GUAM PUBLIC UTILITIES COMMISSION
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Attorneys for *Guam Solid Waste Authority*

BEFORE THE GUAM PUBLIC UTILITIES COMMISSION

IN THE MATTER OF: The Application of the Guam Solid Waste Authority for Review and Approval of the Award and Contract to EA Engineering, Science, and Technology, Inc. for Landfill Compliance and Engineering Services	GSWA DOCKET No.: **SUPPLEMENT TO PETITION FOR CONTRACT REVIEW AND APPROVAL**

COMES NOW the **GUAM SOLID WASTE AUTHORITY (GSWA)** and respectfully submits and supplements its Petition for Contract Review and Approval with the Request for Proposal for Landfill Compliance & Engineering Consulting Services to the **GUAM PUBLIC UTILITIES COMMISSION (PUC).**

Respectfully submitted this 17th day of MAR, 2025.

CAMACHO & TAITANO LLP
Attorneys for Petitioner

By: ______________________
SHANNON TAITANO

RFP COVER SHEET

REQUEST FOR PROPOSALS (RFP)

GUAM SOLID WASTE AUTHORITY

LANDFILL COMPLIANCE & ENGINEERING CONSULTING SERVICES

ISSUED BY: **Guam Solid Waste Authority**
546 N. Marine Corps Dr.
Tamuning, Guam 96913

PROPOSAL NO: **GSWA-RFP004-24**

ISSUE DATE: **Wednesday, April 24, 2024**

DEADLINE: **Tuesday, May 14, 2024, 4:00PM CHST**

NAME AND LOCATION OF PROJECT(S):
Guam Solid Waste Authority
546 N. Marine Corps Dr.
Tamuning, Guam 96913

TABLE OF CONTENTS OF RFP

This entire Request for Proposals consists of the following:

Section I.

INSTRUCTIONS TO OFFERORS

A. TABLE OF CONTENTS OF INSTRUCTIONS TO OFFERORS

These Instructions to Offerors contain the following lettered sections:

B. PURPOSE

The Guam Solid Waste Authority ("GSWA") is issuing this Request for Proposals (RFP) because it is seeking an experienced and qualified Offeror to provide professional Landfill Compliance & Engineering Consulting Services ("Services") for the GSWA. The issuance of this RFP in no way constitutes a commitment by GSWA to award a contract.

C. TYPE OF CONTRACT TO BE OFFERED AND TERM

The estimated time for performance of the Services contained in the Scope of Services in this RFP is three (3) years. Therefore, the contract that results from this solicitation will be a firm-fixed price multi-term contract.

1. Initial Term. The initial term of the contract shall be for three (3) years and shall begin upon the date that GSWA issues a written Notice to Proceed ("NTP") to the awarded contractor (the "Initial Term").

2. Renewal Terms. At the sole option of the GSWA, and upon satisfactory performance by the Contractor, the contract may be renewed for any number of time period(s) determined to be in the best interests of the government of Guam, for a total of up to two (2) additional years (each being a "Renewal Term") for the purposes of promoting internal efficiency and minimizing expenses. Any Renewal Term shall not be subject to negotiation, but shall be a continuation of the contract on the same terms, conditions, and pricing as in effect under the existing contract. All Renewal Terms are subject to the availability of additional funds.

All Renewal Terms are subject to the availability of funds. In no case shall any extension or renewal extend the total term of the contract beyond five (5) years. Unless cancelled for lack of funds, terminated, renewed, or extended prior to expiration, the contract shall expire at the end of the Initial term or at the end of any subsequent Renewal Term exercised by the GSWA.

D. REQUEST FOR PROPOSALS PACKAGE AND FORMS

The Request for Proposals package and forms will be available on GSWA's website at the web address below under the tab labeled "BIDS/RFPs". GSWA's web address is: www.gswa.guam.gov. Hard copies of the Request for Proposals package will be available at GSWA Office (2nd Fl), 546 N. Marine Corps Dr. Tamuning, Guam 96913, starting Wednesday, April 3, 2024, 8am ChST. All required forms attached to this RFP must be completed, executed by the authorized representative of the Offeror, and included with the Offeror's Proposal.

