FINAL
UNIFORM FEDERAL POLICY-QUALITY ASSURANCE PROJECT PLAN ADDENDUM FOR SS062 AND SS067 FORMER GRIFFISS AIR FORCE BASE, ROME, NEW YORK

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ACRONYMS AND ABBREVIATIONS

AFB	Air Force Base
AFCEC	Air Force Civil Engineer Center
Bhate	Bhate Environmental Associates, Inc.
°C	Degree Celsius
CA	Corrective action
CAS	Chemical Abstract Service
CCV	Continuing calibration verification
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
%D	Percent Difference
DGI	Data Gap Investigation
DL	Detection Limit
DoD	Department of Defense
DQI	Data quality indicators
DQO	Data Quality Objective
ECC	Environmental Chemical Corporation
EICP	Extracted Ion Current Potential
FID	Flame Ionization Detector
GC	Gas Chromatograph
GC/MS	Gas Chromatograph/Mass Spectrometer
ICAL	Initial calibration
ICV	Initial calibration verification
IS	Internal standard
JBSA	Joint Base San Antonio
LCS	Laboratory control sample
LCSD	Laboratory control sample duplicate
LOD	Limit of detection
LOQ	Limit of quantitation
µg	Micrograms
kg	Kilogram
mL	Milliliter
mg	Milligrams
MPC	Measurement performance criteria
MS	Matrix spike
MSD	Matrix spike duplicate
NA	Not applicable or not available
ng	Nanogram
NYSDEC	New York State Department of Environmental Conservation
PARCCS	Precision, accuracy, representativeness, comparability, completeness, and sensitivity
PFAS	Per- and Polyfluoroalkyl Substances
PQO	Project quality objective
QA	Quality Assurance
QAPP	Quality Assurance Project Plan
QC	Quality Control
QSM	Quality Systems Manual
r2	Coefficient of determination
%R	Percent Recovery
RPD	Relative percent difference
RSD	Relative standard deviation
SGS	SGS North America
SOP	Standard Operating Procedure
SVOC	Semi-volatile Organic Compound
TPH	Total Petroleum Hydrocarbon
UFP	Uniform Federal Policy
VOA	Volatile organic analyte
VOC	Volatile Organic Compound

INTRODUCTION

Bhate Environmental Associates, Inc. (Bhate), in association with Environmental Chemical Corporation (ECC) under contract with the Air Force Civil Engineer Center (AFCEC), is performing a Supplemental Investigation at Site SS062 and a Free Product Assessment and Data Gap Investigation at Site SS067 located at the former Griffiss Air Force Base (AFB) in Rome, New York. Site SS062 is managed under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and Site SS067 is managed under the New York State Department of Environmental Conservation (NYSDEC) Corrective Action Program. This Uniform Federal Policy Quality (UFP)-Assurance Project Plan (QAPP) Addendum for SS062 and SS067 has been prepared to address the required soil and groundwater analytical requirements that are not addressed in the Basewide UFP-QAPP. The analytical data will be used in support of evaluating and delineating contaminated media to prepare a Supplemental Investigation (SI) Report for SS062 and a Free Product Assessment and Data Gap Investigation (DGI) Report for SS067. Standard operating procedures (SOPs) for soil sampling and for Per- and Polyfluoroalkyl Substances (PFAS) sampling are included as **Attachment A**. The following worksheets contain changes to the Basewide UFP-QAPP applicable to this scope of work.

WORKSHEET 12 – MEASUREMENT PERFORMANCE DATA

This worksheet documents the quantitative measurement performance criteria (MPC) in terms of precision, bias, and sensitivity for both field and laboratory measurements and is used as guidance for selecting appropriate techniques and analytical methods. In conjunction with the data quality objective (DQO) development in Worksheet 11 of the Basewide Uniform Federal Policy-Quality Assurance Project Plan, Long Term Monitoring, Former Griffiss Air Force Base, Rome, New York (Bhate, April 2022), these MPC ensure data will satisfy the project quality objectives (PQOs) and DQOs. MPC should be determined for each matrix and analytical group. MPC were established for each analytical parameter. Refer to the following worksheets for the required information in this worksheet:

- Worksheet 15 (Reference Limits and Evaluation) for data quality indicators (DQIs) consisting of precision and accuracy;
- Worksheet 24 (Analytical Instrument Calibration);
- Worksheet 28 (Laboratory Quality Control Sample Summary);

The quality of the data to be collected for this project will be verified using appropriate MPC established for both sampling procedures and analytical methods. The criteria will relate to the DQIs in the table below. The MPC follow those criteria defined in the EPA Method 537 modified for the analysis of environmental water and soil samples per Department of Defense (DoD) Quality Systems Manual (QSM) Version 5.3 Table B-15-Department of Defense (DoD) Quality Systems Manual [QSM], Version 5.3 dated (May 2019). The sampling procedures and the quality of the laboratory results will be evaluated for compliance with the project-specific DQOs through a review of overall precision, accuracy, representativeness, comparability, completeness, and sensitivity (PARCCS).

