A1. QUALITY ASSURANCE PROJECT PLAN
FOR
FORMER NEBRASKA ORDNANCE PLANT - MEAD
MEAD, NEBRASKA

U.S. EPA Work Assignment No.: 0-280
Lockheed Martin Work Order No.: EAC00280
U.S. EPA Contract No.: EP-C-04-032

Prepared For:
United States Environmental Protection Agency/Environmental Response Team
Edison, New Jersey

September 24, 2007

Approved By:

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REAC Task Leader	Date
______________________	______________________
REAC Group Leader	Date
______________________	______________________
REAC Quality Assurance Officer	Date
______________________	______________________
REAC Program Manager	Date
______________________	______________________
U.S. EPA Work Assignment Manager	Date

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A. PROJECT MANAGEMENT

This Quality Assurance Project Plan (QAPP) was prepared in accordance with *EPA Requirements for Quality Assurance Project Plans (QAPPs)*, EPA QA/R-5 and the *Response Engineering and Analytical Contract (REAC) Program QAPP*. This QAPP follows the graded approach outlined in the Uniform Federal Policy (UFP)-QAPP.

A3. DISTRIBUTION LIST

The following personnel will receive copies of the approved QAPP for the Former Nebraska Ordnance Plant (NOP) - Mead site, Work Assignment (WA) No. 0-280:

1. David Mickunas, Environmental Protection Agency/Environmental Response Team (EPA/ERT) Work Assignment Manager (WAM)
2. Scott Marquess, EPA Region VII Remedial Project Manager (RPM)
3. Deborah Killeen, REAC Quality Assurance Officer (QAO)
4. Danielle McCall, REAC Task Leader (TL)/Quality Control (QC) Coordinator
5. Jeffrey Bradstreet, REAC Air Section Leader
6. Stephen Blaze, REAC Advanced Analytical Group Leader
7. Dennis Miller, REAC Program Manager

A4. PROJECT ORGANIZATION

The following individuals will participate in the project:

<u>EPA/ERT</u>
David Mickunas- WAM
Raj Singhvi – Acting Quality Assurance (QA) Manager

<u>EPA Region 7</u>
Scott Marquess - RPM

<u>REAC</u>
Danielle McCall - TL/QC Coordinator/Gas Chromatograph/Mass Spectrometer (GC/MS) Analyst
John Wood - Trace Atmospheric Gas Analyzer (TAGA) Analyst.
Stephen Blaze - Monitoring and Sampling Operations
Jessica Fry - Monitoring and Sampling Operations
Oleksandr Chubatyy - TAGA Data Reducer
William Weeks- Commercial Driver License (CDL) Driver and Sampling Operations Leader
Deborah Killeen – QA

The REAC TL/QC Coordinator for the project is the primary point of contact with the EPA/ERT WAM. The TL is responsible for the completion of the Work Plan (WP), QAPP, project team organization, and supervision of all project tasks, including reporting and deliverables. The RPM from EPA Region VII will provide oversight and guidance in the field through the WAM.

A5. PROBLEM DEFINITION

<u>Background</u>. The 17,000-acre NOP site operated from 1942 to 1956 as a munitions production plant during World War II and the Korean War. Army operations included loading, assembling, and packing of munitions at four load line facilities. The plant was also used by the Army for munitions storage and ammonium nitrate production. The Air Force built and maintained three Atlas missile silos at the facility from 1959 to 1964. Some of the processes associated with the Air Force operations used organic solvents.

Beginning in 1962, portions of the plant were sold to various entities. Today, the major production area of the former plant, approximately 9,000 acres, belongs to the University of Nebraska, which operates their Agricultural Research and Development Center (ARDC) at the site. During the operations of the ARDC, the University disposed of low-level radioactive wastes, other chemicals and solid wastes on site. The remaining acreage is owned by the Nebraska National Guard and numerous private individuals and corporations. The former NOP is being investigated by the Army Corps of Engineers as part of the Defense Environmental Restoration Program. The site, however, is not currently owned by the Federal government.

The groundwater is contaminated with volatile organic compounds (VOCs) and explosives. Residential water supply wells have been contaminated. Public water systems may also be threatened. The majority of soil contamination has been previously remediated, however, unexploded ordnance may remain a concern at the site. Those persons with direct contact or who ingest contaminated water or soil may be at risk. Approximately 400 people obtain drinking water from wells located within three miles of the site. Public water supply well fields, which serve the cities of Ashland and Lincoln, are located approximately three miles south of the site. In addition, the construction of a new well field to serve the city of Omaha is underway at a location northeast of the site. The well field is scheduled to begin operations in 2008. Groundwater also is used for crop irrigation and livestock watering.

The extent of contamination at the NOP is defined where concentrations of trichloroethene (TCE) exceed the TCE final target groundwater cleanup goal of 5 microgram per liter (µg/L) and where hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX) concentrations exceed the final target groundwater cleanup goal of 2 µg/L. The Operable Unit 2 (OU2) Record of Decision (ROD) defines the extent of contamination based on the following four-groundwater contamination plumes:

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

An aerial view of the site depicting the plumes is presented in Appendix A.

A6. PROJECT DESCRIPTION AND SCHEDULE

All monitoring and analyses performed on-site will be considered a rapid screening process for collecting preliminary data at the site or for determining indoor/ambient air quality. The VOCs of interest are TCE, dichloroethenes (DCEs) – (cis-1,2-dichloroethene (DCE), trans-1,2-DCE, 1,1-DCE and vinyl chloride (VCL)). REAC personnel will provide support during the ongoing vapor intrusion studies by performing the following:

1. The Sciex TAGA mass spectrometer/mass spectrometer (MS/MS) will be used to perform real time monitoring of indoor air in several University of Nebraska buildings and residential units (see Appendix B), as well as, mobile monitoring of outdoor ambient air at and adjacent to the NOP for the target compounds. Subsequent to TAGA monitoring, indoor air samples will be collected in SUMMA® canisters with 24-hour flow controllers. Outdoor and indoor ambient air monitoring and/or sampling for TCE, DCEs, and VCL will be conducted at the following locations:
    - 101 – Former shipping /receiving building – TAGA
    - 102 – Dairy science building - TAGA
    - 103 – Dairy farm manager's residence – TAGA and (2) 24-hour SUMMAs® – (1) in basement and (1) on 1st floor
    - 104 – Entomology building -TAGA
    - 105 – Swine farm manager's residence - TAGA and (2) 24-hour SUMMAs® – (1) in basement and (1) on 1st floor
    - 402 – North end of Load Line 4 - TAGA
    - 403 – Agronomy building (with 2 or 3 other buildings) - TAGA
    - 404 – Residence at domestic well 54 - TAGA and (3) 24-hour SUMMAs® – (2) in basement and (1) on 1st floor
    - 405 – Residence at domestic well 53 - TAGA and (2) 24-hour SUMMAs® – (1) in crawl space and (1) on 1st floor

- 406 - Domestic well 52C – TAGA
- Additionally, two (2) ambient SUMMAs® shall be collected for the target compounds.