E. SUBMISSION OF PROPOSALS AND DUE DATE

<u>RFP TIMETABLE</u>:

Registration Form for GSWA RFP Packet will be available on the Guam Solid Waste Authority website at www.gswa.guam.gov. Hard copies of RFP will be available at GSWA Office (2nd Floor), 546 N Marine Corps Dr. Tamuning, Guam 96913.	Wednesday, April 24, 2024
Deadline for Requests to Hold Pre-Proposal Conference must be e-mailed to the Guam Solid Waste Authority at procurement@gswa.guam.gov.	Monday, April 29, 2024 on or before 5:00PM Chamorro Standard Time
Deadline for Receipt of Written Questions must be e-mailed to the Guam Solid Waste Authority at procurement@gswa.guam.gov.	Friday, May 3, 2024 on or before 5:00PM Chamorro Standard Time
Deadline for Answers to Written Questions will be e-mailed to Offerors who registered.	Tuesday, May 7, 2024 on or before 5:00PM Chamorro Standard Time
Deadline for Receipt of Un-Priced Technical Proposals at the Guam Solid Waste Authority, Chief of Administration Office at GSWA Office, 2nd Floor, 546 N. Marine Corps Dr. Tamuning, Guam.	Tuesday, May 14, 2024 on or before 4:00PM Chamorro Standard Time

Sealed Proposals shall be submitted including one (1) fully executed original and five (5) copies. Faxed or Emailed proposals will not be accepted. Failure to submit the required forms in the number or format required may be cause for rejection of Proposals due to non-responsiveness. The narrative Statements of Qualifications, which consist of the total of all of the responses to Sections I, J, K, L, M, and N below, shall not exceed fifteen (15) pages total (exclusive of resumes and exhibits). See the Proposal Format and Content provisions for full instructions and minimum requirements for the content of the Proposal.

<u>Faxed or E-mailed Proposals will not be accepted.</u>

By submitting a Proposal in response to this solicitation, the Offeror agrees to accept and comply with the terms and conditions incorporated in this RFP, and to be bound by Guam's Procurement Law and the Guam Procurement Rules and Regulations.

The Offeror further agrees that the Proposal offer shall remain firm and may not be withdrawn for one-hundred twenty (120) days after the conclusion of discussions. In no case will failure to inspect or review constitute grounds for a claim or for the withdrawal of a Proposal after opening. Proposals conditioned upon receiving award of both the contract being solicited in this RFP and another contract will be rejected as non-responsive.

Proposals must be received no later than Tuesday, May 14, 2024; 4:00 p.m., Chamorro Standard Time. Proposals received after the closing time for receipt will not be considered. Office hours for receipt of Proposal are Monday through Friday (excluding government of Guam Holidays), 8:00 a.m. to 5:00 p.m. **Proposals may be hand delivered, delivered by mail, or delivered by other courier service to:**

Guam Solid Waste Authority, Procurement Office (2nd Floor)
RFP No. GSWA-RFP004-24
c/o Alicia Fejeran, Chief of Administration
546 N. Marine Corps Dr.
Tamuning, Guam 96913

Each Offeror submitting a Proposal for any portion of the work covered by the RFP, the Proposal, or the Proposal Documents shall execute all required affidavits and certification forms, in the form provided with this RFP. Such affidavits and certification forms shall be attached to the Proposal. Any forms that are required to be notarized must be notarized no more than thirty (30) days prior to submission of the Proposal. Failure to submit all required forms will result in rejection of the Proposal.

F. PRE-PROPOSAL CONFERENCE

Any potential Offeror may submit a request for a Pre-proposal conference in writing to the attention of Alicia Fejeran at procurement@gswa.guam.gov no later than: **Monday, April 29, 2024, on or before 5:00PM CHST**

G. NO PRE-PROPOSAL DISCUSSIONS WITH OFFERORS

No oral discussion, explanation, or instructions in regard to the meaning of any provision of this RFP will be allowed or given on or before the submission due date for all Proposals.

H. QUESTIONS/COMMUNICATIONS AND SINGLE POINT OF CONTACT

All communications and any questions concerning possible discrepancies, omissions, or doubts as to the meaning of any provision of this RFP shall be raised before the submission due date for Proposals and shall be communicated in writing on or before **5:00pm ChST, Friday, May 3, 2024** to the following Single Point of Contact for the GSWA:
Alicia Fejeran, Chief of Administration via email at procurement@gswa.guam.gov.

Written answers to all timely and properly submitted written questions submitted on or before **5:00pm ChST, Friday, May 3, 2024** shall be answered on or before **5:00pm ChST, Tuesday, May 7, 2024**. GSWA will notify all Offerors of any substantive modification or clarification provided in response to any timely and properly submitted written questions. GSWA may extend any applicable dates or due dates if any circumstance or information significantly amends the solicitation or makes compliance with the original proposed due dates impractical. GSWA is not required to respond to untimely or improperly submitted questions or communications.

