DRAFT FINAL

CONTAINMENT EVALUATION WORK PLAN OPERABLE UNIT NO. 2 (GROUNDWATER) FORMER NEBRASKA ORDNANCE PLANT MEAD, NEBRASKA CONTRACT NO. W9128F-04-D-0001 TASK ORDER NO. DHO1

Prepared for
Department of the Army
U.S. Army Engineer District
Kansas City District
Corps of Engineers
Kansas City, Missouri

April 2009

URS Group, Inc.
8300 College Blvd., Suite 200
Overland Park, Kansas 66210
Project 16530276

DEPARTMENT OF THE ARMY
KANSAS CITY DISTRICT, CORPS OF ENGINEERS
700 FEDERAL BUILDING
KANSAS CITY, MISSOURI 64106-2896

REPLY TO
ATTENTION OF:

April 21, 2009

Environmental Programs Branch
Planning, Programs and Project Management Division

Mr. Ken Rapplean, Remedial Project Manager
U.S. Environmental Protection Agency, Region VII
Superfund Division, Missouri/Kansas Remedial Branch
901 N. 5th Street
Kansas City, Kansas 66101

Mr. Ed Southwick
Nebraska Department of Environmental Quality
P.O. Box 98922
Lincoln, Nebraska 68509-8922

Dear Mr. Rapplean and Mr. Southwick:

Enclosed is the *Draft Final Containment Evaluation Work Plan for Operable Unit No. 2.* In addition, an electronic version of the document is provided. Please contact me at 816-389-3172 or by e-mail at kristine.m.stein@usace.army.mil with any questions on this matter.

Sincerely,

Kristine M. Stein
Project Manager

Enclosure

TABLE OF CONTENTS

List of Abbreviations, Acronyms, and Terms

Term	Definition
AFBMD	Air Force Ballistic Missile Division
AMA	Atlas Missile Area
AOP	Advanced Oxidation Processes
CERCLA	Comprehensive Environmental Response Compensation and Liability Act
COC	Contaminant of Concern
2,4-DNT	2,4-Dinitrotoluene
ECC	Environmental Chemical Corporation
EPA	United States Environmental Protection Agency
EW	Extraction Well
GAC	Granular Activated Carbon
GCW	Groundwater Circulation Well
GMP	Groundwater Monitoring Program
GWM	Groundwater Model
HA	Lifetime Health Advisory
MCL	Maximum Contaminant Level
MT3DMS	Containment Transport Model by Zheng (1999)
MW	Monitoring Well
NOP	Nebraska Ordnance Plant
O&M	Operation and Maintenance
OU1	Operable Unit 1
OU2	Operable Unit 2 (Groundwater)
RA	Remedial Action
RAO	Remedial Action Objective
RDGM	Remedial Design Groundwater Model
RDX	Hexahydro-1,3,5-trinitro-1,3,5-triazine
ROD	Record of Decision
TCE	Trichloroethene (trichloroethylene)
TNB	1,3,5-Trinitrobenzene
TNT	2,4,6-Trinitrotoluene
USGS	United States Geological Survey
URS	URS Group, Inc.
USACE	U.S. Army Corps of Engineers
µg/L	Micrograms per liter (ppb)

This document is the Work Plan for the evaluation of the hydraulic containment component of the Remedial Action (RA) for Operable Unit 2 (OU2) activities at the former Nebraska Ordnance Plant (NOP) near Mead, Nebraska (Site). This Work Plan supersedes the Containment Evaluation Work Plan (URS, 2006). This work plan is divided into the following sections:

- **Section 1.0** of this report presents a discussion of the OU2 RA, site chemicals of concern as defined in the OU2 Record of Decision (ROD), and the extent of groundwater contamination. This section also summarizes modeling and capture zone evaluation efforts to date.
- **Section 2.0** presents the methodology to evaluate the compliance and system effectiveness component of the containment evaluation.
- **Section 3.0** presents a discussion of possible response actions in the event that the future containment evaluations indicate that action may be needed.
- **Section 4.0** describes the content of containment evaluation reporting.

References are presented in **Section 5.0**.

1.1 SITE HISTORY

The former NOP was a load, assemble, and pack facility that produced bombs, boosters, and shells. Section 6.0 contains a more thorough list of project related reports that document the site history and investigation and remedial efforts to date.

A general site location map is presented on **Figure 1-1**.

1.2 DESCRIPTION OF REMEDIAL ACTION

The remedial action objectives (RAOs) outlined in the OU2 ROD address the contaminated groundwater and explosives-contaminated soil which could act as a source of explosives contamination of groundwater while considering the long-term goals of protecting human health and the environment and meeting Applicable, Relevant and Appropriate Regulations (ARARs) of federal and state laws and regulations. The RAOs defined in the OU2 ROD are:

- Minimize the potential for ingestion of contaminated groundwater, or reduce concentrations to acceptable health-based levels.
- Minimize the potential for dermal exposure to contaminated groundwater, or reduce concentrations to acceptable health-based levels.
- Minimize the potential for inhalation of chemicals released during the use of contaminated groundwater, or reduce concentrations to acceptable health-based levels.

Explosives-contaminated soils which could act as a contamination source to groundwater (as defined by OU2 ROD) were remediated during the Operable Unit 1 (OU1) RA in the fall of 1997.

