APPENDIX F

PROJECT QUALITY ASSURANCE SUMMARY

F. PROJECT QUALITY ASSURANCE SUMMARY

This appendix presents the actions and methodologies undertaken to meet the QA goals for the project. These goals were established in the *Facility-Wide Sampling and Analysis Plan for the Ravenna Army Ammunition Plant* (USACE 1996), the *Phase II Remedial Investigation* (RI) *Sampling and Analysis Plan Addendum No. 1 for Load Line 1* (USACE 1999), and the *Phase II RI Sampling and Analysis Plan Addendum No. 2 for Load Line 1* (USACE 2000). These were implemented through project-specific procedures and requirements, the SAIC QA Program, and the U.S. Army Corps of Engineers – Louisville District QA requirements. A large proportion of project QA was focused on field and analytical laboratory activities and project administration.

F.1 FIELD QUALITY ASSURANCE

F.1.1 Readiness Review

Field QA was initiated at the RVAAP LL1 Phase II RI readiness review held at the SAIC Oak Ridge offices on August 31, 2000. The purpose of the readiness review was to ensure that (1) all project documents and procedures were approved, controlled, and properly distributed; (2) all assigned personnel were trained or a schedule was established to conduct training; (3) the mobilization and site logistics were established; (4) the laboratories were ready to accept samples; (5) all other subcontractors were ready to begin work; and (6) the QA system was implemented. All elements of the readiness review were completed prior to initiating field activities.

F.1.2 Procedures

Standard operating methods for field activities performed during the Phase II RI at LL1 are incorporated into the governing documents for the project. The *Facility-Wide Sampling and Analysis Plan* (USACE 1996) describes the overall approach and methodologies to be used for projects at RVAAP, and the *Phase II Remedial Investigation Sampling and Analysis Plan Addenda for LL1* (USACE 1999 and 2000) details project-specific requirements for field implementation. These documents were reviewed and approved by USACE – Louisville District and were reviewed and commented on by the Ohio EPA prior to implementation. Clarifications and/or planned deviations from these methods have been documented as field change orders (FCOs), and variances have been documented as NCRs. Copies of the FCOs are attached to this Appendix.

F.1.3 Training

Field team personnel were trained in all procedures applicable to their assigned tasks. Training was accomplished by combinations of classroom lectures, reading assignments, and on-the-job training. Surveillance performed by an SAIC QA specialist provided assessments of worker proficiency and training effectiveness.

Training was documented by the completion of training records. The QA specialist completed the performance documentation in the field after observing successful implementation of a procedure by a field team member. Copies of training records and surveillance reports were maintained in the project file and/or in the SAIC Central Records Facility (CRF). Copies of training records required for OSHA and DOT compliance also were maintained in the field.

F.1.4 Equipment Calibration

Various types of Measuring and Testing Equipment (M&TE) were used during the field investigation. All M&TE was categorized, assigned unique identifiers, and listed in an inventory in the M&TE logbook. Last and next calibration recall dates were also recorded. As appropriate, instruments were calibrated daily according to the manufacturer's instructions. Only equipment and standards having verifiable traceability to nationally recognized standards were used for calibration. Daily calibration activities and results were recorded in the M&TE logbook as well as source information for all calibration standards and reagents.

F.1.5 Quality Control Samples

Field QC samples, including trip blanks, equipment rinsate blanks, source water, field duplicates, and field QA splits, were collected as specified in the *Phase II RI Sampling and Analysis Plan Addenda for LL1* (USACE 1999 and 2000) pertaining to contractor chemical quality control. Implementation of the Contractor Chemical Quality Control program was observed by the SAIC QA specialist. Field QC data and analysis of QC results are presented in Appendix H.

F.1.6 Field Records

Field data, observations, activities, and information were recorded in preformatted, bound field logbooks. The use of structured logbooks ensured that all necessary data were entered consistently. Logbook entries were checked for accuracy and completeness by independent reviewers. Critical and/or contract-required original records (e.g., sampling forms) were recorded in duplicate using carbonless paper. Other field records, which were collected and likewise maintained, included equipment/material certifications, boring logs, and air-bill forms.

F.1.7 Surveillance and Audits

No QA surveillance or audits were conducted during the Phase II RI at LL1. However, discrepancies identified during and after the fieldwork have been documented as NCRs.

F.2 ANALYTICAL LABORATORY QUALITY ASSURANCE

SAIC subcontracted an analytical laboratory, Severn Trent, to perform chemical analysis for the LL1 Phase II RI. The selected laboratory was qualified by the USACE – Missouri River Division (MRD). In addition, this laboratory was technically audited by SAIC prior to contract award.

F.2.1 Readiness Review

Laboratory QA activities were initiated during the readiness review. The readiness review ensured that (1) governing documents and approved analytical methods were controlled and properly distributed; (2) the laboratory was scheduled and ready to conduct the analysis; (3) logistical coordination was established between the laboratory and the field team; and (4) laboratory QA programs were consistent and compatible with the project requirements.

F.2.2 Procedures

Prior to initiation of analytical support for the LL1 Phase II RI, Severn Trent and SAIC reviewed and negotiated a contract based on a comprehensive Statement of Work (laboratory SOW). The laboratory

SOW represented and referenced project-specific requirements, including the parameters to be measured, the analytical methods to implement, adherence to USEPA SW-846 protocol, project quantitation goals (sensitivity), and data deliverables required. All laboratory comments and questions were resolved before analytical work proceeded.

F.2.3 Laboratory Quality Control

To document laboratory data quality and to measure the quality of the analytical process, laboratory QC samples and data verification/validation were employed. The results of laboratory QC are discussed in the project data quality assessment (Appendix G). Analytical results of laboratory QC samples are included in the project file and form the basis of the data validation and verification process.