Table 1. Quantitative Measurement Performance Criteria

DQI	Quality Control (QC) Sample or Measurement Performance Activity	Measurement Performance Criteria
Bias Contamination	Field Blank/ Equipment Blank	<1/2 Limit of Quantitation (LOQ)
Precision - Overall	Field Duplicate	Relative Percent Difference (RPD) ≤ 30% (water) RPD ≤ 50% (soil)
Accuracy/Bias Contamination	Method Blank	<1/2 LOQ
Accuracy/Method bias in ideal matrix	Laboratory Control Sample, spiked at mid-to-low range	Within statistically derived limits
Accuracy in project matrix	Matrix Spike	Within Laboratory Control Sample (LCS) limits
Precision and Accuracy in project matrix	Matrix Spike Duplicate	<30% RPD
Sensitivity	Low Level continuing calibration verification (CCV) (at LOQ)	+/- 30% of true value
Accuracy in individual samples	Extracted Internal Standards	+/- 50% of relative value

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WORKSHEET 15 – REFERENCE LIMITS AND EVALUATION

This worksheet includes laboratory quality control data for each matrix and analytical method. The goal is that the laboratory and method can provide accurate data at the detection limits. The planning process identified target analytes and reference limits on which detection limits are based. Reference limits for SGS North America (SGS) and applicable screening objectives are presented in the following tables.

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Table 2. Reference Limits and Evaluation – Volatiles

Analyte	Chemical Abstract Service (CAS) Number	LOQ	Limit of Detection (LOD)	Detection Limit (DL)	Screening Standard*	Accuracy Control Limit (Percent Recovery [(%R)]	Precision Control Limit RPD (%)
Matrix: Soil Analytical Group: Volatiles (8260D) Units: micrograms (µg)/kilogram (kg)							
Acetone	67-64-1	200	150	100	50	61-152	27
Benzene	71-43-2	5	2	1.2	60	76-126	26
Bromobenzene	108-86-1	5	2	1	NA	76-122	32
Bromochloromethane	74-97-5	5	2	1.5	NA	77-120	24
Bromodichloromethane	75-27-4	5	2	1	NA	74-130	25
Bromoform	75-25-2	5	2	1	NA	76-127	26
Methyl Bromide	74-83-9	5	3.5	2	NA	65-139	31
2-Butanone (MEK)	78-93-3	25	15	7.3	120	75-137	25
n-Butylbenzene	104-51-8	5	2	1	12,000	71-128	35
sec-Butylbenzene	135-98-8	5	2	1	11,000	79-135	34
tert-Butylbenzene	98-06-6	5	2	1	5,900	77-133	34
Carbon Disulfide	75-15-0	5	2	1	NA	72-122	29
Carbon Tetrachloride	56-23-5	5	2	1	760	78-133	29
Chlorobenzene	108-90-7	5	2	1	1,100	81-129	29
Chloroethane	75-00-3	5	3.5	2	NA	68-133	29
Chloroform	67-66-3	5	2	1.3	370	72-123	26
Methyl Chloride	74-87-3	5	3.5	2	NA	71-144	27
o-Chlorotoluene	95-49-8	5	2	1	NA	77-129	33
p-Chlorotoluene	106-43-4	5	2	1	NA	80-134	33
Dibromochloromethane	124-48-1	5	2	1	NA	76-127	27
1,2-Dibromo-3-chloropropane	96-12-8	5	3.5	1.9	NA	70-137	29
1,2-Dibromoethane	106-93-4	5	2	1	NA	77-126	26
Methylene Bromide	74-95-3	5	2	1	NA	74-124	24

Analyte	Chemical Abstract Service (CAS) Number	LOQ	Limit of Detection (LOD)	Detection Limit (DL)	Screening Standard*	Accuracy Control Limit (Percent Recovery [(%R)]	Precision Control Limit RPD (%)
1,2-Dichlorobenzene	95-50-1	5	2	1	1,100	80-129	32
1,3-Dichlorobenzene	541-73-1	5	2	1	2,400	81-129	33
1,4-Dichlorobenzene	106-46-7	5	2	1.2	1,800	76-130	32
1,1-Dichloroethane	75-34-3	5	2	1.8	270	73-125	27
1,2-Dichloroethane	107-06-2	5	2	1	20	74-128	23
Dichlorodifluoromethane	75-71-8	5	3.5	2	NA	68-168	29
1,1-Dichloroethylene	75-35-4	5	2	1	330	81-136	28
cis-1,2-Dichloroethylene	156-59-2	5	2	1.4	250	74-126	26
trans-1,2-Dichloroethylene	156-60-5	5	2	1	190	70-127	27
1,2-Dichloroethene (total)	540-59-0	10	4	2.4	NA	73-125	27
1,2-Dichloropropane	78-87-5	5	2	1	NA	74-125	25
1,3-Dichloropropane	142-28-9	5	2	1	NA	76-122	26
2,2-Dichloropropane	594-20-7	5	2	1	NA	77-133	28
1,1-Dichloropropene	563-58-6	5	2	1	NA	75-130	28
cis-1,3-Dichloropropene	10061-01-5	5	2	1	NA	80-123	26
trans-1,3-Dichloropropene	10061-02-6	5	2	1	NA	75-131	28
Ethylbenzene	100-41-4	5	2	1	1,000	77-123	31
Hexachlorobutadiene	87-68-3	5	2	1.3	NA	74-136	38
2-Hexanone	591-78-6	25	15	7.5	NA	72-133	26
Isopropylbenzene	98-82-8	5	2	1	NA	80-136	32
p-Isopropyltoluene	99-87-6	5	2	1	NA	77-131	34
4-Methyl-2-pentanone (MIBK)	108-10-1	25	15	7.5	NA	76-132	26
Methylene Chloride	75-09-2	20	15	11	50	74-137	28
Methyl Tert Butyl Ether	1634-04-4	5	2	1	930	77-120	24
Naphthalene	91-20-3	5	3.5	2	NA	79-129	33
n-Propylbenzene	103-65-1	5	2	1	3,900	80-135	33
Styrene	100-42-5	5	2	1	NA	78-125	30
1,1,1,2-Tetrachloroethane	630-20-6	5	2	1	NA	78-126	27
1,1,2,2-Tetrachloroethane	79-34-5	5	2	1	NA	71-126	30