The remedial action for OU2 addresses one of the principal threats at the Site, contaminated groundwater, by containing, extracting, and treating the contaminated groundwater on-site. The major components of the selected remedy include:

- Hydraulically contain contaminated groundwater exceeding the Final Target Groundwater Cleanup Goals.
- Focused extraction of groundwater in areas with relatively high concentrations of trichloroethene (TCE) and explosives.
- Treat all extracted groundwater using granular activated carbon (GAC) adsorption, advanced oxidation processes (AOP), and air stripping. GAC adsorption and AOP may be applied individually or in combination, while air stripping must be applied in combination with one of the other technologies to effectively treat explosives.
- Dispose of the treated groundwater by beneficially reusing it or through surface discharge.
- Provide a potable water supply to local groundwater users whose water supply contains hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX) exceeding the Lifetime Health Advisory (HA) and/or TCE exceeding the Maximum Contaminant Level (MCL).
- Monitor the groundwater elevations and water quality.
- Excavate and treat explosives-contaminated soil which could act as a source of explosives contamination of groundwater and which does not meet the OU1 excavation criteria

1.3 CHEMICALS OF CONCERN

The Chemicals of Concern and associated cleanup goals defined in the OU2 ROD are summarized below.

Final Target Groundwater Cleanup Goals	
Chemical of Concern	Concentration (µg/L)
Methylene Chloride	5
1,2-Dichloropropane	5
TCE	5
TNB	0.778
TNT	2
2,4-DNT	1.24
RDX	2

1.4 EXTENT OF GROUNDWATER CONTAMINATION

The groundwater flow direction in the Todd Valley is generally to the south and southeast, with an average hydraulic gradient of 12 feet/mile. The groundwater flow direction in the Platte River alluvial aquifer is approximately south.

The OU2 ROD defined the following four groundwater contaminant plumes:

- TCE plume with the suspected source at the Atlas Missile Area (AMA),

- TCE plume with the suspected source at the Air Force Ballistic Missile Division (AFBMD) Tech Area,
- Explosives plume with the suspected source at Load Line 1,
- Explosives plume with suspected sources at Load Lines 2, 3, and 4 and the North Burning Grounds area.

TCE concentrations exceeded the TCE Final Target Groundwater Cleanup Goal of 5 µg/L in both TCE plumes. RDX was the most commonly detected explosive compound in groundwater at the former NOP, and was detected at concentrations exceeding the Final Target Groundwater Cleanup Goal of 2 µg/L. RDX is used as an indicator for explosives in groundwater at the Site. Where RDX is detected above the cleanup goal, other explosive compounds are also typically detected and, conversely, when RDX is not detected other explosives are typically absent.

The goal of the hydraulic system is to contain groundwater contamination that exceeds the Final Target Groundwater Cleanup Goals.

1.5 REMEDY DESCRIPTION

This document addresses the performance evaluation of the OU2 selected remedy, as it relates to the hydraulic containment system meant to contain the Site groundwater that is contaminated at levels above the Final Target Groundwater Cleanup Goals defined in the ROD. Containment will be accomplished through the operation of groundwater extraction wells.

The remedy currently includes the following components:

- Thirteen extraction wells have been installed to contain contaminated groundwater.
- Groundwater from extraction wells EW-1, EW-2, EW-3, EW-4, EW-5, EW-6, EW-7, EW-9, and EW-10 are treated at a main groundwater treatment facility (Main Treatment Plant).
- Extraction well EW-12 contains the TCE plume associated with Load Line 1 TCE plume. EW-13 will be used in the future, if necessary, to complement the EW-12 pumping. Groundwater from extraction well EW-12 is treated at the Load Line 1 Treatment Plant.
- Extraction wells EW-14 and EW-16 will be installed in spring 2009 in between current extraction wells EW-5 and EW-3 to contain the Load Line 3 RDX plume. Extraction well EW-16 will function as a containment well along the leading edge of the plume. EW-14 be placed upgradient of the leading edge of the plume and will function as a focused extraction well. EW-14 will assist in maintaining the groundwater plume pathway consistent with the capture zone created by EW-4 and EW-16. Groundwater from both extraction wells will be treated at the Main Treatment Plant.
- EW-8, located in the Load Line 1 TCE plume was turned off in August 2007. Extraction well EW-11 began operating in March 2008 as a focused extraction well to remediate groundwater containing high concentrations of TCE associated with the Load Line 1 TCE plume. Contaminated groundwater from EW-11 is treated at the AOP Treatment Plant.
- Extraction well EW-15 will be installed in spring 2009 as a focused extraction well to remediate groundwater containing high concentrations of TCE associated with the AMA

TCE plume. Contaminated groundwater from EW-15 will be treated at a new treatment plant (Load Line 4 Treatment Plant) which will be located adjacent to the AOP Treatment Plant.

The operation of EW-14, EW-15, and EW-11 meet the OU2 ROD requirement to implement focused extraction in areas with relatively high concentrations. Additional actions may be warranted in the future to further address the focused extraction requirement of the OU2 ROD. For the purposes of this containment evaluation, focused extraction will not be considered.

Additional hydraulic conductivity, hydrostratigraphic, water use, and potentiometric data will be incorporated into the groundwater model on an annual basis, and shall be addressed in the annual containment evaluations. The effects of other extraction wells (external to the remediation system), and their registered locations, construction, and operating details will be provided in the annual containment evaluation.

