FINAL

CONTAINMENT EVALUATION WORK PLAN OPERABLE UNIT NO. 2 (GROUNDWATER) FORMER NEBRASKA ORDNANCE PLANT MEAD, NEBRASKA CONTRACT NO. DACW41-03-D-0001 TASK ORDER NO. 002

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

November 2006

URS Group, Inc.
8300 College Blvd., Suite 200
Overland Park, Kansas 66210
16529979

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List of Abbreviations, Acronyms, and Terms

The following abbreviations, acronyms, and terms are commonly used in environmental reports, work plans, and guidance documents. They are listed here as an aid to the reader because they are in common use in the industry or are specific to the subject of this document.

Term	Definition
AFBMD	Air Force Ballistic Missile Division
AOA	Area of Attainment
AOP	Advanced Oxidation Processes
ARAR	Applicable, Relevant and Appropriate Regulation
ARPR	Annual Remedy Performance Report
CE	Containment Evaluation
CERCLA	Comprehensive Environmental Response Compensation and Liability Act
CEWP	Containment Evaluation Work Plan
COC	Contaminant of Concern
2,4-DNT	2,4-Dinitrotoluene
ECC	Environmental Chemical Corporation
EPA	United States Environmental Protection Agency
EW	Extraction Well
ft/day	Feet per day
GAC	Granular Activated Carbon
gpd/ft	Gallons per day per foot
GMP	Groundwater Monitoring Program
gpm	Gallons Per Minute
GWM	Groundwater Model
HA	Lifetime Health Advisory
K_z	Hydraulic Conductivity
MCL	Maximum Contaminant Level
MODFLOW	Groundwater Flow Model by McDonald and Harbaugh (1988)
MODPATH	Groundwater Particle Tracking Model by Pollock (1989)
MT3DMS	Containment Transport Model by Zheng (1999)
MW	Monitoring Well
NDEQ	Nebraska Department of Environmental Quality
NOP	Nebraska Ordnance Plant
OU1	Operable Unit 1
OU2	Operable Unit 2 (Groundwater)
OW	Observation Well
RA	Remedial Action
RAO	Remedial Action Objective
RDGM	Remedial Design Groundwater Model

List of Abbreviations, Acronyms, and Terms

Term	Definition
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
VOC	Volatile Organic Compound
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 No. 2 (OU2) activities at the former Nebraska Ordnance Plant (NOP) near Mead, Nebraska (Site). This Work Plan supercedes the initial Containment Evaluation Work Plan (URS, 2002b). 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 hydraulic component of the containment evaluation.

- **Section 3.0** presents the methodology to evaluate the analytical component of the containment evaluation.

- **Section 4.0** presents a discussion of possible response actions in the event that the future containment evaluations indicate that action may be needed.

- **Section 5.0** describes the content of future containment evaluation reports.

References are presented in **Section 6.0**.

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.

The remediation of explosives-contaminated soils, which could act as a source of explosives contamination of groundwater (as defined by OU2 ROD), was completed during the OU1 RA by incineration during 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 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 Operable Unit 1 (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,
- TCE plume with the suspected source at the (AFBMD) Air Force Ballistic Missile Division 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 containment is to prevent groundwater outside the area of attainment from becoming contaminated in excess of the Final Target Groundwater Cleanup Goals in the future. The plumes shown on Figure 3 (lf the ROD) delineate the area of attainment.

For the purposes of performing the containment evaluation, the extent of contamination is defined as the known extent of contamination – in both the horizontal and vertical directions - that exceeds the Final Target Groundwater Cleanup Goals. At the time this document was authored the best depiction of the extent of contamination was found in the Sept 2005 Groundwater Monitoring Program (GMP) Quarterly Report (ECC, 2006).

Figure 1-2 presents the known extent of contamination (as depicted in the Sept 2005 GMP Quarterly Report), as well as RDX and TCE results from site monitoring wells, extraction wells, domestic wells, and surface water sampling performed during 2005.

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 capture the site groundwater that is contaminated at levels above the Final Target Cleanup Goals defined in the ROD. Containment will be accomplished through the operation of groundwater extraction wells. Extracted groundwater will be treated at a main treatment facility and a smaller treatment facility for the Load Line 1 plume.

The remedy that has been implemented to date, includes the following components:

- Thirteen extraction wells have been installed to contain contaminated groundwater.
- Extraction wells EW-12 and EW-13 will contain the TCE plume associated with Load Line 1. EW-8 will be turned off.
- Extraction well EW-11 will eventually act as a focused extraction well to remediate groundwater containing high concentrations of TCE associated with the Load Line 1 TCE plume.

The selected remedy defined in the ROD also calls for focused extraction. Focused extraction has not yet been fully implemented, and will be addressed in future documents as appropriate. 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 evaluations.

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

The following table summarizes the designed pumping rate for each extraction well. The rates summarized below are documented in the RDGM III modeling report (URS, 2002a). Pumping rates for EW-12 and EW-13 are from the Load Line 1 Remedial Design (URS, 2005).

Extraction Well	RDGMIII Pumping Rate (gpm)
EW-1	200
EW-2	150
EW-3	200
EW-4	150
EW-5	175
EW-6	275
EW-7	300
EW-8	250
EW-9	275
EW-10	400
EW-11	350
EW-12	250
EW-13	250

1.6 DEVELOPMENT OF THE SITE GROUNDWATER MODEL

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

- Conceptual Groundwater Model (Woodward-Clyde, 1996b and 1996c)
- Remedial Design Groundwater Model (RDGM) (Woodward-Clyde, 1998)
- Remedial Design Groundwater Model Part II (RDGMII) (Woodward-Clyde, 1999a)
- Remedial Design Groundwater Model III (RDGMIII) (URS, 2002a)
- Remedial Design Groundwater Model IV (RDGMIV) (URS, 2004a)
- Updates to RDGMIV described in the Load Line 1 Remedial Design (URS, 2005).

To minimize redundancies, this work plan will refer to the above-mentioned documents when appropriate. The current version of the RDGM model, was last updated with additional site-specific information as part of the design effort for the new Load Line 1 treatment system. The Draft Final Load Line 1 Containment System Remedial Design (URS, 2005) documents how the model was used during the design. The RDGM is currently being updated with additional site-specific data, and is being modified in response to previous EPA and NDEQ comments.

The primary purpose of the RDGM modeling activities was to provide a basis of design for the hydraulic containment system. The containment system was designed to contain the area of attainment boundary as defined in the ROD (Woodward-Clyde, 1996a). The area of attainment (AOA) is defined in Figure 3 of the 1997 OU2 ROD.

In 2003-2004, the groundwater model was significantly revised by expanding the model domain to the physical boundaries of the aquifer (e.g., the Platte River, Silver Creek, and the loess-mantled till uplands), refining the grid dimensions to place observation wells in cells separate from pumping wells, and to update concentrations based on additional plume characterization.

The current site model has three layers: Layer 1 (the unsaturated zone), Layer 2 (the upper part of the unconsolidated aquifer corresponding to the shallow monitoring well network), and Layer 3 (the lower part of the unconsolidated aquifer corresponding to the intermediate monitoring well network). The top of the sandstone and shale of the Omadi Formation represent the bottom of the model. Section 4 of the Draft RDGMIV Technical Memorandum (URS, 2004a) provides a complete description of the site geology used to construct the model layers.

Section 4 of the Draft RDGMIV Technical Memorandum (URS, 2004a) also provides a complete description of the modeled hydraulic conductivity field.

The groundwater model was further updated in 2005 for the design of the Load Line 1 treatment system including extraction wells EW-12 and EW-13. The update included:

- Inclusion of Wahoo Creek by expanding the active part of the model from Silver Creek to the southwest edge of Todd Valley (i.e., to the loess-mantled till uplands south of Wahoo Creek).
- Adjustment of drain cell elevations in the Platte River valley to generally within 1 to 5 feet of ground surface.
- Addition of chemical data collected by ECC using direct-push methods near Silver Creek in 2004.
- Addition of registered irrigation and municipal supply wells. This includes use of Lincoln Water System wells in the history matching and future predictions, and the use of Omaha Municipal Utility District Platte West wells in future predictions.

1.7 SUMMARY OF PAST CONTAINMENT EVALUATION EFFORTS

The particle tracking code MODPATH (Pollock, 1989) and solute transport code MT3DMS (Zheng, 1999) have been used at different points throughout the life of this project to estimate the containment system capture zone.

A containment evaluation was performed for EW-1 and EW-8 using hydraulic data from October 1998 through July 1999. Measured water levels were compared with predicted water levels, and aquifer parameters were calculated. The results were compared to the aquifer parameter values calculated in the pumping tests of EW-1 and EW-8 (Woodward-Clyde, 1996d). The drawdown observed during pumping of EW-1 and EW-8 generally fell within ± 20 percent of predicted values.

In August 2001, pumping tests were conducted on EW-3, EW-5, and EW-10 to estimate aquifer parameters.

In the Initial Containment Evaluation (URS, 2003) aquifer parameters were estimated using water level data from EW-1, EW-3, EW-5, EW-7, and EW-10. The estimates of hydraulic conductivity were revised for EW-5, EW-7, and the hydraulic conductivity estimates for EW-1, EW-3, EW-8 and EW-10 were corroborated. As a result, the assumed hydraulic conductivity near EW-3, EW-5 and EW-7 was updated in the model. The revised model (RDGMIII) was used to evaluate the system capture zone. The revised capture zone estimates indicated that an additional well, EW-11, was needed to contain the Load Line 1 TCE plume.

The One-Year Containment Evaluation (URS, 2004b) evaluated the effectiveness of the containment system by comparing the model-predicted drawdowns to the observed drawdowns. In general there was good agreement between the predicted and measured drawdowns in the observation wells at EW-1, EW-3, EW-5, EW-7, and EW-10. Aquifer parameters were recalculated using drawdown observations. Hydraulic conductivity values were within 10% of the original estimates, but storativity values were higher.

In February 2003, three wells, EW-4, EW-9, and EW-10 were operating below their design rates. Particle-tracking analysis using the revised groundwater model predicted that if the system continued to operate at February 2003 pumping rates (2,450 gpm) there would be some uncertainty as to whether or not the system would completely contain the plumes near EW-1, EW-4, and EW-10.

Subsequent analysis using transient particle tracking in the new model (RDGMIV) in 2004 estimated that the plumes were contained while the system was operating at the March 2002 (2,615 gpm) and August 2002 (2,500 gpm) pumping rates. However, the particle tracking analysis indicated that there would be some uncertainty as to whether or not the system would completely contain the plumes using the October 2003 pumping rate (2,345 gpm).

These areas of uncertainty will be addressed as part of this Containment Evaluation Work Plan.

Although not part of the previous evaluations discussed above, regional water levels in October 2005 were the lowest water levels recorded since the system began pumping in February 2002,

and did not rebound significantly over the following winter. For example, the water level in background monitoring well MW-3A dropped approximately 4 feet in four years, representing a decline in aquifer thickness (one of the factors determining capture pumping rate) of approximately 3.5 percent. As stated in the materials for the "Capture Zone Analysis for Pump-and-Treat Systems" training (EPA, 2005), capture width is dependent on aquifer thickness, as well as a number of other parameters.

In conclusion, the discussion above serves to illustrate that hydraulic containment can be achieved under a variety of different pumping rates, depending on the prevailing hydraulic conditions of the time. Each of the evaluations performed in the past concluded that, based on the site conditions of the time, there was adequate hydraulic containment, except in a few localized areas that were less certain. These areas of uncertainty are specifically addressed in this document by the addition of new Observation and Monitoring Wells. As has been documented by USACE and others, the entire region encompassing the Mead site is currently experiencing depressed groundwater elevations, and has experienced other drought-like conditions in the recent past. Due to these variable hydraulic conditions at the site, it must be understood that the extraction flow rates necessary to maintain hydraulic containment are not fixed or static, and that hydraulic containment can be achieved under a variety of different pumping rates.

1.8 SCOPE

The primary goal of the containment evaluation is to determine whether the hydraulic containment system is effectively capturing the extent of TCE and RDX contamination above the final target cleanup goals of 5 µg/L and 2 µg/L, respectively. Effective capture means containment. The intent of the annual containment evaluation will be to demonstrate "effective capture" by illustrating that the known extent of contamination (in both the horizontal and vertical directions) is within the hydraulic capture zone generated by the extraction wells. It is the extent of contaminated groundwater in both the horizontal and vertical directions that define the "Target Capture Zone" for this evaluation. Therefore, the capture zone(s) developed by the extraction well system will be evaluated in three dimensions. The Target Capture Zone is shown on **Figure 1-3**. **Figure 1-3** depicts the Ttarget Capture Zone that is based on previous containment evaluations and the estimated extent of the hydraulic capture zone generated by the extraction wells.

Several lines of converging evidence will be used to evaluate the performance of the extraction well system. In order to evaluate the performance, the following items will be performed:

- Install additional observation wells at non-instrumented extraction wells.
- Evaluate water level measurements collected throughout each year and develop potentiometric surface maps and groundwater flow-line maps to demonstrate that the extraction system is maintaining an inward gradient.
- Comparison of specific capacities to previous measurements to evaluate the need for well maintenance.

- Particle tracking using updated aquifer parameters to estimate the width and continuity of capture zones.
- Install additional monitoring wells and evaluate concentration trends at all screened intervals.

The additional observation and monitoring wells specified in this document have been specifically designed and located to address the areas of uncertainty that were identified in previous containment evaluations. Future evaluations of containment will rely on updated information regarding the horizontal and vertical extent of contamination. It is expected that the known extent of contamination will change over time, as new investigation efforts are completed at the Site. This workplan is not intended to present a complete depiction of the known extent of contamination at the time it was authored. Instead, this workplan will present methodologies for assessing whether or not adequate containment is being maintained, regardless of how the size or area of the contaminant plume (or plumes) may change over time.

The purpose of this section is to present the methods for collecting the hydraulic data that will be used in order to demonstrate the ability of the extraction system to contain the groundwater contaminant plumes.

2.1 OBJECTIVE OF HYDRAULIC DATA COLLECTION

As part of the containment evaluation, the hydraulic water level data will be used to accomplish the following objectives:

1) Estimate aquifer parameters at all of the instrumented extraction wells, compare those parameters to the modeling assumptions used, and update the model if necessary.