No other oral or written communications concerning possible discrepancies, omissions, objections, or doubts as to the meaning of any provision of this RFP shall be submitted to GSWA at any time prior to the submission date for Proposals, except as permitted by Guam's

Procurement Law and Guam's Procurement Rules and Regulations. Any communication concerning the provisions of the RFP initiated by an Offeror, other than a timely submission of permitted pre-proposal questions: 1) shall contain a citation to the Guam code section or Guam procurement regulation that authorizes the communication; 2) shall be submitted in writing; and 3) shall only be communicated to the above-designated Single Point of Contact. GSWA is not required to respond to any communication that does not comply with the requirements of this paragraph, or any communication that is untimely. GSWA will notify all Offerors of any substantive modification or clarification of the solicitation provided in response to any properly submitted communication, as permitted by law. GSWA may extend any applicable dates or due dates if any circumstance or information significantly amends the solicitation or makes compliance with the original proposed due dates impractical.

I. OTHER COMMUNICATIONS

Discussions after the submission due date for Proposals and prior to award for the purpose of clarifying and/or modifying timely Proposals submitted by the Offerors are permitted in accordance with 2 GARR, Div. 4 § 3114(i) and/or 2 GARR, Div. 4 § 3116. (See also General Terms and Conditions, Clarification/Discussion of Proposals.)

Direct or indirect contact or communication concerning this RFP with any other GSWA employees, other employees or representatives of the government of Guam who are participating in the solicitation process, or any other person participating in the solicitation process is strictly prohibited at all times during the solicitation process and prior to award of the contract, unless such contact or communication is specifically authorized by Guam's Procurement Law and Guam's Procurement Rules and Regulations.

J. PROPOSAL FORMAT AND CONTENT

All Proposals and Proposal Documents must be submitted in writing. Interested Offerors shall submit their written Proposals and Proposal Documents in a sealed envelope to include one (1) original and five (5) copies. The outer envelope shall be marked in bold letters:

Guam Solid Waste Authority
ATTN: Alicia Fejeran, Chief of Administration
Request for Proposal No. GSWA-RFP004-24
LANDFILL COMPLIANCE & ENGINEERING CONSULTING SERVICES

The envelope shall also be marked with the Offeror's name and the name of Offeror's authorized representative. Proposals and Proposal Documents shall be filled out in ink or typewritten and signed in black or blue ink. Erasures, strikeouts, or other types of changes, made to a Proposal, which are evident on its face, must be explained or noted over the signature of the Offeror. Unexplained erasures or alterations, and omissions to the Proposal or Proposal Documents may be cause for rejection by the government.

The Proposal must include:

- A cover letter on the Offeror's letterhead, listing the legal name of the Offeror, location of Offeror's principal place of business, location of the formation of Offeror's business entity, and current place(s) of operation and other projects. This cover letter must be signed in the legal name of the Offeror and by an authorized officer, representative, agent or employee of the Offeror, who has authority to bind the Offeror. Proof of authority to bind the Offeror may be requested by the GSWA;

- A detailed plan for performance of the Services listed in the Scope of Services;
- A statement of the abilities, qualifications, and experience of all persons who would be assigned to provide the required Services under this RFP;
- A statement of the availability and capacity of the Offeror to perform the Services under this RFP;
- A listing of other contracts under which services similar in scope, size, or discipline were performed;
- A listing of any other contracts under which any services were performed within the last five (5) years.

The Proposal must contain a concise narrative including a statement of qualifications addressing the aforementioned bulleted items, the evaluation criteria set forth in this solicitation, and information described in the Scope of Services. All costs associated with preparation of a Proposal in response to this RFP shall be solely the Offeror's responsibility. GSWA shall not be liable for any costs incurred by a potential Offeror in connection with this RFP. By submitting a Proposal, the Offeror expressly waives any right it may have against the GSWA for any expenses incurred in connection with the preparation of its Proposal, unless otherwise entitled to such expenses by law.

All Proposals should follow and address each of the evaluation criteria and must be complete as to the requested information. Failure to follow the prescribed format or omission of required information may result in a lower score on evaluation and may result in rejection of the Proposal. Supporting graphical information, i.e., photos, drawings, illustrations may be provided to support the information given in the Proposal; such material will not be separately evaluated; but may be utilized as supporting documentation.

No Price Proposals or price information should be submitted with written Proposals. Such information will be requested from an Offeror at the time the Offeror is selected for negotiations.