Analyte	Chemical Abstract Service (CAS) Number	LOQ	Limit of Detection (LOD)	Detection Limit (DL)	Screening Standard*	Accuracy Control Limit (Percent Recovery [(%R)]	Precision Control Limit RPD (%)
Tetrachloroethylene	127-18-4	5	2	1.3	1,300	79-130	31
Toluene	108-88-3	20	15	10	700	76-124	30
1,2,3-Trichlorobenzene	87-61-6	5	3.5	1.4	NA	77-128	35
1,2,4-Trichlorobenzene	120-82-1	5	3.5	1	NA	78-130	34
1,1,1-Trichloroethane	71-55-6	5	2	1	680	70-129	27
1,1,2-Trichloroethane	79-00-5	5	2	1	NA	74-124	28
Trichloroethylene	79-01-6	5	2	1	470	75-128	27
Trichlorofluoromethane	75-69-4	5	3.5	2	NA	73-145	31
1,2,3-Trichloropropane	96-18-4	5	3.5	1.3	NA	74-127	27
1,2,4-Trimethylbenzene	95-63-6	5	2	1	3,600	74-123	34
1,3,5-Trimethylbenzene	108-67-8	5	2	1	8,400	73-122	33
Vinyl Acetate	108-05-4	25	20	16	NA	48-164	37
Vinyl Chloride	75-01-4	5	2	1	20	76-141	27
m,p-Xylene	--	10	4	1.1	NA	80-128	30
o-Xylene	95-47-6	5	2	1	NA	80-132	30
Xylenes, total	1330-20-7	15	6	2.1	260	80-129	30
Dibromofluoromethane (Surrogate)	1868-53-7	NA	NA	NA	NA	75-124	NA
1,2-Dichloroethane-d4 (Surrogate)	17060-07-0	NA	NA	NA	NA	72-135	NA
Toluene-D8	2037-26-5					75-126	
4-Bromofluorobenzene (Surrogate)	460-00-4	NA	NA	NA	NA	71-133	NA

Table 3. Reference Limits and Evaluation – Semi-Volatiles

Analyte	CAS Number	LOQ	LOD	DL	Screening Standard*	Accuracy Control Limit (%R)	Precision Control Limit RPD (%)
Matrix: Soil **Analytical Group: Semi-Volatiles (8270E)** **Units: µg/kg**							
Benzoic Acid	65-85-0	830	330	170	NA	36-118	41
4-Chloro-3-methyl Phenol	59-50-7	170	33	19	NA	52-108	21
2-Chlorophenol	95-57-8	170	33	20	NA	48-104	26
2,4-Dichlorophenol	120-83-2	170	33	19	NA	51-105	27
2,4-Dimethylphenol	105-67-9	170	67	44	NA	43-96	23
2,4-Dinitrophenol	51-28-5	830	500	170	NA	40-119	32
4,6-Dinitro-o-cresol	534-52-1	330	130	67	NA	64-121	29
2-Methylphenol	95-48-7	170	33	20	330	46-107	24
3&4-Methylphenol	--	170	67	27	NA	44-111	24
2-Nitrophenol	88-75-5	170	33	18	NA	49-104	27
4-Nitrophenol	100-02-7	830	330	170	NA	56-116	23
Pentachlorophenol	87-86-5	830	330	170	800	61-114	23
Phenol	108-95-2	170	33	17	330	45-110	24
2,4,5-Trichlorophenol	95-95-4	170	33	27	NA	58-112	22
2,4,6-Trichlorophenol	88-06-2	170	33	19	NA	56-109	25
Acenaphthene	83-32-9	170	33	18	20,000	56-109	23
Acenaphthylene	208-96-8	170	33	17	100,000	56-106	23
Aniline	62-53-3	170	67	36	NA	42-108	28
Anthracene	120-12-7	170	33	19	100,000	61-110	21
Benzidine	92-87-5	1700	830	330	NA	10-109	35
Benzo(a)anthracene	56-55-3	170	33	17	1,000	66-111	23
Benzo(a)pyrene	50-32-8	170	33	20	1,000	59-104	23
Benzo(b)fluoranthene	205-99-2	170	33	18	1,000	67-113	24
Benzo(g,h,i)perylene	191-24-2	170	33	17	100,000	67-113	21
Benzo(k)fluoranthene	207-08-9	170	33	22	800	67-114	22
Benzyl Alcohol	100-51-6	170	33	17	NA	53-108	24
4-Bromophenyl phenyl ether	101-55-3	170	33	17	NA	62-110	21
Butyl benzyl phthalate	85-68-7	170	67	33	NA	65-113	20