The following is a brief summary of the remedy design and construction efforts completed to date:

- June 1995 Extraction wells EW-1 and EW-8 installed
- April 1997 OU2 ROD signed
- October 1997 Construction of CRA Treatment Plant
- March 1999 Remedial Design completed for addition/expansion of Treatment Plant
- April 2000 GCW-1 and GCW-2 and pilot systems installed
- March 2001 GCW Pilot Studies completed
- August 2001 Phase II Remedial Design (for GCWs) completed
- February 2002 Expansion of Main Treatment Plant operational
- September 2005 Load Line 1 Remedial Design completed
- January 2006 Load Line 1 Treatment Plant operational
- November 2006 AOP Remedial Design completed
- March 2008 AOP Treatment Plant and EW-11 operational

1.6 DEVELOPMENT OF THE SITE GROUNDWATER MODEL

The design of the OU2 containment system was accomplished by developing a series of site-specific groundwater models. The current model is the culmination of groundwater modeling efforts that started with the Removal Action Groundwater Modeling (Woodward-Clyde, 1994), subsequently followed by:

- Conceptual Groundwater Model Technical Memorandum (Woodward-Clyde, 1996b and 1996c)
- Remedial Design Groundwater Model (RDGM) (Woodward-Clyde, 1998)
- RDGMII (Woodward-Clyde, 1999a)
- RDGMIII (URS, 2002a)

- RDGMIV (URS, 2004a)
- Updates to RDGMIV described in the Load Line 1 Remedial Design (GWM05) (URS, 2005)
- Draft Final 2006 Groundwater Modeling Report (GWM06) (URS, 2007)

The Draft Final GWM06 Report (URS, 2007) details the updates that have occurred over time. The next groundwater modeling update is scheduled for 2009.

1.7 PREVIOUS CONTAINMENT EVALUATION APPROACH

Previous containment evaluations, including the Initial Containment Evaluation (URS, 2003) and the One-Year Containment Evaluation (URS, 2004b) relied on hydraulic data, for the following reasons:

1) The Load Line 2 and Load Line 3 RDX plumes had not reached the extraction wells
2) Hydraulic data from the initial transient stresses from extraction well pumping had not yet been used to verify the assumptions in RDGMII (Woodward-Clyde, 1999a), which was the groundwater model used to design the containment system.
3) The perimeter and compliance groundwater monitoring well networks were not yet in place.
4) Previous guidance was targeted to sites without detailed groundwater models or extensive perimeter and compliance groundwater monitoring well networks.

1.8 SCOPE

The goal of the containment evaluation is to determine whether the hydraulic containment system is containing TCE and RDX contamination above the Final Target Groundwater Cleanup Goals of 5 µg/L and 2 µg/L, respectively. Containment will be determined based on the chemical data collected from the downgradient compliance monitoring wells **(Figure 1-2)**. The general performance, or effectiveness, of the hydraulic containment system will be evaluated using contaminant transport modeling.

The purpose of this section is to discuss the collection, evaluation, and reporting of chemical groundwater data as well as present the methods for simulating contaminant transport to evaluate the effectiveness of the hydraulic extraction system. The primary containment evaluation tool at the site is the compliance groundwater monitoring well network, augmented by the predictive capacity of groundwater model contaminant transport simulations.

2.1 COMPLIANCE REVIEW

Perimeter and compliance monitoring wells placed outside of groundwater contamination exceeding the Final Target Groundwater Cleanup Goals are shown on **Figure 1-2**. Hydraulic containment will be demonstrated using the chemical data from the calendar year the evaluation is being performed. ROD compliance will be demonstrated if COCs are not detected above the Final Target Groundwater Cleanup Goals in the compliance monitoring wells. If detections of ROD COCs above the Final Target Groundwater Cleanup Goals occur in one or more perimeter monitoring well or water supply well the response actions, as outlined in Section 3.1.1, will be performed. If detections of ROD COCs above the Final Target Groundwater Cleanup Goals occur in one or more of the compliance monitoring wells, the response actions, as outlined in Section 3.1.2, will be performed.

2.2 SYSTEM EFFECTIVENESS REVIEW

The steps outlined below describe the secondary analysis which evaluated the effectiveness of the hydraulic containment system.

Step 1: Review Site Data

The site conceptual model will be reviewed and new information on hydraulic conductivity, depth to bedrock, and groundwater/surface water interaction will be incorporated into the model during model updates. During updates, groundwater elevation data are used to re-calibrate the model. The last model update was in 2007 (URS, 2007), and the next update is scheduled for 2009.

Step 2: Review of the Extent of Contamination above the Final Target Groundwater Cleanup Goals

The most recent characterization data through the end of the year being evaluated will be used to define the horizontal and vertical extent of contamination.

Step 3: Interpret Water Levels

Semi-annual regional water level measurements collected from site-wide monitoring and observation wells, along with existing piezometers, the United States Geological Survey (USGS) wells, the Lower Platte North Natural Resource District wells, and the Lincoln Water System wells will be contoured to provide a supporting line of evidence to the Containment Evaluation. The water level data will also be used to assess the presence and magnitude of any vertical flow gradients that would affect the ability of the extraction well system to capture the contaminated groundwater in a vertical direction as well as the horizontal direction.