The following is a listing of all Proposal Documents that must be completed, signed and/or notarized if required, and included in the envelope with the written Proposals:

- Cover letter referencing GSWA-RFP004-24 which lists the contents of the response and all required information about the Offeror, as set forth in this section
- Offeror's Proposal addressing all informational items and factors required in the RFP
- Proof of any required licensure to perform the Services on Guam (unless not required until a later time pursuant to the terms of this RFP)
- Affidavit Disclosing Ownership and Commissions (AG Form 002) (attached)
- Affidavit re: Non-Collusion (AG Form 003) (attached)
- Affidavit re: No Gratuities or Kickbacks (AG Form 004) (attached)
- Affidavit re: No Gratuities or Kickbacks (AG Form 004) (attached)
- Affidavit re: Ethical Standards (AG Form 005) (attached)
- Declaration re: Compliance with U.S. DOL Wage Determination (AG Form 006) (attached)
- Affidavit re: Contingent Fees (AG Form 007) (attached)
- Current U.S. Department of Labor Wage and Benefit Determination (SCA) (attached)
- Certification of Non-Employment of Convicted Sexual Offenders (attached)

The failure to include any items of information required by this section, or any of these documents and forms with the Proposal will result in rejection of the Proposal. All Proposals and Proposal Documents must be fully completed and signed. Any Proposal Documents that are required to be notarized must be notarized prior to submission, but no more than thirty (30) days prior to submission.

K. PLAN FOR PERFORMING THE SERVICES

As part of the written Proposal, Offerors shall submit a plan for the proposed Project outlining the components, qualities, uses, and benefits of the Offeror's proposed solution, along with a comprehensive plan for performing the Services, providing as much detail as is practical explaining the Offeror's Proposal and how any Services contained in the Scope of Services will be performed and how any objectives outlined in the Scope of Services will be achieved. The Offeror shall describe the advantages of the proposed plan, and Offeror's method for performing the Services, avoiding problems and delays, and resolving conflict. The Offeror's proposed plan should describe any processes in detail for the functions being addressed, and identify any outstanding issues the proposed solution may present. The proposed plan shall further describe Offeror's approach to completing this Project on budget, on schedule, with high quality, and how the Offeror's proposed plan will offer GSWA and the government of Guam the most advantage.

L. ABILITY, QUALIFICATIONS, EXPERIENCE, AND QUALITY OF PERSONNEL, EQUIPMENT, AND FACILITIES

As part of the written Proposal, Offerors shall submit the qualifications and a brief work history of the identified personnel to be assigned to the project, addressing, in particular, any proposed Project Manager and core project staff or Key Personnel. The work history and qualifications shall not exceed (3) three pages per staff member. The Offeror shall also submit a detailed, but brief description of the following:

- Provide a Project Organizational Chart of designated or key personnel to be assigned to this project with identification of their project roles and description of their area of responsibilities and the location of their office.
- Identify the project principal, project manager, assistant project manager, key staff, subcontractors, and their qualifications and experience as it relates to this project.
- List the Project Team, key personnel, and/or subcontractor experience on similar projects.
- Quantify the time commitment of key personnel or team members during the project life cycle.
- Unique qualifications of key personnel or team members.
- Qualifications and relevant individual technical training, education, and experience including degree(s), year and discipline, and active registrations and licenses with number and jurisdiction. Include the description of the specific role performed by each individual on each project listed, highlighting projects of similar size and scope where the individual's role is similar to his/her role on this project.
- Provide a detailed description of the resources, equipment, and facilities that are currently available to perform the Services or can be demonstrated to be available to perform the services at the time of contracting.

Offerors shall also submit a detailed description of the benefits and quality of any resources, equipment, and/or facilities Offeror intends to utilize to perform the Services which may not be currently available, but will be made available, or can be demonstrated to be made available at the time of contracting. All Offerors, when identifying Key Personnel in their Proposal, must accurately, comprehensively and correctly provide the information about the key person(s) requested in the solicitation. Inaccurate information in the Proposal constitutes a material misrepresentation and could result in disqualification of the Offeror.

M. AVAILABILITYAND CAPACITY OF THE OFFEROR TO PERFORM

As part of the written Proposal, Offerors shall submit a brief explanation of why the Offeror is available or will be available and has the capacity to provide the services listed in the Scope of Services. The explanation shall address how the Offeror's current workload can accommodate the addition of a contract of this type; the Offeror's current or demonstrated available resources; and how the Offeror will implement Quality Assurance/Quality Control measures. This statement shall not exceed 10 (ten) pages.

The Proposal should provide a clear description of all specific project staff or subcontractors who are intended to work on the Project, the nature, extent, and manner of their involvement, and their availability for the Project. The Proposal shall also address the availability of any equipment or facilities that may be used to provide the services. As part of this Proposal description, Offerors must include the following:

- Identify and describe the current and projected workload of all designated personnel or subcontractor(s), including a list of ongoing projects and his/her role on these ongoing projects.
- Describe the procurement, involvement, management, and availability of any subcontractors.
- Describe how the current workload of each designated personnel or subcontractor can accommodate the addition of this project.
- Describe the approach and organizational capabilities to perform the Services on time and within budget.
- Detail the extent of each designated personnel member's and subcontractor's involvement in providing the Services.
- Describe the internal quality and cost-control measures or procedures.
- Provide a disclosure of financial resources sufficient to demonstrate an ability to complete this Project.
- Provide a detailed description of how any required resources, equipment, and facilities will be obtained or made available to perform the Services.