All locations, access, and scheduling will be determined, arranged and provided by Region VII.

2. Install and sample sub-slab wells at locations listed below. Soil gas samples will be collected in 1-Liter (1-L) Tedlar® bags for on-site analysis on the Agilent gas chromatograph/mass spectrometer (GC/MS) for the target compounds. Soil gas samples will also be collected in SUMMA® canisters with 24-hour flow controllers. All locations, access, and scheduling will be determined, arranged and provided by Region VII.
   - 101 – Former shipping /receiving building – 1 probe – Tedlar® bag
   - 102 – Dairy science building – 1 probe – Tedlar® bag
   - 103 – Dairy farm manager's residence – 2 probe – Tedlar® bag and (2) 24-hour SUMMAs®
   - 104 – Entomology building – 1 probe – Tedlar® bag
   - 105 – Swine farm manager's residence – 1 probe – Tedlar® bag and (1) 24-hour SUMMA®
   - 402 – North end of Load Line 4 – 2 probe – Tedlar® bags
   - 403 – Agronomy building (with 2 or 3 other buildings) - 1 probe/building – 1 Tedlar® bag per probe
   - 404 – Residence at domestic well 54 – 1 probe – Tedlar® bag and (1) 24-hour SUMMA®
   - 405 – Residence at domestic well 53 - 1 probes – Tedlar® bag and (1) 24-hour SUMMA®
   - 406 - Domestic well 52C - 1 probe – Tedlar® bag

3. Using the TAGA MS/MS perform mobile monitoring for the target compounds during irrigation operations.

4. Acquire local meteorological data (wind speed and direction, temperature, relative humidity, rainfall, barometric pressure, etc.) prior to (7days) and concurrent with the TAGA monitoring and SUMMA ® canister sampling.

The schedule of activities and reports is as follows:

• WP	September 24, 2007
• QAPP	September 24, 2007
• TAGA Indoor Air Survey	Week of October 1, 2007
• TAGA Mobile/Stationary Air Monitoring	Week of October 1, 2007
• SUMMA® Canister Sampling	Week of October 1, 2007
• GC/MS Analysis	Week of October 1, 2007
• TAGA Analytical Report	4 weeks after completion of mobilization event
• GC/MS Analytical Report	4 weeks after completion of mobilization event
• Final Report	4 weeks after receipt of final validated data from lab.

All project deliverable dates are estimated based on the information available at the time of the WP completion. New information, additional tasks and events outside REAC control may result in revisions to these dates.

A7. DATA QUALITY OBJECTIVES AND CRITERIA FOR MEASUREMENT OF DATA

The purpose of this mobilization will be to assist the EPA Region VII during the performance of a soil gas intrusion study. The study is to be conducted at and adjacent to the former NOP in Mead, Nebraska. The vapor intrusion study will assist in determining if a subsurface gas plume exists and evaluate the potential impact to indoor air associated with the subsurface plume. This is a preliminary assessment to determine if volatile and toxic levels are present, determine if inhabited buildings are, or in the future could potentially be, located near subsurface contaminants and based on assessed risks determine if any further action is warranted. At the present time, no action limits have been defined for sub-slab or indoor air concentrations. The California indoor air guideline of 1.4 microgram per cubic meter ($\mu g/m^3$) or 0.26 part per billion by volume (ppbv) for TCE may be used to determine if the concentrations obtained pose a potential risk.

The TAGA MS/MS quantitation limits (QLs) for the target compounds are based on a one-minute average for indoor and outdoor monitoring and will be less than 1.0 ppbv, except for VCL, whose QL will range from 5 to 10 ppbv. The QL for the on-site GC/MS analyses will be 0.5 ppbv for all target compounds, except for VCL, whose QL will be 1.0 ppbv.

The VOCs reporting limits (RLs) for the indoor air samples collected in SUMMA canister samples will be less than or equal to 0.070 ppbv and the RLs for the sub-slab samples will be less than or equal to 0.10 ppbv.

The data categories (DCs) corresponding to the data use objectives required for successful completion of this WA are summarized in Table 1, *Field Sampling and Monitoring Summary – Air and Soil Gas* and Table 2, *QA/QC Analyses and Data Categories Summary – Air and Soil Gas*. These tables identify analytical parameters desired; type, volume and number of containers needed; preservation requirements; number of samples to be collected; and associated number and type of QA/QC samples based on the data category. Two of the three DCs based on the two Superfund Data Categories described in the 1993 Office of Solid Waste and Emergency Response (OSWER), Office of Emergency and Remedial Response (OERR) Directive, Screening Data (SD) and Definitive Data (DD) will be used for this WA and are described below.

Screening data will be used to evaluate indoor air, within the breathing zone, and soil gas in several commercial and residential units, as well as, outdoor ambient air at the and adjacent to the site for the target compounds. Screening data without definitive confirmation is not considered "data of known quality.@ All analytical results from TAGA monitoring and On-site GC/MS analysis will be screening data. Results from the indoor air monitored by the TAGA will be confirmed by the analysis of indoor samples collected in SUMMA® canisters. A minimum of 10 percent of monitored locations will be confirmed. GC/MS results of the sub-slab soil gas samples will be confirmed by the analysis sub-slab soil gas samples collected in SUMMA® canisters. A minimum of 10 percent of sampled locations will be confirmed.

The following requirements for ASD@ will be used for all TAGA monitoring activities and on-site GC/MS analyses:

1. Sample documentation in the form of field logbooks and appropriate field data sheets. Chain of custody (COC) records are optional for field screening locations.
2. All instrument calibration and/or performance check procedures/methods will be summarized and documented in the field, personal, or instrument log notebook. The manufacturer=s instructions or standard operating procedures (SOPs) should specify the procedure and frequency for calibration during use.
3. DLs will be determined and documented, along with the data, where appropriate.