Analyte	CAS Number	LOQ	LOD	DL	Screening Standard*	Accuracy Control Limit (%R)	Precision Control Limit RPD (%)
Carbazole	86-74-8	170	33	23	NA	60-111	19
4-Chloroaniline	106-47-8	170	67	42	NA	30-115	30
bis(2-Chloroethoxy)methane	111-91-1	170	33	17	NA	48-105	24
bis(2-Chloroethyl)ether	111-44-4	170	33	19	NA	46-103	27
2,2'-Oxybis(1-chloropropane)	108-60-1	170	33	21	NA	40-110	25
2-Chloronaphthalene	91-58-7	170	33	17	NA	53-106	23
4-Chlorophenyl phenyl ether	7005-72-3	170	33	17	NA	58-106	21
Chrysene	218-01-9	170	33	17	1,000	65-112	25
Dibenzo(a,h)anthracene	53-70-3	170	33	21	330	68-115	23
Dibenzofuran	132-64-9	170	33	17	NA	57-108	22
1,2-Dichlorobenzene	95-50-1	170	67	17	NA	44-102	28
1,3-Dichlorobenzene	541-73-1	170	67	18	NA	42-100	30
1,4-Dichlorobenzene	106-46-7	170	67	22	NA	40-106	29
3,3'-Dichlorobenzidine	91-94-1	170	67	40	NA	36-114	28
Diethyl Phthalate	84-66-2	330	120	33	NA	61-109	20
Dimethyl Phthalate	131-11-3	170	67	33	NA	59-108	20
Di-n-octyl Phthalate	117-84-0	170	67	33	NA	64-119	21
Di-n-butyl Phthalate	84-74-2	330	120	67	NA	63-108	19
2,4-Dinitrotoluene	121-14-2	170	33	17	NA	59-109	20
2,6-Dinitrotoluene	606-20-2	170	33	21	NA	61-107	22
1,2-Diphenylhydrazine	122-66-7	170	33	17	NA	58-112	22
bis(2-Ethylhexyl)phthalate	117-81-7	330	120	33	NA	64-115	23
Fluoranthene	206-44-0	170	33	17	100,000	60-108	25
Fluorene	86-73-7	170	33	18	30,000	58-109	21
Hexachlorobenzene	118-74-1	170	33	17	NA	59-111	21
Hexachlorobutadiene	87-68-3	170	67	17	NA	41-108	27
Hexachlorocyclopentadiene	77-47-4	170	67	33	NA	49-110	31
Hexachloroethane	67-72-1	170	67	20	NA	40-105	32
Indeno(1,2,3-cd)pyrene	193-39-5	170	33	20	500	66-116	22
Isophorone	78-59-1	170	33	17	NA	42-89	22
1-Methylnaphthalene	90-12-0	170	33	17	NA	49-106	26

Analyte	CAS Number	LOQ	LOD	DL	Screening Standard*	Accuracy Control Limit (%R)	Precision Control Limit RPD (%)
2-Methylnaphthalene	91-57-6	170	33	17	NA	47-106	27
Naphthalene	91-20-3	170	33	17	NA	44-104	27
2-Nitroaniline	88-74-4	170	67	39	NA	56-123	24
3-Nitroaniline	99-09-2	170	67	19	NA	41-111	25
4-Nitroaniline	100-01-6	170	67	48	NA	54-113	22
Nitrobenzene	98-95-3	170	33	17	NA	43-108	25
N-Nitrosodimethylamine	62-75-9	170	67	28	NA	40-106	27
N-Nitrosodi-n-propylamine	621-64-7	170	33	17	NA	48-108	27
N-Nitrosodiphenylamine	86-30-6	170	67	18	NA	62-110	21
Phenanthrene	85-01-8	170	33	17	100,000	63-111	22
Pyrene	129-00-0	170	33	19	100,000	65-115	25
Pyridine	110-86-1	330	120	67	NA	31-102	38
2-Fluorophenol	367-12-4	NA	NA	NA	NA	40-102	NA
Phenol-d5 (surrogate)	4165-62-2	NA	NA	NA	NA	41-100	NA
2,4,6-Tribromophenol (surrogate)	118-79-6	NA	NA	NA	NA	42-108	NA
Nitrobenzene-d5 (surrogate)	4165-60-0	NA	NA	NA	NA	40-105	NA
2-Fluorobiphenyl (surrogate)	321-60-8	NA	NA	NA	NA	43-107	NA
Terphenyl-d14 (surrogate)	1718-51-0	NA	NA	NA	NA	45-119	NA

Table 4. Reference Limits and Evaluation – Total Petroleum Hydrocarbon (TPH)

