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PITT-05-7-034

May 17, 2007

Project 00295

Dept of the Navy
Naval Station Great Lakes
NAVFAC MW Code EV
Attn: Howard Hickey
201 Decatur Ave.
Building 1A
Great Lakes, IL 60088

Reference: CLEAN Contract No. N62467-04-D-0055
Contract Task Order 0013

Subject: Final Quality Assurance Project Plan and Work Plan
Signature Page
Site 1 – Willow Glen Golf Course Landfill
Naval Station Great Lakes
Great Lakes, Illinois

Dear Mr. Hickey:

Please find attached four (4) copies of the signature page (title page) for the subject report. Also attached are four (4) copies of several pages with minor changes based on Illinois Environmental Protection Agency April 19, 2007 letter. Copies have also been distributed as indicated below.

If you have any questions, please call Chris Pike at 412-921-8861 or me at 412-921-7251.

Sincerely,

Robert F. Davis, P.E.
Task Order Manager

RFD/kf

Enclosure

cc: A. Robinson, NAVFAC SE (1 copy)
M. Singletary, NAVFAC SE (1 copy)
B. Conrath, Illinois EPA (3 copies)
D. Humbert, TtNUS (cover letter only)
Mark Perry/File 00295, TtNUS (1 copy)
C. Pike, TtNUS (1 copy)
A. Bernhardt, TtNUS (1 copy)
T. Jackman, TtNUS (1 copy)
S. Anderson, TtNUS (1 copy)

QUALITY ASSURANCE PROJECT PLAN
FOR
SITE 1- WILLOW GLEN GOLF COURSE LANDFILL
REMEDIAL INVESTIGATION & RISK ASSESSMENT
NAVAL STATION GREAT LAKES
GREAT LAKES, ILLINOIS

COMPREHENSIVE LONG-TERM
ENVIRONMENTAL ACTION NAVY (CLEAN) CONTRACT

Submitted to:
Naval Facilities Engineering Command Midwest
201 Decatur Avenue, Building 1A
Great Lakes, Illinois 60088

Submitted by:
Tetra Tech NUS, Inc.
661 Andersen Drive
Foster Plaza 7
Pittsburgh, Pennsylvania 15220

CONTRACT NUMBER N62467-04-D-0055
CONTRACT TASK ORDER 0013

FEBRUARY 2007

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ACRONYMS

^{0}C	Degrees Celsius
%R	Percent Recovery
bgs	below ground surface
CERCLA	Comprehensive Environmental Response, Compensation, Liability Act
CLEAN	Comprehensive Long-Term Environmental Action, Navy
CLP	Contract Laboratory Program
COC	Chain of Custody
CTO	Contract Task Order
DI	Dionized Water
DO	Dissolved Oxygen
DOT	Department of Transportation
DPT	Direct Push Technology
DQO	Data Quality Objectives
EVS	Environmental Visualization Systems
FFTU	Fire Fighter Training Unit
FOL	Field Operations Lead
FSP	Field Sampling Plan
FTMR	Field Task Modification Report
GC/MS	Gas Chromatograph/Mass Spectroscopy
GMS	Groundwater Modeling System
Guernsey	C.H. Guernsey & Company
HASP	Health and Safety Plan
HPLC	High Performance Liquid Chromatography
HAS	hollow stem auger
IAS	Initial Assessment Study
ICP	Inductively Coupled Plasma
I.D.	Inside Diameter
IDW	Investigation Derived Waste
Illinois EPA	Illinois Environmental Protection Agency
LCS	Laboratory Control Sample
MDL	Method Detection Limit
MNA	Monitored Natural Attenuation
MS	Matrix Spike