2) Compare observed drawdowns to model-predicted drawdowns.

3) Prepare potentiometric surface maps to assess inward gradient.

4) Determine the current specific capacity of each extraction well, and compare this to the initial specific capacity to determine if well maintenance is required.

In order to accomplish these four objectives, additional monitoring points (observation wells) are needed. These additional monitoring points are described below, and in **Table 2-1**. **Table 2-2** describes the well screen intervals of the existing observation wells.

1) Install three sidegradient observation wells at EW-4, EW-6, EW-9, and EW-11 to estimate aquifer parameters at these wells.

2) Install two downgradient observation wells at EW-4, EW-6, EW-9, and EW-11 to provide gradient pairs to identify the extent of the inward gradient near these wells.

3) Install one observation well downgradient of the observation wells between EW-8 and EW-11 (OW-19), EW-10 and EW-9 (OW-51), EW-9 and EW-7 (OW-40), EW-7 and EW-6 (OW-44), and EW-6 and EW-5 (OW-33). These will serve as gradient pairs to evaluate the gradient between the extraction wells.

The proposed observation wells will be screened at the same elevation as the nearest extraction well, provided that the observation well screen is above bedrock at the proposed location. Locations of the proposed observation wells are presented on **Figures 2-1, 2-2, 2-3, 2-4,** and **2-5**.

These additional observation wells will complement the observation wells that already exist at the Site and are shown on **Figures 2-6** and **2-7**. The primary area of uncertainty revealed by the previous containment evaluation efforts is the area between EW-4 and EW-5. The additional monitoring points described above are intended to address this area of uncertainty by establishing several pairs of observation wells (i.e. gradient pairs) that will help to determine the actual extent of the capture zones developed by each EW. Extraction well EW-4 is downgradient of EW-5, EW-3 is downgradient of EW-4, and EW-2 is downgradient of EW-3. Therefore, the downgradient gradient pairs at each well are oriented towards the adjacent well, and inter-well gradient pairs would be redundant. Therefore, a sidegradient pair of wells will be

installed near EW-4 to serve as a gradient pair. The locations of the observation wells may need to be adjusted, particularly in cultivated areas, to accommodate property owner restrictions.

Installation of additional observation wells at EW-2 is likely to be delayed due to access restrictions imposed by the landowner. However, USACE will continue to pursue this issue with the intent of eventually installing observation wells in the vicinity of EW-2.

2.2 ESTIMATION OF AQUIFER PARAMETERS

The aquifer parameters of hydraulic conductivity, storativity, and saturated thickness were estimated from pumping tests of EW-1 and EW-8 in 1996 (Woodward-Clyde, 1996d); and EW-3, EW-5, and EW-10 in 2001 (URS, 2001). Steady-state water level data collected for previous containment evaluations were also used to estimate aquifer parameters in EW-1 and EW-8 in the Containment Evaluation Summary Technical Memorandum (Woodward-Clyde, 1999b). Aquifer parameters were corroborated in EW-1, EW-3, EW-5, EW-7, EW-8, and EW-10 in the Initial Containment Evaluation (URS, 2003), and again in the One-Year Containment Evaluation (URS, 2004b).

Aquifer parameters will be estimated using steady-state water level data at the newly instrumented extraction wells EW-4, EW-6, EW-9, and EW-11. The drawdown contribution from neighboring extraction wells will be removed using the principle of superposition. According to the principle of superposition, the drawdown caused by two or more wells is the sum of the drawdown caused by each separate well. This principle is used to remove the effects of adjacent pumping wells so that only the drawdown from the pumping well being analyzed is used to estimate aquifer properties.

The estimated aquifer parameters will again be compared to the values used in the Site groundwater model to determine if there are any significant discrepancies between the estimated parameters based on observed water levels, and the assumed parameters used in the model. Estimated parameters based on observed water levels will also be used to determine if any of the parameters assumed in the model should be modified The parameters in the model will continue to be modified to reflect the actual observations and measurements obtained in the field, as appropriate. Consistent with the previous Containment Evaluation Work Plan (CEWP), differences in aquifer parameters are considered significant if they differ by ±20 percent. The value of ± 20% is sufficient to account for normal variation in aquifer parameters due to seasonal effects and minor AND acceptable differences between the modeled parameters and the conditions observed in the field. The purpose of defining a variation of ± 20% is to identify areas of higher uncertainty that may require more attention from the site modeler and site managers. The actions that will be taken will be dependent on the type and magnitude of variation observed.

2.3 WATER LEVEL MEASUREMENTS

Water levels in the new observation wells will be measured following installation. Water levels will also be collected on a semiannual frequency (or more frequent), along with existing piezometers, site monitoring wells, the USGS wells, the Lower Platte North Natural Resource District wells, and the Lincoln Water System wells. The wells in the Wann Basin that are

measured by the Lower Platte North Natural Resource District, the U.S. Geological Survey, Lincoln Water Service, and the University of Nebraska are listed in **Table 2-3**.

The groundwater level measurements to be collected will include the well location coordinates, the date of measurement, time of measurement, depth to water, elevation of the top of the observation well casing/riser pipe, and water level elevation. The depth to groundwater will be measured from the top of the observation well casing/riser pipe. Surface water stages at existing gauges will also be measured within the same period. The observation and monitoring well measurements will be coordinated with the Lower Platte North Natural Resource District to coincide with the semi-annual measurement of water levels by numerous agencies within the Wann Basin area.

There are times when the extraction well system is taken off-line, in order to perform planned maintenance work. These planned shutdown events provide opportunities to collect hydraulic information (water level readings) while the extraction wells are not in operation. Most of the rebound in the vicinity of the extraction system observation wells will occur overnight, if not within hours. A continuous data level recorder installed in OW-45, located 41 feet from EW-10, showed that after a temporary shutdown on March 4, 2002, water levels rebounded approximately 3 feet (60 percent) within an hour, and an additional foot (20 percent) overnight. Measurements in more distant monitoring wells MW-3B, MW-25B, MW-44B, MW-45B, and MW-46B showed drawdowns of approximately 0.2 feet or less. The water levels should be collected as close to the resumption of pumping as possible (allowing as much rebound as possible) while allowing sufficient time to complete the task. These data will be used to establish a potentiometric surface under non-pumping conditions, for use in the ongoing modeling efforts.

Water level data will be used to verify that actual observed drawdowns and observed capture zones compare well to the model predicted drawdowns and estimated capture zones. Water level data will be used to generate new potentiometric surface maps for use during the containment evaluation process. 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.

The observed capture zones will be illustrated using the actual operational data and the measured water levels collected during the previous year. The current version of the site groundwater model will be used to prepare these illustrations (such as particle tracking figures, drawdown, flow vectors, etc…).

Hydrographs will also be prepared and examined for local water level trends or fluctuations. To evaluate non-pumping regional groundwater fluctuations, hydrographs will be prepared from the following baseline monitoring well clusters: MW-3, MW-25, MW-32, MW-44, MW-45, and MW-46. Examples of regional water level trends are system-wide decreases in the potentiometric surface due to irrigation pumping or increases in the potentiometric surface due to increased recharge to the aquifer.

2.4 DETERMINE SPECIFIC CAPACITY OF THE EXTRACTION WELLS

The containment system has been, and will continue to be operated in accordance with standard operating procedures defined in the 2002 Operations and Maintenance Manual (ECC, 2002).

The specific capacity of an extraction well is the pumping rate per unit drawdown. Specific capacity varies with pumping rate, i.e., specific capacity declines as pumping rate increases. An obvious reduction in specific capacity over time can be an indication of poor well performance, and that well maintenance may be necessary. The purpose of collecting specific capacity data will be to compare (at a similar pumping rate) the current specific capacity to the initial specific capacity determined at the time of installation. As part of the annual containment evaluation, the hydraulic water level data will be used in conjunction with the well pump operating data to calculate the specific capacity of each extraction well. Well maintenance shall be performed if the specific capacity drops to 75% of the capacity of the well as originally installed. The 75% specific capacity threshold ensures that specific capacities are not permitted to drop in an unconstrained manner.

The purpose of this section is to discuss the collection, evaluation, and reporting of chemical groundwater data for use during the containment evaluation. Both chemical and hydraulic data will be collected from the Site monitoring wells.

The foundation of the containment evaluation is a comprehensive monitoring program. This section describes additional monitoring wells that will be incorporated into the ongoing site-wide GMP.

3.1 ADDITIONAL GROUNDWATER MONITORING WELLS

In order to address the areas of uncertainty identified in previous containment evaluations and summarized in Section 1.7, additional monitoring wells are proposed in downgradient areas as well as along the eastern side of the site. Proposed new well locations are shown on **Figure 3-1**, and are also described in **Tables 3-1** and **3-2**.

Monitoring wells MW-86-88 and MW-94-118 will be installed in Fall 2006 pending access and lease agreement approval with the individual landowners. A direct-push investigation may or may not be conducted prior to the installation of the wells on a case-by-case basis. The purpose of the sampling is to verify that the monitoring wells are placed in areas where contamination is below action levels, with the exception of MW-99 which will be installed within the plume. The determination for sampling prior to drilling will be based on historic sampling results, proximity to other monitoring wells, and proximity to other Site features.

Each proposed monitoring location includes 2 to 3 wells. Shallow monitoring wells will be installed at the base of the top half of the saturated thickness of the aquifer, and the intermediate wells will be installed at the base of the unconsolidated aquifer. If sandstone is encountered at the top of bedrock, as anticipated, deep wells with 5-foot screens will be installed screened 4 feet below the top of bedrock to accommodate a seal, consistent with the well construction methods used at this Site.

The monitoring wells will be located outside of the cone of influence of the extraction wells. Final placement of the well is dependent on approved access agreements as well as final lease agreements with individual landowners.

Once installed, the monitoring wells will be sampled quarterly for the first year and analyzed for VOCs and explosives. After the first year of sampling, the monitoring wells will be placed on the schedule for monitoring as part of the site-wide GMP.

3.2 RATIONALE FOR SELECTING MONITORING WELLS

Locations of new monitoring wells are based on the model-predicted capture zones and results from the October and November 2005 direct-push investigation. Groundwater monitoring wells to be sampled and evaluated as part of the containment evaluation are shown on **Figure 3-2**. The rationale for proposed sampling is listed in **Table 3-1**.

3.3 EVALUATION OF COC CONCENTRATION TRENDS

Monitoring well results will be reviewed, tabulated, plotted on figures, and graphed versus time as part of the containment evaluation. Concentration trends, related to the chemicals of concern (Section 1.3), will be evaluated at all screened intervals.

Prior to the long term operation of EW-12, a direct-push investigation was conducted in January 2006 to determine the extent of contamination above the target cleanup goals in the area downgradient of EW-12 and EW-13. The results of that investigation will be presented in a separate document. Based on previous direct-push activities, there is known to be TCE contamination above the target cleanup goal downgradient of EW-12 and EW-13. As part of the containment evaluation, the capture zone for EW-12 will be evaluated to determine the extent to which downgradient concentrations above the action level are being captured. The methods of evaluation of the Load Line 1 plume will follow the same procedures as outlined in this work plan. (Section 4.2 – POSSIBLE RESPONSE ACTIONS). If it is determined that the capture zone for EW-12 or EW-12 and EW-13 combined will not capture the contamination above the cleanup goals, the portion of that contamination south of the extraction wells that is not captured will be addressed in a separate action.

The purpose of this section is to describe potential response actions that may be necessary in the event that future groundwater sampling results show detections of site-related contaminants at locations outside the known extent of contamination.

4.1 ANNUAL CONTAINMENT EVALUATION

An annual evaluation of the performance of the extraction system will be performed by USACE, and submitted to the United States Environmental Protection Agency (USEPA) and Nebraska Department of Environmental Quality (NDEQ), for review. This annual evaluation will be based on the observations and measurements collected during the course of each calendar year. The evaluation will present a determination that the known extent of groundwater contamination is, or is not, being successfully contained within the hydraulic capture zone generated by the extraction wells.

4.2 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 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.

If the results of future groundwater sampling efforts show detections of site-related contaminants at locations outside the known extent of contamination, then USACE will implement a series of responses actions, as described below. These response actions will be implemented even if it is demonstrated that the remedy is operating properly and that the known extent of groundwater contamination is within the hydraulic capture zone generated by the extraction wells.

Regardless of any findings related to this tiered approach, alternate water supply will be provided to any residence where the water supply well has become impacted by site related contaminants at levels above the established action levels for this site. 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.

Tier 1 Actions:

If detection(s) of ROD Contaminants of Concern above action levels occur in a single monitoring well (MW) or water supply well (WSW) outside of the known extent of contamination, then:

- If detection above action level occurs in a private WSW, immediately supply the residence with alternate water supply (bottled water or carbon filtration system). Continue to sample WSW quarterly.
- If detection occurs in a MW, resample that MW immediately upon receipt of (validated) data;
- place that MW on a quarterly sampling schedule for a 2 year period;
- include resampling of any nearby MW, as appropriate, if within close proximity to the MW with the exceedance;
- any detects above action levels in that MW (or adjacent MW) within the 2 year period triggers escalation to Tier 2 actions;
- escalation to Tier 2 actions may be triggered if more than one MW 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 WSWs 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 MW in areas near the MW where the exceedance(s) were detected;
- Hydraulic evaluation of vicinity groundwater which could include installation and monitoring of temporary pieziometers, aquifer testing, and additional modeling specific to the area in question.
- If Tier 2 investigation shows plume movement beyond the original known extent of contamination that may impact water supply wells, move to Tier 3 action;
- If Tier 2 investigation shows that the plume may migrate beyond the capture zone (break containment), move to Tier 3 action;
- If plume movement does not threaten water supply wells and will remain within the capture zone of the extraction network, Tier 3 action is not warranted. Continue monitoring the MW on a quarterly basis for one year.

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:

- Provide alternate water or filtered water to impacted residents per the OU2 ROD (contamination exceeding action levels). Time to implement: 1-2 weeks.
- Take abatement actions to mitigate plume movement, such as, but not necessarily limited to:
    - Modifying pumping rates of existing EWs. Time to implement: 3-6 months.
    - Adding pumping/cleanup capacity (such as EWs or groundwater circulation wells (GCWs) to augment the EW network). Time to implement: 9-18 months.
    - Consulting with the regulatory agencies to implement alternate groundwater remediation techniques as appropriate. Time to implement: Indeterminate.
    - 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.