F.2.4 Laboratory Documentation

The laboratory maintains comprehensive information regarding the entire analytical process. The laboratory delivered summary data packages and electronic deliverables consistent with those identified in EPA SW-846 protocol to SAIC for validation and verification. Laboratory QC sample analyses were cross-referenced to the appropriate environmental field sample analyses in the laboratory deliverables.

F.2.5 Data Verification/Validation

Analytical data generated during this project have been subjected to a rigorous process of data validation and verification. Criteria were established against which the analytical data were compared and from which a judgment was rendered regarding the acceptability and qualification of the data. Upon receipt of data packages from each laboratory, the information was subjected to a systematic examination following standardized checklists and procedures to ensure content, presentation, administrative validity, and technical validity. All deficiencies in the data were documented through Nonconformance Reports (NCRs).

F.3 QUALITY ASSURANCE DOCUMENTATION

Primary methods for documenting QA during the LL1 Phase II RI include the completion of FCOs and NCRs. Copies of FCOs completed during the investigation are included at the back of this appendix. Copies of NCRs are on record in the SAIC RVAAP project file.

F.3.1 Field Change Control

Field changes were implemented during the 1999 installation of monitoring wells and the main field investigation phases of the RI to address changes to the approved *Facility-Wide Sampling and Analysis Plan for the Ravenna Army Ammunition Plant* (USACE 1996) and the *Phase II RI Sampling and Analysis Plan Addenda for LL1* (USACE 1999 and 2000) necessitated by field conditions or laboratory requirements. Field changes implemented were all minor in scope, providing clarification or refinement in the procedural approach to a specific field activity. All FCOs were reviewed and approved by designated representatives of USACE – Louisville District prior to implementation. None of the FCOs resulted in an adverse impact to project quality, schedule, or scope. Copies of the six approved FCOs are included in Attachment F-1.

The purpose of most of the FCOs was to request and document changes to the approved plans. For example, FCO-004 provides for the speciation of hexavalent chromium for risk purposes identified after the work plan was issued. FCO number 002, dated 7/28/99, addressed analytical data quality objectives.

F.3.2 Nonconformance Reports

To identify and correct conditions adverse to quality as described in the field and laboratory QA plans, NCRs and corrective action reports (CARs) were completed as necessary. Between project initiation and March 2001, three NCRs were completed. During the LL1 Phase II RI, NCRs were initiated both by field personnel and the laboratory coordinator when a nonconformance occurred. The NCRs initiated during the project are closed.

A summary of the actions or items that warranted the initiation of NCRs included:

NCR-2001-RVAAP-003: Soil sampling Logbooks #2 and #6 were not completed according to the requirements established in the *Final Facility-Wide Sampling and Analysis Plan for Environmental Investigations at the RVAAP* (USACE 1996). These logbooks are currently being corrected, and the corrected pages will be inserted in Appendix A in the draft final version of the RI Report.

NCR-2001-RVAAP-004: The analytical results for TNT and RDX in the field laboratory were not calculated correctly because of an error in the field standard operating procedure. This resulted in the values being reported as two orders of magnitude lower than the actual value. This error had no effect on the LL1 samples because samples greater than 0.01 mg/kg were sent to the fixed-base laboratory.

NCR-2001-RVAAP-005: This NCR addressed the following items: (1) QA review of COC forms in the field indicated several administrative mistakes, most of these were corrected in the field; and (2) three samples arrived at the QC laboratory at room temperature; this issue was addressed through improved scheduling for shipping of samples.

ATTACHMENT F-1

FIELD CHANGE ORDERS

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FCO NO 01

Field Change Order (FCO)

MODIFICATION NO. _____ DATE 9.11.00 WORK AUTHORIZATION _____

TYPE OF CHANGE correction PRIORITY O EMERGENCY ● URGENT O ROUTINE

S NO. _____ CYWP NO. _____ CWBS NO. _____ O MINOR O MAJOR O OTHER

REQUESTER IDENTIFICATION

NAME KATHI DOMINIC ORGANIZATION SAIC PHONE 718.625.7614

TITLE Field Mgr. SIGNATURE K L Dominic

BASELINE IDENTIFICATION

BASELINE(S) AFFECTED O COST ● SCOPE O MILESTONES O METHOD OF ACCOMPLISHMENT

PROGRAM SERVICE ORDER NO. -- _____ REVISION NO. _____ CAM SIGNATURE _____

DESCRIPTION OF CHANGE SECTION 4.3 + TABLE 5-2. PHONE _____

TOC + GRAIN SIZE ANALYSIS WERE PLANNED FOR ALL SEDIMENT SAMPLES PER COMMENT FROM OHIO EPA. INSTEAD, TOC + GRAIN SIZE WILL BE DELETED FROM ALL SANITARY + STORM SEWER SAMPLES.

JUSTIFICATION

NO PROJECT SCOPE/ANALYTICAL CAPACITY IN CONTRACT FOR >20 SUCH ANALYSES.

IMPACT OF NOT IMPLEMENTING REQUEST

COST OVERRUN.