Analyte	CAS Number	LOQ	LOD	DL	Screening Standard*	Accuracy Control Limit (%R)	Precision Control Limit RPD (%)
Matrix: Soil **Analytical Group: TPH-GRO, DRO (8015)** **Units: mg/kg**							
TPH-GRO (C6-C10)	--	5	2.5	2.5	NA	74-128	17
4-Bromofluorobenzene (Surrogate)	460-00-4	NA	NA	NA	NA	56-149	NA
aaa-Trifluorotoluene (Surrogate)	98-08-8	NA	NA	NA	NA	66-132	NA
TPH (C10-C28)	--	5	3.8	2.5	NA	62-116	35
TPH (C28-C40)	--	5	3.8	2.5	NA	62-116	35
o-Terphenyl (Surrogate)	84-15-1	NA	NA	NA	NA	56-122	NA
*6 Code Rules and Regulations (CRR)-New York (NY) 375-6.8(a) Unrestricted Soil Cleanup Objectives							

Table 5. Reference Limits and Evaluation – PFAS

Analyte (ng/L)	CAS Number	LOQ	LOD	DL	Screening Standard*	Accuracy Control Limit (%R)	Precision Control Limit RPD (%)
Perfluorobutanoic acid	375-22-4	8.0	4.0	2.0		73-129	30
Perfluoropentanoic acid	2706-90-3	4.0	2.0	1.0		72-129	30
Perfluorohexanoic acid	307-24-4	4.0	2.0	1.0		72-129	30
Perfluoroheptanoic acid	375-85-9	4.0	2.0	1.0		72-130	30
Perfluorooctanoic acid	335-67-1	4.0	2.0	1.0	40	71-133	30
Perfluorononanoic acid	375-95-1	4.0	2.0	1.0		69-130	30
Perfluorodecanoic acid	335-76-2	4.0	2.0	1.0		71-129	30
Perfluoroundecanoic acid	2058-94-8	4.0	2.0	1.0		69-133	30
Perfluorododecanoic acid	307-55-1	4.0	2.0	1.0		72-134	30
Perfluorotridecanoic acid	72629-94-8	4.0	2.0	1.0		65-144	30
Perfluorotetradecanoic acid	376-06-7	4.0	2.0	1.0		71-132	30
Perfluorobutanesulfonic acid	375-73-5	4.0	2.0	1.0	600	73-130	30
Perfluoropentanesulfonic acid	2706-91-4	4.0	2.0	1.0		71-127	30

Analyte (ng/L)	CAS Number	LOQ	LOD	DL	Screening Standard*	Accuracy Control Limit (%R)	Precision Control Limit RPD (%)
Perfluorohexanesulfonic acid	355-46-4	4.0	2.0	1.0		68-131	30
Perfluoroheptanesulfonic acid	375-92-8	4.0	2.0	1.0		69-134	30
Perfluorooctanesulfonic acid	1763-23-1	4.0	2.0	1.0	40	65-140	30
Perfluorononanesulfonic acid	68259-12-1	4.0	2.0	1.0		69-127	30
Perfluorodecanesulfonic acid	335-77-3	4.0	2.0	1.0		53-142	30
PFOSA	754-91-6	4.0	2.0	1.0		67-137	30
MeFOSAA	2355-31-9	8.0	4.0	2.0		65-136	30
EtFOSAA	2991-50-6	8.0	4.0	2.0		61-135	30
4:2 Fluorotelomer sulfonate	757124-72-4	8.0	4.0	2.0		63-143	30
6:2 Fluorotelomer sulfonate	27619-97-2	8.0	4.0	2.0		64-140	30
8:2 Fluorotelomer sulfonate	39108-34-4	8.0	4.0	2.0		67-138	30

Note: High level water samples reported by serial dilution and direct injection must have prior approval from the client and the results must be footnoted.

WORKSHEET 18 – SAMPLING LOCATIONS AND METHODS

The following tables summarize the sampling matrix, number of samples to be collected, analytical parameters, and the rationale for sampling locations described in Worksheet 17.

The sample nomenclature for samples collected will be as follows:

SS062SB-1_0722-x

- Site alpha numeric identifier: SS062 = Site SS062
- Sample type identifier:
    - SB = soil boring
    - MW = monitoring well
    - WG = single use temporary well
    - TW = short term temporary well
    - WL = surface water/water level point
- Sample date: 0722 = July 2022
- x = Reserved for the following Quality Assurance (QA) sample identifiers:

-a = field duplicate	-d = equipment blanks	-MS = matrix spike
-c = trip blank	-MSD = matrix spike duplicate	

Field Duplicates will be collected at frequency of 10 percent, MS/MSD samples will be collected at a frequency of 5 percent, and a trip blank will be included with each shipped cooler containing field samples selected for volatile organic compound (VOC) analysis.

Refer to Tables 13 and 14 for sampling locations and the number of samples summarized for each site by analytical group.

WORKSHEETS 19 AND 30 – SAMPLE CONTAINERS, PRESERVATION, AND HOLD TIMES

This worksheet summarizes the analytical methods for each sampling matrix, including the required sample volume, containers, preservation, and holding time requirements. Further information on the analytical SOPs is provided in Worksheet 23. All other parameters are referenced on Worksheets 19 and 30 of the Basewide UFP-QAPP.