5.1 ANNUAL REMEDY PERFORMANCE REPORT

The annual containment evaluation will be incorporated into the Annual Remedy Performance Report (ARPR), which is intended to include the annual summary of all data generated at the Site during the course of each year.

For the purpose of the annual containment evaluation, the remedy is considered to be functioning properly as long as it can be demonstrated by USACE to the satisfaction of the EPA and NDEQ, that the known extent of contamination is being hydraulically contained within the capture zone by the extraction well system. This demonstration will be performed on an annual basis and will use the hydraulic, chemical and operational data from the previous year, in conjunction with the current site groundwater model to illustrate that the known extent of contamination is within the hydraulic capture zone generated by the extraction well system.

The general approach to how this demonstration will be performed is as follows:

1. The known extent of contamination 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 illustrate the hydraulic capture zone generated by the extraction wells, using the operational and monitoring data obtained throughout the year. The known extent of contamination will be compared (or overlaid) to the hydraulic capture zone, in order to conclude that the extent of contamination is, or is not, within the hydraulic capture zone. 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 hydraulic measurements obtained each year will be used to verify the model's conclusions, along with the analytical results from the downgradient and sidegradient monitoring wells.

Relative to the containment evaluation, the ARPR will include, but is not limited to, the following specific items:

- 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 O&M data such as well pumping rates and water levels in the extraction wells.
- Tables summarizing the analytical results of the southern and eastern perimeter monitoring wells identified in the CEWP.
- Plots showing observed drawdown for each instrumented extraction well.
- Tables and plots showing gradients between gradient pairs.
- Hydrographs of MW-3, MW-25, MW-32, MW-44, MW-45, and MW-46 (or other wells as deemed appropriate) located outside of the influence of the extraction system, to illustrate seasonal groundwater level variations across the entire site.
- Potentiometric surface maps and flow lines.
- Particle tracking analysis to determine and illustrate the capture zone of each extraction well as well as the entire system – in both the horizontal and vertical directions.

- Discussion of the stagnation zone, and the implications to containment.
- Analysis of external influences such as other supply wells in the vicinity.
- Discussion of the specific capacity in each extraction well, measured over time.
- Discussion of aquifer parameters based on observations vs. model assumptions.

The specific information described above will be used to support the evaluation of containment using the six step process described in Section 5.2 below.

In addition to the minimum requirements described above, future containment evaluations will be performed using pertinent EPA and other agency guidance documents as appropriate. The guidance documents that will be followed include, but are not limited to:

- "A Systematic Approach for Evaluation of Capture Zone at Pump and Treat Systems" – Draft EPA document currently in review but expected to be published in 2006
- "Elements of Effective Management of Operating Pump and Treat Systems" EPA 542-R-02-009, 2002
- "Methods for Monitoring Pump and Treat Performance" EPA/600/R-94/123, 1994

5.2 SCOPE OF THE ANNUAL CONTAINMENT EVALUATIONS

In accordance with the EPA guidance documents referenced above, the annual containment evaluation will present an analysis of the system effectiveness using a six-step process. This six-step process was outlined in the October 2005 training session – "Capture Zone Analysis for Pump and Treat Systems" – which was presented at the USEPA Region VII offices, and is also documented in the EPA guidance documents referenced above. The six-step process is built upon the use of converging lines of evidence and technical judgment. The following table presents a summary of the six-step process and how this containment evaluation workplan will allow future evaluations to be performed in accordance with the six-step process:

STEP PROCESS FOR CAPTURE ZONE ANALYSIS AS DESCRIBED IN EPA GUIDANCE	
STEPS	**CONTRIBUTING COMPONENTS OF THIS WORKPLAN (OR OTHER RESOURCES)**
STEP 1	
Review site data, site conceptual model, and remedy objectives	• Site data will be included in annual ARPR – along with annual containment evaluation • Site conceptual model included in updated site groundwater models – history of site model described in Section 1 of this workplan • Remedy Objectives defined in OU2 ROD and summarized in Section 1 of this workplan
STEP 2	
Define site-specific Target Capture Zone(s)	• Target capture zone described in Section 1 of this workplan
STEP 3	
Interpret Water levels - potentiometric surface maps - water level pairs	• Described in Section 2 of this workplan
STEP 4	
Perform calculations as appropriate based on site complexity - estimated flow rate calculations - capture zone width calculations - modeling to simulate water level heads, in conjunction with particle tracking and/or transport modeling	• Updated site groundwater model will be used to perform calculations such as flow rates, capture zone widths, and particle tracking to conservatively simulate transport • This workplan describes additional data needs and measures to fulfill those needs, in order to continuously improve the site model
STEP 5	
Evaluate Concentration Trends	• Described in Section 3 of this workplan
STEP 6	
Interpret actual capture based on Steps 1-5, compare to target capture zone, assess uncertainties	• Future containment evaluation will provide such interpretation – using data and methods described in Steps 1-5 as well as justifiable technical judgment

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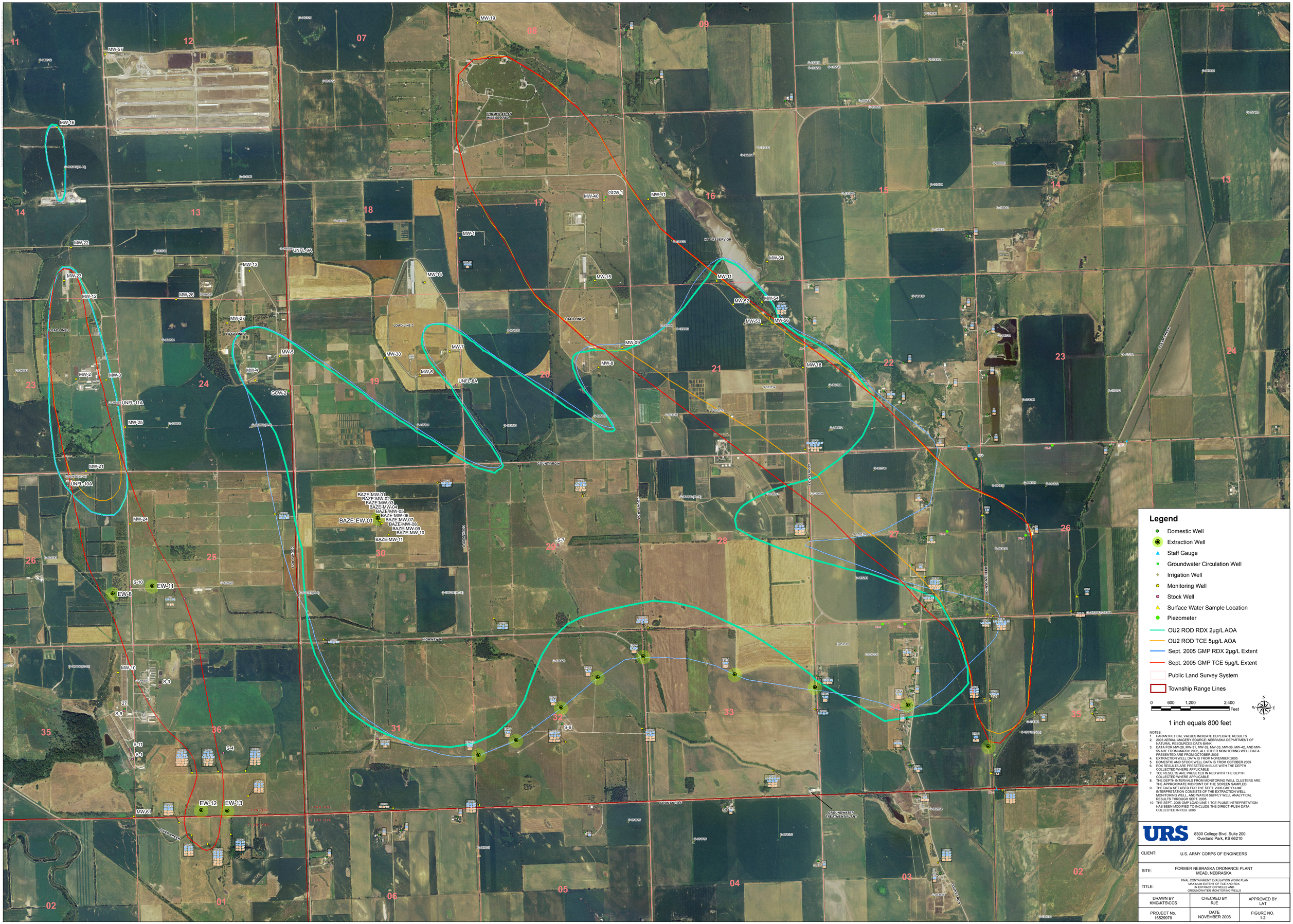


Legend

- Domestic Well
- Extraction Well
- Staff Gauge
- Groundwater Circulation Well
- Irrigation Well
- Monitoring Well
- Stock Well
- Surface Water Sample Location
- Piezometer
- OU2 ROD RDX 2µg/L AOA
- OU2 ROD TCE 5µg/L AOA
- Sept. 2005 GMP RDX 2µg/L Extent
- Sept. 2005 GMP TCE 5µg/L Extent
- Public Land Survey System
- Township Range Lines

0 600 1,200 2,400 Feet

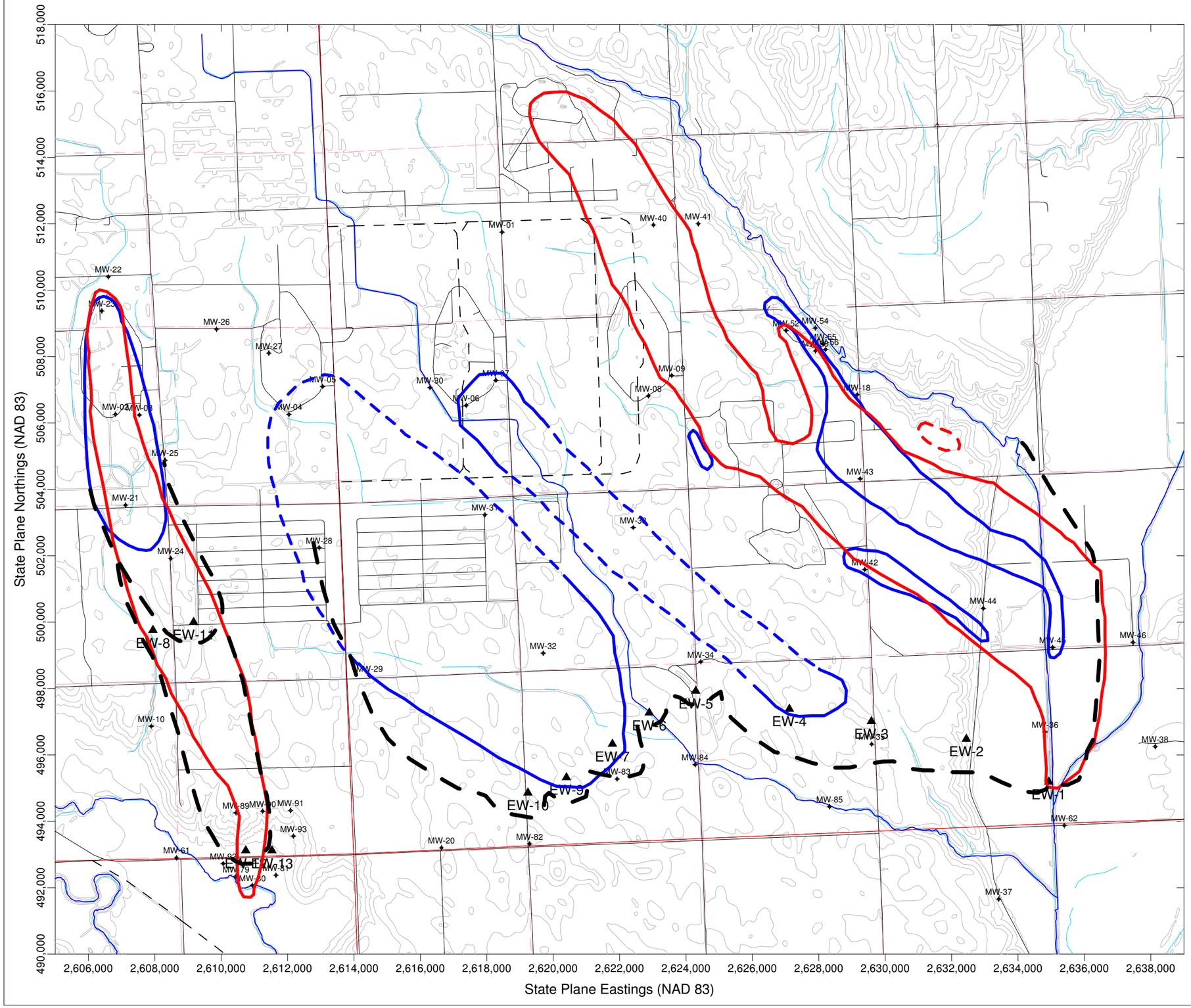
1 inch equals 800 feet

NOTES:
1. PARANTHETICAL VALUES INDICATE DUPLICATE RESULTS
2. 2003 AERIAL IMAGERY SOURCE: NEBRASKA DEPARTMENT OF NATURAL RESOURCES DATA BANK
3. DATA FOR MW-28, MW-31, MW-32, MW-33, MW-36, MW-42, AND MW-55 ARE FROM MARCH 2005. ALL OTHER MONITORING WELL DATA PRESENTED ARE FROM OCTOBER 2005
4. EXTRACTION WELL DATA IS FROM NOVEMBER 2005
5. DOMESTIC AND STOCK WELL DATA IS FROM OCTOBER 2005
6. RDX RESULTS ARE PRESETED IN BLUE WITH THE DEPTH COLLECTED WHERE APPLICABLE
7. TCE RESULTS ARE PRESETED IN RED WITH THE DEPTH COLLECTED WHERE APPLICABLE
8. THE DEPTH INTERVALS FROM MONITORING WELL CLUSTERS ARE THE APPROXIMATE MIDPOINT OF THE SCREEN SAMPLED
9. THE DATA SET USED FOR THE SEPT. 2005 GMP PLUME INTERPRETATION CONSISTS OF THE EXTRACTION WELL, MONITORING WELL, AND WATER SUPPLY WELL ANALYTICAL RESULTS THROUGH SEPT. 2005
10. THE SEPT. 2005 GMP LOAD LINE 1 TCE PLUME INTREPRETATION HAS BEEN MODIFIED TO INCLUDE THE DIRECT-PUSH DATA COLLECTED IN FEB. 2006