Definitive data is used for all data collection activities that require a high level of accuracy using EPA, National Institute of Occupational Safety and Health (NIOSH), American Society for Testing and Materials (ASTM), and other industry-recognized methods. For the data to be definitive, either total measurement error or analytical error must be determined. The following requirements for "DD" are applicable for the VOC samples collected in SUMMA® canisters:

1. Sample documentation in the form of field logbooks, the appropriate field data sheets, and chain of custody forms will be provided.
2. All instrument calibration and/or performance check procedures/methods will be summarized and documented in the field/personal or instrument log notebook.
3. Detection limit(s) will be determined and documented, along with the data, where appropriate.
4. Sample holding times will be documented; this includes documentation of sample collection and analysis dates.
5. Initial and continuing instrument calibration data will be provided.
6. SUMMA® canister/air samples, collocated samples and trip blanks will be included at the rate specified in Table 2, footnotes 1-7, respectively.
7. For SUMMA® canister samples, trip blanks will be included for each day sampling is performed.
8. Performance Evaluation (PE) samples are optional.
9. Analyte identification will be confirmed on 100 percent (%) of the samples by analytical methods associated with definitive data.
10. Quantitation results for all samples will be provided.
11. Analytical or total measurement error must be determined on 100% of the samples.
    - Analytical error determination measures the precision of the analytical method. At a minimum, two replicate aliquots are taken from a thoroughly homogenized sample or two

media blanks, prepared and analyzed in accordance with the method, calculated and compared to method-specific performance criteria.

- Total measurement error is determined from independently collected samples from the same location and analyzed by analytical methods associated with definitive data. Quality control parameters such as the mean, variance, and coefficient of variation is calculated and compared to established measurement criteria.

The data use categories are based on the Data Quality Indicators (DQIs) used to determine the acceptability or usability of the data. Two DQIs used in the laboratory measurement process that will be evaluated during the validation procedure are precision and accuracy.

$ Precision is a measure of agreement between replicate measurements under similar conditions and may be expressed as Relative Percent Difference (RPD). The RPD will be calculated between the results of a sample and a field duplicate sample after the measurement process is complete.

$ Accuracy is a measure of the agreement between an observed value and an accepted reference value. This will be determined by analyzing a known reference material or a sample to which a specific amount of a known reference material has been added. Accuracy will be expressed as Percent Recovery (%R). Since accuracy takes into account the effects of variability (precision), accuracy is a combination of bias and precision.

A8. TRAINING AND CERTIFICATION

All field personnel involved with sampling and monitoring activities will have the following documented training:

- Occupational Safety and Health Administration (OSHA) 40-hour and/or 8-hour refresher in Hazardous Waste Operations (20 CFR1910.120)
- Department of Transportation (DOT) hazardous materials shipping
- First Aid and Cardiopulmonary Resuscitation (CPR) training (at least one team member)

A9. DOCUMENTS AND RECORDS

The REAC Program QAPP serves as the basis for this site-specific QAPP. The most current approved version is available to all REAC technical personnel as an uncontrolled copy on the REAC Local Area Network (LAN). Documents and records that will be generated during this project include:

- WP
- QAPP
- HASP
- Laboratory, site log books
- Sample Labels
- Chain of Custody (COC) forms
- Custody Seals
- Air Sampling Work Sheets
- Projected Work Assignment (PWA)
- Data Reduction Records
- Data Assessment Forms
- Data Validation Records
- Instrument Printouts
- Instrument Logbooks
- Site Maps
- Laboratory Analytical Reports
- TAGA Analytical Report
- GC/MS Analytical Report
- Final Report
- Field Change Form (if required)

The Final Report will provide a description of the project, field procedures, laboratory procedures, difficulties encountered and validated final analytical reports (with copies of the COC) as appendices.

All documentation will be recorded in accordance with REAC SOP #4001, *Logbook Documentation* and REAC SOP #2002, *Sample Documentation*. All Analytical Reports will be prepared in accordance with REAC SOP #4020, *Analytical Report Preparation*. The Final Report will be prepared in accordance with REAC SOP #4021, *Preparation of Final Reports.*

B. DATA GENERATION AND ACQUISITION

B1. SAMPLING/MONITORING PLAN DESIGN

Residential Soil Gas Well Installation. **S**ub-slab soil gas wells will be installed in residential locations by REAC personnel. The gas wells will be installed at locations chosen by the RPM and or the WAM on site. Wells will be installed flush with the basement slab and capped with Teflon® fitting that can be removed during sampling operations. Wells will be installed in accordance with REAC SOP # 2082, *Construction and Installation of Permanent of Sub-Slab Soil Gas Wells.* One collocated port will be installed in one of the residences.

Non-Residential Soil Gas Well Installation. Sub-slab soil gas wells will be installed in non-residential locations by REAC personnel. The gas wells will be installed at locations chosen by the RPM and or the WAM on site. Wells will be installed flush with the cement slab and capped with Teflon® fitting that can be removed during sampling operations. Wells will be installed in accordance with draft REAC SOP # 2082, *Construction and Installation of Permanent of Sub-Slab Soil Gas Wells.* One collocated port will be installed in one of the non-residential locations.

Tedlar® Bag Sampling. Soil gas samples for both residential and non-residential locations will be collected into 1-L Tedlar® bags from the established sub-slab well ports using a vacuum box and a sampling train. These samples will be collected prior to and after the collection of the 24-hour canister samples.

SUMMA® Canister Sampling. Indoor, ambient air and soil gas samples will be collected into a 6-L SUMMA® canister during a 24-hour sampling period. Each canister will be fitted with a restrictive orifice set at approximately 3.4 milliliter/minute (mL/min) to collect between 4 to 5-L of sample. These sampling events will occur subsequent to TAGA monitoring of the building structure.

TAGA Monitoring. The TAGA MS/MS will be used to monitor and assist in the identification of any lifestyle source of contaminants of interest. All lifestyle substances (possible chemical sources) that can be accessed should be removed and all windows and doors closed for 24-hours prior to any indoor air-monitoring events. (Refer to Appendix C) REAC personnel, while holding the distal end of the TAGA sampling hose at breathing height, will proceed to each location to be monitored and collect a one-minute data segment. If elevated levels are encountered, efforts will be made to isolate the source of the contaminants by taking additional measurements at various locations. All monitoring performed on this site will be considered to be a rapid screening process for collecting preliminary data at the site and determining concentration of the target compounds, if any, in the indoor/ambient air.