Step 4: Evaluate Capture Using Contaminant Transport Simulations

The plume contour based on data collected through the Containment Evaluation period will be converted into initial concentration files. Measured, estimated, and predicted pumping rates from the containment system, public water supplies, and irrigation will be incorporated in the model, and used to predict capture of the plume using the contaminant transport modeling software MT3DMS. Containment system pumping rates prescribed by the most recent optimization modeling will be used in the predictive analyses. Initial plumes and results from the simulation will be presented in 5 year increments for TCE and RDX in both the shallow and intermediate layers, as was presented in the 2007 Containment Evaluation. These figures over time illustrate the extent of the capture zone as compared to the area of contaminated groundwater above ROD criteria in the horizontal and vertical directions.

Step 5: Evaluate Concentration Trends

Concentration trends will be evaluated from the perimeter and compliance groundwater monitoring well networks described in Section 2 of this work plan. Such chemical data may also be used to assess consistency with the site conceptual model and/or with the contaminant transport model.

Step 6: Interpret Actual Capture and Compare to Groundwater above the Final Target Groundwater Cleanup Goals

The contamination transport simulation figures over time illustrate the extent of the capture zone as compared to the area of contaminated groundwater above ROD criteria in the horizontal and vertical directions. The results will be evaluated to assess whether the current system meets remedy objectives with respect to plume capture both horizontally and vertically. Based on the results of the contaminant transport simulations, the necessity of modifying extraction rates will be evaluated.

The purpose of this section is to describe potential response actions in the event that future groundwater sampling results show detections of site-related contaminants above the Final Target Groundwater Cleanup Goals in perimeter monitoring wells, water supply wells, or compliance monitoring wells.

3.1 POSSIBLE RESPONSE ACTIONS

The use of the term "response action" in this context is not intended to conflict with, or supersede the meaning of "response action" in the context of an action performed under Comprehensive Environmental Response Compensation and Liability Act (CERCLA). Also, any response action described in this section is not intended to conflict with, or supersede any other requirements that are already defined in the OU2 ROD, especially those requirements related to the provision of alternate water supply.

Regardless of any findings related to the tiered approach presented below, alternate water supply will be provided to any residence where the water supply well has become impacted by ROD contaminants of concern (COCs) at levels above the Final Target Groundwater Cleanup Goals. Alternate water supply could include (but is not limited to) installation of a point of use treatment system, provision of bottled water, or a combination thereof.

Response actions and time frames described in this section take into consideration regional and local groundwater velocities. In the project area, the natural gradient (northwest to southeast) results in an approximate average groundwater velocity of 2 feet/day, or around 730 feet/year. Contamination in the groundwater moves more slowly, on the average of 1.5 feet/day or around 550 feet/year. For example, it likely took the TCE contamination in the eastern plume approximately 40 years to move from the source area in the north to the EW-1 in the south. Contamination does not easily move across the natural gradient.

3.1.1 Perimeter Monitoring Well and Water Supply Well Response Actions

The following identifies response actions if detection(s) of ROD COCs above Final Target Groundwater Cleanup Goals occur in a single perimeter monitoring well or water supply well.

Tier 1 Actions:

- If a detection above a Final Target Groundwater Cleanup Goal occurs in a residential water supply well, immediately supply the residence with alternate water supply in accordance with the OU2 ROD.
- If a detection above a Final Target Groundwater Cleanup Goal occurs in a perimeter monitoring well, resample that monitoring well immediately upon receipt of (validated) data.
- If the detection above a Final Target Groundwater Cleanup Goal is not verified in the perimeter well upon resampling, sample monitoring well quarterly for two years.
- If the detection above a Final Target Groundwater Cleanup Goal is verified in the perimeter well upon resampling, evaluate whether the perimeter monitoring well is within the capture zone of the extraction system.

- If the perimeter monitoring well is within the capture zone of the extraction system, no further action is required.
- If the perimeter monitoring well is outside of the capture zone of the extraction system, sample the monitoring well quarterly for two years. Include sampling of any nearby monitoring well(s), as appropriate, if within close proximity to the perimeter monitoring well with the exceedance. If any detection above a Final Target Groundwater Cleanup Goal occurs in the perimeter monitoring well within the 2 year period, move to Tier 2 actions.
- Escalation to Tier 2 actions may be triggered if more than one perimeter monitoring well is impacted above action levels, or if the magnitude of exceedances is "high" (i.e. TCE or RDX > 25 ppb).

Tier 1 Time Frames

- Escalation from Tier 1 to Tier 2 is highly dependent upon sampling results. Escalation could occur immediately upon reaching specific criteria above. Valid sampling results are available 60-90 days after sample collection.
- Provision of alternate water supply to residential water supply wells takes 1-2 weeks for bottled water and 1-2 months for a carbon filtration unit.

Tier 2 Actions:

Upon meeting conditions outlined in Tier 1:

- Conduct direct-push groundwater investigations and/or install additional monitoring well(s) in areas near the perimeter monitoring well where the exceedance(s) were detected.
- Conduct hydraulic evaluation of vicinity groundwater which could include installation and monitoring of temporary piezometers, aquifer testing, and additional modeling specific to the area in question.
- If Tier 2 investigations show plume movement that may impact compliance monitoring wells above the Final Target Groundwater Cleanup Goals, move to Tier 3 action.
- If Tier 2 investigations show plume movement does not appear to impact compliance monitoring wells, Tier 3 action is not warranted.