URS
8300 College Blvd. Suite 200
Overland Park, KS 66210

CLIENT:	U.S. ARMY CORPS OF ENGINEERS
SITE:	FORMER NEBRASKA ORDNANCE PLANT MEAD, NEBRASKA
TITLE:	FINAL CONTAINMENT EVALUATION WORK PLAN MAXIMUM EXTENT OF TCE AND RDX IN EXTRACTION WELLS AND GROUNDWATER MONITORING WELLS

DRAWN BY KMG\KTS\CCS	CHECKED BY RJE	APPROVED BY LAT
PROJECT No. 16529979	DATE NOVEMBER 2006	FIGURE NO. 1-2



MW-25 Monitoring Well Cluster

EW-2 Existing Extraction Well

Target Capture Zone (Includes Entire Saturated Thickness of Aquifer Within Capture Zone)

Spring 2006
Maximum Extent of TCE > 5µg/L

Spring 2006
Maximum Extent of RDX > 2µg/L

N

0 1000 2000 3000 4000 Feet

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Designed by: M.E.W.	FINAL CONTAINMENT EVALUATION WORK PLAN OPERABLE UNIT NO. 2 FORMER NEBRASKA ORDNANCE PLANT - MEAD, NE
Drawn by: M.E.W.	U.S. Army Corps of Engineers **EXTRACTION WELL SYSTEM TARGET CAPTURE ZONE**
Checked by: L.A.T.	Scale: As Indicated
Submitted by: L.A.T.	Date: NOVEMBER 2006
	Fig. No.: 1-3
	Figure Number: 1-3

State Plane Northings (NAD 83)

497,400
497,200
497,000
496,800
496,600
496,400
496,200
496,000
495,800
495,600
495,400
495,200
495,000
494,800
494,600

2629000
2629400
2629800
2630200
2630600
2631000
2631400
2631800
2632200
2632600
2633000
2633400
2633800
2634200
2634600

State Plane Eastings (NAD 83)

OW-24 Existing OW

EW-2 Existing EW

OW-74 Proposed OW

Modeled Groundwater Elevations

Flow Vectors Based on Modeled Groundwater Elevations. Groundwater Flow Directions Are Not Necessarily Equivalent to Transport Pathlines.

0 100 200 300 400 Feet

N

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KANSAS CITY, MISSOURI

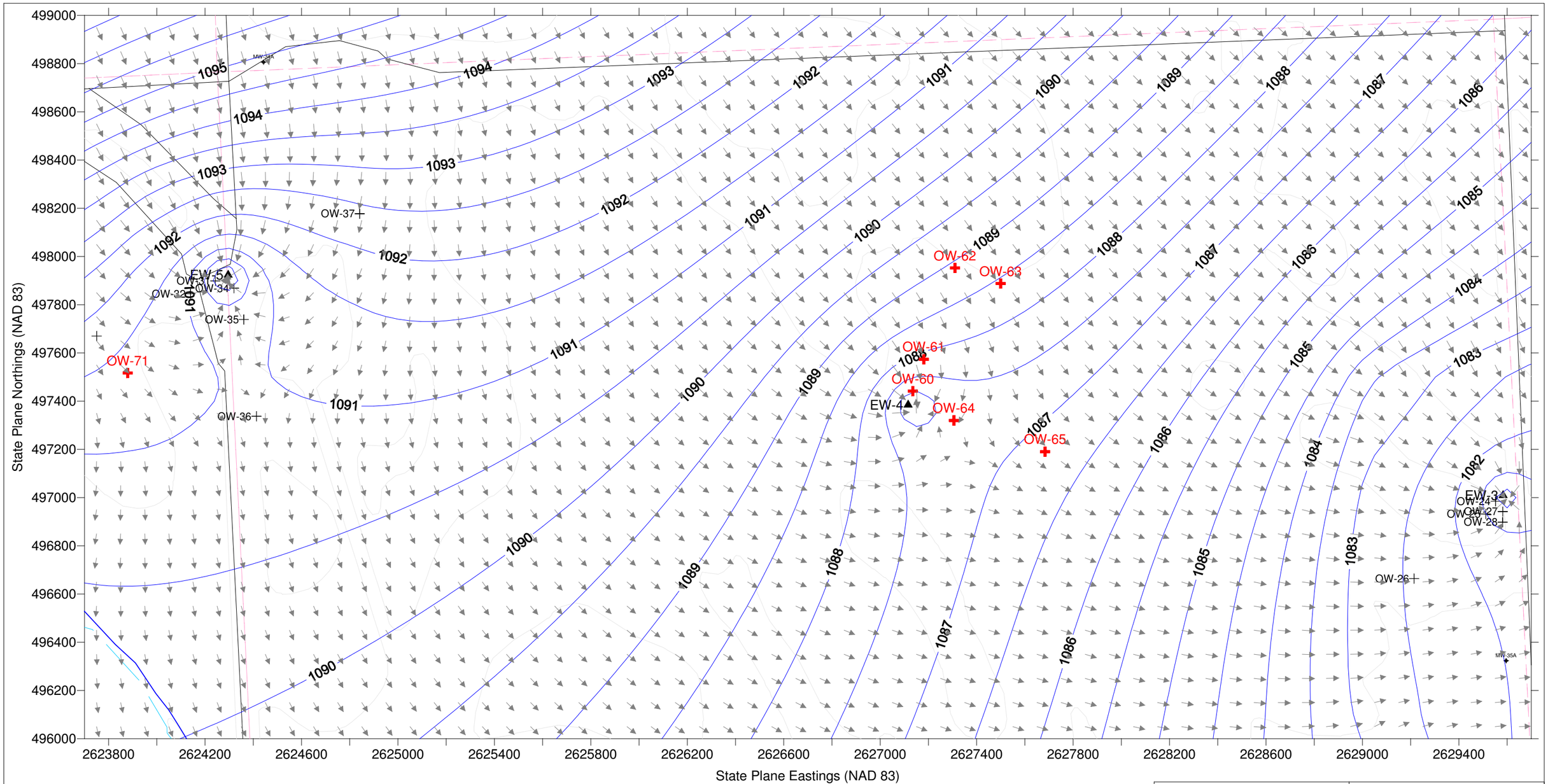
Designed by: M.E.W.
Drawn by: M.E.W.
Checked by: L.A.T.
Submitted by: L.A.T.

U.S. Army Corps of Engineers

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

PROPOSED EW-2 OBSERVATION WELLS

Scale: As Indicated
Date: NOVEMBER 2006
Fig. No.: 2-1
Figure Number: 2-1



OW-24 Existing OW

EW-2 Existing EW

OW-74 Proposed OW

Modeled Groundwater Elevations

Flow Vectors Based on Modeled Groundwater Elevations. Groundwater Flow Directions Are Not Necessarily Equivalent to Transport Pathlines.

0 100 200 300 400 Feet

N

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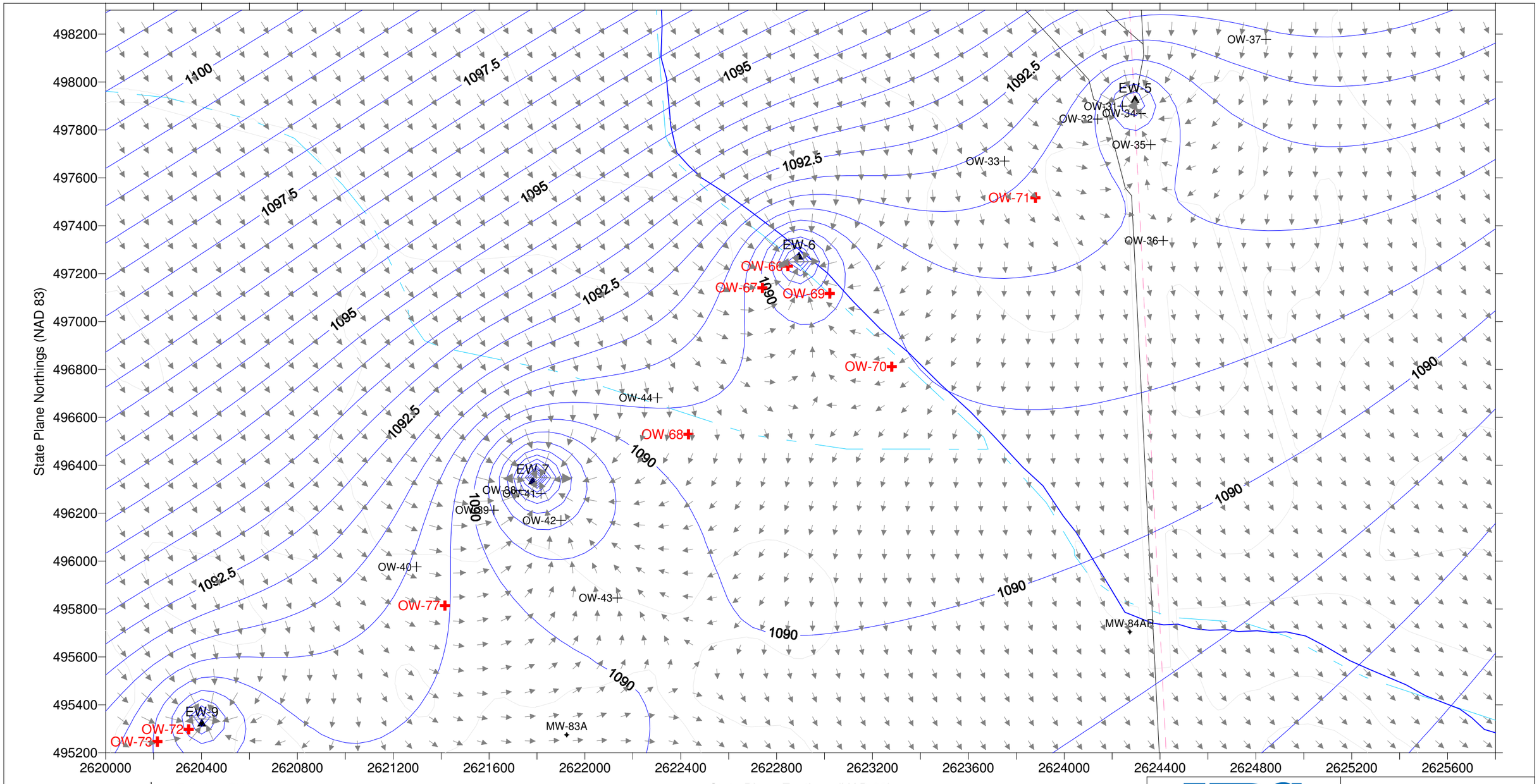
Drawn by: M.E.W.	U.S. Army Corps of Engineers **PROPOSED EW-4 OBSERVATION WELLS**
Checked by: L.A.T.	Scale: As Indicated
Submitted by: L.A.T.	Date: NOVEMBER 2006
	Fig. No.: 2-2
	Figure Number: 2-2



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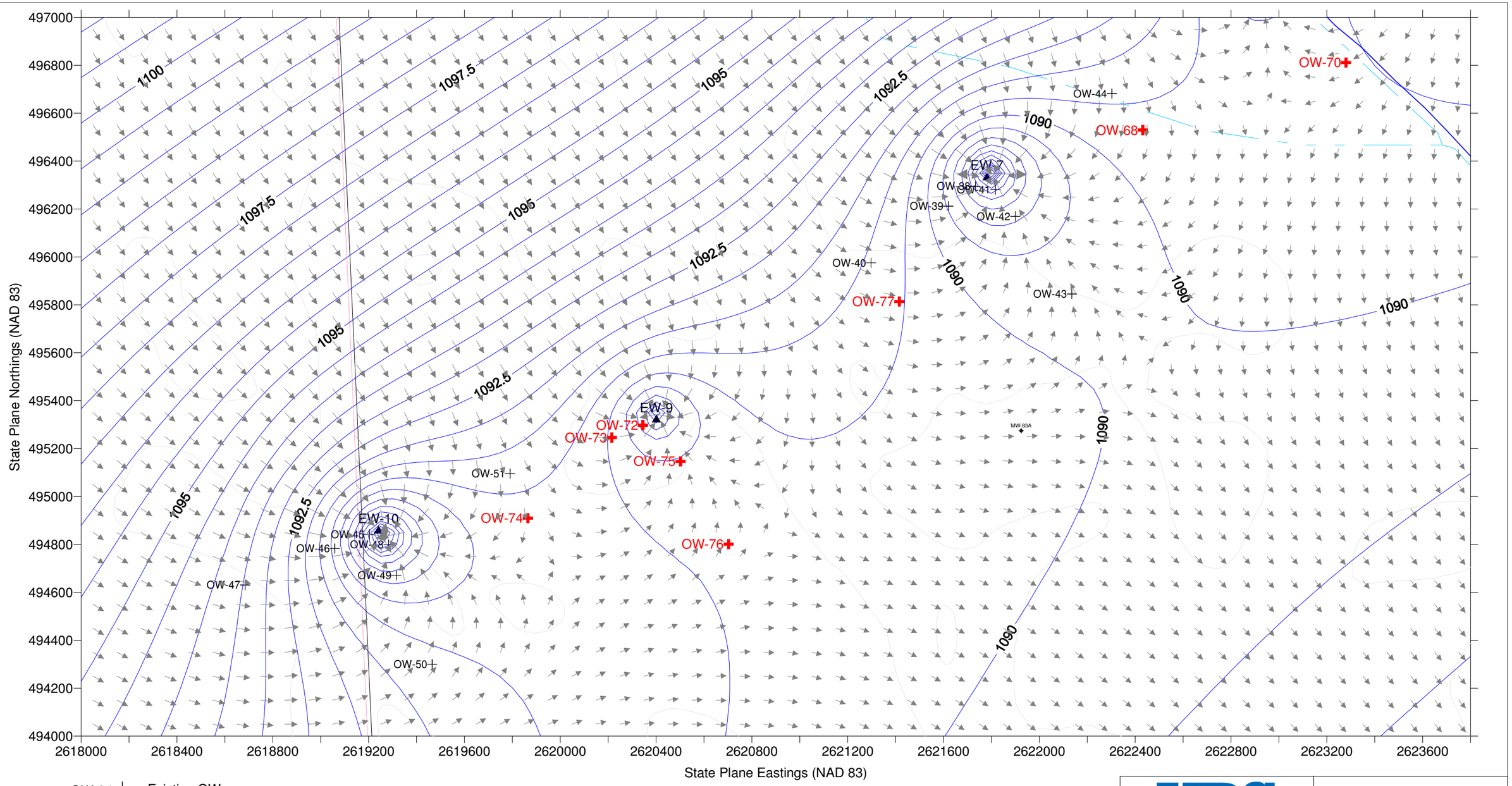
Drawn by: M.E.W.	U.S. Army Corps of Engineers **PROPOSED EW-6 OBSERVATION WELLS**
Checked by: L.A.T.	Scale: As Indicated
Submitted by: L.A.T.	Date: NOVEMBER 2006
	Fig. No.: 2-3
	Figure Number: 2-3



OW-24 Existing OW

EW-2 Existing EW

OW-74 Proposed OW

Modeled Groundwater Elevations

Flow Vectors Based on Modeled Groundwater Elevations. Groundwater Flow Directions Are Not Necessarily Equivalent to Transport Pathlines.