Table 6. Sample Containers, Preservation, and Hold Times

Matrix	Analytical Group	Method (Laboratory SOP)	Containers	Sample Volume	Preservation Requirements	Maximum Holding Time
Soil	VOCs	SW-846 8260D (SOP MS020.2)	Terracore or other sampling device (3) 40 milliliter (m)L glass plus 2 oz jar	5 grams	Cool to 0-6 degrees Celsius(°C), methanol and sodium bisulfate	48 hrs
Soil	Semi-volatile Organic Compounds (SVOCs)	SW-846 8270E (SOP MS021.2)	(1) 4 oz glass	30 grams	Cool < 6°C	14 days to prep 40 days to analysis
Soil	TPH-GRO	SW-846 8015 (GC010.14)	(3) Volatile Organic Analyte (VOA) Vials – Terra Core	10 grams	Methanol; Cool < 6°C	48 hours from sampling to preservation/ 14 days from preservation to analysis
Soil	TPH-DRO	SW-846 8015 (GC011.16)	(1) 4oz, glass jar	60 grams	Cool < 6°C	14 days to extract, 40 days from extract
Soil	PFAS	537M (MS019.5)	2 - 125 mL, Wide Mouth HDPE	125 mL	Cool to 4 ± 2°C	28 days to extract, 40 days to analyze
Water	PFAS	537M (MS019.5)	2 – 250 ml, Wide Mouth HDPE	4 oz	Cool to 4 ± 2°C	28 days to extract, 40 days to analyze

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WORKSHEET 23 – ANALYTICAL STANDARD OPERATING PROCEDURE REFERENCES

The laboratory SOP references identified in the table below were provided by SGS in Orlando, Florida. Note that the laboratory SOPs have not been modified specifically for this project and may not reflect the exact requirements of this document. The laboratory SOPs are supplemented by internal communication systems within the laboratory to disseminate the project requirements to technical staff. Laboratory SOPs are available upon request.

Table 7. Analytical SOP References

SOP #	Title, Date, and URL (if available)	Definitive or Screening Data	Matrix/Analytical Group	SOP Option or Equipment Type	Modified for Project? Y/N
MS019.6	ANALYSIS OF PER- and POLYFLUORINATED ALKYL SUBSTANCES BY LC/MS/MS AND ISOTOPE DILUTION, 5/2021	Definitive	Aqueous/Soils PFAS	Agilent LC/MS/MS	No
MS016.8	Analysis of Volatile Organics By Gas Chromatograph / Mass Spectrometer (GC/MS) 12/18/20	Definitive	Volatiles, Soil	GC/MS	SGS North America, Orlando
MS006.18	ANALYSIS OF SEMIVOLATILE ORGANICS BY GC/MS 10/02/20	Definitive	Semi-Volatiles, Soil	GC/MS	SGS North America, Orlando
GC010.14	ANALYSIS OF GASOLINE RANGE ORGANICS BY GAS CHROMATOGRAPHY USING FLAME IONIZATION DETECTOR 10/09/19	Definitive	Gasoline Range Organics, Soil	GC/flame ionization device (FID)	SGS North America, Orlando
GC011.16	ANALYSIS OF DIESEL RANGE ORGANICS BY GAS CHROMATOGRAPHY USING FLAME IONIZATION DETECTOR 10/09/19	Definitive	Diesel/Oil Range Organics, Soil	GC/FID	SGS North America, Orlando

WORKSHEET 24 – ANALYTICAL INSTRUMENT CALIBRATION

To confirm that the analytical methods and the selected instrumentation meet the project requirements, each analytical instrument will be calibrated according to the procedures outlined in Worksheet 28 and the following table.

Specific analytical method SOP references are provided in Worksheet 23. Full method QA/QC tables are provided for ease of use to the Bhate Project Chemist and the laboratory. This information provides documentation on corrective actions, flagging criteria for laboratory services and expectations for analytical services, and meets the requirements outlined in Worksheet 28 and reflects the requirements of the DoD *Quality Systems Manual*, *Version 5.3* (DoD, May 2019).

Table 8. Summary of Calibration and Quality Control Procedures for PFAS Method 537M and TPH Method 8015

Instrument	Calibration Procedure	Frequency of Calibration	Acceptance Criteria	Corrective Action (CA)	Person Responsible for CA	SOP Reference
LC/MS/MS for PFAS	Mass Calibration	Initially prior to use and after performing major maintenance, as required to maintain documented instrument sensitivity and stability performance.	Calibrate the mass scale of the MS with calibration compounds and procedures described by the manufacturer	NA	Analyst / Section Supervisor	SGS - Orlando – MS019.5
	Tune Check	When the masses fall outside of the ±0.5 amu of the true value.	Mass assignments of the tuning standard within 0.5 amu of true value.	Retune instrument and verify		
	Initial Calibration (ICAL) Standards containing both branched and linear	Initial calibration prior to sample analysis	S/N Ratio: ≥ 10:1 for all ions used for quantification. For analytes having a promulgated standard,	Verify standard solutions still valid, perform instrument maintenance as needed,		