Tier 2 Time Frame

- Upon escalation to Tier 2 investigations, 6-9 months are required to properly plan and implement field work, and evaluate data.

Tier 3 Actions:

Upon meeting conditions outlined in Tier 2:

- Take abatement actions to mitigate plume movement, such as, but not necessarily limited to:
  a) Modifying pumping rates of existing extraction wells. Time to implement: 3-6 months.

b) Adding pumping/cleanup capacity (such as extraction wells or groundwater circulation wells (GCWs) to augment the extraction well network). Time to implement: 9-18 months.

c) Consulting with the regulatory agencies to implement alternate groundwater remediation techniques as appropriate. Time to implement: Indeterminate.

d) Consulting with well operators in the area where the operations of such wells may have a negative impact on the performance of the OU2 remedy, to modify their pumping operations, as appropriate.

3.1.2 Compliance Monitoring Well Response Actions

The following identifies response actions if detection(s) of ROD COCs above Final Target Groundwater Cleanup Goals occur in a single compliance monitoring well.

Tier 1 Actions:

- If a detection above a Final Target Groundwater Cleanup Goal occurs in a compliance monitoring well, resample that monitoring well immediately upon receipt of (validated) data.
- If the detection above a Final Target Groundwater Cleanup Goal is not verified in the compliance monitoring well upon resampling, sample monitoring well quarterly for two years. If any detection above a Final Target Groundwater Cleanup Goal in the compliance monitoring well occurs within the 2 year period, move to Tier 2 actions.
- If the detection above a Final Target Groundwater Cleanup Goal is verified in the compliance monitoring well upon resampling, move to Tier 2 action.

Tier 1 Time Frames

- Escalation from Tier 1 to Tier 2 is highly dependent upon sampling results. Escalation could occur immediately upon reaching specific criteria above. Valid sampling results are available 60-90 days after sample collection.

Tier 2 Actions:

- Conduct direct-push groundwater investigations and/or install additional monitoring well(s) in areas near the compliance monitoring well where the exceedance(s) were detected.
- Conduct hydraulic evaluation of vicinity groundwater which could include installation and monitoring of temporary piezometers, aquifer testing, and additional modeling specific to the area in question.
- Take abatement actions to mitigate plume movement, such as, but not necessarily limited to:
  a) Modifying pumping rates of existing extraction wells. Time to implement: 3-6 months.
  b) Adding pumping/cleanup capacity (such as extraction wells or GCWs to augment the extraction well network). Time to implement: 9-18 months.

c) Consulting with the regulatory agencies to implement alternate groundwater remediation techniques as appropriate. Time to implement: Indeterminate.

d) Consulting with well operators in the area where the operations of such wells may have a negative impact on the performance of the OU2 remedy, to modify their pumping operations, as appropriate.

A Containment Evaluation Report will be prepared annually and will include all data collected during the previous calendar year. For the purpose of the annual containment evaluation, the remedy is considered to be operating properly and successfully if ROD COCs are not detected above the Final Target Groundwater Cleanup Goals in the compliance monitoring wells. The general performance, or effectiveness, of the hydraulic containment system will be evaluated using the following:

1) The area of contamination above Final Target Groundwater Cleanup Goals will be mapped out, based on all of the data available at the time. Both the horizontal and vertical extent will be addressed.
2) The current version of the groundwater model will be used to perform containment transport simulations to compare capture zone with the area of contamination above Final Target Groundwater Cleanup Goals. Operational and monitoring data obtained throughout the calendar year will be used to perform the modeling. Both the horizontal and vertical extent will be addressed.
3) The conclusions of the model will be verified against actual data and measurements obtained during the course of routine monitoring. The analytical results from the downgradient compliance monitoring wells obtained each year will be used to verify the model's conclusions.

The annual Containment Evaluation Report will include, but is not limited to, the following specific items:

- Contaminant transport simulations to determine and illustrate the capture zone of the area of contamination above Final Target Groundwater Cleanup Goals in both the horizontal and vertical directions.
- Tables summarizing the analytical results of perimeter monitoring wells and compliance monitoring wells identified in the Containment Evaluation Work Plan.
- Tables containing the observed water level data, including water level measurements, time of measurement, depth to water, elevation of the top of the observation well casing/riser pipe, and water level elevation.
- Pertinent operation and maintenance (O&M) data such as well pumping rates and water levels in the extraction wells.
- Potentiometric surface maps and flow lines.

Future reporting for the hydraulic containment requirement of the OU2 ROD may include an Interim Remedial Action Completion Report (I-RACR). *DoD/EPA Joint Guidance on Streamlined Site Closeout and NPL Deletion Process for DoD Facilities* (signed December 2005 by DoD and January 2006 by EPA) defines the I-RACR as a document that demonstrates the remedy for an operable unit has been constructed and is in place and operating successfully.

According to the joint guidance, the I-RACR documents Remedy-in-Place (roughly equivalent to EPA's "construction complete" milestone) and should demonstrate that all remedial actions taken achieve remedial action objectives.