0 100 200 300 400 Feet

N

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

U.S. Army Corps of Engineers

FINAL
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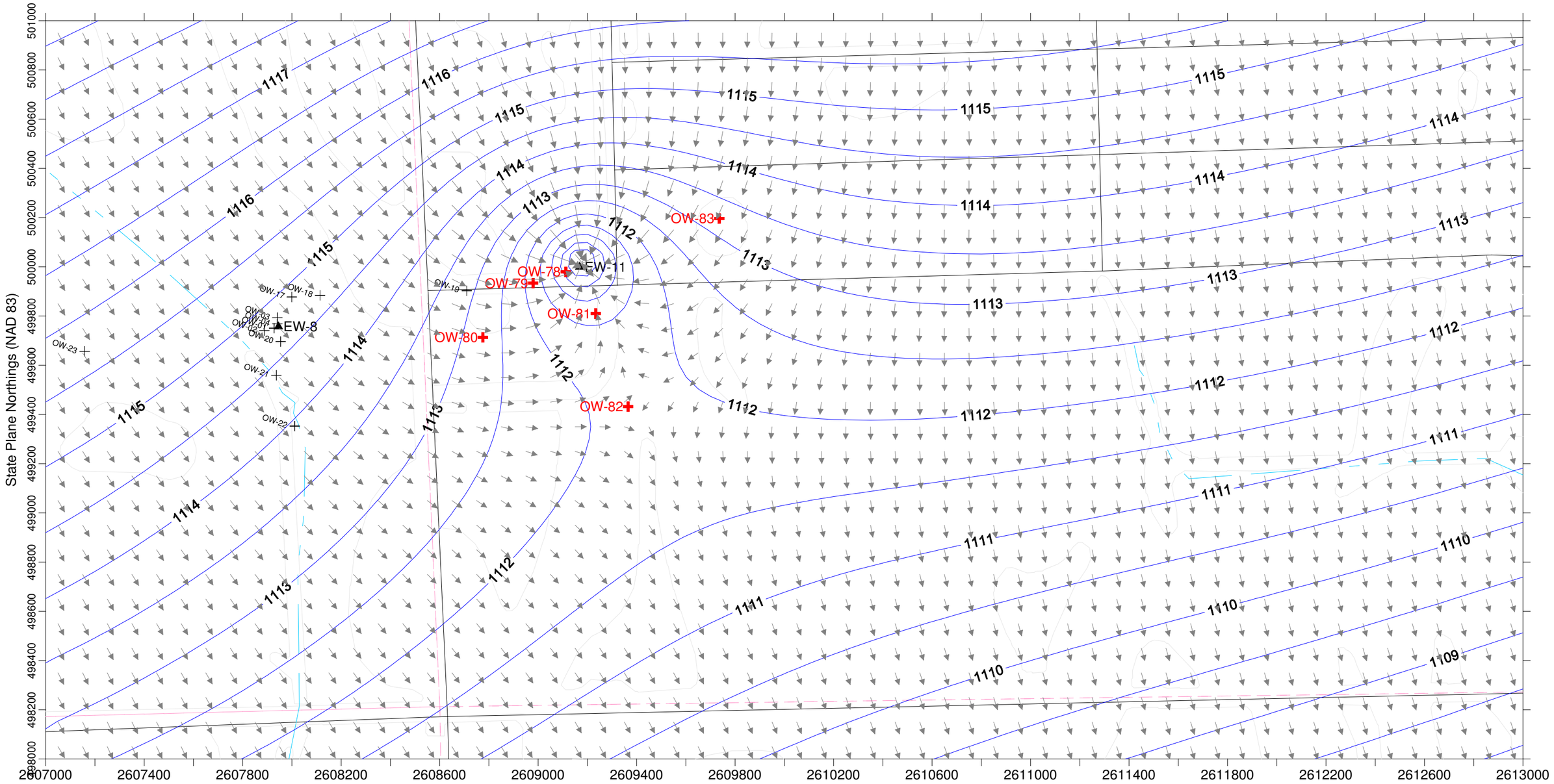
OPERABLE UNIT NO. 2
FORMER NEBRASKA ORDNANCE PLANT - MEAD, NE

PROPOSED EW-9 OBSERVATION WELLS

Scale: As Indicated
Date: NOVEMBER 2006
Fig. No.: 2-4
Figure Number: 2-4



OW-24 Existing OW

EW-2 Existing EW

OW-74 Proposed OW

Modeled Groundwater Elevations

Flow Vectors Based on Modeled Groundwater Elevations. Groundwater Flow Directions Are Not Necessarily Equivalent to Transport Pathlines.

0 100 200 300 400 Feet

N

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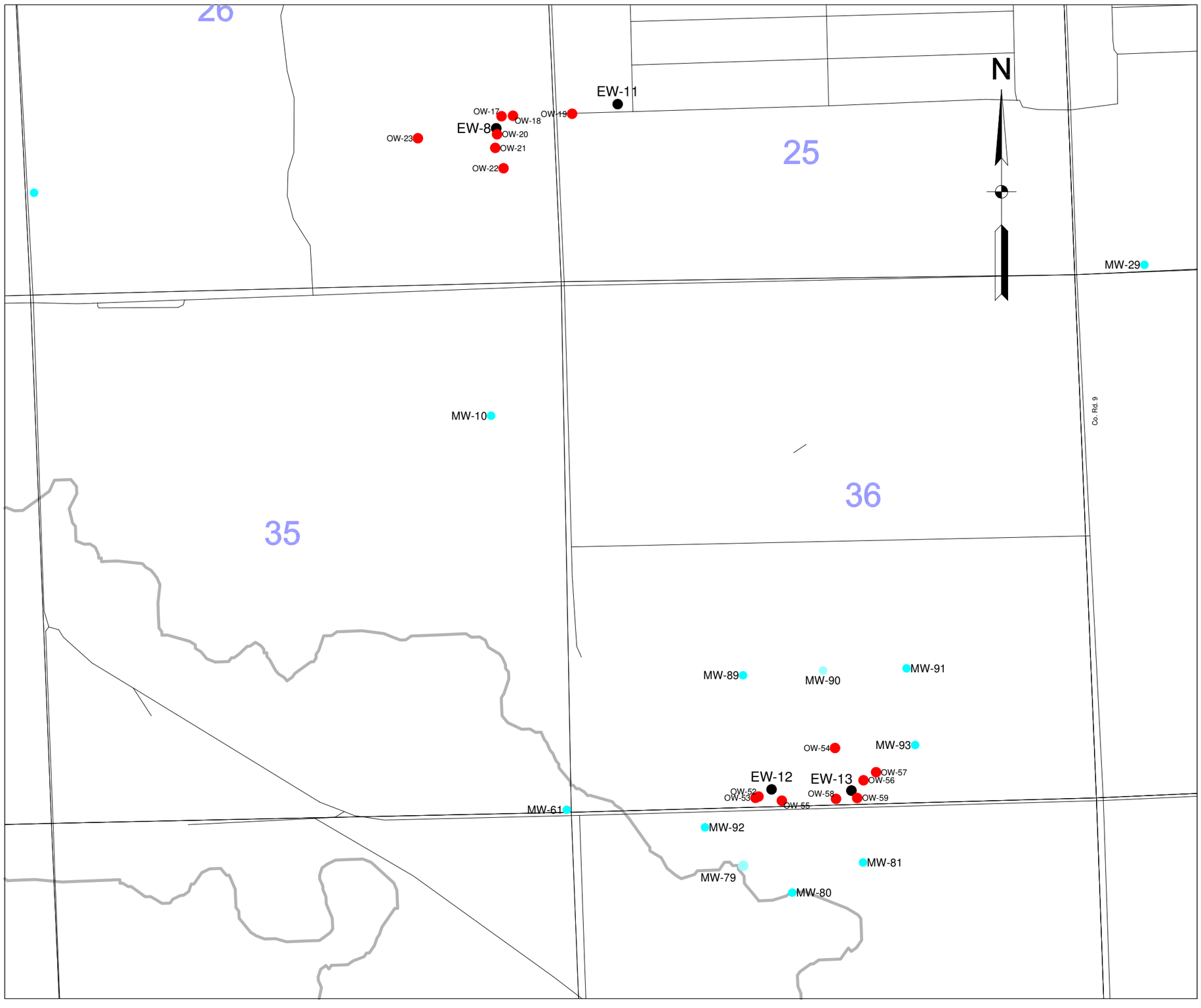
Drawn by: M.E.W.	U.S. Army Corps of Engineers **PROPOSED EW-11 OBSERVATION WELLS**
Checked by: L.A.T.	Scale: As Indicated Figure Number: **2-5**
Submitted by: L.A.T.	Date: NOVEMBER 2006 Fig. No.: **2-5**



LEGEND

- EXTRACTION WELL
- MONITORING WELL
- OBSERVATION WELL

0 500 1000 1500 2000 2500 3000 Feet

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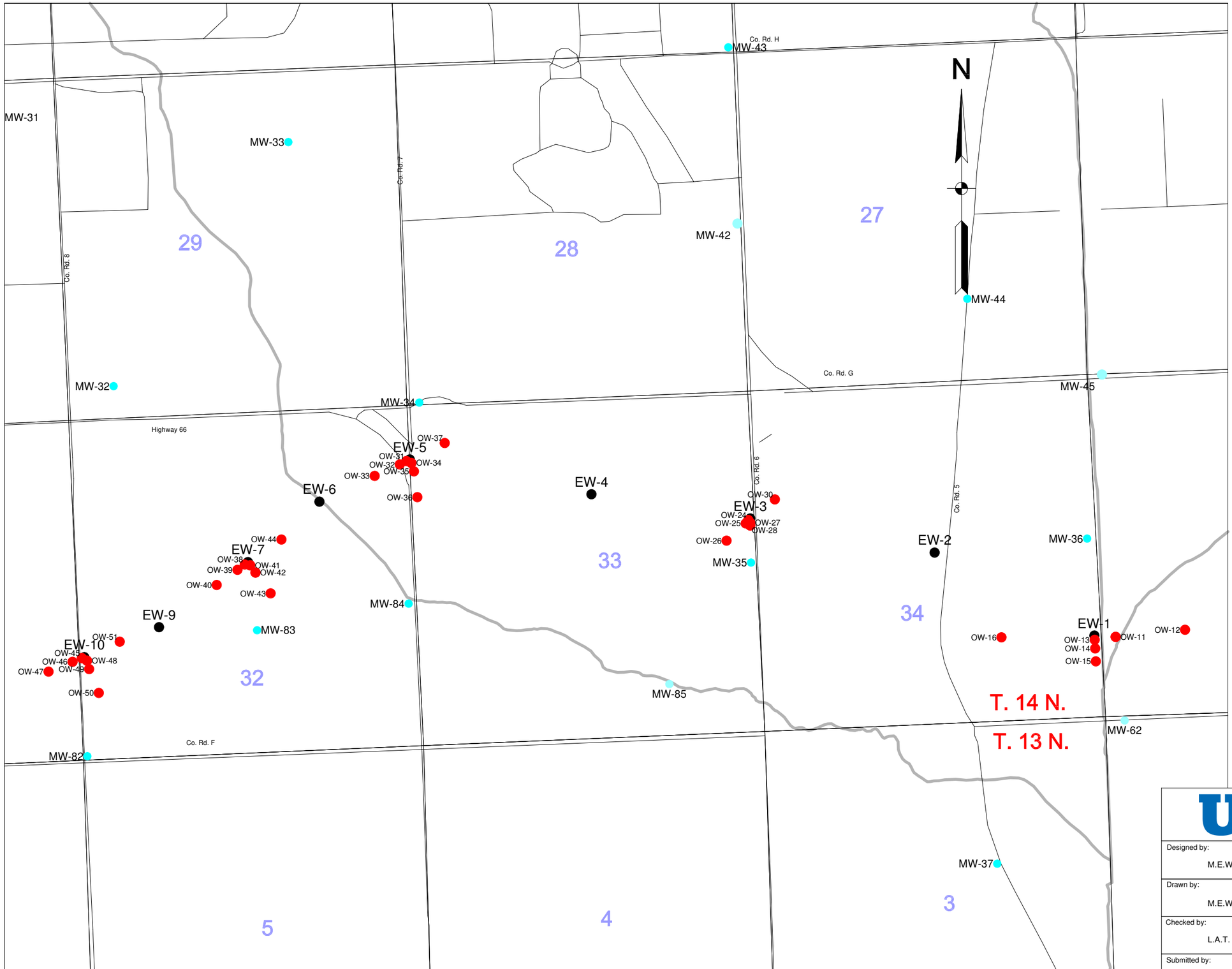
Drawn by: M.E.W.	U.S. Army Corps of Engineers
Checked by: L.A.T.	**LOCATIONS OF EXISTING OBSERVATION WELLS FOR EW-8, EW-12 AND EW-13**
Submitted by: L.A.T.	Scale: As Indicated; Date: NOVEMBER 2006; Fig. No.: 2-6; Figure Number: 2-6