PARTICIPANTS AFFECTED BY IMPLEMENTING REQUEST

FIELD TEAMS, SAMPLE MANAGERS

COST ESTIMATE $ NA ESTIMATOR SIGNATURE _____

PHONE _____ DATE _____

PREVIOUS FC AFFECTED O YES ● NO

APPROVAL CLIENT PROJECT MANAGER SIGNATURE John P Jones DATE 9-11-00

QAS REVIEW _____ DATE _____

TIME FROM INITIATION TO ACTION immediate

Field Change Order (FCO)

FCO NO. M1

MODIFICATION NO. _____ DATE 9.12.00 WORK AUTHORIZATION _____

TYPE OF CHANGE method PRIORITY O EMERGENCY ✓ URGENT O ROUTINE

O. _____ CYWP NO. _____ CWBS NO. _____ O MINOR O MAJOR O OTHER

REQUESTER IDENTIFICATION

NAME KATHY DOMINIC ORGANIZATION SAIC PHONE 919.625.7614

TITLE Field Mgr SIGNATURE Kathy L Dominic

BASELINE IDENTIFICATION

BASELINE(S) AFFECTED O COST O SCOPE O MILESTONES ✓ METHOD OF ACCOMPLISHMENT

PROGRAM SERVICE ORDER NO. _____ REVISION NO. _____ CAM SIGNATURE _____

DESCRIPTION OF CHANGE Section 4.3.2.2 Subaqueous Sediments PHONE _____

Hand core sampler is not available for use in LLI sampling. Instead, sample team will use a PVC pipe section as a temporary coring tool. They will bail the water out of the coring w/ teflon bailer + use a hand auger to collect samples.

JUSTIFICATION

No suitable coring device readily obtainable. Method of accomplishment has no impact on integrity of samples.

IMPACT OF NOT IMPLEMENTING REQUEST

significant delay in collection of time-critical samples.

PARTICIPANTS AFFECTED BY IMPLEMENTING REQUEST

sampling teams

COST ESTIMATE $ N/A ESTIMATOR SIGNATURE _____

PHONE _____ DATE _____

PREVIOUS FC AFFECTED O YES ✓ NO

APPROVAL CLIENT PROJECT MANAGER SIGNATURE _____ DATE 9-12-00

QAS REVIEW _____ DATE _____

TIME FROM INITIATION TO ACTION _____

FCO NO 03

Field Change Order (FCO)

MODIFICATION NO. _____ DATE 9.18.00 WORK AUTHORIZATION _____

TYPE OF CHANGE _____ PRIORITY O EMERGENCY O URGENT O ROUTINE

P.O. _____ CYWP NO. _____ CWBS NO. _____ O MINOR O MAJOR O OTHER

REQUESTER IDENTIFICATION

NAME KATHY DOMICK ORGANIZATION SAIC PHONE 919.625.7614

TITLE FIELD MANAGER SIGNATURE KDomick

BASELINE IDENTIFICATION

BASELINE(S) AFFECTED O COST ✓ SCOPE O MILESTONES ✓ METHOD OF ACCOMPLISHMENT

PROGRAM SERVICE ORDER NO. _____ REVISION NO. _____ CAM SIGNATURE _____ PHONE _____

DESCRIPTION OF CHANGE Section 4.3.1.2 Sediment Sampling - Locations. Many locations of storm sewer lines and sanitary lines have been covered or destroyed during building demolition. For example, manholes 206, C1, are no longer accessible. Several manholes are completely empty - dry (83, 210, others) Several inlets are not accessible & NOT representative. This sampling approach will be used at other locations TBD. by USACE project mgr 9/25/00.

JUSTIFICATION

No info on contamination can be obtained at the planned locations.

IF NOT IMPLEMENTING REQUEST

No characterized data on sewer lines.

PARTICIPANTS AFFECTED BY IMPLEMENTING REQUEST

Field teams, sample manager, data manager.

COST ESTIMATE $ _____ ESTIMATOR SIGNATURE _____

PHONE _____ DATE _____

PREVIOUS FC AFFECTED O YES ✓ NO

APPROVAL CLIENT PROJECT MANAGER SIGNATURE _____ DATE 9-18-00

QAS REVIEW _____ DATE _____

TIME FROM INITIATION TO ACTION _____

Field Change Order (FCO)

FCO NO. 04

MODIFICATION NO. Additional DATE 9.18.00 WORK AUTHORIZATION _____

TYPE OF CHANGE _____ PRIORITY O EMERGENCY ✓ URGENT O ROUTINE

NO. _____ CYWP NO. _____ CWBS NO. _____ O MINOR O MAJOR O OTHER

REQUESTER IDENTIFICATION

NAME W.L. DOMINICK ORGANIZATION SAIC PHONE 9186257614

TITLE FIELD MANAGER SIGNATURE W.L. Dominick

BASELINE IDENTIFICATION

BASELINE(S) AFFECTED ✓ COST ✓ SCOPE O MILESTONES O METHOD OF ACCOMPLISHMENT

PROGRAM SERVICE ORDER NO. _____ REVISION NO. _____ CAM SIGNATURE _____

DESCRIPTION OF CHANGE Section 4.3 Surface Soil Sampling - PHONE _____
Additional analysis of solid media has been requested. Speciation of Chromium-6 from total chromium will be performed on 100 soil and sediment samples.

JUSTIFICATION
CLIENT REQUESTS SPECIATION OF Chromium-6 FROM TOTAL CHROMIUM IN TAL METALS FOR RISK PURPOSES. NOT PART OF ORIGINAL SCOPE. ANALYSIS OF HEXAVALENT CHROMIUM WILL BE ADDED TO 100 SOIL/SEDIMENT SAMPLE SETS WITH AN ADDITIONAL 10% QC. PROJECT HOLDING TIME WILL BE 4 DAYS FROM THE TIME OF EXTRACTION. THE EXTRACTION SHOULD BE ANALYZED FOR HEXAVALENT CHROMIUM WITHIN 24 HRS. To wjb 9/20/00

IMPACT OF NOT IMPLEMENTING REQUEST
INCOMPLETE INFORMATION ON CHROMIUM SPECIES W.R.T. TOTAL CHROMIUM.

PARTICIPANTS AFFECTED BY IMPLEMENTING REQUEST SAMPLE MANAGER WILL ADD Cr^{+6} ANALYSIS TO THE LABORATORY CHAINS AND METALS LABEL. NILE LUEDTKE (PROJECT CHEMIST) CONTACTED BELLA STRATT @ SEVERN TRENT. JOHN JENT (COE PROJECT MANAGER) CONTACTED BILL LOCK @ GPL LABORATORIES.