Instrument	Calibration Procedure	Frequency of Calibration	Acceptance Criteria	Corrective Action (CA)	Person Responsible for CA	SOP Reference
	isomers must be used when commercially available. Isotope Dilution or Internal Standard Calibration is required. Minimum five-point initial calibration for linear, or six-point calibration for quadratic.		(e.g., HA levels for PFOA and PFOS), the qualitative (confirmation) transition ion must have a S/N Ratio of ≥ 3:1. The RT of the Branched peak relative to the exact mass labeled analyte can be checked. Average RF: Relative Standard Deviation (RSD) of the RFs for each analyte ≤ 20% Linear or non-linear Calibration: Coefficient of Determination (r^2) ≥ 0.99. Analytes must be within 70-130% of their true value for each calibration standard.	then repeat the ICAL		
	Instrument Sensitivity Check (ISC). ISC can serve as initial daily CCV	Prior to analysis and at least once every 12 hours	Analyte concentrations must be at LOQ; concentrations must be within ±30% of true value.	Correct problem, rerun ISC. If problem persists, report ICAL.		

Instrument	Calibration Procedure	Frequency of Calibration	Acceptance Criteria	Corrective Action (CA)	Person Responsible for CA	SOP Reference
	Initial Calibration Verification (ICV)	Once after each ICAL; analysis of second source standard prior to sample analysis.	Analyte concentrations must be within ±30% of true value.	Correct problem, rerun ICV. If problem persists, report ICAL.		
	Continuing Calibration Verification (CCV)	Prior to sample analysis, after every 10 field samples, and at end of analytical sequence.	Analyte concentrations must be within ±30% of true value. Concentration of analytes must range from LOQ to mid-level calibration concentrations.	Immediately analyze two additional consecutive CCVs. If both pass, samples may be reported without reanalysis. Otherwise, perform corrective action, repeat CCV (or ICAL) and reanalyze all associated samples since last successful CCV.		
	Instrument Blanks	Immediately following highest standard analyzed and daily prior to sample analysis.	Concentration of each analyte must be ≤ ½ the LOQ.	If acceptance criteria are not met after the highest calibration standard, calibration must be performed using a lower high standard until criteria is met.		

Instrument	Calibration Procedure	Frequency of Calibration	Acceptance Criteria	Corrective Action (CA)	Person Responsible for CA	SOP Reference
GC/FID	ICAL- minimum of five levels	Initially or if continuing calibration no longer meets criteria	%RSD <20%, or Retention Time for each analyte within 0.10 minutes of the mean retention time over the ICAL range.	Inspect the system for problems and perform required maintenance Repeat ICAL.	Analyst, Department Manager	GC010.14 GC011.16
	ICV	1 per ICAL, analyzed after ICAL, before field samples	Percent Difference (%D) $\leq$20%	Correct problem and verify second source standard. Rerun second source verification. If that fails, correct problem and repeat ICAL.		
	CCV	Analyze standard at beginning and end of sequence and after every 10 field samples or every 12 hours, whichever is more frequent.	%D $\leq$20%	Analyze two additional CCVs. Identify and correct problem; re-analyze or if necessary qualify the data. Repeat ICAL if CCV corrective action is unsuccessful.		

LC/MS/MS - Liquid chromatography tandem mass spectrometry, amu – atomic mass units, S/N – signal to noise, HA – Health advisory, RF- Response factor, RSD – Relative standard deviation, r2 – Coefficient of determination, LOQ – Limit of Quantitation

WORKSHEET 25 – ANALYTICAL INSTRUMENT AND EQUIPMENT MAINTENANCE, TESTING, AND INSPECTION

To confirm that the analytical instrument and equipment are available and in working order when needed, all laboratory analytical equipment will be maintained and tested in accordance with procedures described in the laboratory SOPs listed in Worksheet 23. The analytical instrument and equipment maintenance, testing, and inspection activities and acceptance criteria are provided in the following table.

Table 9. Analytical Instrument and Equipment Maintenance, Testing, and Inspection

Instrument/ Equipment	Maintenance Activity	Testing Activity	Inspection Activity	Frequency	Acceptance Criteria	Corrective Action	Responsible Person	SOP Reference
Agilent HPLC/MS/MS	Spray chamber, Clean capillary	DoD QSM 5-series Table B-15 Perfluorinated compounds	Check Tune Leak checks Pressure check Mobile phase filters Needle inspection	Needed for maintenance determined by passing calibration – see MS019.5	Passing calibration	Check LC column Run autotune Check calculations Re-run affected samples	Laboratory Analyst	MS019.5

WORKSHEET 28 – LABORATORY QUALITY CONTROL SAMPLE SUMMARY

Worksheet 28 of the Griffiss AFB Basewide UFP-QAPP presents the analytical QC requirements relevant to analysis of environmental samples that will be followed by laboratories producing definitive data. The purpose of the laboratory QC activities is to produce data of known quality that satisfy the project-specific DQOs. Laboratory QC samples will follow method specific requirements of the DoD *Quality Systems Manual, Version 5.3*.