Environmental Chemical Corporation (ECC), 2002. Operation and Maintenance Manual, Attachment 1, Vol. 1 – Remedial Design Groundwater Treatment (OU2), Former Nebraska Ordnance Plant (NOP), Mead, Nebraska, Prepared for U.S. Army Corps of Engineers, Kansas City District. April.

Environmental Chemical Corportaion (ECC), 2005. Work Plans, Field Sampling Plans and Quality Assurance Project Plans for Monitoring Well Sampling, Water Supply Well Sampling, Operation and Maintenance Sampling, Former Nebraska Ordnance Plant (NOP), Mead, Nebraska, Prepared for U.S. Army Corps of Engineers, Kansas City District. March.

Environmental Chemical Corporation (ECC). 2006. Third Quarter (September) 2005 Analytical Results (Validated); Water Supply Well, Groundwater Monitoring Well, and Surface Water Sampling Events; Former Nebraska Ordnance Plant, Mead, Nebraska. January.

Pollock, D.W. 1989. Documentation of Computer Programs to Compute and Display Pathlines Using Results from the U.S. Geological Survey Modular Three-Dimensional, Finite-Difference, Groundwater Flow Model. USGS Open File Report. 89-391, 188 pp.

URS, 2001. Extraction Well Efficiency and Aquifer Parameter Calculations Memorandum, Operable Unit No. 2 (Groundwater) for Former Nebraska Ordnance Plant, Mead, Nebraska. Prepared for U.S. Army Corps of Engineers; Kansas City District. October.

URS, 2002a. Remedial Design Groundwater Model III Technical Memorandum, Operable Unit No. 2 (Groundwater) for Former Nebraska Ordnance Plant, Mead, Nebraska. Prepared for U.S. Army Corps of Engineers; Kansas City District. February.

URS, 2002b. Containment Evaluation Work Plan, Operable Unit No. 2 (Groundwater) for Former Nebraska Ordnance Plant, Mead, Nebraska. Prepared for U.S. Army Corps of Engineers, Kansas City District. May.

URS, 2003. Initial Containment Evaluation, Operable Unit No. 2 (Groundwater) for Former Nebraska Ordnance Plant, Mead, Nebraska. Draft Final. Prepared for U.S. Army Corps of Engineers; Kansas City District. May.

URS, 2004a. Remedial Design Groundwater Model IV Technical Memorandum, Operable Unit No. 2 (Groundwater) for Former Nebraska Ordnance Plant, Mead, Nebraska. Draft. Prepared for U.S. Army Corps of Engineers; Kansas City District. February.

URS, 2004b. One-Year Containment Evaluation, Operable Unit No. 2 (Groundwater) for Former Nebraska Ordnance Plant, Mead, Nebraska. Draft Final. Prepared for U.S. Army Corps of Engineers; Kansas City District. March.

URS, 2005. Load Line 1 Containment System Remedial Design, Operable Unit No. 2 (Groundwater) for Former Nebraska Ordnance Plant, Mead, Nebraska. Draft Final. Prepared for U.S. Army Corps of Engineers; Kansas City District. July.

URS, 2007. 2006 Groundwater Modeling Report, Operable Unit No. 2 (Groundwater), Former Nebraska Ordnance Plant, Mead, Nebraska. Draft Final. Prepared for U.S. Army Corps of Engineers; Kansas City District. May.

U.S. Environmental Protection Agency (USEPA). 2008. A Systematic Approach for Evaluation of Capture Zones at Pump and Treat Systems, Final Project Report. Office of Research

and Development, National Risk Management Research Laboratory, Ground Water and Ecosystems Restoration Division, EPA 600/R-08/003. January.

Woodward-Clyde. 1994. Removal Action Groundwater Modeling, Operable Unit No. 2 (Groundwater) for Former Nebraska Ordnance Plant, Mead, Nebraska. Prepared for U. S. Army Corps of Engineers, Kansas City District. May.

Woodward-Clyde. 1996a. Record of Decision, Operable Unit No. 2, Former Nebraska Ordnance Plant Site, Mead, Nebraska. Prepared for the U.S. Army Corps of Engineers, Kansas City District. October. Effective date April 7, 1997.

Woodward-Clyde. 1996b. Conceptual Groundwater Model Technical Memorandum, Operable Unit No. 2 (Groundwater), Former Nebraska Ordnance Plant, Mead, Nebraska. Draft. Prepared for U.S. Army Corps of Engineers, Tulsa District. May.

Woodward-Clyde. 1996c. Responses to Comments on the Draft Technical Memorandum, Conceptual Groundwater Model, Operable Unit No. 2 (Groundwater), Former Nebraska Ordnance Plant, Mead, Nebraska. Draft. Prepared for U.S. Army Corps of Engineers, Tulsa District. July.