COST ESTIMATES rel. Nile Luedtke ESTIMATOR SIGNATURE _____
PHONE _____ DATE _____

PREVIOUS FC AFFECTED O YES ✓ NO

APPROVAL CLIENT PROJECT MANAGER SIGNATURE _____ DATE 9-18-00

QAS REVIEW _____ DATE _____

TIME FROM INITIATION TO ACTION _____

TOTAL P.05

Field Change Order (FCO)

FCO NO 001

MODIFICATION NO. _____ DATE 8.19.99 WORK AUTHORIZATION _____

TYPE OF CHANGE _____ PRIORITY ○ EMERGENCY ● URGENT ○ ROUTINE

ADS NO. _____ CYWP NO. _____ CWBS NO. _____ ○ MINOR ○ MAJOR ○ OTHER

REQUESTER IDENTIFICATION

NAME K. Dominic ORGANIZATION SAIC PHONE 937-431-2239

TITLE Field Mgr. SIGNATURE K. Dominic

BASELINE IDENTIFICATION

BASELINE(S) AFFECTED ○ COST ● SCOPE ○ MILESTONES ● METHOD OF ACCOMPLISHMENT

PROGRAM SERVICE ORDER NO. _____ REVISION NO. _____ CAM SIGNATURE _____

DESCRIPTION OF CHANGE Section 4.1.2.3.2, Soil PHONE _____

SAM Priority During Rock Coring + Drilling — "bedrock interval will be cored using an air rotary rig fitted w/NQ-sized coring device." Bedrock will instead be cored using potable water. Cores will be collected from four (4) of the eight (8) borings for lithologic logging.

JUSTIFICATION Use of water is required to accomplish coring with the rig being used. Large volumes of water are needed because of lost circulation in the highly fractured sandstone. Introduction of water makes selection of the target saturated zone extremely difficult. The Sharon Sandstone at the site appears to be analogous to that at Ramsdell Quarry Landfill; thus, coring at each boring will yield very little new information for the effort expended.

IMPACT OF NOT IMPLEMENTING REQUEST

Cost growth due to procurement of water; potential for setting well screens above or below the saturated zone, resulting in dry wells; extended well development to remove introduced water volume from boreholes.

PARTICIPANTS AFFECTED BY IMPLEMENTING REQUEST

Field team, drillers

COST ESTIMATE $ NA ESTIMATOR SIGNATURE _____

PHONE _____ DATE _____

PREVIOUS FC AFFECTED ○ YES ● NO

APPROVAL CLIENT PROJECT MANAGER SIGNATURE _____ DATE _____

QAS REVIEW _____ DATE _____

TIME FROM INITIATION TO ACTION ASAP

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CONTACT REPORT

PROJECT NAME: Load Line 1 Phase II RI DELIVERY ORDER NO: 003

INDIVIDUAL CONTACTED, TITLE, PHONE: JOHN JENT, Technical Project Manager

ORIGINATOR: K. Dominic

ORGANIZATION: USACE LOUISVILLE

DATE CONTACTED: 8.19.99 7:40a

ADDRESS: CITY: STATE: ZIP:

Telecon: ☑ Visit: ☐

SUBJECT: Monitoring Well Drilling

DISCUSSION:

I called John this a.m. to apprise him of the technical difficulty associated with coring in the unsaturated sandstone at LL1. The issues: ① we need water to cool the coring bit and circulation is lost to the highly fractured formation. For 20 ft of coring at LL1mw-085, we used almost 900 gallons of potable water. For 8ft of coring at LL1mw-080 (and almost no recovery) we used almost 600gal. ② The Sharon sandstone at LL1 looks very similar to the Ramsdell Quarry Landfill cores, and I expect it to be fairly homogeneous. For this reason, I feel the effort and expense of coring is not yielding valuable subsurface information.

I agreed and said we could omit coring from the program, but we should try to get a core from one more well, at a greater distance from these 2.

I said I would call Diane Kurlick and discuss this w/her, and then write a field change request to this effect.

COMMENTS ACTION, DATES

All ASAP.

① Omit coring from 5 of the 8 well borings - direct field team accordingly (KD)

② Call Diane Kurlick @ OEPA re Ellen Mohr (KD)

③ Write field change request (KD)

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CONTACT REPORT

PROJECT NAME: Lead Line 1 Phase II RI **DELIVERY ORDER NO:** 003

INDIVIDUAL CONTACTED, TITLE, PHONE: DIANE KURTICH, Div of Drinking + Ground Water

ORIGINATOR: K. Dennis

ORGANIZATION: Ohio EPA - NEDO

DATE CONTACTED: 8-19-99

ADDRESS: **CITY:** **STATE:** **ZIP:**

Telecon: ☑ Visit: ☐

SUBJECT: Monitoring Well Drilling @ LL1

DISCUSSION:

Related the technical difficulties of coring in sandstone at LL1; as discussed earlier with John Jent. Diane suggested a compromise, i.e., collect cores from only half of the wells (4) instead of from all. She suggested we take cores from 2 borings spaced relatively far apart. I told her this would be okay, since we already have 2 nearly completed.

COMMENTS, ACTION, DATES

(1) Drive field team to omit coring at 4 of the remaining 6 borings.

(2) Prepare change order.