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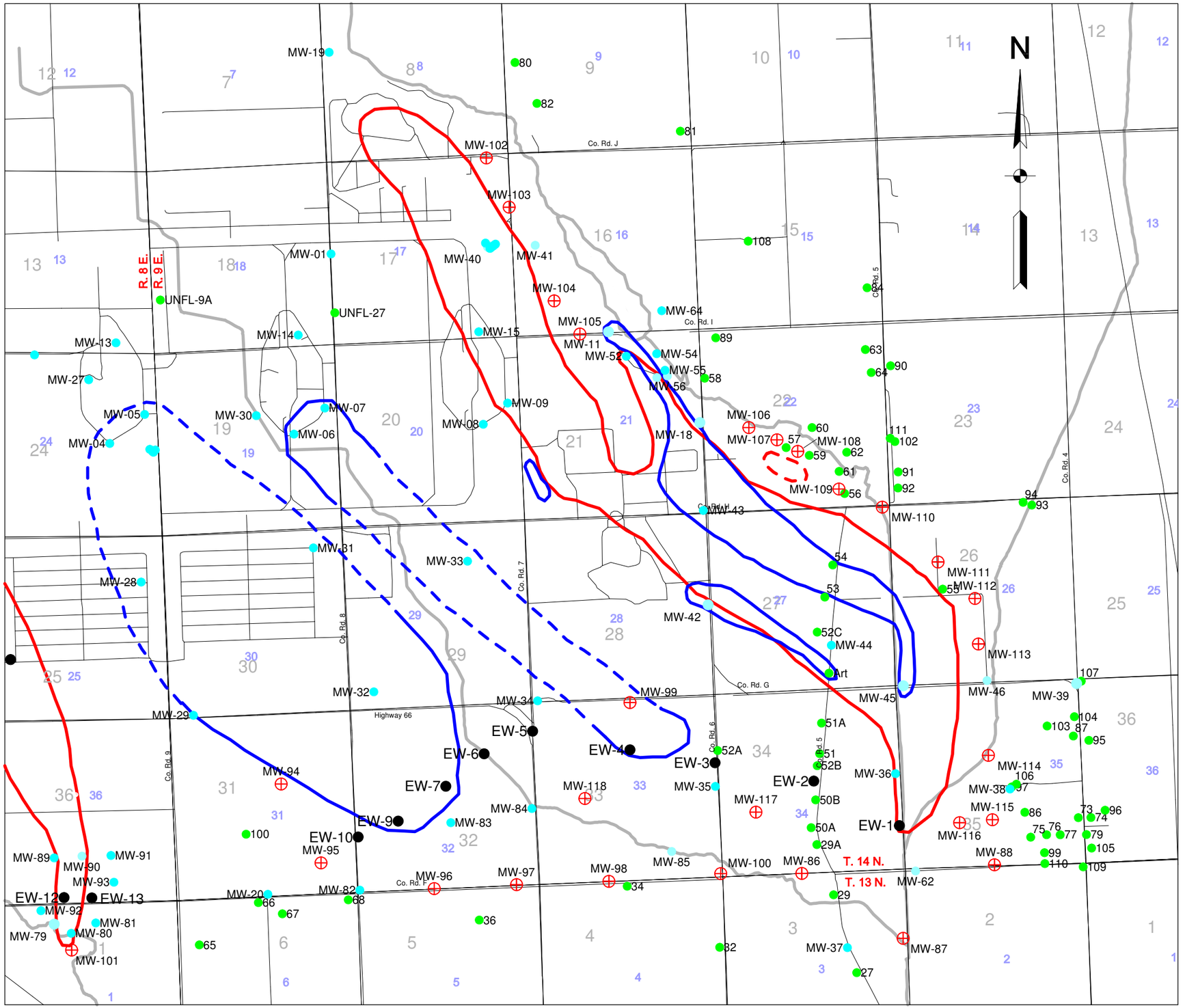
Drawn by: M.E.W.	U.S. Army Corps of Engineers **LOCATIONS OF EXISTING OBSERVATION WELLS FOR EW-1 THROUGH EW-7, EW-9, AND EW-10**
Checked by: L.A.T.	Scale: As Indicated Figure Number: **2-7**
Submitted by: L.A.T.	Date: NOVEMBER 2006 Fig. No.: **2-7**



LEGEND

- EXTRACTION WELL
- WATER SUPPLY WELL
- MONITORING WELL
- PROPOSED MONITORING WELL LOCATION
- RDX 2µg/L SPRING 2006 EXTENT
- TCE 5 µg/L SPRING 2006 EXTENT

NOTES

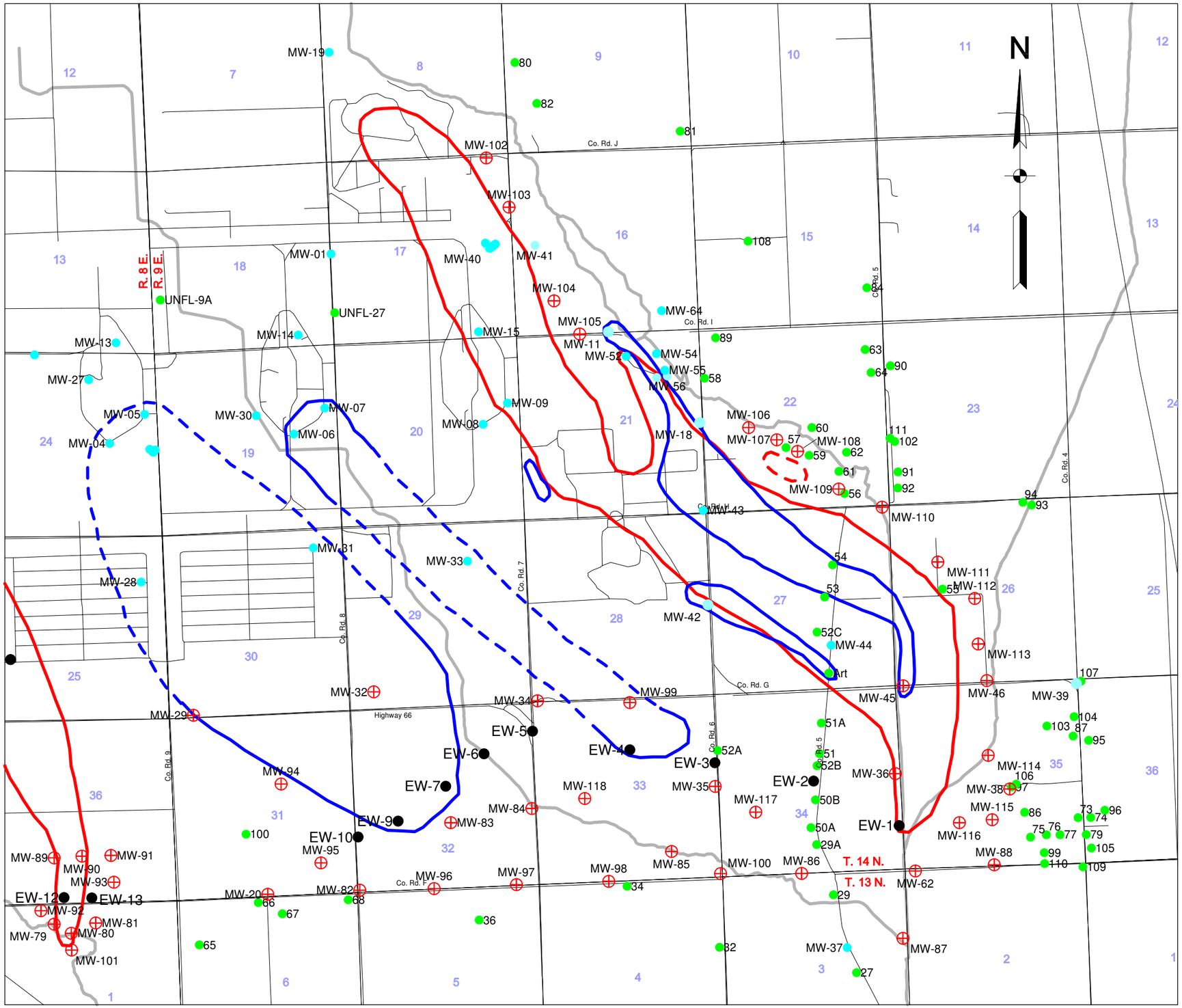
1. The Fall 2005/Spring 2006 extent is based on Fall 2005/ Spring 2006 direct-push groundwater data and GMP monitoring well and water supply well data from March 2005 and September 2005 as well as November 2005 extraction well data.
2. Proposed monitoring well locations are approximate. Final locations may change based on property access and utility clearance.
3. The September Groundwater Monitoring Program Load Line 1 TCE plume interpretation has been modified to include the direct-push data collected in Feburary 2006.

0 1000 2000 3000 4000 5000 6000 Feet

URS

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

Designed by: M.E.W.	FINAL
Drawn by: M.E.W.	CONTAINMENT EVALUATION WORK PLAN OPERABLE UNIT NO. 2 FMR. NEBRASKA ORDNANCE PLANT - MEAD, NE
Checked by: L.A.T.	U.S. Army Corps of Engineers
Submitted by: L.A.T.	**PROPOSED GROUNDWATER MONITORING WELL LOCATIONS**
	Scale: As Indicated
	Date: NOVEMBER 2006
	Fig. No.: 3-1
	Figure Number: 3-1



LEGEND

- EXTRACTION WELL
- WATER SUPPLY WELL
- MONITORING WELL (NOT PROPOSED TO BE SAMPLED)
- MONITORING WELL TO BE SAMPLED
- RDX 2µg/L SPRING 2006 EXTENT
- TCE 5 µg/L SPRING 2006 EXTENT

NOTES

1. The Fall 2005/Spring 2006 extent is based on Fall 2005/ Spring 2006 direct-push groundwater data and GMP monitoring well and water supply well data from March 2005 and September 2005 as well as November 2005 extraction well data.
2. Proposed monitoring well locations are approximate. Final locations may change based on property access and utility clearance.
3. The September Groundwater Monitoring Program Load Line 1 TCE plume interpretation has been modified to include the direct-push data collected in Feburary 2006.
4. Samples will be collected from all wellls from each cluster designated for sampling.

0 1000 2000 3000 4000 5000 6000 Feet

URS

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

Designed by: M.E.W.	FINAL CONTAINMENT EVALUATION WORK PLAN OPERABLE UNIT NO. 2 FMR. NEBRASKA ORDNANCE PLANT - MEAD, NE
Drawn by: M.E.W.	U.S. Army Corps of Engineers **GROUNDWATER MONITORING WELLS TO BE SAMPLED**
Checked by: L.A.T.	Scale: As Indicated
Submitted by: L.A.T.	Date: NOVEMBER 2006
	Fig. No.: 3-2
	Figure Number: 3-2

TABLE 2-1
PROPOSED OBSERVATION WELL SCREEN INTERVALS
OPERABLE UNIT NO. 2 (GROUNDWATER)
FORMER NEBRASKA ORDINANCE PLANT, MEAD, NEBRASKA

Well ID	Easting (ft State Plane, NAD83)	Northing (ft State Plane, NAD83)	Est. Ground Surface Elev. (ft NGVD 29)	Est. Elev Bedrock (ft NGVD 29)	Estimated Elevation of Top of Screen (ft NGVD 29)	Estimated Elevation of Bottom of Screen (ft NGVD 29)	Screen Length (ft)	Nearest Well	Distance to Nearest Extraction Well (ft)
OW-60	2,627,136	497,442	1146	1041	1064.75	1044.75	20	EW-4	60
OW-61	2,627,181	497,574	1146	1041	1064.75	1044.75	20	EW-4	200
OW-62	2,627,310	497,953	1146	1041	1064.75	1044.75	20	EW-4	600
OW-63	2,627,499	497,888	1146	1041	1064.75	1044.75	20	EW-4	632
OW-64	2,627,305	497,320	1146	1041	1064.75	1044.75	20	EW-4	200
OW-65	2,627,684	497,191	1146	1041	1064.75	1044.75	20	EW-4	600
OW-66	2,622,847	497,231	1144	1052	1072.70	1057.70	15	EW-6	60
OW-67	2,622,740	497,141	1144	1052	1072.70	1057.70	15	EW-6	200
OW-68	2,622,432	496,529	1144	1051	1082.13	1067.13	15	OW-44	872
OW-69	2,623,022	497,117	1144	1052	1072.70	1057.70	15	EW-6	200
OW-70	2,623,280	496,811	1144	1052	1072.70	1057.70	15	EW-6	600
OW-71	2,623,880	497,517	1152	1034	1079.88	1064.88	15	OW-33	1017
OW-72	2,620,346	495,298	1152	1049	1074.77	1054.77	20	EW-9	60
OW-73	2,620,216	495,246	1152	1049	1074.77	1054.77	20	EW-9	200
OW-74	2,619,865	494,910	1147	1049	1081.50	1061.50	20	OW-51	675
OW-75	2,620,502	495,147	1152	1049	1074.77	1054.77	20	EW-9	200
OW-76	2,620,702	494,801	1152	1049	1074.77	1054.77	20	EW-9	600
OW-77	2,621,416	495,814	1154	1050	1089.21	1069.21	20	OW-40	1128
OW-78	2,609,112	499,980	1161	1022	1066.45	1026.45	40	EW-11	60
OW-79	2,608,980	499,934	1161	1022	1066.45	1026.45	40	EW-11	200
OW-80	2,608,776	499,714	1159	1010	1086.39	1046.39	40	OW-18	486
OW-81	2,609,234	499,810	1161	1022	1066.45	1026.45	40	EW-11	200
OW-82	2,609,366	499,432	1161	1022	1066.45	1026.45	40	EW-11	600
OW-83	2,609,736	500,196	1161	1022	1066.45	1026.45	40	EW-11	600

TABLE 2-1
PROPOSED OBSERVATION WELL SCREEN INTERVALS
OPERABLE UNIT NO. 2 (GROUNDWATER)
FORMER NEBRASKA ORDINANCE PLANT, MEAD, NEBRASKA

Well ID	Easting (ft State Plane, NAD83)	Northing (ft State Plane, NAD83)	Est. Ground Surface Elev. (ft NGVD 29)	Est. Elev Bedrock (ft NGVD 29)	Estimated Elevation of Top of Screen (ft NGVD 29)	Estimated Elevation of Bottom of Screen (ft NGVD 29)	Screen Length (ft)	Nearest Well	Distance to Nearest Extraction Well (ft)
OW-84	2,632,425	496,423	1100	1042	1054.15	1044.15	10	EW-2	60
OW-85	2,632,377	496,292	1107	1042	1054.15	1044.15	10	EW-2	200
OW-86	2,632,238	495,917	1106	1041	1054.15	1044.15	10	EW-2	600
OW-87	2,632,426	495,848	1094	1041	1054.15	1044.15	10	EW-2	632
OW-88	2,632,502	496,459	1099	1042	1054.15	1044.15	10	EW-2	60
OW-89	2,632,634	496,410	1092	1041	1054.15	1044.15	10	EW-2	200

Notes: (1) For the gradient pairs between extraction wells (OW-68/OW-44, OW-71/OW-33, OW-74/OW-51, OW-77/OW-40, and OW-80/OW-18) the midpoint of the screen interval is the same as the mipoint of the existing OW in the gradient pair. The screens of the existing OWs extend from approx. 50ft bgs to within 5-10 ft of the top of bedrock, in 5-ft increments.

