

Who Will Collect and Generate the Data?

The CH2M team will collect the data on behalf of USACE and IAAAP. Samples for analysis will be sent under chain of custody to the TestAmerica Laboratory, which maintains required certifications to meet State of Iowa and DoD requirements, which include National Environmental Laboratory Accreditation Program certification and the DoD Environmental Laboratory Accreditation Program (ELAP).

How Will the Data Be Reported and Archived?

The data will be reported in the RFI report according to procedures outlined in this UFP-QAPP. Hard copy and/or electronic (such as database management system) data will be stored by CH2M for 5 years after project completion. Project data and reports will be managed by CH2M via a CH2M proprietary database system with final data deliverables to the USACE into the Environmental Restoration Information System (ERIS). The final RFI report will become part of the Administrative Record file.

Table DA-11-1. Data Quality Objectives
UFP-QAPP RI/RFI, IAAAP, Middletown, Iowa

Step 1: Problem Statement	Step 2: Decisions to be Made	Step 3: Input to the Decision	Step 4: Study Area Boundaries	Step 5: Decision Rules	Step 6: Acceptable Limits on Decision Error	Step 7: Optimize the Design
The west RDX groundwater plume and the south RDX groundwater plume at the DA require further delineation to evaluate extent and complete the RFI. Explosives and RCRA metals analytical data are needed to evaluate risk to human health and the environment.	To evaluate RDX and RCRA metals in groundwater, explosives in seep samples (if identified), and potential risk to human health and the environment, the following decisions will need to be made: 1. What quantity and location of samples are required to adequately delineate bedrock groundwater contamination? 2. Are explosives concentrations in groundwater or seep water above screening levels? Do site-related chemicals in groundwater pose potential unacceptable risk to human health and the environment? 3. Are metals in groundwater site-related or significant relative to background concentrations?	Elements to be considered in the decisions include the following: 1. Information and data collected during the RFI and previous investigations. 2. Existing historical records of onsite use and releases. 3. The site-specific CSM, such as topography, geology and hydrogeology, nature and extent of contamination, current and historical surface water drainage features, and groundwater flow direction. 4. Site improvements, development history, or removal actions that have occurred after releases or sampling. 5. Expected volume or mass of potential release. 6. Availability and capabilities of drilling equipment. 7. Field observations and measurements from sampling activities. 8. Evaluation of lithology based on soil cuttings. 9. Depth to groundwater measurements and groundwater gradient. 10. Sample locations and depths. 11. Existing and newly collected RFI analytical data.	**Spatial Boundaries**: Three bedrock monitoring wells will be installed at the DA. One nested well pair will be installed west of the current monitoring network at the first-encountered groundwater-bearing zone so that the screened interval remains saturated during seasonal periods of low groundwater elevations. The second well screen in the well pair be screened 20 feet below the first screen. An additional monitoring well will be installed adjacent to DA-TTMW-054 at a depth of approximately 50 feet bgs (approximately 30 feet below the screened interval of the existing well) to assess vertical delineation and lithologic changes with depth. The drainage features will be inspected for seeps from the DA to the property boundary. If present, one seep water sample will be collected for explosives analysis at a frequency not to exceed one sample for every 20 feet of ditch length. The seep investigation and/or sampling will be conducted over a minimum of two seasons to evaluate fluctuations in groundwater discharge due to changes in rainfall/the water table. One permanent monitoring well may be installed at the downgradient facility boundary, if warranted, after the seep and groundwater sample results have been evaluated.	***Decision 1—Location of Samples*** The locations of the proposed bedrock monitoring wells are based on historical groundwater information and the current understanding of the nature and extent of RDX in groundwater. The locations are also based on accessibility, existing records of site use and potential releases, topography, and using professional judgement to place sample locations. The locations of seeps will be assessed and collected based on accessibility and professional judgement. Analytical results will be compared to screening levels to evaluate if the plumes have been adequately delineated to assess potential risk, complete the RFI, and develop a FS. If the nature and extent of the RDX plumes are not adequately delineated to complete the RFI, then the stakeholders will be engaged to determine if further investigation is warranted. ***Decision 2—Evaluate Potential Risk*** If explosive concentrations in groundwater and seep water at the DA are greater than applicable risk-based screening levels during this investigation, then these chemicals will be incorporated into the baseline risk assessment and a FS will be recommended, if warranted. If explosive concentrations are below screening levels, then the RFI will be complete. ***Decision 3—Validity of Historical Metals Detection*** Existing and proposed groundwater analytical data for total metals will be assessed to evaluate whether the metals are site-related or if they are significant with respect to background.	Decision errors will be minimized through site understanding obtained from previous site visits, development of the CSM, and adherence to SOPs during well installation and sampling. Laboratory analyses will be conducted in accordance with this UFP-QAPP. Analytical chemical data will meet quality expectations for PARCCS, as defined by this UFP-QAPP. The analytical methods will provide the lowest available DLs (DL/LOD/LOQ) that will allow for the data to be compared to screening levels summarized in Appendix B and meet risk assessment objectives. Collection and interpretation of field measurements (groundwater sample depth and so on) will be conducted in accordance with standard industry practice and as specified in this UFP-QAPP.	To optimize the design, available site specific data will be reviewed to determine the appropriate quantity and location of samples to be collected. The proposed sample design to address the problem statements is summarized below. Refer to Demolition Area Worksheet #17 for sample design and rationale. 1. One bedrock well and one bedrock well pair will be installed to evaluate the lateral and vertical extent of RDX in downgradient groundwater. 2. The 3 new wells and 11 existing wells will be sampled for explosives and total RCRA metals in accordance with the SOPs in Appendix A. 3. The drainage ditches will be evaluated for seeps from the DA and DF to the downgradient property boundary and sampled if identified to evaluate RDX migration pathways and assess delineation. 4. One groundwater sampling event and a minimum of two seep sampling events will be conducted. 5. During the groundwater sampling events, water quality parameters (turbidity, dissolved oxygen, oxidation-reduction potential, specific conductance, temperature, and pH) will be measured to assess subsurface conditions.