N. OFFEROR'S RECORD OF PERFORMANCE ON SIMILAR PROJECTS

As part of the written Proposal, the Offeror is required to provide proof to GSWA that it has delivered a quality work product on similar projects. The Offeror shall provide its past performance record on similar projects. Offeror should demonstrate a track record of effective planning, scheduling and on-time delivery, and successful performance on its projects. Offeror should also demonstrate a track record of teamwork, cooperation, fair dealing, client service, and relationships of mutual trust and confidence. Emphasis should include the quality of work and timeliness of delivery. The submittal shall not exceed four (4) pages.

The Proposal shall include:

- A list of projects similar in scope and with emphasis on experience in the monitoring, compliance and engineering consulting services of Landfill, gas & groundwater. The list shall identify project name, project description, location, client references including contact name, address and telephone number, completion date, project budget, project role, type of services provided highlighting work performed similar in scope, and other pertinent information.
- A list of the Offeror's record of schedule performance (list original schedule versus final completion date) and explain any schedule deviations.
- A history of performance on projects similar in scope to this RFP that the Offeror was involved with over the past five (5) years. This description of Offeror's performance history should demonstrate Offeror's teamwork, cooperation, fair dealing, client service, and establishment of relationships of mutual trust and confidence.

O. OFFEROR'S GENERAL EXPERIENCE AND PAST PERFORMANCE

As part of the written Proposal, the Offeror is required to provide proof to GSWA that it has delivered a quality work product in a majority of its areas of work and projects. The Offeror shall provide its past performance record on any projects performed in the last five (5) years, for all projects which are not encompassed by the list required in the previous Paragraph. Offeror should demonstrate a track record of effective planning, scheduling and on-time delivery, and successful performance on its projects. Offeror should also demonstrate a track record of teamwork, cooperation, fair dealing, client service, and relationships of mutual trust and confidence. Emphasis should include the quality of work and timeliness of delivery. This submittal shall not exceed three (3) pages.

The Proposal shall include:

- A list of all projects performed in the last five (5) years, which are not included in the list required in the paragraph above for similar projects. This list shall identify project name, project description, location, client references including contact name, address and telephone number, completion date, project budget, project role, type of services provided highlighting work performed and other pertinent information.
- A list of the Offeror's record of schedule performance (list original schedule versus final completion date) and explain any schedule deviations.
- A history of performance on these other projects that the Offeror was involved with over the past five (5) years. This description of Offeror's performance history should demonstrate Offeror's teamwork, cooperation, fair dealing, client service, and establishment of relationships of mutual trust and confidence.

P. EVALUATION FACTORS FOR PROPOSALS

Proposals will be evaluated only on the Evaluation Factors listed in this RFP. The quality of Offerors' written Proposals shall be determined using the following Evaluation Factors and the listed associated possible scoring totals. Written Proposals scoring less than 70 points may be rejected from consideration for the award of the contract. The total of 100 possible points is broken down as follows:

EVALUATION FACTORS	SCORE
Quality of Proposal Content and Plan for Performing the Required Services: Overall quality, comprehensiveness, and value of the Proposal's presentation regarding the Services that provides the most benefit to Guam and in responding to items described in the Scope of Services section of this RFP. Proposed plan and method for accomplishing the Services, avoiding problems and delays, and resolving conflict. The Offeror's approach to completing this Project on budget, on schedule, with high quality; and Offeror's plans to meet GSWA's goals for the Services.	**30 Points**
Ability, Qualifications, Experience, and Quality of Personnel, Equipment, and Facilities: Specialized experience and qualifications of designated Project personnel to perform the Services, as reflected by technical training and education, general experience, specific experience in providing the Services, and the qualifications and abilities of personnel proposed to be assigned to perform the Services. Specialized benefits and/or quality of the Offeror's resources, equipment, and/or any facilities Offeror intends to utilize to perform the Services.	**20 Points**
Availability and Capacity of Offeror: The Offeror's current capacity to successfully apply its skills and resources to perform and complete the Services on time and within budget at a level of quality expected by GSWA. This includes an evaluation of the resources, personnel, facilities, and equipment currently available to perform the Services or demonstrably available at the time of contracting, and an evaluation of the Project Organizational Chart to complete the Services.	**20 Points**
Offeror's Record of Past Performance on Similar Projects: The Offeror's specialized experience on projects similar in scope and type. Successful performance on projects that are similar in nature and scope. A demonstrated track record of effective planning, scheduling and on-time delivery performance on those similar projects. Successful performance of similar past projects. A demonstrated track record of teamwork, cooperation, fair dealing, client service and relationships of mutual trust and confidence.	**20 Points**
Offeror's General Experience and Past Performance: The Offeror's general experience in all areas of its work. A demonstrated track record of effective planning, scheduling and on-time delivery performance on those schedules. Successful performance of all past projects. A demonstrated track record of teamwork, cooperation, fair dealing, client service and relationships of mutual trust and confidence.	**10 Points**