(2) The remaining OWs will screened at the same elevations as the extraction well, provided that the bottom of the OW screen is above bedrock at the proposed location.

(3) In the case of the EW-11 OWs, the screens are 1/2 the length of the EW screen due to the 45-ft length of the EW screen

(4) Extraction Well Locations:

	Easting (NAD83)	Northing (NAD83)		Easting (NAD83)	Northing (NAD83)
EW-2	2,632,445.94	496,479.68	EW-9	2,620,401.35	495,320.23
EW-4	2,627,116.10	497,384.80	EW-11	2,609,168.75	499,999.28
EW-6	2,622,892.98	497,269.75			

TABLE 2-2
EXISTING OBSERVATION WELL SCREEN INTERVALS
FORMER NEBRASKA ORDINANCE PLANT, MEAD, NEBRASKA

Location	Depth (ft bgs)	Screened Interval (ft bgs)
EW-1	39	22-39
OW-10	40	20-40
OW-11	40	20-40
OW-12	40	20-40
OW-13	40	20-40
OW-14	40	20-40
OW-15	40	20-40
OW-16	40	20-40
EW-2	59.9	48.9-58.9
EW-3	104.6	88.6-103.6
OW-24	100	50-95
OW-25	110	50-105
OW-26	100	50-95
OW-27	95	50-90
OW-28	100	50-95
OW-30	85	50-80
EW-4	103.7	83.7-102.7
EW-5	105.1	83.1-104.1
OW-31	105	47-97
OW-32	100	50-95
OW-33	115	50-110
OW-34	93	48-93
OW-35	100	50-95
OW-36	110	50-105
OW-37	105	50-100
EW-6	88.6	72.6-87.6
EW-7	93.6	77.6-92.6
OW-38	110	50-90
OW-39	100	50-95
OW-40	105	50-100
OW-41	95	50-90

TABLE 2-2
EXISTING OBSERVATION WELL SCREEN INTERVALS
FORMER NEBRASKA ORDINANCE PLANT, MEAD, NEBRASKA

Location	Depth (ft bgs)	Screened Interval (ft bgs)
OW-42	95	50-90
OW-43	105	50-100
OW-44	95	50-90
EW-8	152	70-150
OW-17	150	50-140
OW-18	150	50-140
OW-19	150	50-140
OW-20	150	50-140
OW-21	150	50-140
OW-22	150	50-140
OW-23	150	50-140
EW-9	99.8	78.9-98.9
EW-10	100.8	79.8-99.8
OW-45	108	44-104
OW-46	100	46-96
OW-47	100	47-97
OW-48	114.5	48.5-113.5
OW-49	110.5	50-110
OW-50	97.5	47-97
OW-51	105	50-100
EW-11	139.4	93.4-138.4
MW-3A	147.4	97-145.8
MW-3B	99.5	39.9-98.39
MW-21A	128.5	116-126
MW-21B	79	66-76
MW-21D	139	133-138
MW-24A	140.8	111.5-121.5
MW-24B	67.5	56-66
MW-25A	156.6	145-155
MW-25B	85	74-84
MW-25D	170	163.2-168.2
MW-32A	99.5	88.5-98.5

TABLE 2-2
EXISTING OBSERVATION WELL SCREEN INTERVALS
FORMER NEBRASKA ORDINANCE PLANT, MEAD, NEBRASKA

Location	Depth (ft bgs)	Screened Interval (ft bgs)
MW-32B	82	71-81
MW-34A	113	102-112
MW-34B	76	65-75
MW-35A	92.5	81.5-91.5
MW-35B	68	57-67
MW-36A	39	28-38
MW-36B	28.5	17-27
MW-36D	49	43-48
MW-44A	42.5	29.5-39.5
MW-44B	30	16-26
MW-44D	57	50.8-55.8
MW-45A	39	28-38
MW-45B	28.5	17-27
MW-45D	49.7	43-48
MW-46A	48	33.2-43.2
MW-46B	34	21-31
MW-46D	58.5	52.5-57.5
MW-62A	37.5	27-37
MW-62B	24.5	17-24

TABLE 2-3
WANN BASIN OBSERVATION WELLS
FORMER NEBRASKA ORDNANCE PLANT, MEAD, NEBRASKA

Well Name	Registration #	Owned by	Measured by
MUD 94-7	G-100706	MUD	LPNNRD
S.Wann	G-098492	LPNNRD	LPNNRD
M90-01	G-105896	LWS	LWS
Frahm	G-098491	LPNNRD	LPNNRD
M90-05R	G-105899	USGS	USGS
M90-04	G-105898	LWS	LWS
TV-17A	G-078376	V. Frahm	LPNNRD
M90-09	G-105900	LWS	LWS
UNL-CSD	Not Reg.	UNL-CSD	UNL-SNR
M90-16R	G-105903	USGS	USGS
M90-15	G-105902	LWS	LWS
M90-21	G-105906	LWS	LWS
M90-22R	G-105907	USGS	USGS
M90-02	G-105897	LWS	LWS
M90-12R	G-105901	USGS	USGS
M90-17R	G-105904	USGS	USGS
M90-23R	G-105908	USGS	USGS
M90-20R	G-105905	USGS	USGS
M90-24R	G-105909	USGS	USGS
D.Starns	G-051879	D. Starns	LPSNRD
M90-36R	G-105912	USGS	USGS
M90-26R	G-105910	USGS	USGS
M90-37	G-109464P	LWS	LWS
N.Wann	G-098487	LPNNRD	LPNNRD
PV-38	G-047830	C. Karloff	LPNNRD
PV-37	G-066531	H. Kolb	LPNNRD
PV-41	G-053428	C. Karloff	LPNNRD
MUD 94-5	G-100704	MUD	LPNNRD
MUD 94-6	G-100705	MUD	LPNNRD
PV-39	G-053630	E. Kresek	LPNNRD
N.Keiser	Not Reg.	S. Keiser	LPNNRD
S.Keiser	Not Reg.	S. Keiser	LPNNRD
MUD 90-10	G-102612	MUD	LPNNRD
MUD 94-4	G-100703	MUD	LPNNRD
PV-40	G-051424	D. Veskerna	LPNNRD
MUD 94-3	G-100702	MUD	LPNNRD

TABLE 3-1
RATIONALE FOR PROPOSED MONITORING WELL SAMPLING
FORMER NEBRASKA ORDNANCE PLANT, MEAD, NEBRASKA

Location	Well Type	Approximate Location of Well(s)	Rationale for Sampling
MW-20	Existing Monitoring Well	Outside RDX Plume, Downgradient of EW-10	Provide downgradient data: Long-term Containment Confirmation
MW-29	Existing Monitoring Well	Within RDX Plume, Cross-gradient and Upgradient of EW-10	Provide cross-gradient data: Long-term Containment Confirmation
MW-32	Existing Monitoring Well	Within RDX Plume, Upgradient of EW-6 and EW-7.	Monitor concentration within plume and evaluate the migration of RDX toward the capture zone
MW-34	Existing Monitoring Well	Outside RDX Plume, Upgradient of EW-4 & EW-5	Monitor concentration of plume as it moves towards the Extraction Wells
MW-35	Existing Monitoring Well	Outside RDX Plume, Downgradient of EW-3	Provide downgradient data: Long-term Containment Confirmation
MW-36	Existing Monitoring Well	Within TCE Plume, Upgradient of EW-1	Monitor concentrations within plume and evaluate the migration of TCE toward the capture zone
MW-38	Existing Monitoring Well	Outside TCE Plume, Cross-gradient of EW-1	Provide cross-gradient data: Long-term Containment Confirmation
MW-45	Existing Monitoring Well	Within TCE Plume, Upgradient of EW-2 and EW-1	Monitor concentration within plume and evaluate the migration of TCE toward the capturezone
MW-46	Existing Monitoring Well	Outside TCE Plume, Cross-gradient of EW-1	Provide cross-gradient data: Long-term Containment Confirmation
MW-62	Existing Monitoring Well	Outside TCE Plume, Downgradient of EW-12	Monitor immediately downgradient of EW-1, Long-term Containment Confirmation
MW-79	Existing Monitoring Well	Outside TCE Plume, Cross-gradient of EW-1	Provide cross-gradient data: Long-term Containment Confirmation
MW-80	Existing Monitoring Well	Within TCE Plume, Downgradient of EW-12	Monitor concentration within the plume and evaluate the migration of TCE toward the capture zone. Long-term Containment Confirmation
MW-81	Existing Monitoring Well	Outside TCE Plume, Downgradient EW-12	Provide downgradient data: Long-term Containment Confirmation
MW-82	Existing Monitoring Well	Outside of RDX Plume, Downgradient of EW-10	Provide downgradient data: Long-term Containment Confirmation
MW-83	Existing Monitoring Well	Outside of RDX Plume, Downgradient of EW-7 and EW-9	Provide downgradient data: Long-term Containment Confirmation

TABLE 3-1
RATIONALE FOR PROPOSED MONITORING WELL SAMPLING
FORMER NEBRASKA ORDNANCE PLANT, MEAD, NEBRASKA

Location	Well Type	Approximate Location of Well(s)	Rationale for Sampling
MW-84	Existing Monitoring Well	Downgradient of EW-6 and EW-7	Provide downgradient data: Long-term Containment Confirmation
MW-85	Existing Monitoring Well	Outside of RDX Plume, Downgradient of EW-5 and EW-6	Provide downgradient data: Long-term Containment Confirmation
MW-86	Proposed Monitoring Well	Outside of RDX Plume, Downgradient of EW-2	Provide downgradient data: Long-term Containment Confirmation
MW-87	Proposed Monitoring Well	Outside of TCE Plume, Downgradient of EW-1	Provide downgradient data: Long-term Containment Confirmation
MW-88	Proposed Monitoring Well	Outside of TCE Plume, Downgradient of EW-1	Provide downgradient data: Long-term Containment Confirmation
MW-89	Existing Monitoring Well	Outside of Load Line 1 TCE Plume, Upgradient of EW-12	Provide upgradient data: Long Term Containment Confirmation
MW-90	Existing Monitoring Well	Within Load Line 1 TCE Plume, Upgradient of EW-12	Monitor Concentration within the Plume and Evaluate the Migration of TCE toward the Capture Zone
MW-91	Existing Monitoring Well	Outside of Load Line 1 TCE Plume, upgradient of EW-13	Provide upgradient data: Long Term Containment Confirmation
MW-92	Existing Monitoring Well	Outside of Load Line 1 TCE Plume, cross-gradient of EW-12	Provide downgradient data: Long-term Containment Confirmation
MW-93	Existing Monitoring Well	Outside of Load Line 1 TCE Plume, cross-gradient of EW-12	Provide cross-gradient data: Long-term Containment Confirmation
MW-94	Proposed Monitoring Well	Outside of RDX Plume, Cross-gradient of EW-10	Provide cross-gradient data: Long-term Containment Confirmation
MW-95	Proposed Monitoring Well	Outside of RDX Plume, Cross-gradient of EW-10	Provide downgradient data: Long-term Containment Confirmation
MW-96	Proposed Monitoring Well	Outside of RDX Plume, Downgradient of EW-9 and EW-10	Provide downgradient data: Long-term Containment Confirmation
MW-97	Proposed Monitoring Well	Outside of RDX Plume, Downgradient of EW-7 and EW-9	Provide downgradient data: Long-term Containment Confirmation
MW-98	Proposed Monitoring Well	Outside of RDX Plume, Downgradient of EW-4 and EW-5	Provide downgradient data: Long-term Containment Confirmation
MW-99	Proposed Monitoring Well	Within RDX Plume, Upgradient of EW-3 and EW-4	Monitor concentration within Plume and Evaluate Migration of RDX toward the Capture Zone