See Acronyms and Abbreviations section for abbreviations used in this table.

Demolition Area Worksheet #14: Project Tasks

The RFI at the DA will consist of the following:

- Mobilization
- Utility clearance
- Monitoring well installation, development, and sampling
- Seep sampling
- Surveying
- Decontamination
- Demobilization
- Waste management
- Laboratory analysis and data management
- Baseline risk assessment
- Reporting and ERIS

Mobilization

See IAAAP Worksheet #14.

Utility clearance

See IAAAP Worksheet #14. In addition, all intrusive activities will be performed with munitions avoidance procedures under the supervision of qualified UXO oversight.

Monitoring Well Installation, Development, and Sampling

Three new monitoring wells (DA-MW-66 through DA-MW-68) will be installed under this investigation (Figure DA-10-3). Borings for new monitoring wells will be advanced using rotary drilling methods. The single well will be drilled to within the upper permeable bedrock strata, so that the screened interval will straddle the perceived water table. At the well pair, the borehole will be drilled to approximately 20 feet below the water table, with one well screened across the water table and one well screened 20 feet deeper. Samples for logging purposes only will be collected from a rock core or from cuttings. Soil samples will be logged using the Unified Soil Classification System in accordance with American Society for Testing and Materials (ASTM) D2488 (visual-manual method for field description). The boring log will differentiate between fill and native soil and include observations on soil type, grain-size distribution, changes in lithology, stained soil or chemical odor, soil moisture, total depth of boring, and photoionization detector screening results. A CH2M field team member will observe and record soil descriptions.

The monitoring wells will be constructed in accordance with the EM-1110-1-4000 (USACE 1998) and State of Iowa regulations, as described in the SOP-01, Monitoring Well Installation and Development (Appendix A). Monitoring wells will consist of a 2-inch-nominal-diameter Schedule 40 polyvinyl chloride (PVC) screen and riser. Monitoring well screens will be machine-slotted, 0.010 inch. The single well screen will be 10 feet long, the nested wells will have 5-foot screen lengths. In accordance with IAC 567 Chapter 49, the diameter of the borehole must be 3 inches larger than the outside diameter of the riser pipe and screen. For the nested well pair, a minimum 8-inch-diameter auger is proposed. A certified-

clean 20/40 silica sand or equivalent filter pack will be placed around the annular space of the well screen from the bottom of the boring extending to a depth of 2 feet above the top of the screen. A 3- to 5-foot bentonite layer will be placed above the top of the sand pack. If the bentonite seal is located above the unsaturated zone, the bentonite chips will be hydrated using potable water. For bentonite seals above the saturated zone, about 1 gallon of potable water per foot of chips or pellets will be added to initiate hydration of the bentonite. After the placement of the final lift, the bentonite will be allowed to hydrate prior to placement of the grout. After the bentonite is hydrated, a cement-bentonite grout will be placed in the remaining annular space. The monitoring wells will be completed with a flush-mount or stick-up well protector and surrounded by bollards (for stick-up wells only). A locking watertight cap will be placed on the PVC pipe (if completed as a flush-mount well) or on the stick-up well protector (if completed as an aboveground well), and the well designation will be marked on the well.