Q. REQUEST FOR NON-DISCLOSURE OF CONFIDENTIAL DATA

After award, the winning Proposal becomes a part of the public record of procurement. Offerors may request that portions of their Proposal be kept confidential. If an Offeror is submitting trade secrets or proprietary information in its Proposal that it wishes to keep confidential, then a written request for non-disclosure must be included with the Proposal and those portions of the Proposal which are proprietary must be clearly marked or designated. Material so designated shall accompany the Proposal and shall be readily separable from the Proposal in order to facilitate inspection of the non-confidential portion of the Proposal. However, prices and makes and models or catalogue numbers of the items offered, deliveries, and terms of payment of the winning Proposal shall be publicly available at the time of the Notice of Award regardless of any designation to the contrary. Any Proposals marked or designated as “Confidential” or “Proprietary” for the entirety of the Proposal shall be rejected.

After receipt of a request to designate portions of the Proposal as confidential, the GSWA will examine the request. GSWA may review the material declared to be confidential to determine the validity of any requests for nondisclosure of trade secrets and other proprietary data identified in writing. The GSWA will then inform the Offeror of its decision on the request in writing. If the parties do not agree as to the disclosure of certain data, the Offeror may then withdraw the Proposal or submit a protest if permitted by law. If the Proposal is not withdrawn and no protest is received, then the GSWA may disclose those portions of the Proposal for which a non-disclosure request was not granted.

R. MULTIPLE, ALTERNATE, OR LATE PROPOSALS

Multiple or Alternate Proposals will not be accepted, and any multiple or alternate Proposals submitted will be rejected.

Late Proposals will not be accepted, and any late Proposals will be rejected.

S. ALL OR NONE PROPOSALS

Proposals may not limit acceptance to the entire bid or Proposal offering. Proposals that violate this provision shall be deemed to be nonresponsive.

T. AMENDMENTS TO REQUEST FOR PROPOSALS

GSWA reserves the right to amend this RFP at any time, as provided under Guam’s Procurement Law and Guam’s Procurement Rules and Regulations. Changes will be announced by an amendment or amendments to this RFP and shall be identified as such. Each Amendment shall refer to the portions of the RFP it amends. Amendments shall be sent to all parties known to have registered for and received an RFP package. GSWA requires that all prospective Offerors acknowledge receipt of all amendments issued. Amendments shall be distributed to allow prospective Offerors time to consider the amendments in preparing their Proposals or other documents. GSWA may extend any due date if any amendment makes compliance with the original due date impractical.

U. PRICE PROPOSALS

The Price Proposal shall not be submitted with the Offeror’s Proposal. It shall only be submitted when and if requested by the GSWA. After evaluation of all Proposals, any Offeror selected for negotiations will be required to submit a Price Proposal.

All Price Proposals shall include a proposed Project budget addressing the entire time of performance.

A unit price shall be given for each type of service, and such unit prices shall be the same throughout any resulting contract except to the extent price adjustments may be provided in the solicitation and resulting contract. All deliverables will be payable upon completion, delivery, approval, and acceptance by GSWA. Monthly or other regularly scheduled deliverables should be itemized and priced by task. Regularly recurring monthly tasks, e.g. offsite data storage, month end batch reconciliation, flat rate hardware maintenance, should each be listed as discrete items and the sum of all recurring monthly costs should equal the total monthly invoicing/pricing amount for regular recurring tasks. Travel expenses must be included in the Offeror's service rates and pricing (or the hourly rates which are built into the cost of the deliverable) and may not be billed or priced separately.

Any price adjustments must be agreed to by the Parties and shall be in accordance with the Price Proposal or any cost or pricing data submitted. Price adjustments in the Price Proposal may be considered as a result of documented changes in pricing of materials or labor.

V. STATUS OF FUNDING AND COMPLIANCE WITH FUNDING TERMS AND CONDITIONS

Funds are presently available for this solicitation. These funds are currently available from Solid Waste Operations Fund. The government's obligation under any proposed contract is contingent upon the availability of funds from which payment for contract purposes can be made. The issuance of this solicitation does not compel the award of any contract.