Field Change Order (FCO)

FCO NO 002 Load Line #1
MODIFICATION NO. _____ DATE 7/28/99 WORK AUTHORIZATION DACA27-94-D-0025 D.O. 0005

TYPE OF CHANGE Analytical Methods PRIORITY ○ EMERGENCY ☒ URGENT ○ ROUTINE

ADS NO. _____ CYWP NO. _____ CWBS NO. _____ ○ MINOR ☒ MAJOR ○ OTHER

REQUESTER IDENTIFICATION

NAME Nile A. Luedtke ORGANIZATION SAIC PHONE 423-481-8751

TITLE Project Chemist SIGNATURE Nile A Luedtke

BASELINE IDENTIFICATION

BASELINE(S) AFFECTED ☒ COST ☒ SCOPE ○ MILESTONES ☒ METHOD OF ACCOMPLISHMENT

PROGRAM SERVICE ORDER NO. _____ REVISION NO. _____ CAM SIGNATURE _____

DESCRIPTION OF CHANGE PHONE _____

Based on attached technical direction from USACE (John Jent/ Samir Mansy) Analytical Method Quality Objectives for RVAAP projects has been expanded. (SEE ATTACHED ANALYTICAL METHOD DIRECTION)

JUSTIFICATION

Addition of a QCMRL standard to method calibration and inclusion of all target compounds to LCS runs will enable the program to quantify accuracy and precision at the lower analytical levels and monitor method performance for all analytes.

IMPACT OF NOT IMPLEMENTING REQUEST

Non-compliance with client direction.

PARTICIPANTS AFFECTED BY IMPLEMENTING REQUEST

Under current direction to use QCMRL and expanded LCS compound results as advisory, the analytical laboratories implementing analysis (Quanterra, Inc.) will be impacted. Validation will not be impacted at this time.

COST ESTIMATE $ 1,800.00 ESTIMATOR SIGNATURE Nile A Luedtke

Phase II Load Line 1 Groundwater 1999 PHONE 481-8751 DATE 7/28/99

PREVIOUS FC AFFECTED ○ YES ○ NO

APPROVAL

PROJECT MANAGER SIGNATURE [signature] DATE 8-4-99

QAS REVIEW _____ DATE _____

TIME FROM INITIATION TO ACTION _____

380.19990818.005

27 July 1999

MEMORANDUM FOR John Jent, Project Engineer

SUBJECT: Summary of Method Quality Objectives for Ravenna Army Ammunition Plant, Ravenna, Ohio

1. QC criteria for analyses are summarized in the attached tables. The acceptance criteria are based on the QA guidance published in the latest version of SW846, and Corps of Engineers' Shell document dated November 1998.

2. There is a new criteria included in these tables, Quality Control Method Reporting Limit (QCMRL) sample i.e. a QC sample analyzed at the reporting level, and that QC sample is not subjected to a method preparation procedure. The QCMRL is conducted like a Continuous Calibration Verification (CCV) to monitor the changes at the lower end of the calibration curve. The QC limits are advisory till further notice. The QCMRL recoveries should provide information on the accuracy and confidence of analyte concentrations determined at low levels.

3. Laboratory Control Sample (LCS): the LCS will contain all the method target compounds but only method subset compounds will adhere to the laboratory QC limits according to their SOPs.

4. Since there are no QC limits enforced on the QCMRL and LCSs, the validator will not monitor results against extra QC limits; there will be no cost increase for an A-E performance.

5. The above conditions for the QCMRL and LCSs were communicated to Quanterra Laboratories.

SAMIR A.MANSY, Ph.D.
Quality Assurance Manager

Table 5
Summary of Method Quality Objectives for Method 8082
PCBs

QC Element	Target Analyte/Surrogate
Initial Calibration (9.2.2.3)	$r \geq 0.995$, RSD $\leq 20\%$, $r^2 \geq 0.990$
ICV (9.3 / 9.3.2)	1. Recovery = 85 - 115% 2. **QC/MRL**: recovery = 85-115%
CCV (9.5 / 9.5.2)	1. Drift $\leq$ 15%, D $\leq$ 15% 2. **QC/MRL**: D $\leq$ 15%
M B (10.2.1 / 11.4. 1	Analytes < IVIDL Check Sample (-2X IVIDL)
LCS (10.2.2 1 11.4.2)	Water: Recovery = 50 - 130% Soil: Recovery = 50 - 130%
M S (10. 2.3 / 11.4.3)	Recovery = 40 - 140%
MSD/MD (10.2.4/ 11.4.4)	RPD $\leq$ 50
Surrogates (10.2.5 /11.4.5)	Interference- Free Matrix: Water: Recovery = 50 - 130% Soil: Recovery = 50 - 130% Project Sample Matrix: Recovery = 40 - 140%
Target Analyte Confirmation (12.3)	RPD $\leq$ 40

Table 6
Summary of Method Quality Objectives for Method 8260 VOCs

QC Element	Target Analyte / Surrogate	Poor Purgers / Gases / Sporadic Marginal Failures[1]
Initial Calibration (9.2.2.4)	Instrument Evaluation: SPCCs: minimum RIF values per method requirements CCCs: verify RSD ≤ 30% Primary Evaluation: r ≥ 0.995, RSD ≤ 15%, r^2 ≥ 0.990 Alternative Evaluation: Mean RSD for all target analytes ≤15%	No allowance Alternative Evaluation: Maximum allowable RSD for each target analyte ≤ 30%
ICV (9.3)	Recovery = 80 - 120% **QC/MRL**: Recovery = 80-120%	Sporadic Marginal Failures[1]: Recovery = 60 - 140%
CCV (9.5 / 9.5.2 9.5.2.4)	Instrument Evaluation: 1. SPCCs: minimum RF values per method requirements 2. CCCs: verify D ≤ 30% 3. Primary Evaluation (CCCs): Drift ≤ 20%, D ≤ 20% 4. **QC/MRL**: Recovery = 80-120%	Primary Evaluation (remaining target analytes): Qualitative, see text
MB (10.2.1 / 11.4.1)	Target Analytes: Analytes < MDL Check Sample (-2X MDL)	Common Lab Contaminants: Analytes < MDLs
LCS (10.2.2 / 11.4.2)	Water: Recovery = 80 - 120% Soil: Recovery = 75 - 125%	Sporadic Marginal Failures[1]: Recovery = 60-140%
IVIS (10.2.3 / 11.4.3 11.4.3.2)	Recovery = 70 - 130%	Sporadic Marginal Failures[1]: Recovery = 60 - 140%
MSD/MD (10.2.4 / 11.4.4)	Water: RPD ≤ 30 Soil: No RPID Limits	Water: RPD ≤ 40 Soil: No RPD Limits
Surrogates (110.2.5 11.4.5)	Interference-Free Matrix: Water: Recovery = 80 - 120% Soil: Recovery = 75% - 125% Project Sample Matrix: Recovery = 70 - 130%	No Applicable