Sufficient data should be obtained with the real-time instrument during the initial entry to screen the site for the appropriate contaminants. These gross measurements may be used on a preliminary basis to (1) determine levels of personal protection, (2) establish site work zones, and (3) map candidate areas for more thorough qualitative and quantitative studies involving air sampling.

B2. SAMPLING/MONITORING METHODS

Tedlar® Bag Sampling. Soil gas samples will be collected into 1-L Tedlar® bags in accordance with REAC SOP # 2102, *Tedlar Bag Sampling.*

SUMMA® Canister Sampling. Each canister will be equipped with a restrictive orifice set collect samples over a 24-hour period in accordance with REAC SOP #1704, *SUMMA Canister Sampling.*

TAGA Monitoring. The TAGA MS/MS will be used to perform indoor and ambient air monitoring for TCE, DCE, and VCL in real-time. Monitoring will be in accordance with draft REAC SOP #1711, *Trace Atmospheric Gas Analyzer (TAGA) IIe.* Real-time preliminary results will be available at time of monitoring. Final validated results will be available no later than four weeks after the monitoring events.

<u>Mass Spectrometer/Mass Spectrometer General Theory</u>. The ECA TAGA IIe is based upon the Perkin-Elmer API 365 MS/MS and is a direct air monitoring instrument capable of detecting, in real time, trace levels of many organic compounds in ambient air. The technique of triple quadrupole MS/MS is used to differentiate and quantitate compounds.

The initial step in the MS/MS process involves simultaneous chemical ionization of the compounds present in a sample of ambient air. The ionization produces both positive and negative ions by donating or removing one or more electrons. The chemical ionization is a "soft" ionization technique, which allows ions to be formed with little or no structural fragmentation. These ions are called parent ions. The parent ions with different mass-to-charge (m/z) ratios are separated by the first quadrupole (the first MS of the MS/MS system). The quadrupole scans selected m/z ratios allowing only the parent ions with these ratios to pass through the quadrupole. Parent ions with m/z ratios different than those selected are discriminated electronically and fail to pass through the quadrupole.

The parent ions selected in the first quadrupole are accelerated through a collision cell containing uncharged nitrogen molecules in the second quadrupole. A portion of the parent ions entering the second quadrupole fragment as they collide with the nitrogen molecules. These fragment ions are called daughter ions. This process, in the second quadrupole, is called collision induced dissociation (CID). The daughter ions are separated according to their m/z ratios by the third quadrupole (the second MS of the MS/MS system). The quadrupole scans selected m/z ratios, allowing only the daughter ions with these ratios to pass through the quadrupole. Daughter ions with m/z ratios different than those selected are discriminated electronically and fail to pass through the quadrupole. Daughter ions with the selected m/z ratios are then counted by an electron multiplier. The resulting signals are measured in ion counts per second (icps) for each parent/daughter ion pair selected. The intensity of the icps for each parent/daughter ion pair is directly proportional to the ambient air concentration of the organic compound that produced the ion pair. All of the ions discussed in this report have a single charge. The m/z ratios of all of the ions discussed are equal to the ion masses in atomic mass units (amu). Therefore, the terms parent and daughter masses are synonymous with parent and daughter ion m/z ratios.

Meteorological Monitoring. REAC personnel will obtain local meteorological data from a certified, permanent station with one-hour data (or less) averages of the following parameters: wind speed, wind direction, barometric pressure, temperature, relative humidity, solar radiation, and rainfall. Data will be collected one week prior to and concurrent with the monitoring and sampling events.

B3. SAMPLE HANDLING AND CUSTODY

Scribe will be used for sample management, as well as, generation of sample labels and COC records. Chain of custody records will be used to document the collection indoor or ambient air and soil gas samples. All COC records will receive a peer review in the field prior to shipment of samples in accordance with REAC SOP # 4005, *Chain of Custody Procedures.* At least two custody seals will be placed across the canister shipping containers to ensure sample integrity. The samples collected by REAC personnel will be shipped under the COC to the contract laboratory for analysis in accordance with REAC SOP #2004, *Sample Packaging and Shipment.*

B4. ANALYTICAL METHODS

On-Site GC/MS Analysis: Soil gas samples collected in 1-L Tedlar® bags will be analyzed in accordance with draft REAC SOP, *Field Analysis of VOCs in Gaseous Phase Samples by GC/MSD Loop Injection.* The 1-L Tedlar® bag is attached to the sample introduction port of the heated direct dual loop injection apparatus. With the injection apparatus in the load sample position, the 1-L Tedlar® bag is opened to allow the sample to flow into the 5 mL loop. At the same time, a second loop is filled with the internal standard. By switching the injection apparatus to the inject sample position, the contents of both loops are simultaneously injected onto the head of the GC column for analysis. The VOCs are separated by a ramped temperature program and then detected by the MS using Simultaneous Ion Monitoring (SIM) mode.

Fixed Laboratory GC/MS Analysis: Analysis of all samples collected in SUMMA® canisters will be performed by a contracted Laboratory in accordance with EPA Method TO-15, *Determination of Volatile Organic Compounds (VOCs) in Air Collected in Specially-Prepared Canisters and Analyzed by Gas Chromatography/Mass Spectrometry (GC/MS).*

B5. QUALITY CONTROL

Appropriate QA/QC procedures will be followed using the guidelines in REAC SOP #2005,*Quality Assurance/Quality Control Samples*.

Field QC samples are designed to assess the variability of the matrix or medium being sampled and to detect contamination and sampling error in the field. The following field QC samples will be collected during SUMMA® canister and Tedlar® bag sampling events:

- Trip blanks will be collected at a rate of one per shipment.
- Collocated samples will be collected at a rate of one in twenty samples for sub-slab and indoor air samples.
- A minimum of one ambient air sample will be collected for each day of sampling (SUMMA ® and Tedlar ®).

TAGA Air Monitoring QA/QC:

- Daily beginning of day (BOD) and ending of day (EOD) calibrations.
- Daily beginning of day and ending of day transport efficiencies >85% (if the 300-foot hose is used).
- Calculation of detection and quantitation limits for each day.
- Calculation of intermediate response factors for each day.