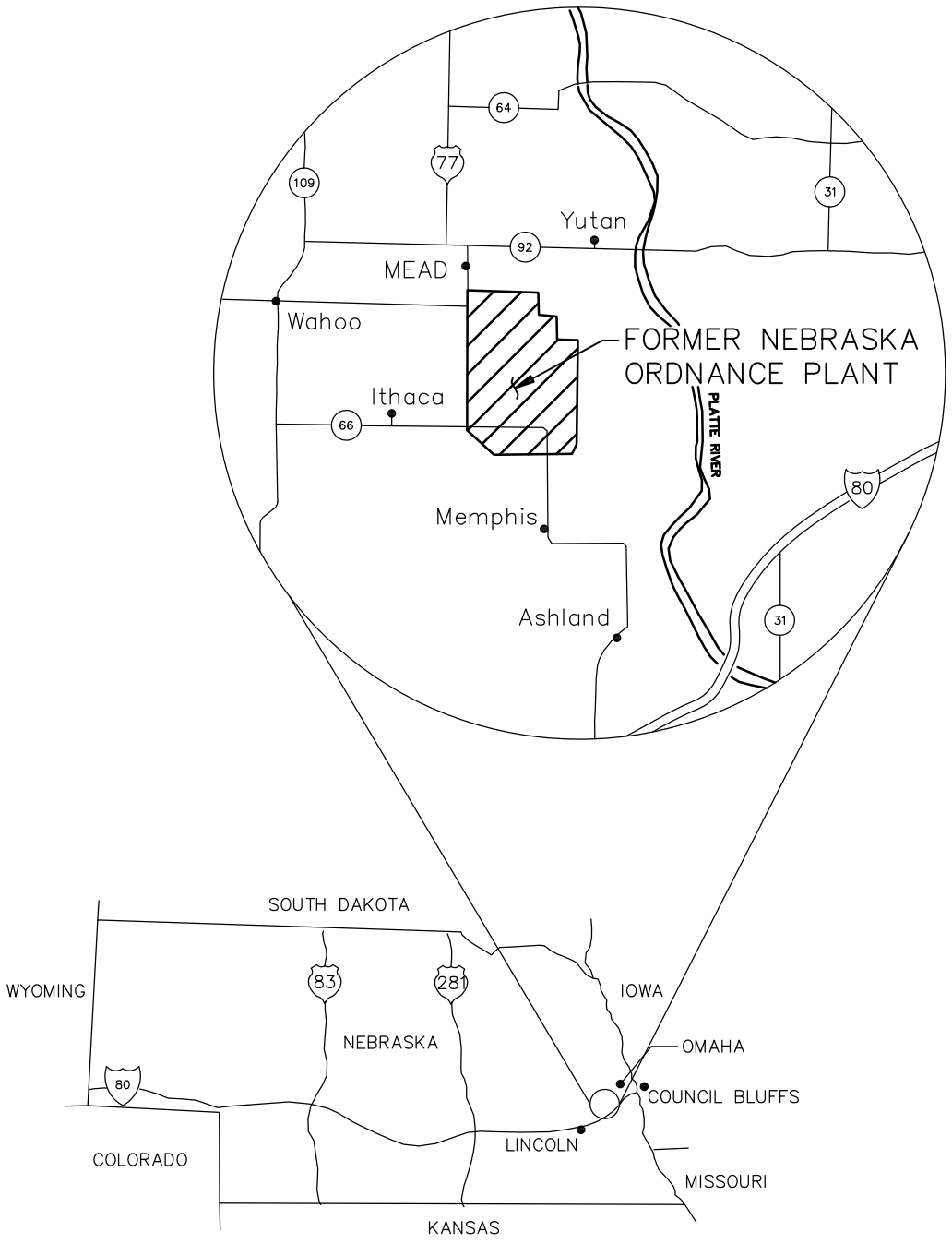
Woodward-Clyde. 1996d. Pumping Tests for Groundwater Containment Removal Action For Former Nebraska Ordnance Plant Operable Unit No. 2 (Groundwater). Draft Technical Memorandum. Prepared for U.S. Army Corps of Engineers, Kansas City District. April.

Woodward-Clyde. 1998. Remedial Design Groundwater Model Technical Memorandum, Operable Unit No. 2 (Groundwater) for Former Nebraska Ordnance Plant, Mead, Nebraska. Prepared for U.S. Army Corps of Engineers; Kansas City District. January.

Woodward-Clyde. 1999a. Design Analysis Attachment 1 - Remedial Design Groundwater Model, Operable Unit No. 2 (Groundwater) for Former Nebraska Ordnance Plant, Mead, Nebraska. Prepared for U.S. Army Corps of Engineers; Kansas City District. March.