[1] The number of Sporadic Marginal Failure (SMF) allowances depend upon the number of target analytes reported from the analysis. For instance, if the full list of 68 compounds are reported from the GC/MS analysis, then five (5) SMFs are allowed to

Table 7
Summary of Method Quality Objectives for Method 8270 Semivolatiles

QC Element	**Target Analyte/Surrogate**	**Poor Performers/ Sporadic Marginal Failures'**
Initial Calibration (9.2.2.5)	Instrument Evaluation: SPCCs: minimum RF values per method Requirements CCCs: verify RSD ≤ 30% Primary Evaluation (all target analytes) r ≥ 0.995, RSD ≤ 15%, r2 ≥ 0.990 Alternative Evaluation. Mean RSD for all target analytes ≤ 15%	No allowance Alternative Evaluation: Maximum allowable RSD for each target analyte ≤ 40%
ICV (9.3)	1. Recovery = 70 - 130% 2. **QC/MRL: D ≤ 20%**	Sporadic Marginal Failures': Recovery = 50 - 150%
CCV (9.5 / 9.5.2 9.5.2.4)	Instrument Evaluation: 1. SPCCs: minimum RF values per method requirements 2. CCCs: verify D ≤ 30% 3. Primary Evaluation (CCCs Drift ≤20%, D ≤ 20% 4. **QC/MRL: D ≤ 20%**	Primary Evaluation (remaining target analytes): Qualitative, see text
MB (10.2.1 / 11.4.1)	Target Analytes: Analytes < MDL Check Sample (-2X MDL)	Common Lab Contaminants: Analytes ≤ MDLs
LCS (10.2.2 / 11.4.2)	Water: Recovery = 60 - 120% (-15 analytes) = 45 - 135% (-30 analytes) = 20 - 150% (-45 analytes) Soil: Recovery = 60 - 120% (-20 analytes) = 45 - 135% (-25 analytes) = 30 - 150% (-45 analytes)	Sporadic Marginal Failures': Water: Recovery = 15 - 150% Soil: Recovery = 25 - 150%
MS (10.2.3 11.4.3 11.4.3.2)	Water: Recovery = 45 - 135% Soil: Recovery = 45% - 135%	Sporadic Marginal Failures': Water: Recovery = 15% - 150% Soil: Recovery = 20% - 150%
MSD/MD (10.2.4 / 11.4.4)	Water: RPD ≤ 50 Soil: RPD ≤ 60	Sporadic Marginal Failures'-: Water: RPD≤ 60 , Soil: RPD≤ 60
Surrogates (10.2.5 / 11.4.5)	Interference- Free Matrix: Water: Recovery = 60 - 120% B/N cmpds Recovery = 45 - 135% A cmpds Soil: Recovery = 60 - 120% B/N cmpds Recovery = 45 - 135% A cmpds Project Sample Matrix: Water: Recovery = 45 - 135% B/N cmpds Recovery = 35 - 140% A cmpds Soil: Recovery = 45 - 135% B/N cmpds Recovery = 35 - 140% A cmpds	Sporadic Marginal Failures': Water: Recovery = 15 - 150% Soil: Recovery = 20 - 150%

Table 8
Summary of Method Quality Objectives for Method 8330
Explosives

QC Element	Target Analyte/Surrogate	Tetryl / Sporadic Marginal Failures'
Initial Calibration (9.2.2.6)	Primary Evaluation: $r \geq 0.995$, RSD $\leq$ 20%, $r^2 \geq 0.990$ Alternative Evaluation: Mean RSD for all target analytes $\leq$ 20%	No allowance Alternative Evaluation: Maximum allowable RSD for each target analyte $\leq$ 40%
ICV (9.3)	1. Recovery = 85 - 115% 2. **QC/MRL: D $\leq$ 15%**	Sporadic Marginal Failures': Recovery = 70 - 130%
CCV (9.5 / 9.5.2)	1. Primary Evaluation: Drift $\leq$ 15%, D $\leq$ 15% Alternative Evaluation: Mean Drift (D) for all target analytes $\leq$ 15% 2. **QC/MRL: D $\leq$ 15%**	Primary Evaluation: Drift $\leq$ 20%, D $\leq$ 20% Alternative Evaluation: Maximum allowable Drift (D)for each target analyte $\leq$ 30%
MB (10.2.1 / 11.4.1)	Target Analytes: Analytes < MDL Check Sample (-2X MDL)	Not Applicable
LCS (10.2.2/11.4.2)	Water: Recovery = 60 - 120% Soil: Recovery = 60 - 120%	Sporadic Marginal Failures': Recovery = 40 - 150%
MS (10.2.3 / 11.4.3/11.4.3.2)	Recovery = 50 - 140%	Sporadic Marginal Failures': Recovery = 40 - 150%
MSD/M D (10.2.4 11.4.4)	RPD $\leq$ 50	RPD $\leq$ 60
Surrogates (10.2.5 / 11.4.5)	Interference-Free Matrix: Water: Recovery = 60 - 140% Soil: Recovery = 50 - 150% Project Sample Matrix: Recovery = 50 - 150%	Not Applicable
Target Analyte Confirmation (12.3)	RPD $\leq$ 40	RPD $\leq$ 40

1 The number of Sporadic Marginal Failure (SMF) allowances depend upon the number of target analytes reported from the analysis. For instance, if between seven (7) to fifteen (15) explosives are reported from the HPLC analysis, one (1) SMF is allowed to the expanded criteria presented for the ICV and LCS. If greater than 15 explosives are reported, two (2) SMFs are allowed for the ICV and LCS. If the MS includes only a subset of compounds, allow only one (1) SMF for this QC element. Refer to Section 9.3 for additional information on the application of sporadic marginal failures.
2 Due to the tendency for Tetryl to decompose, an expanded criteria may be applied at 45% - 140% for both water and soil matrices.