W. WAGE AND BENEFIT REQUIREMENTS

Whenever the Government of Guam enters into a procured contractual arrangement with an Offeror for the provision of a service to the Government of Guam, and the Offeror employs a person(s) whose purpose, in whole or in part, is the direct delivery of the service contracted by the Government of Guam, then the Offeror shall pay such employee(s) in accordance with the Wage Determination for Guam and the Northern Mariana Islands issued and promulgated by the U.S. Department of Labor for such labor as is employed in the direct delivery of the contract deliverables to the Government of Guam. The Wage Determination most recently issued by the U.S. Department of Labor at the time a contract is awarded to the Offeror by the Government of Guam shall be used to determine the wages which shall be paid to employees pursuant to Guam's Procurement Law, if applicable. Should any contract contain a renewal clause, then at the time of renewal adjustments, there shall be made stipulations contained in that contract for applying the Wage Determination, as required by Guam's Procurement Law, that the Wage Determination promulgated by the U.S. Department of Labor on a date most recent to the renewal date shall apply, if applicable. In addition to the required Wage Determination, any contract to which this requirement applies shall also contain provisions mandating health and similar benefits for employees, such benefits having a minimum value as detailed in the Wage Determination issued and promulgated by the U.S. Department of Labor and shall contain provisions guaranteeing a minimum of ten (10) paid holidays per annum per employee.

To ensure compliance with these provisions, Offeror must complete and attach Declaration re: Compliance with U.S. DOL Wage Determination (AG Form 006), located at Section VIII of this RFP, to the Proposal. Failure to complete, sign, and submit this document with the Proposal will result in rejection of the Proposal. Offeror must also attach the most current applicable Wage Determination issued by the U.S. Department of Labor for Guam and the Marianas Islands, located at Section X of this RFP, to the Proposal. Failure to submit this document with the Proposal will result in rejection of the Proposal.

X. SUBCONTRACTORS

1. **Subcontractor.** A subcontractor is a person or entity who has a direct contract with the Offeror/Contractor or a higher tier subcontractor to perform a portion of the Services in this solicitation.

2. **Award of Subcontracts and Other Contracts for Portions of the Services.**

   a. All Offerors shall furnish in writing to GSWA the names of all known persons or entities (including those who are to furnish materials or equipment fabricated to a special design) proposed to provide subcontracting services on each principal portion of the Scope of Services by completing, signing, and attaching the Subcontractor Utilization Form to the Offeror's Proposal. GSWA may conduct discussions with the Offeror: (1) stating whether GSWA has reasonable objection to any such proposed person or entity; or (2) stating whether GSWA requires additional time for review or additional information concerning the utilization of a proposed person or entity. If the Offeror fails to submit this form with its Proposal, that Offeror may be disqualified. If this occurs GSWA will select the next highest ranked qualifying Offeror for negotiations.

   b. GSWA and the government of Guam reserve the rights to object to Offeror's utilization of any subcontractor and to require substitution of the contractor for cause. The Offeror shall not contract with a proposed person or entity to whom GSWA has made reasonable and timely objection. The Offeror shall not be required to contract with anyone to whom the Offeror has made reasonable objection.

   c. The Offeror shall not substitute a subcontractor, person or entity set forth in its Proposal or in the Subcontractor Utilization Form, located at Section XI of this RFP, unless Offeror has obtained the written consent of the GSWA, or unless GSWA requires such substitution. Offeror must notify GSWA in writing prior to any termination or substitution of a subcontractor listed in the Proposal or Proposal Documents. Failure by the Offeror to follow these requirements shall constitute a material breach of the terms of this RFP, which may result in the termination of any awarded contract or other legally available remedies.

3. **Subcontractual Relations.** By appropriate written agreement, the Offeror shall require each subcontractor, to the extent of the Services to be performed by the subcontractor, to be bound to the Offeror by the terms of its Proposal and any resulting Contract, and to assume toward the Offeror all the obligations and responsibilities, including the responsibility for safety of the subcontractor's Services, which the Offeror assumes toward GSWA. Each subcontract agreement shall preserve and protect the rights of GSWA under this solicitation with respect to the Services to be performed by the subcontractor so that the subcontracting thereof will not prejudice such rights. Offeror shall have full responsibility for the satisfactory performance of the Services under the RFP, the Proposal and Proposal Documents, the Scope of Services and any conditions, plans, or specifications, and any awarded contract, for any subcontracts which the Offeror may let.

4. **Subcontracts.** The Offeror and subcontractor(s) shall insert in any subcontracts the clauses set forth in this solicitation and any awarded contract, to include a clause requiring all subcontractors to include these clauses in any lower tier subcontracts. The Offeror shall be responsible for compliance by any subcontractor or lower tier subcontractor with the clauses set forth in this Paragraph BB.