GC/MS VOC Analysis by Loop Method:

- Method blank for on-site GC/MS analyses for each day of analysis.
- Replicate sample analysis for on-site GC/MS with the frequency of 5 percent.

Laboratory QC samples are analyzed in the laboratory and are used to determine any matrix effects and to assess the performance of the laboratory. All appropriate QC samples required by the method will be run. This includes but is not limited to: tunes, initial and continuing calibration standards, internal standards, and method detection limit studies.

B6. INSTRUMENT/EQUIPMENT TESTING, INSPECTION, AND MAINTENANCE

REAC field personnel will be responsible for conducting preventive maintenance on a routine and on an as needed basis to prevent instruments/equipment from failing during use, ensure proper performance and increase the reliability of the system.

Each piece of equipment will be checked operationally prior to deployment. The 24-hour restrictive orifices will be tested prior to sampling to ensure that the appropriate flow rate has been set.

The contract laboratory will be responsible for conducting preventive maintenance on a routine and on an as needed basis to prevent instruments/equipment from failing during use, ensure proper performance and increase the reliability of the system.

B7. INSTRUMENT/EQUIPMENT CALIBRATION AND FREQUENCY

Operational calibration is generally performed as part of the analytical procedure and is dependent upon the type of instrumentation. Typically, certified standards with certificates of analysis are used to prepare calibration standards for analytical instruments. Preparation of a standard curve is accomplished by using calibration standards containing the species to be analyzed into a specific solvent mixture to be introduced into the instrument. The concentrations of the working standards are chosen to cover the working range of the instrument. The calibration curve is prepared by plotting instrument response versus the concentration of the standards. Concentrations of the samples analyzed are read directly from the calibration curve or determined by interpolation.

TAGA MS/MS Calibration: At the beginning of each TAGA monitoring day, a gas mixture containing the target analytes of concern (i.e., TCE and/or PCE, etc.) will be introduced by a mass flow controller (MFC) into the sample air flow (SAF). The gas mixture is introduced into the SAF and the tuning parameters for the first quadrupole at 30, 62, 106, 130 and 166 amu, and the third quadrupole at 78, 105,131,164 and 166 amu will be optimized for sensitivity and mass assignment. The peak widths will be limited between 0.55 amu and 0.85 amu. The mass assignments will be set to the correct values within 0.15 amu.

The calibration system will consist of a regulated gas cylinder with a MFC. The MFC will be checked with a National Institute of Standards and Technology (NIST) traceable flow rate meter. The calibration system will be used to generate the analytes response factors (RFs), in units of ion counts per second/part per billion by volume (icps/ppbv), which will then be used to quantify the trace component in ambient air. The TAGA will be calibrated for the target compounds at the beginning and end of the monitoring day and/or at the discretion of the WAM.

The gas cylinder standard, which contains a known mixture of the target compound, certified by the supplier, will be regulated at preset flow rates, and diluted with ambient air. Dilution of the gas cylinder standard will give known analyte concentrations. The calibrations will consist of a zero point and five known concentrations obtained by setting the MFC to 0, 10, 20, 40, 80, and 90 mL/min with the sample air flow at 1,500 milliliters per second (mL/sec). The approximate concentration range of the standard introduced into the TAGA will be between 1 ppbv and 25 ppbv. The RFs will then be determined by using a least-square-fit algorithm to calculate the slope of the curves. The coefficient of variation will be checked for each ion pair's RF to ensure that it is greater than 0.90. The software will utilize the analyte's cylinder concentration, gas flow rates, air sampling flow rates, and atmospheric pressure to calculate the RFs. The RFs will be obtained for the ion pairs of the compound of interest in the cylinder. The cylinder calibration will be used for TCE, DCE, and VCL. The calibration will be performed with a 200- to 400-foot length of corrugated Teflon® sampling hose attached. After the initial calibration and the final unit survey is complete, the transport efficiency and residence time determinations are performed.

On-Site GC/MS Calibration: At the beginning of each day, the GC/MS system will be tuned, either automatically or manually, using perfluorotributylamine (PFTBA) to set the proper mass calibration, mass resolution and ion abundance ratios. After PFTBA tuning is successfully completed, 5 mL of 4-Bromofluorobenzene (BFB) is analyzed to check the analytical performance and confirm that the ion abundance ratios for BFB meet requirements. The mass spectrum of BFB meeting the criteria must be acquired in the following manner; three scans (the peak apex and the scans immediately preceding and following the apex) are acquired and averaged. Background subtraction is conducted using a single scan prior to the elution of BFB.

Before any sample or blank analyses, the GC/MS will be calibrated using target analytes and internal standards contained in pressurized cylinders or canisters. The target analytes are at a nominal 500-ppbv concentration in nitrogen. The internal standards are at a nominal one part per million by volume (ppmv) concentration in nitrogen. A multipoint calibration, typically a 5 to 6-point calibration, should be established before sample injection. The initial calibration curve results from injecting 5mLs of 0.5, 1, 5, 50, 250, and 500 ppbv calibration standards. One of the calibration standards should be near the QL for the compound(s) of interest. Internal standards are added by typically filling a 50µL loop (equivalent to 10 ppbv) of the 1-ppmv internal standard.

A minimum of three of the calibration standards analyzed must be used to generate the initial calibration curve. The primary ion should be used for quantitation unless interferences are present, in which case a secondary ion is used.

Data generated by use of an average RF or a linear regression forced through zero is acceptable. The preferred approach is to first create a calibration using RFs. The initial calibration is acceptable when the calibration percent relative deviation (%RSD) for each analyte is less than or equal to 30%, with at most two exceptions with a limit up to 40%. The average RF is then used for calculating sample concentrations.

Flow Controller Check: A flow check of each 24-hour flow controller will be performed before sampling is initiated. By means of a clean SUMMA® canister and a certified flow meter, the initial and final flow rate of each flow controller will be measured. The average of the two flow rates will be used to determine the volume of air sampled. All information will be recorded on worksheets for inclusion in the final deliverable.