Table 2
Summary of Method Quality Objectives for Method 7000 series
GFAA/CVAA Metals

Quality Control Element	Description of Element	Frequency of Implementation	Acceptance Criteria
Initial Calibration (9.2.1.2)	3 stds and blank	Daily	r ≥ 0.995
Instrumental Precision (9.2.1.2)	RPD of 2 injections	All standards, and ICV/CCV	RPD ≤ 10
Initial Calibration Verification (ICV) (9.3)	**1. Mid-level (2nd source) Verification** **2. QC/MRL: Low level stnd**	After initial calibration	QC limits = 90-110% QC limits: 80-120%
Initial Calibration Blank (I CB) (9.4)	Interference-free matrix To assess analysis contamination	After initial calibration	Analytes < MDL Check Sample (-2X MDL)
Continuing Calibration Blank (CCB) (9.4)	Interference-free matrix to assess analysis contamination	Every 10 samples and at end of analytical sequence	Analytes < MDL Check Sample (-2X MDL)
Continuing Calibration Verification (CCV) (9.5 / 9.5.1)	**1. Mid-level verification** **2. QC/MRL**	Every 10 samples and at end of analytical sequence	QC limits = 80-120% QC limits=80-120%
Method Blank (MB) (10.2.1 / 11.4.1)	Interference-free matrix to assess overall method contamination	1 per sample batch	Analytes < MDL Check Sample (-2X MDL)
Laboratory Control Sample (LCS) (10.2.2 / 11.4.2)	Interference-free matrix containing target analytes	1 per sample batch	%Rec = 80% - 120%
Matrix Spike (MS) (10.2.3 / 11.4.3/ 11.4.3.1)	Sample matrix spiked with target analytes prior to digestion	1 per sample batch	%Rec = 80% - 120%
Matrix Duplicate (MD) or Matrix Spike Duplicate (MSD) (10.2.4 / 11.4.4)	Refer to text for MID or Ms.	1 per sample batch	RPD ≤ 20
Post Digestion Spike (PDS) (10.3.1 / 11.4.6)	Sample digestate spiked with target analytes	As needed to confirm matrix effects	Recovery = 85 - 115%
Serial Dilution (SD) (10.3.2)	1:4 dilution analyzed to assess matrix effects	As needed to assess new and unusual matrices	Agreement between undiluted and diluted results v 10%
Method of Standard Addition (MSA) (12.2.1)	Method of quantitation	As needed for samples with suspected or confirmed matrix effects	r ≥ 0.995

Table 1
Summary of Method Quality Objectives for Method 6010
ICP metals

Quality Control Element	Description of Element	Frequency of Implementation	Acceptance Criteria
Initial Calibration (9.2.1.1)	3-stds and blank	Daily	$r \geq 0.995$
Instrumental Precision (9.2.1.1)	RSD 3 integrations (exposures)	Each calibration and calibration verification standards (ICV/CCV)	RSD < 5%
Initial Calibration Verification (ICV) (9.3)	1.**Mid-level (2nd source) verification** 2. **QC/MRL : Low-level Check standard at MRL**	After initial calibration	QC limits = 90-110% QC limits = 80-120%
Initial Calibration Blank (ICB) (9.4)	Interference-free matrix to assess analysis contamination	After initial calibration	Analytes < MDL Check Sample (-2X MDL)
Interelement Check Standards (ICS) (8.1)	ICS-A - interferents only ICS-B - interferents and target analytes	Beginning of analytical sequence	QC limits = 80-120% for target analytes
Continuing Calibration Blank (CCB) (9.4)	Interference-free matrix to assess analysis contamination	Every 10 samples and at end of analytical sequence	Analytes < MDL Check Sample (-2X MDL)
Continuing Calibration Verification (CCV) (9.5 / 9.5.1)	1. **Mid-level verification** 2. **QC/MRL**	Every 10 samples and at end of analytical sequence	QC limits = 90-110% QC limits = 80-120%
Method Blank (MB) (10.2.1 / 11.4.1)	Interference-free matrix to assess overall method contamination	1 per sample batch	Analytes < MDL Check Sample (-2X MDL)
Laboratory Control Sample (LCS) (10.2.2 / 11.4.2)	Interference-free matrix containing all target analytes	1 per sample batch	Recovery = 80 - 120%
Matrix Spike (MS) (10.2.3 / 11.4.3 11.4.3.1)	Sample matrix spiked with all/subset of target analytes prior to digestion	1 per sample batch	Recovery = 75 - 125%
Matrix Duplicate (MD) or Matrix Spike Duplicate (MSD) (10.2.4 / 11.4.4)	Refer to text for MD or Ms.	1 per sample batch	RPD $\leq$ 25

Table 1 (Continued)
Summary of Method Quality Objectives for Method 6010
ICP metals

Quality Control Element	Description of Element	Frequency of Implementation	Acceptance Criteria
Post Digestion Spike (PDS) (10.3.1 / 11.4.6)	Sample digestate spiked with all/subset of target analytes	As needed to confirm matrix effects	Recovery = 75 - 125%
Serial Dilution (SD) (10.3.2)	1:4 dilution analyzed to assess matrix effects	As needed to assess new and unusual matrices	Agreement between undiluted and diluted results V 10%
Method of Standard Addition (MSA) (12.2.1)	Method of quantitation	As needed for samples with suspected or confirmed matrix effects	$r \geq 0.995$

1 The number of Sporadic Marginal Failure (SMF) allowances depend upon the number of target analytes reported from the analysis. For instance, if between seven (7) to fifteen (15) metals are reported from the ICP analysis, one (1) SMF is allowed to the expanded criteria presented. If greater than 15 metals are reported from the ICP analysis, two (2) SMFs are allowed. Refer to Section 9.3 for additional information on the application of sporadic marginal failures.