Newly installed monitoring wells will be allowed to sit for at least 24 hours prior to development. Development equipment will be cleaned before use at each location. Development and decontamination water will be temporarily stored in labeled 55-gallon drums or the equivalent pending characterization and staged onsite. Water quality parameters will be measured during development. Alternating periods of pumping and surging will occur until the measured field parameters have stabilized, per the SOP-01, Monitoring Well Installation and Development (Appendix A).

Monitoring wells will be inspected for signs of tampering or other damage. Suspected tampering (casing is damaged, lock or cap is missing) will be recorded in the field logbook, in accordance with the SOP-07, Note Taking and Field Log Books (Appendix A) and on the well sampling form, and be reported to the field team leader (FTL). Monitoring wells that appear to have been tampered with will not be sampled until the FTL has notified the project manager to discuss the path forward with the USACE.

Sampling of the wells to achieve the DQO will take place no sooner than 48 hours after well development has been completed and after water levels have reached equilibrium following well development. Static depth to groundwater measurements will be recorded in accordance with the SOP-11, Water Level Measurements (Appendix A), at the existing and newly installed monitoring wells before each groundwater sampling event. Groundwater levels will be measured to the nearest 0.01 foot using an electric water level indicator. Water levels will be measured in feet below top of casing. Groundwater elevation data from the existing wells and the proposed wells will be used to evaluate groundwater flow direction.

Groundwater samples will be collected from 11 existing wells and the 3 proposed wells for laboratory analysis of explosives, total RCRA metals (reference IAAAP Worksheet #15 for test method) to evaluate the downgradient extent of the plumes. Sampling activities will be recorded in the field logbook, in accordance with the SOP-07, Note Taking and Field Log Books (Appendix A), and sampling data on a well sampling form. Samples will be collected using groundwater low flow purging and sampling techniques as presented in the SOP-14, Groundwater Sampling (Appendix A). Depth-to-groundwater measurements, temperature, pH, turbidity, dissolved oxygen, oxidation-reduction potential, and specific conductance measurements will be recorded before and during purging each well. If a groundwater sample cannot be collected following the SOP methods, the FTL or designee will discuss the path forward with CH2M's project manager.

Seep Sampling

If seeps are identified, seep sampling will be completed in accordance with SOP-13, Surface Water Sampling (Appendix A). The exact number of seep samples that will be collected will be dependent upon the frequency at which seeps are identified, if at all. No more than one sample for every 20 feet of

traverse distance along the drainage ditches from the DA to the facility boundary will be collected by either direct grab method or sample transfer device method (Figure DA-10-3). Samples will be analyzed for explosives. Sample handling procedures will follow SOP-10, Sample Handling and Custody (Appendix A). Fieldwork will be documented in accordance with SOP-07, Note Taking and Field Log Books (Appendix A).

Surveying

The location and elevation of each newly installed well will be surveyed by a licensed surveyor.

See IAAAP Worksheet #14.

Decontamination

See IAAAP Worksheet #14.

Demobilization

See IAAAP Worksheet #14.

Waste Management

See IAAAP Worksheet #14.

Laboratory Analysis and Data Management

Laboratory Analysis

TestAmerica in Arvada, Colorado, is the primary laboratory and will analyze the groundwater samples for parameters. There will be no quality assurance split samples collected for this project effort. TestAmerica holds current DoD ELAP certification for the required methods and analytes. The laboratory analyses will be performed in accordance with the analytical methods, this UFP-QAPP, and the Laboratory SOPs as defined in IAAAP Worksheet #23 (Analytical SOPs).

Data Management

See IAAAP Worksheet #14.

Data Review

See IAAAP Worksheet #14.

Data Evaluation and Usability

See IAAAP Worksheet #14.

Baseline Risk Assessment

See IAAAP Worksheet #14.

Reporting and ERIS

See IAAAP Worksheet #14.

Demolition Area Worksheet #17: Sampling Design and Rationale

This worksheet describes the design and rationale for the RFI activities.

Investigation Design and Rationale

The following subsections describe the proposed wells and groundwater samples to characterize the site.

Rationale for Numbers and Locations of Samples

The DA has historical exceedances of explosives in groundwater. Based on previous investigations, groundwater at the site has not been adequately characterized. The proposed investigation at the DA will be as follows:

- Three bedrock monitoring wells will be installed to delineate the groundwater plumes. Proposed locations are depicted on Figure DA-10-3, but final locations will be determined based on site accessibility. The proposed monitoring locations include a nested pair, with one well screened at the water table and the second well screened approximately 30 feet deeper for vertical delineation. The third well is proposed adjacent to DA-TTMW-054, approximately 30 feet deeper for vertical delineation.
- One groundwater monitoring event to assess current concentrations will be conducted at the 3 new wells and 11 existing wells to evaluate current concentrations and potential migration of the plumes. Samples will be analyzed for explosives and total RCRA metals. Groundwater elevations will be gauged at 23 existing monitoring well locations.
- Drainage ditches extending downgradient from the DA to the facility boundary will be traversed to evaluate the presence of seeps. If identified, seep water samples will be collected at a frequency of one sample for every 20 lateral feet for explosives analysis. Seep investigation and sampling will occur twice, at a minimum, to evaluate fluctuations in groundwater discharge due to changes in rainfall and the water table. The events will be conducted during wetter summer months (May through July) when seeps are more likely to occur and drier winter months (November through January).