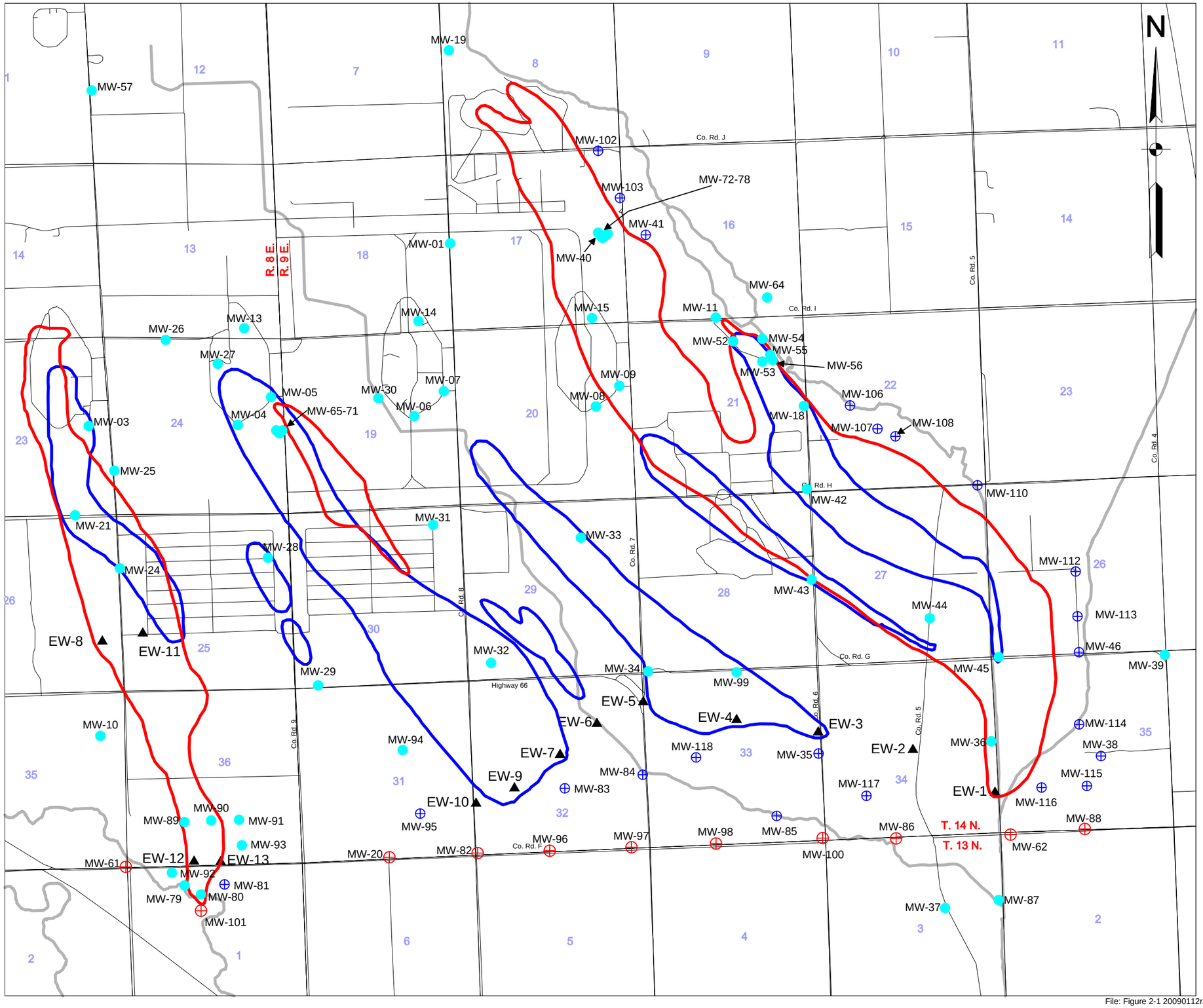
Woodward-Clyde. 1999b. Containment Evaluation Summary Technical Memorandum, Operable Unit No. 2 (Groundwater) for Former Nebraska Ordnance Plant, Mead, Nebraska. Prepared for U.S. Army Corps of Engineers; Kansas City District. September.

Zheng, C. 1999. MT3DMS A Modular Three Dimensional Multispecies Transport Model for Simulation of Advection, Dispersion and Chemical Reactions of Contaminants in Groundwater Systems. Prepared for the United States Army Corps of Engineers.



URS Group Inc. 8300 College Boulevard, Suite 200 Overland Park, Kansas 66210		U.S. ARMY ENGINEER DISTRICT CORPS OF ENGINEERS KANSAS CITY, MISSOURI
Designed by: D.C.C. Drawn by: R.E.K. Checked by: L.A.T. Submitted by: L.A.T.	U.S. Army Corps of Engineers	CONTAINMENT EVALUATION WORK PLAN FMR NEBRASKA ORDNANCE PLANT – MEAD, NEBRASKA **GENERAL SITE LOCATION MAP**
	Scale: NONE Date: APRIL 2009 Dwg. No.: 1–1	Figure number: 1 – 1

March 2, 2009 1:57.19 pm (Jam)
I:\16530276 Mead NOP Tech Support (Omaha Contract\Containment Evaluation WP\2009 CE WP Revision\Draft\Drawings\Figure 1-1.dwg



LEGEND

- COMPLIANCE MONITORING WELL CLUSTERS
- PERIMETER MONITORING WELL CLUSTERS
- EXTRACTION WELL
- MONITORING WELL CLUSTER
- MAXIMUM EXTENT OF TCE > 5µg/L
- MAXIMUM EXTENT OF RDX > 2µg/L

NOTES:
1) TCE and RDX extent interpretations as of May 2008

0 1000 2000 3000 4000 5000 6000

URS

U.S. ARMY ENGINEER DISTRICT
CORPS OF ENGINEERS
KANSAS CITY, MISSOURI

Designed by: M.E.W.
Drawn by: M.E.W.
Checked by: L.A.T.
Submitted by: L.A.T.

U.S. Army Corps of Engineers

DRAFT FINAL
CONTAINMENT EVALUATION WORK PLAN
OPERABLE UNIT NO. 2
FMR. NEBRASKA ORDNANCE PLANT - MEAD, NE

PERIMETER AND COMPLIANCE GROUNDWATER MONITORING WELL NETWORKS

Scale: As Indicated
Date: APRIL 2009
Fig. No.: 1-2
Figure Number: 1-2

File: Figure 2-1 20090112r3.