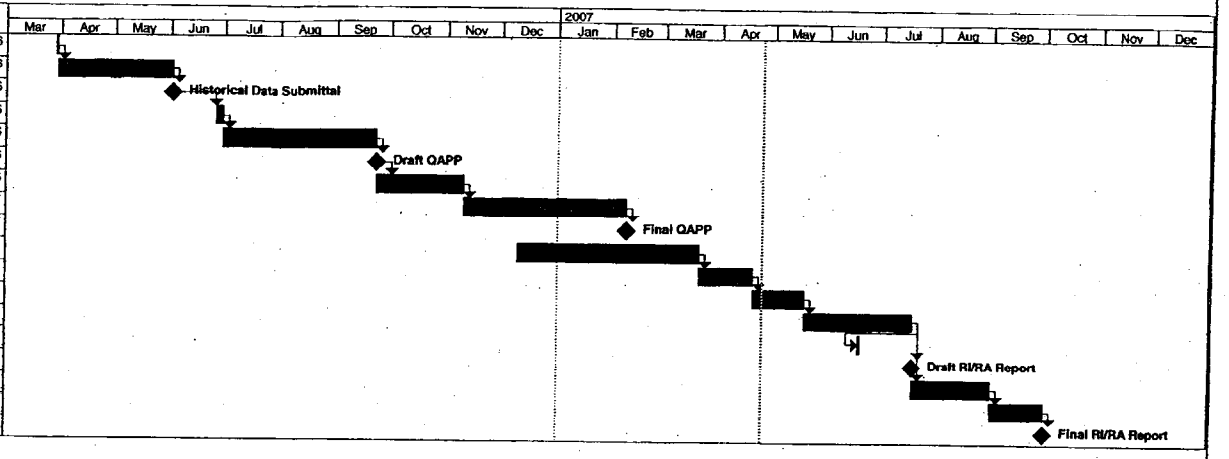
MSD	Matrix Spike Duplicate
mS/cm	milliSiemens per Centimeter
NAD83	1983 North American Datum
NAVD88	1988 North American Vertical Datum
NAVFAC	Naval Facilities Engineering Command
NFESC	Naval Facilities Engineering Service Center
NIST	National Institute of Standards and Technology
NTU	Nephelometric Turbidity Unit
ORP	Oxidation Reduction Potential
OSHA	Occupational Safety and Health Administration
PAH	Polynuclear Aromatic Hydrocarbon
PARCC	Precision, Accuracy, Representativeness, Completeness and Comparability
PCB	Polychlorinated Biphenyl
PDS	Post-digestion Spike
PID	photo ionization detector
PM	Project Manager
PPE	Personal Protection Equipment
PVC	Polyvinyl Chloride
QA	Quality Assurance
QAM	Quality Assurance Manager
QAO	Quality Assurance Officer
QAPP	Quality Assurance Project Plan
QC	Quality Control
RA	Risk Assessment
RBTL	Risk-Based Target Levels
RCRA	Resource Conservation and Recovery Act
RI	Remedial Investigation
RL	Reporting Limits
RPD	Relative Percent Difference
RPM	Remedial Project Manager
SDG	Sample Delivery Group
SOP	Standard Operating Procedure
SSO	Site Safety Officer
STL	Severn Trent Laboratories
SVOC	Semivolatile Organic Compound
TACO	Tiered Approach to Corrective Action Objectives

TAL	Target Analyte List
TCL	Target Compound List
TOC	Total Organic Carbon
TolTest	TolTest, Inc.
TOM	Task Order Manager
TSA	Technical System Audit
TtNUS	Tetra Tech NUS, Inc.
U.S. EPA	United States Environmental Protection Agency
U.S. Navy	United States Navy
VOC	Volatile Organic Compound

FIGURE A-17
PROJECT SCHEDULE
SITE 1 - WILLOW GLEN GOLF COURSE
NAVAL STATION GREAT LAKES
GREAT LAKES, ILLINOIS

Naval Station Great Lakes
QAPP
Revision : 0
Date: February 2007

ID		Task Name	Duration	Start	Finish
1		Project Start	1 day	Wed 3/29/06	Wed 3/29/06
2		Historical Data Management	64 days	Thu 3/30/06	Thu 6/1/06
3		Historical Data Submittal	0 days	Thu 6/1/06	Thu 6/1/06
4		QAPP Meeting	4 days	Mon 6/26/06	Thu 6/29/06
5		Prepare Draft QAPP	85 days	Fri 6/30/06	Fri 9/22/06
6		Submit Draft QAPP	0 days	Fri 9/22/06	Fri 9/22/06
7		Regulatory Review	48 days	Sat 9/23/06	Thu 11/9/06
8		Prepare Final QAPP	90 days	Fri 11/10/06	Wed 2/7/07
9		Submit Final QAPP	0 days	Wed 2/7/07	Wed 2/7/07
10		Field Investigation	100 days	Sun 12/10/06	Mon 3/19/07
11		Laboratory Analysis	30 days	Tue 3/20/07	Wed 4/18/07
12		Data Validation and Management	30 days	Thu 4/19/07	Fri 5/18/07
13		Prepare Draft RI/RA Report	60 days	Sat 5/19/07	Tue 7/17/07
14		RI/RA Meeting	1 day	Mon 6/18/07	Mon 6/18/07
15		Submit Draft RI/RA Report	0 days	Tue 7/17/07	Tue 7/17/07
16		Regulatory Review	45 days	Wed 7/18/07	Fri 8/31/07
17		Prepare Final RI/RA Report	30 days	Sat 9/1/07	Sun 9/30/07
18		Submit Final RI/RA Report	0 days	Sun 9/30/07	Sun 9/30/07