TABLE 3-1
RATIONALE FOR PROPOSED MONITORING WELL SAMPLING
FORMER NEBRASKA ORDNANCE PLANT, MEAD, NEBRASKA

Location	Well Type	Approximate Location of Well(s)	Rationale for Sampling
MW-100	Proposed Monitoring Well	Outside of RDX Plume, Downgradient of EW-3 and EW-4	Provide downgradient data: Long-term Containment Confirmation
MW-101	Proposed Monitoring Well	Outside of Load Line 1 TCE Plume, Downgradient of EW-12	Provide downgradient data: Long-term Containment Confirmation
MW-102	Proposed Monitoring Well	Outside of TCE Plume, Eastern Boundary Monitoring	Monitor eastern boundary: Long-term Containment Evaluation
MW-103	Proposed Monitoring Well	Outside of TCE Plume, Eastern Boundary Monitoring	Monitor eastern boundary: Long-term Containment Evaluation
MW-104	Proposed Monitoring Well	Outside of TCE Plume, Eastern Boundary Monitoring	Monitor eastern boundary: Long-term Containment Evaluation
MW-105	Proposed Monitoring Well	Outside of TCE Plume, Eastern Boundary Monitoring	Monitor eastern boundary: Long-term Containment Evaluation
MW-106	Proposed Monitoring Well	Outside of TCE Plume, Eastern Boundary Monitoring	Provide cross-gradient data: Long-term Containment Evaluation
MW-107	Proposed Monitoring Well	Outside of TCE Plume, Eastern Boundary Monitoring	Provide cross-gradient data: Long-term Containment Evaluation
MW-108	Proposed Monitoring Well	Outside of TCE Plume, Eastern Boundary Monitoring	Provide cross-gradient data: Long-term Containment Evaluation
MW-109	Proposed Monitoring Well	Outside of TCE Plume, Eastern Boundary Monitoring	Provide cross-gradient data: Long-term Containment Evaluation
MW-110	Proposed Monitoring Well	Outside of TCE Plume, Eastern Boundary Monitoring	Provide cross-gradient data: Long-term Containment Evaluation
MW-111	Proposed Monitoring Well	Outside of TCE Plume, Eastern Boundary Monitoring	Provide cross-gradient data: Long-term Containment Evaluation
MW-112	Proposed Monitoring Well	Outside of TCE Plume, Eastern Boundary Monitoring	Provide cross-gradient data: Long-term Containment Evaluation
MW-113	Proposed Monitoring Well	Outside of TCE Plume,Cross-gradient of EW-1	Provide cross-gradient data: Long-term Containment Evaluation
MW-114	Proposed Monitoring Well	Outside of TCE Plume, Cross-gradient of EW-1	Provide cross-gradient data: Long-term Containment Evaluation
MW-115	Proposed Monitoring Well	Outside of TCE Plume, Cross-gradient of EW-1	Provide cross-gradient data: Long-term Containment Evaluation
MW-116	Proposed Monitoring Well	Outside of TCE Plume, Cross-gradient of EW-1	Provide cross-gradient data: Long-term Containment Evaluation

TABLE 3-1
RATIONALE FOR PROPOSED MONITORING WELL SAMPLING
FORMER NEBRASKA ORDNANCE PLANT, MEAD, NEBRASKA

Location	Well Type	Approximate Location of Well(s)	Rationale for Sampling
MW-117	Proposed Monitoring Well	Outside of TCE Plume, Downgradient of EW-3 and EW-4	Provide downgradient data: Long-term Containment Evaluation
MW-118	Proposed Monitoring Well	Outside of TCE Plume, Downgradient of EW-6	Provide downgradient data: Long-term Containment Evaluation
Note: Data from the new wells will be used in the Containment Evaluation if installed, and sampling of the new wells, and validation of the data is completed before the Draft 2006 Containment Evaluation is submitted, as planned.			

TABLE 3-2
PROPOSED MONITORING WELL SCREEN INTERVALS
FORMER NEBRASKA ORDNANCE PLANT, MEAD, NEBRASKA

Well Cluster ID	Proposed Easting (ft, State Plane, NAD27)	Proposed Northing (ft, State Plane, NAD27)	Proposed Easting (ft, State Plane, NAD83)	Proposed Northing (ft, State Plane, NAD83)	Estimated Ground Surface Elev. (ft NAVD88)	Estimated Water Elev. March '06 (ft NAVD88)	Estimated Bedrock Elev. (ft NAVD83)	Presumed Lithology at Bedrock Surface
MW-86	2,854,407	549,102	2,632,099	493,803	1,101	1,079	1,041	Sandstone
MW-87	2,857,333	547,205	2,635,036	491,925	1,076	1,075	1,036	Sandstone
MW-88	2,859,991	549,319	2,637,680	494,055	1,084	1,077	1,030	Sandstone
MW-94	2,839,332	551,784	2,617,012	496,392	1,151	1,101	1,040	Sandstone
MW-95	2,840,470	549,492	2,618,164	494,108	1,153	1,096	1,035	Sandstone
MW-96	2,843,749	548,730	2,621,446	493,366	1,150	1,091	1,041	Sandstone
MW-97	2,846,134	548,826	2,623,830	493,477	1,140	1,090	1,044	Sandstone
MW-98	2,848,813	548,908	2,626,508	493,575	1,140	1,088	1,046	Sandstone
MW-99	2,849,456	554,082	2,627,119	498,752	1,160	1,091	1,043	Sandstone
MW-100	2,852,057	549,113	2,629,749	493,800	1,138	1,083	1,045	Sandstone
MW-101	2,833,227	547,010	2,610,938	491,582	1,101	1,099	1,022	Sandstone
MW-102	2,845,389	569,887	2,622,955	514,529	1,170	1,133	1,042	Sandstone
MW-103	2,846,042	568,458	2,623,616	513,104	1,170	1,129	1,054	Sandstone
MW-104	2,847,333	565,734	2,624,924	510,388	1,169	1,122	1,075	Sandstone
MW-105	2,848,069	564,770	2,625,666	509,429	1,160	1,117	1,070	Sandstone
MW-106	2,852,950	562,032	2,630,563	506,721	1,117	1,096	1,041	Sandstone
MW-107	2,853,763	561,668	2,631,378	506,363	1,123	1,095	1,038	Sandstone
MW-108	2,854,365	561,329	2,631,981	506,027	1,117	1,094	1,036	Sandstone
MW-109	2,855,554	560,231	2,633,177	504,937	1,114	1,092	1,038	Sandstone
MW-110	2,856,807	559,699	2,634,433	504,413	1,090	1,089	1,039	Sandstone
MW-111	2,858,412	558,100	2,636,047	502,824	1,083	1,082	1,039	Sandstone
MW-112	2,859,474	557,036	2,637,115	501,767	1,079	1,078	1,037	Sandstone
MW-113	2,859,566	555,719	2,637,215	500,450	1,080	1,079	1,035	Sandstone
MW-114	2,859,837	552,488	2,637,506	497,222	1,080	1,080	1,035	Sandstone
MW-115	2,859,942	550,625	2,637,623	495,360	1,080	1,078	1,033	Sandstone
MW-116	2,858,988	550,543	2,636,670	495,272	1,081	1,078	1,036	Sandstone
MW-117	2,853,091	550,887	2,630,772	495,580	1,123	1,082	1,044	Sandstone
MW-118	2,848,133	551,314	2,625,813	495,976	1,141	1,089	1,044	Sandstone

TABLE 3-2
PROPOSED MONITORING WELL SCREEN INTERVALS
FORMER NEBRASKA ORDNANCE PLANT, MEAD, NEBRASKA

Well Cluster ID	Estimated Depth to Water (ft BGS)	Estimated Depth to Bedrock (ft BGS)	Estimated Aquifer Thickness (ft)	Shallow ("B") Well		Intermediate ("A") Well		Bedrock ("D") Well	
				Proposed Top of Screen (ft BGS)	Proposed Bottom of Screen (ft BGS)	Proposed Top of Screen (ft BGS)	Proposed Bottom of Screen (ft BGS)	Proposed Top of Screen (ft BGS)	Proposed Bottom of Screen (ft BGS)
MW-86	22	59	37	31	41	49	59	63	68
MW-87	2	40	38	11	21	30	40	44	49
MW-88	7	55	48	21	31	45	55	59	64
MW-94	50	111	61	71	81	101	111	115	120
MW-95	58	118	60	78	88	108	118	122	127
MW-96	59	110	50	75	85	100	110	114	119
MW-97	50	97	47	63	73	87	97	101	106
MW-98	53	94	42	64	74	84	94	98	103
MW-99	70	117	48	83	93	107	117	121	126
MW-100	56	93	38	65	75	83	93	97	102
MW-101	3	79	76	31	41	69	79	83	88
MW-102	37	128	91	73	83	118	128	132	137
MW-103	42	116	75	69	79	106	116	120	125
MW-104	47	93	46	60	70	83	93	97	102
MW-105	43	91	48	57	67	81	91	95	100
MW-106	21	77	56	39	49	67	77	81	86
MW-107	28	85	57	47	57	75	85	89	94
MW-108	23	82	59	42	52	72	82	86	91
MW-109	22	77	54	40	50	67	77	81	86
MW-110	1	52	51	17	27	42	52	56	61
MW-111	1	44	43	13	23	34	44	48	53
MW-112	1	41	41	11	21	31	41	45	50
MW-113	1	45	44	13	23	35	45	49	54
MW-114	0	45	45	13	23	35	45	49	54
MW-115	2	48	46	15	25	38	48	52	57
MW-116	2	45	42	13	23	35	45	49	54
MW-117	41	79	38	50	60	69	79	83	88
MW-118	51	97	46	64	74	87	97	101	106

Notes:

(1) Depths for all wells are dependent on the depth to bedrock, and the saturated thickness at each location.

(2) The base of the screen of the shallow ("B") wells will be installed at the middle of the saturated thickness of the aquifer.

(3) The intermediate ("A") wells will be installed with the bottom of the screen at the bedrock surface, unless fine materials are encountered on the top of bedrock. In such a case, the well should be screened at the base of the lowermost sand or gravel with less than 15% fines.

(4) The bedrock wells will be installed with the top of the screen at least 4 feet into bedrock to provide for an adequate seal.

(5) It is anticipated that sandstone will be encountered at all of the proposed locations. If shale is encountered at the top of bedrock, no deep well will be installed.

TABLE 3-2
PROPOSED MONITORING WELL SCREEN INTERVALS
FORMER NEBRASKA ORDNANCE PLANT, MEAD, NEBRASKA

Well Cluster ID	Proposed Easting (ft, State Plane, NAD27)	Proposed Northing (ft, State Plane, NAD27)	Proposed Easting (ft, State Plane, NAD83)	Proposed Northing (ft, State Plane, NAD83)	Estimated Ground Surface Elev. (ft NAVD88)	Estimated Water Elev. March '05 (ft NAVD88)	Estimated Bedrock Elev. (ft NAVD83)	Presumed Lithology at Bedrock Surface
MW-86	2,855,172	548,527	2,632,867	493,233	1,093	1,076	1,041	Sandstone
MW-87	2,857,275	547,510	2,634,976	492,230	1,086	1,072	1,037	Sandstone
MW-88	2,859,705	549,492	2,637,393	494,226	1,081	1,074	1,031	Sandstone
MW-94	2,839,332	551,784	2,617,012	496,392	1,151	1,098	1,040	Sandstone
MW-95	2,840,470	549,492	2,618,164	494,108	1,153	1,097	1,035	Sandstone
MW-96	2,843,779	548,923	2,621,475	493,560	1,150	1,091	1,041	Sandstone
MW-97	2,846,175	549,044	2,623,870	493,695	1,141	1,093	1,044	Sandstone
MW-98	2,848,812	549,113	2,626,505	493,780	1,140	1,088	1,046	Sandstone
MW-99	2,849,260	554,335	2,626,921	499,003	1,160	1,082	1,043	Sandstone
MW-100	2,852,057	549,113	2,629,749	493,800	1,138	1,082	1,045	Sandstone
MW-101	2,833,227	547,010	2,610,938	491,582	1,102	1,098	1,022	Sandstone

TABLE 3-2
PROPOSED MONITORING WELL SCREEN INTERVALS
FORMER NEBRASKA ORDNANCE PLANT, MEAD, NEBRASKA

Well Cluster ID	Estimated Depth to Water (ft BGS)	Estimated Depth to Bedrock (ft BGS)	Estimated Aquifer Thickness (ft)	Shallow ("B") Well		Intermediate ("A") Well		Bedrock ("D") Well	
				Proposed Top of Screen (ft BGS)	Proposed Bottom of Screen (ft BGS)	Proposed Top of Screen (ft BGS)	Proposed Bottom of Screen (ft BGS)	Proposed Top of Screen (ft BGS)	Proposed Bottom of Screen (ft BGS)
MW-86	17	52	35	24	34	42	52	56	61
MW-87	14	48	34	21	31	38	48	52	57
MW-88	7	50	43	18	28	40	50	54	59
MW-94	53	111	59	72	82	101	111	115	120
MW-95	57	118	62	77	87	108	118	122	127
MW-96	59	110	50	75	85	100	110	114	119
MW-97	48	97	49	63	73	87	97	101	106
MW-98	53	95	42	64	74	85	95	99	104
MW-99	78	117	39	87	97	107	117	121	126
MW-100	57	94	37	65	75	84	94	98	103
MW-101	3	79	76	31	41	69	79	83	88

Notes:

(1) Depths for all wells are dependent on the depth to bedrock, and the saturated thickness at each location.
(2) The base of the screen of the shallow ("B") wells will be installed at the middle of the saturated thickness of the aquifer.
(3) The intermediate ("A") wells will be installed with the bottom of the screen at the bedrock surface, unless fine materials are encountered on the top of bedrock. In such a case, the well should be screened at the base of the lowermost sand or gravel with less than 15% fines.
(4) The bedrock wells will be installed with the top of the screen at least 4 feet into bedrock to provide for an adequate seal.
(5) It is anticipated that sandstone will be encountered at all of the proposed locations. If shale is encountered at the top of bedrock, no deep well will be installed.

Table 2-1B
Monitoring Well Screen Intervals

ID	EastingNAD27	NorthingNAD27	EastingNAD83	NorthingNAD83	Ground_SurfaceNAVD88	WaterElev.March05NAVD88	BedrockElev.NAVD83
MW-86	2,855,172	548,527	2,632,867	493,233	1,093	1,076	1,041
MW-87	2,857,275	547,510	2,634,976	492,230	1,086	1,072	1,037
MW-88	2,859,705	549,492	2,637,393	494,226	1,081	1,074	1,031
MW-94	2,839,332	551,784	2,617,012	496,392	1,151	1,098	1,040
MW-95	2,840,470	549,492	2,618,164	494,108	1,153	1,097	1,035
MW-96	2,843,779	548,923	2,621,475	493,560	1,150	1,091	1,041
MW-97	2,846,175	549,044	2,623,870	493,695	1,141	1,093	1,044
MW-98	2,848,812	549,113	2,626,505	493,780	1,140	1,088	1,046
MW-99	2,849,260	554,335	2,626,921	499,003	1,160	1,082	1,043