Table 3
Summary of Method Quality Objectives for Method 8021
VOCS

QC Element	Target Analyte / Surrogate	Poor Purgers / Gases / **Sporadic Marginal Failures'**
Initial Calibration (9.2.2.1)	Primary Evaluation: r ≥ 0.995, RSD ≤ 20%, r^2 ≥ 0.990	No allowance
ICV (9.3)	1. Recovery = 85 -115% 2. **QC/MRL**: D ≤ 15%	Sporadic Marginal Failures': Recovery = 70 - 130%
CCV (9.5 / 9.5.2 9.5.2.1)	1. Primary Evaluation: Drift ≤ 15%, D ≤ 15% Alternative Evaluation: Mean Drift/D For all target analytes ≤ 15% 2. **QC/MRL**: D ≤ 15%	Primary Evaluation: Drift ≤ 20%, D ≤ 20% Alternative Evaluation: Maximum allowable Drift/D For each target analyte ≤ 30%
MB (10.2.1 / 11.4.1)	Target Analytes: Analytes < MDL Check Sample (-2X MDL)	Common Lab Contaminants: Analytes < MRL
LCS (10.2.2 / 11.4.2)	Water : Recovery, 80 - 120% Soil: Recovery, 75 – 125%	Sporadic Marginal Failures': Recovery = 60 - 140%
IVIS (10.2.3/ 11.4.3/ 11.4.3.2)	Recovery = 70 - 130%	Sporadic Marginal Failures': %Rec = 60% - 140%
MSD/MD (10.2.4 / 11.4.4)	Water: RPD ≤ 30 Soil: No RPD Limits	Water: RPD ≤ 40 Soil: No RPD Limits
Surrogates (10.2.5 11.4.5)	Interference-Free Matrix: Water: Recovery 80 - 120% Soil: Recovery 75 - 125% Project Sample Matrix: Recovery = 70 - 130%	Not Applicable
Target Analyte Confirmation (12.3)	RPD ≤ 40	RPD ≤ 40

1 The number of Sporadic Marginal Failure (SMF) allowances depend upon the number of target analytes reported from the analysis. For instance, if the 8020 Target Analyte List (10 compounds) is reported, 1 SMF is allowed. If the 8010 Target Analyte List (32 compounds) is reported, 3 SMFs are allowed. Ifthefull8021 Target Analyte List (60 compounds) is reported, 4 SMFs are allowed. If the MS includes only a subset of compounds, allow only one (1) SMF for that QC element. Refer to Section 9.3 for additional information on the application of sporadic marginal failures.

Table 4
Summary of Method Quality Objectives for Method 8081
Pesticides

QC Element	Target Analyte/Surrogate	Sporadic Marginal Failure
DDT/Endrin %Breakdown (8.2)	DDT & Endrin Breakdown ≤ 15% each	Not Applicable
Initial Calibration (9.2.2.2)	Primary Evaluation: r ≥ 0.995, RSD ≤ 20%, r^2 ≥ 0.990 Alternative Evaluation: Mean RSD for all target analytes ≤ 20%	No allowance Alternative Evaluation: Maximum allowable RSD for each target analyte ≤ 40%
ICV (9-3 / 9.3.1)	1. Recovery = 85 - 115% 2. **QC/MRL**: Recovery 85-115%	Sporadic Marginal Failures': Recovery = 70 - 130%
CCV (9.5 / 9.5.2 / 9.5.2.2)	1. Primary Evaluation: Drift ≤ 15%, D ≤ 15% Alternative Evaluation: Mean Drift (D) for all target analytes ≤ 15% 2. **QC/MRL**: D ≤ 15%	No allowance Alternative Evaluation: Maximum allowable Drift, D for each target analyte ≤ 30%
MB (10.2.1 / 11.4.1)	Analytes < MDL Check Sample (-2X MDL)	Not Applicable
LCS (10.2.2 11.4.2)	Water: Recovery = 50 - 130% Soil: %Recovery = 50 - 130%	Sporadic Marginal Failures': Recovery = 30-150%
MS (10.2.3 / 11.4.3 /11.4.3.2)	Recovery = 40 - 140%	Sporadic Marginal Failures': Recovery = 30 - 150%
MSD/MD (10.2.4 11.4.4)	RPD ≤ 50	RPD ≤ 60
Surrogates (10.2.5 / 11.4.5)	Interference- Free Matrix: Water: Recovery = 50 - 130% Soil: Recovery = 50 - 130% Project Sample Matrix: Recovery = 40 - 140%	Not Applicable
Target Analyte Confirmation (12.3)	RPD ≤ 40	RPD ≤ 40

'The number of Sporadic Marginal Failure (SMF) allowances depend upon the number of target analytes reported from the analysis. For instance, if the full list of 21 compounds are reported from the GC/ECD analysis, then two (2) SMFs are allowed to the expanded criteria presented. If the MS includes only a subset of compounds, allow only one (1) SMF for that QC element. Refer to Section 9.3 for additional information on the application of sporadic marginal failures.