File: Figure A-17 Schedule.mpp

Task		Milestone		Rolled Up Split		External Tasks		Deadline	
Split		Summary		Rolled Up Milestone		Project Summary			
Progress		Rolled Up Task		Rolled Up Progress		External Milestone			

The following equations will be used to estimate daily intake for the raccoon:

$$CDI(inorganics) = \frac{[(If * Cs * BAF_f)/2 + (If * Cs * BAF_i)/2 + (Iw * Cw) + (Is * Cs)] * SUF}{BW}$$

$$CDI(organics) = \frac{[(If * Cs * BSAF_f * \frac{\%L}{\%TOC})/2 + (If * Cs * BSAF_i)/2 + (Iw * Cw) + (Is * Cs)] * SUF}{BW}$$

Where:

CDI	=	Chronic daily intake (mg/kg-day)
Cs	=	Chemical concentration in sediment (mg/kg)
BAF_f	=	Sediment-to fish bioaccumulation factor (for inorganics) (unitless)
BAF_i	=	Sediment-to invertebrate bioaccumulation factor (for inorganics) (unitless)
$BSAF_f$	=	Sediment-to fish bioaccumulation factor (for organics) (unitless)
$BSAF_i$	=	Sediment-to invertebrate bioaccumulation factor (for organics) (unitless)
If	=	Ingestion rate of food (kg/day)
%L	=	Percent lipids of the fish (assumed to be ≈14.2% dry weight)
%TOC	=	Percent total organic carbon of the sediment (will use actual stream data)
Is	=	Rate of incidental sediment ingestion (kg/day)
Cw	=	Chemical concentration in water using unfiltered metals data (mg/L)
Iw	=	Ingestion rate of water (L/day)
SUF	=	Site use factor [Contaminated area/home area range area ratio (unitless)]
BW	=	Body weight (kg)

The following input parameters will be used in the CDI equation for conservative models:

- Maximum surface water concentration
- Maximum sediment concentration
- Minimum receptor body weight for CDI equation
- Conservative receptor ingestion rate
- Site use factor equal to 1 (receptors spend 100% of their time at the site)

The following input parameters will be used in the CDI equation for average exposure models:

- Average surface water and sediment concentration
- Average receptor body weight for CDI equation
- Average receptor ingestion rate
- Site use factor will be suggested after the field reconnaissance by the ecological risk assessor.

The SERA will use sediment to invertebrate and sediment to fish BAFs and BSAFs to estimate chemical concentrations in invertebrates and fish that are used as inputs to the food chain model for piscivorous wildlife. The following sources of BAFs and BSAFs will be used in the SERA:

- Fish BSAFs – PAHs, PCBs, and Pesticides: The Incidence and Severity of Sediment Contamination in Surface Waters of the United States, Volume 1: National Sediment Quality Survey (USEPA, November 2004). These BSAFs will be used to estimate fish concentrations from chemical concentrations in the sediment.

- Sediment Invertebrate BSAFs - PCBs and Inorganics: Biota Sediment Accumulation Factors for Invertebrates: Review and Recommendations for the Oak Ridge Reservation (ORNL, August 1988). These BSAFs will be used to estimate accumulation from the sediment to benthic invertebrates. The 90th percentile sediment to invertebrate BSAF will be used for the conservative food chain model while the median sediment to invertebrate value will be used for the less conservative food chain model.

Chemicals that do not have BAFs or BSAFs will be assigned a default value of 1.0

The percent lipid value for fish is assumed to be 14.2% (dry weight). It is assumed that the raccoon's diet is comprised of 50 percent fish and 50 percent invertebrates, and the belted kingfisher's diet is comprised fully (100 percent) of fish. This difference is reflected in the above CDI equations. PAHs will not be included in the kingfisher food chain model because they are metabolized in fish tissue and do not accumulate; however, PAHs will be included in the invertebrates portion of the raccoon food chain model because invertebrates may not metabolize PAHs (Eisler, May 1987; USEPA, November 2000). Sediment to fish BSAFs will be used for the organic parameters in the belted kingfisher models. However, because sediment to fish BAFs are not available for inorganic chemicals, sediment to invertebrate BAFs will be used as surrogates. The 90th percentile BAFs and BSAFs will be used in the conservative input models, while the median BAFs and BSAFs will be used in the average input food chain models.