B8. INSPECTION/ACCEPTANCE OF SUPPLIES AND CONSUMABLES

REAC personnel have the responsibility for the inspection and acceptance of supplies and consumables. It is the responsibility of the EPA/ERT to provide adequate facilities, equipment and supplies for REAC to perform all field related tasks for this WA. The REAC contractor is responsible for the procurement, inspection, and acceptance of supplies and consumables for this WA.

B9. NON-DIRECT MEASUREMENTS

This section is not applicable to this QAPP.

B10. DATA MANAGEMENT

All monitored units will be identified by the field assigned number. All monitoring procedures will be reviewed and the data verified for the appropriate QA objectives. Field sampling data will initially be recorded on field data sheets or in field books. Samples will be delivered under COC to the specified fixed or on-site laboratories. Samples will be identified by field assigned numbers. The incoming samples will be checked against the COC for accuracy and assigned a unique laboratory number, which identifies the sample to the laboratory personnel. This number can later be cross-referenced to the field number. All laboratory procedures will be reviewed and the data verified for the appropriate quality assurance objectives. Any problems identified will be brought to the attention of the REAC TL and the EPA/ERT WAM for resolution before release of the Final TAGA Report. Hard copies of all deliverables will be provided to the TL, the WAM and stored in the REAC Central Files. Electronic copies of all deliverables will be saved on the REAC archive drive in accordance with Administrative Procedure (AP) #34, *Archiving Electronic Files*. All data deliverables for this WA will be posted to the ERT-Information Management System (IMS) website either as a Scribe electronic data deliverable (EDD) or in portable document format (.pdf). Any SOPs or APs referenced in this QAPP are available as uncontrolled copies on the REAC LAN. Site logbooks and field sampling worksheets will also be archived once the project is completed and the WA closed.

C. ASSESSMENT/OVERSIGHT

C1. ASSESSMENT AND RESPONSE ACTIONS

The TL/QC Coordinator, the Air Response Section Leader, QAO, and Advanced Analytical Group Leader are responsible for quality control assessments and corrective action for this WA. The tasks associated with this QAPP are assessed through the use of peer reviews and management system reviews. Peer review enables the field chemist to identify and correct reporting errors before reports are submitted. Management system reviews establish compliance with prevailing management structure, policies and procedures, and ensures that the required data are obtained. All project deliverables will receive an internal peer review prior to release, per guidelines established in the REAC AP #22, *Peer Review of REAC Deliverables.*

The EPA/ERT WAM for this task will have the responsibility for verifying that the proper SOPs and sampling procedures are followed. If any technical issues or deficiencies are identified, the REAC TL will be notified and will pursue immediate resolution or corrective action. Any changes in scope of work will be documented on a Field Change Form and approved by the WAM.

C2. REPORTS TO MANAGEMENT

REAC Report	**Recipients**
Monthly Progress	EPA/ERT Project Officer and WAM
Quarterly QA Reports	EPA/ERT Project Officer and QA Manager

D. DATA VALIDATION AND USABILITY

D1. DATA REVIEW, VERIFICATION AND VALIDATION

All data produced under this QAPP will be evaluated to determine compliance with the stated collection methods, type, and number of samples collected, sample handling, and correct analytical procedures. Data review will be conducted prior to data release to evaluate the validity of the TAGA monitoring events and the on-site GC/MS analyses. Two data quality indicators, precision and accuracy, will be used to assess the sample results obtained from the TO-15 analyses. Data verification is the steps taken to determine whether the quality requirements specified in the "B" elements of this QAPP have been met. Data verification will be performed by the REAC TL/QC Coordinator, the TAGA Data Reducer, the Advanced Analytics Group Leader and/or the Data Validation and Report Writing (DV&RW) Group. The TL will be notified by the TAGA Data Reducer, the Advanced Analytics Group Leader and/or the DV&RW Group when inconsistencies or non-compliant monitoring and/or laboratory data are discovered. For field activities, it is necessary to determine whether the samples/monitoring data were collected using the sampling/monitoring design specified in element B1, whether the samples/monitoring events were collected according to a specific method or SOP as specified in element B2, whether the collected samples have been recorded and handled properly as in element B3, and whether the proper amount of QC samples and procedures were taken to satisfy the QC requirements specified in element B5. For analytical activities, each sample/monitoring event should be verified to ensure that the procedures used to generate the data (as specified in element B4) were performed as specified. The proper amount of QC checks (as specified in element B5) that were prepared and analyzed during the actual analysis provide an indication of the quality of the data. Instrument calibrations (as specified in element B7) are evaluated to determine whether the correct number of calibration standards were used and the range of the analysis, whether standards were analyzed in an appropriate sequence specific to the methods used, and were performed prior to monitoring events and analysis of samples, blanks, and QC samples in an appropriate time frame.

The TL/QC Coordinator, TAGA Data Reducer and the DV&RW Group are responsible for reviewing the data against a set of criteria to verify its validity prior to use. The data validation process summarizes the data and QC deficiencies, and determines the impact on the overall data quality. Data validation qualifiers are assigned in the data assessment records, flagged on the results tables, and noted in the "Discussion of Results" section of the TAGA and GC/MS final analytical reports and the case narrative of the final analytical report.

D2. VERIFICATION AND VALIDATION METHODS

Data verification occurs at each level in the field and in the laboratory to ensure that appropriate outputs are being generated routinely. Records produced electronically or maintained as hard copies are subject to data verification. During field activities, records associated with monitoring events and sample collection such as field data sheets, COC records, shipper's air bills, logbook documentation, or electronic devices to log samples or print sample labels are verified against approved SOPs or procedures. At sample receipt, COC records are verified along with refrigerator and freezer logs to ensure the integrity of the samples. During the sample preparation; certificates of analysis for surrogates and spiking compounds, refrigerator and freezer logs, analytical requests and standard preparation logs are verified. Manufacturer=s certificates for calibration and/or internal standards, instrument run or injection logs, standard preparation logs, calculation worksheets, and QC monitoring events/sample results are verified during the analysis of the sample set. Review of data package or client deliverables are verified for compliance with peer review procedures.

Data validation will be conducted by a member of Advanced Analytics Group not immediately responsible for the generation of the TAGA and on-site GC/MS generated data. Definitive data generated by the fixed laboratory will be validated by the DV&RW Group. All data validation will be conducted to determine how seriously the data deviate from acceptance limits and the potential effect on the data. All anomalies will be documented in the final analytical reports.