QC Sample	Frequency Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for CA	DQI	Measurement Performance Criteria
Matrix: Soil **Analytical Group: Volatiles and Semi-Volatiles** **Analytical Method/SOP Reference: SW-846 8260D, 8270E, 8015 / MS016.8, MS006.18, GC010.14, GC011.16**						
Method Blank	One per preparatory batch	No analytes detected > ½ LOQ (for common lab contaminants, no analytes detected >LOQ) and > 1/10th the amount measured in any sample or 1/10th the regulatory limit (whichever is greater).	Correct problem; reanalyze any sample associated with a blank that fails criteria, except when the sample analysis resulted in a non-detect.	Analyst, Supervisor, QA Manager	Bias Contamination	No analytes detected > ½ LOQ or > LOQ for common laboratory contaminants
Surrogates	All field and QC samples	QC acceptance criteria specified in Worksheet 15	Reanalyze and/or re-prep if sufficient sample is available unless recoveries are high with no detection of analytes. If re-prep and reanalysis confirms low recoveries, report and narrate.	Analyst, Supervisor, QA Manager	Accuracy Bias	Acceptance criteria specified in Worksheet 15
LCS/ Laboratory control sample duplicate (LCSD)	One per preparatory batch	QC acceptance criteria specified in Worksheet 15	Reanalyze and/or re-prep all associated samples unless recoveries are high with no detection of analytes.	Analyst, Supervisor, QA Manager	Accuracy Bias Precision	Acceptance criteria specified in Worksheet 15
Internal Standards	In all field samples and standards	Retention time ± 30 seconds from retention time of the midpoint standard in the ICAL; extracted ion current profile (EICP) area within -50% to +100% of ICAL midpoint standard	Inspect mass spectrometer or GC for malfunctions. Reanalyze all samples with IS failures. If reanalysis confirms matrix interference, report sample and narrate.	Analyst, Supervisor, QA Manager	Accuracy Bias	Retention time ± 30 seconds; EICP area within -50% to +100% of midpoint of ICAL

QC Sample	Frequency Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for CA	DQI	Measurement Performance Criteria
MS/MSD	One per preparatory batch per matrix	For matrix evaluation, use LCS recovery and RPD acceptance criteria specified in Worksheet 15	Contact the client to determine if additional measures are required.	Analyst, Supervisor, QA Manager	Accuracy Bias Precision	Acceptance criteria specified in Worksheet 15
Matrix: Soil/Groundwater **Analytical Group: PFAS** **Analytical Method/SOP Reference: 537M/MS019.5**						
Mass Calibration and Tune Check	At initial set-up, after major maintenance and if the masses fall outside of +/-0.5 atomic mass unit (amu)	Mass assignment within 0.5 amu value	Retune instrument and verify. Rerun affected samples. Flagging criteria are not appropriate and problem must be corrected.	Analyst	Laboratory Accuracy	Refer to method for specific ion criteria.
Ion transition	Prior to method implementation	Refer to DoD QSM 5.3 Table B-15 for transitions.	Flagging is not appropriate, cannot proceed without valid transitions.	Analyst	Laboratory Accuracy	
Instrument Blanks	Immediately following high standard analysis and daily prior to sample analysis	<1/2 Limit of Quantitation (LOQ)	If acceptance criteria not met, determine the highest concentration at which carryovers do not occur. Qualify and footnote only if samples cannot be reanalyzed.	Analyst	Absence of interference/ contamination/ carryovers	<1/2 LOQ

Method Blank (MB)	1 per extraction batch	<1/2 LOQ	The source of the contamination is investigated and eliminated before proceeding with further analysis. Corrective actions are: Samples ND or >10x contamination level– report with qualification Samples <10x contamination – re-extract and reanalyze. Insufficient sample - qualify and footnote	Analyst/Prep analyst	Absence of interference/ contamination	<1/2 LOQ
LCS	1 per extraction batch	QC acceptance criteria specified in Worksheet 15	Source of poor recovery is investigated and eliminated before proceeding with further analysis, corrective actions are: Biased high, samples ND – report with qualifications. Biased low – re-extract and reanalyze. Insufficient volume – qualify and footnote.	Analyst/Prep analyst	Laboratory Accuracy/Method bias in ideal matrix	Meets statistically derived or project-specified recoveries
Matrix Spike (MS)/Matrix Spike Duplicate (MSD)	1 per 20 samples or one for each extraction batch	For matrix evaluation, use LCS recovery and RPD acceptance criteria specified in Worksheet 15	If the recoveries indicate that the problem is procedure related, re-extraction and re-analysis is required. If the recoveries indicate that the failures are matrix-related, refer to LCS as measure of method performance in clean matrix. The project Chemist will be contacted and a decision will be made to either report the data as is with a notation in the analytical narrative or if the samples should be re-extract and re-analyzed.	Analyst/Prep analyst	Precision and Accuracy in field samples	Meets statistically derived recoveries; RPD ≤ 30%

Extracted IS	Every sample	Recoveries within 50% of relative value.	If failure is due to instrument performance issues, the problem must be identified, corrected, and the sample must be re-analyzed. If no instrument problem is found the sample must be re-analyzed. If upon re-analysis the responses are still not within limits, the problem may be considered sample matrix interference. Discuss in Case Narrative.	Analyst	Individual sample preparation efficiency control	Detector Stability

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