Existing wells that will provide this supplemental data are as follows (screen interval provided in parentheses in feet bgs):

- G-10 (14–24)
- G-11 (26–36)
- DA-TTMW-051 (7.7–17.7)
- DA-TTMW-052 (22.7–37.7)
- DA-TTMW-054 (8.2–18.2)
- DA-TTMW-055 (23.2–38.2)
- DA-TTMW-057 (18.7–28.7)
- DA-TTMW-059 (14.1–34.1)
- DA-TTMW-061 (18.1–28.1)
- DA-TTMW-063 (22–32)
- DA-02 (14.5–24.5)

Demolition Area Worksheet #18: Sampling Locations and Methods

The following table summarizes the sampling matrix, number of samples to be collected, analytical parameters, and the rationale for sampling location described in Demolition Area Worksheet #17 (Sampling Design and Rationale).

TABLE DA-18-1. Sample Locations and Sampling SOP Requirements
UFP-QAPP RI/RFI, IAAAP, Middletown, Iowa

Matrix	Depth	Analytical Group	Concentration Level	Estimated Number of Samples (Identify FDs)	Sampling SOP Reference [b]	Rationale for Sampling Location
DA						
Groundwater	First encountered groundwater-bearing zone; bedrock (up to 20 feet below the water table)	Explosives, total RCRA metals	Low to moderate	14 samples [a]	SOP-01 through SOP-08, SOP-10, SOP-11, SOP-17	Bias locations to supplement existing data and delineate RDX in groundwater, as warranted. Collect additional groundwater data to refine the CSM and for risk assessment purposes.
Seep Water	Surface	Explosives	Low	Unknown	SOP-03, SOP-07, SOP-10, SOP-13	Evaluate the CSM to assess lateral groundwater migration and extent of explosives at the DA

See Acronyms and Abbreviations section for abbreviations used in this table.

[a] At a minimum, one FD sample will be collected for every 20 samples per field event, one MS/MSD sample will be collected for every 20 samples per field event, and one equipment blank will be collected for every 20 samples per field event.

[b] SOP-01, Monitoring Well Installation and Development
SOP-02, Geographic Land Surveying
SOP-03, Global Positioning Satellite System Surveying
SOP-04, Equipment Decontamination Procedures
SOP-05, Organic Vapor Monitoring and Air Monitoring
SOP-06, Field Water Quality Measurements and Calibration
SOP-07, Note Taking and Field Log Books
SOP-08, Site Reconnaissance, Preparation, and Restoration
SOP-10, Sample Handling and Custody
SOP-11, Water Level Measurements
SOP-13, Surface Water Sampling
SOP-17, Utility Clearance for Intrusive Operations

References

American Ordnance LLC. 2006. *RCRA Hazardous Waste Management (Part B) Permit Application for RCRA Subpart X Units Consisting of: Open Burning in Pans in the Demolition Area and Open Detonation in the Demolition Area, Iowa Army Ammunition Plant, Middletown, Iowa, EPA RCRA# 1A72313820445.* December.

JAYCOR. 1996. *Revised Draft Final Remedial Investigation Report, Iowa Army Ammunition Plant*. May.

Terracon. 2000. *RCRA Closure Report, Iowa Army Ammunition Plant, Middletown, Iowa*. November.

Tetra Tech. 2005. *Revised Draft Supplemental Remedial Investigation Work Plan and Regulatory Path Forward for Six Non-ERA Eligible Sites for Iowa Army Ammunition Plant, Middletown, Iowa*. December.

Tetra Tech. 2008, *Draft Final Digital Geophysical Mapping Report for the Demolition Area, Iowa Army Ammunition Plant, Middleton Iowa,* February.

Tetra Tech. 2009. *Supplemental Remedial Investigation Report for Five Compliance-Related Cleanup Sites for Iowa Army Ammunition Plant, Middletown, Iowa*. July.

Tetra Tech. 2012. *Draft Final Field Technology Screening Work Plan for the Demolition Area for Iowa Army Ammunition Plant, Middletown, Iowa*. June.

USEPA. 1989. *RCRA Hazardous Waste Management Permit, Iowa Army Ammunition Plant, Middletown, Iowa, EPA RCRA# 1A72313820445.* November.