The following REAC SOPs will be used for all data validation procedures:

- REAC SOP #1015, *Data Validation Procedures for Routine Volatile Organics Analyses.*

D3. RECONCILIATION WITH USER REQUIREMENTS

Responsibility lies with the EPA; thus, this element is not applicable to this QAPP.

REFERENCES

U.S. Environmental Protection Agency. 2001. EPA Requirements for *Quality Assurance Project Plans* (EPA QA/R-5), EPA/240/B-01/003, Office of Environmental Information.

U.S. Environmental Protection Agency. 1990. *Quality Assurance/Quality Control Guidance for Removal Activities*, EPA/540/G-90/004, Office of Emergency and Remedial Response.

Response Engineering and Analytical Contract. 2003. *Quality Assurance Project Plan for the Response Engineering and Analytical Contract.*

URS Groups, Inc.. 2007. (*Draft) Vapor Intrusion Pathway Assessment Work Plan Operable Unit NO.2 (Groundwater) Former Nebraska Ordnance Plant- Mead, Nebraska.*

TABLE 1. Field Sampling and Monitoring Summary – Air and Soil Gas
Former Nebraska Ordnance Plant -Mead
Mead, NE
September 2007

Analytical Parameter	Action[1] Level	Sampling Media	Suggested Holding Times	Flow Rate	Volume Min - Max	Subtotal Number
VOCs*	NA	6-L SUMMA® Canisters	30 days	~ 3.4 mL/min	4 – 5-L	11 – 16
VOCs*	NA	6-L SUMMA® Canisters	30 days	~ 3.4 mL/min	4 – 5-L	5 – 9
VOCs*	NA	1-L Tedlar® Bags	24 hours	NA	1-L	10 - 20
VOCs*	NA	TAGA MS/MS	NA	1500 mL/sec	NA	10 – 20 Analyses

NOTES: VOCs = volatile organic compounds, L = liters, mL/sec = milliliters per second, mL/min = milliliters per minute, NA = not applicable, TAGA MS/MS = Trace Atmospheric Gas Analyzer mass spectrometer/mass spectrometer.

1. The concentration level, specific, or generic that is needed in order to make an evaluation. This level will provide a basis for determining the analytical method to be used.

* VOC target compounds are trichloroethene, cis-1,2-dichloroethene, trans-1,2-dichloroethene, 1,1-dichloroethene, and vinyl chloride.

TABLE 2. QA/QC Analyses and Data Categories Summary – Air and Soil Gas
Former Nebraska Ordnance Plant - Mead
Mead, NE
September 2007

Analytical Parameter	Analytical Method	Estimated Limit of Detection[1]	Lot Blanks[2]	Field Blanks[3]	Collocated Samples[4]	Trip Blanks[5]	Breakthrough[6]	PE Samples[7]	Data Category[8]
VOCs	EPA Method TO-15	0.070 – 0.10 ppbv	NA	NA	1 indoor/ 1 sub-slab	1 per shipment	NA	NA	DD
VOCs	Draft REAC SOP*	0.5 & 1.0 ppbv	1 per day	NA	NA	NA	NA	NA	SD
VOCs	Draft REAC SOP# 1711	≤ 1.0 ppbv & 5.0 to 10 ppbv	NA	NA	NA	NA	NA	NA	SD

NOTES: VOCs = Volatile Organic Compounds, ppbv = parts per billion by volume, NA = Not Applicable, SD = Screening Data

1. To be determined by the person arranging the analysis. Should be equal to or less than the action level.
2. Required for all data categories at a minimum rate of 10 percent of the total sample or one per sampling event per lot.
3. Mandatory for Definitive Data at a minimum rate of 5 percent of the total sample or one per sampling event. Certain methods may require a greater frequency.
4. Required for all data categories at a minimum rate of 5 percent of the total sample or one per sampling event.
5. Optional for SD/DC and mandatory for DD at a minimum rate of 5 percent of the total sample or one per sampling event.
6. Recommended for SD/DC and DD. Rate is method dependent. Requirement for use is based on deviations from accepted protocol and atmospheric conditions.
7. Performance evaluation samples are optional for SD/DC and DD at one per parameter per matrix. For SD, enter "NA."
8. Enter QA objective desired: SD, SD/DC, DD

* Refer to Section B4 Analytical Methods for name.

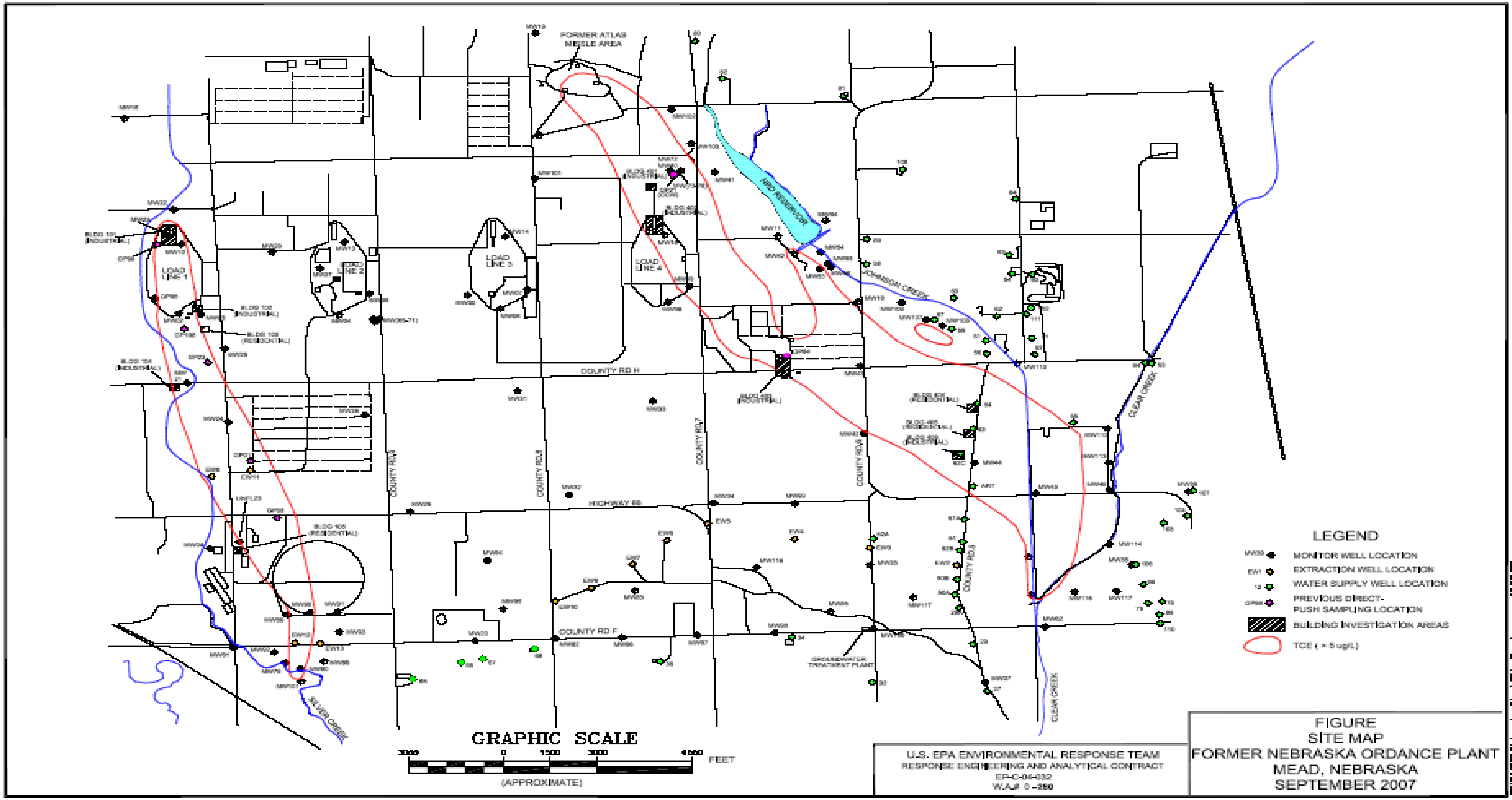
APPENDIX A

Aerial View of the Former Nebraska Ordnance Plant –Mead, Nebraska

Former Nebraska Ordnance Plant - Mead

Quality Assurance Project Plan

September 2007



Aerial View of the Former Nebraska Ordnance Plant – Mead, Nebraska

APPENDIX B

Table 2-2 of Army Corps of Engineers' Work Plan

Former Nebraska Ordnance Plant - Mead

Quality Assurance Project Plan

September 2007

Table 2-2
Buildings of Potential Interest
Vapor Intrusion Pathway Assessment
Former Nebraska Ordnance Plant, Mead, Nebraska

Plume	Building ID and Description	Current Use	Depth to Ground water (ft bgs)	Groundwater TCE[1] Concentration (µg/L)	Approx. Age (Years)	Type of Construction	Comments
Load Line 1	101 – Former Shipping/receiving bldg – UNL storage/maintenance	Industrial	39	140 (GP-98)	60+	Slab-on-grade	Primarily used for storage
	102 – Dairy science building	Industrial	43	5 (MW-2)	40	Slab-on-grade	Office space and milking floor
	103 – Dairy farm manager's residence	Residential	42	4,020 (GP-108)	40	Basement (concrete floor)	One-story brick residence
	104 – Entomology building	Industrial	38	83 (MW-21)	40	Slab-on-grade	Contains offices and labs
	105 – Swine farm manager's residence	Residential	64	283 (GP-08)	20	Basement (concrete floor)	One-story residence
Former Atlas Missile Area	401 – AFE Fire Shop	Industrial	44	16,000 (GP-21)	10	Slab-on-grade	Large metal building
	402 – North end of Load Line 4	Industrial	46	ND (MW-15)	60+	Slab-on-grade	Used for vehicle storage
	403 – Agronomy building	Industrial	51	620 (GP-84)	60	Slab-on-grade	Two-story building with offices, workshops, and maintenance area. Subsurface utilities
	404 – Residence at domestic well 54	Residential	25	14 (WSW-54)	30+	Basement (concrete floor)	Cinderblock foundation. 1.5-story residence.
	405 – Residence at domestic well 53	Residential	20	4 (WSW-53)	30+	Pier-and-beam (?)	Two-story residence with stone foundation
	406 – Domestic well 52C	Industrial	47	610 (WSW-52C)	10	Slab-on-grade (?)	Modern metal building atop bluff.

Notes:

1. Groundwater concentrations are from 2001 and 2002 Direct-Push Groundwater Sampling as well as 2006 Groundwater Monitoring Program Sampling

APPENDIX C

Indoor air Sampling – Instructions for Residents

Former Nebraska Ordnance Plant - Mead

Quality Assurance Project Plan

September 2007

Indoor Air Sampling
Instructions for Residents

Many of the compounds included in this indoor air-sampling program can be found in a number of different sources in your home. Please follow these instructions in preparation for the sampling. Failure to do so could affect the accuracy of the study.

Please begin these procedures 24 - 48 hours prior to and during the sampling event.

IF POSSIBLE please;

_ WEATHER CONDITIONS PERMITTING, keep doors, windows, vents, etc…closed. Do not operate ventilation fans or air conditioning;

_ Do not use air fresheners or odor eliminators;

_ Do not smoke in the house;

_ Do not use wood stoves, fireplace or auxiliary heating equipment (e.g., kerosene heater);

_ Do not use paints or varnishes;

_ Do not use cleaning products (e.g., bathroom cleaners, furniture polish, appliance cleaners, all-purpose cleaners, floor cleaners);

_ Do not use cosmetics, including hair spray, nail polish remover, perfume, etc;

_ Do not partake in indoor hobbies that use solvents;

_ Do not apply pesticides;

_ Do not store containers of gasoline, oil or petroleum-based or other solvents within the house or attached garage (except for fuel oil tanks);

_ Do not operate or store automobiles in an attached garage;

- Remove potential sources of air contamination from your home. See the attached list;

Please remove the following from your home 24 – 48 hours prior to Indoor Air Sampling:

Paints or paint thinners;
Gasoline storage cans;
Gas-powered equipment;
Cleaning solvents;
Air fresheners;
Oven cleaners;
Carpet/upholstery cleaners;
Hairspray;
Nail polish/polish remover;
Bathroom cleaners;
Appliance cleaners;
Furniture/floor polish;
Mothballs;
Fuel tanks;
Perfume/colognes;
Hobby supplies (solvents, glues, lacquers, photography chemicals);
Scented trees, wreaths, potpourri