Y. DISCLOSURE OF MAJOR SHAREHOLDERS

As a condition of submitting a Proposal, any partnership, sole proprietorship or corporation doing business with GSWA shall submit an affidavit executed under oath that lists the name and address of any person who has held more than ten percent (10%) of the outstanding interest or shares in said partnership, sole proprietorship or corporation at any time during the twelve (12) month period immediately preceding submission of the Proposal on the Affidavit Disclosing Ownership and Commissions (AG Form 002) attached to this RFP at Section IV. This Affidavit shall contain the number of shares or the percentage of all assets of such partnership, sole proprietorship or corporation, which have held by each such person during the twelve (12) month period. In addition, the Affidavit shall contain the name and address of any person who has received or is entitled to receive a commission, gratuity or other compensation for procuring or assisting in obtaining business related to the Proposal for the Offeror and shall also contain the amounts of any such commission, gratuity or other compensation. Any Offeror selected for negotiations must keep this Affidavit current through the date that a Notice of Award is issued in this procurement. A Proposal from any Offeror listing a person with a potential conflict of interest on the Affidavit will *OR* may be rejected. The Affidavit shall be open and available to the public inspection and copying. This Affidavit Disclosing Ownership and Commissions attached to this RFP must be completed and returned with the Offeror's Proposal. Failure to submit the Affidavit concerning commissions paid with the Offeror's Proposal shall be deemed nonresponsive and cause for rejection of the Proposal upon opening.

Z. CONFLICTS OF INTEREST

In order to ensure objective contractor performance and eliminate unfair competitive advantage, Offerors that have developed, prepared, furnished, or drafted any specifications, requirements, statements of work, scope of services, invitations for bids, requests for proposals, or significant documents related to this solicitation shall be excluded from competing for such procurements.

Offerors or Subcontractors that have developed, prepared, furnished, or drafted any specifications, requirements, statements of work, scope of services, invitations for bids, requests for proposals, or significant documents related to this solicitation shall disclose this information in their Proposals.

If the Offeror and any Subcontractors determine that they have not developed, prepared, furnished, or drafted any specifications, requirements, statements of work, scope of services, invitations for bids, requests for proposals, or significant documents related to this solicitation, the Proposal shall contain an affirmative statement that the Offeror and all Subcontractors have not developed, prepared, furnished, or drafted any specifications, requirements, statements of work, scope of services, invitations for bids, requests for proposals, or significant documents related to this solicitation.

Offerors that have conflicts of interest, organizational conflicts of interest, or potential conflicts of interest may be excluded from competing for such procurements. Offerors or Subcontractors that have any conflicts of interest, organizational conflicts of interest, or potential conflicts of interest shall disclose this information in their Proposals.

If the Offeror and any Subcontractors determine that they have no conflicts of interest or potential conflicts of interest, including any organizational conflicts of interest, for this solicitation, the Proposal shall contain an affirmative statement that the Offeror and all Subcontractors have they have no conflicts of interest or potential conflicts of interest, including any organizational conflicts of interest related to this solicitation.

If any conflict of interest or potential conflict of interest, including any organizational conflict of interest, is determined to exist, GSWA will attempt to determine whether the conflict of interest can be avoided or mitigated. Before determining to withhold an award based on conflict-of-interest considerations, GSWA shall notify the Offeror, provide the reasons therefore, and allow the Offeror a reasonable opportunity to respond.

The failure of the Offeror or any Subcontractors to make any of the disclosures required by this paragraph may result in the rejection of the Proposal.

Section II.

GENERAL TERMS AND CONDITIONS

A. TABLE OF CONTENTS OF RFP PROVISIONS

These RFP Provisions contain the following lettered sections:

B. AUTHORITY

This Request for Proposal ("RFP") solicitation is issued subject to the provisions of Guam's Procurement Law (as amended) and the Guam Procurement Regulations (copies are available for inspection at the General Services Agency of the government of Guam). By submitting a Proposal, Offerors agree to be bound by all the laws and regulations of Guam. The RFP requires all parties involved in the preparation, negotiation, performance, or administration of contracts to act in good faith.

C. RFP TERMS FOR MULTI-TERM CONTRACTS

Any contract awarded under this RFP is subject to the availability of certified funds. The

Procurement Officer will notify the Contractor on a timely basis whether the funds are, or are not, available for the continuation of the contract for each succeeding fiscal period. In the event that funds are not available for any succeeding fiscal period, the contract shall be cancelled; however, this does not affect either Party's right to terminate under the termination clauses of the contract. If the contract is cancelled for insufficient funds, the awarded Contractor shall be reimbursed its unamortized, reasonably incurred, non-recurring costs.

D. CANCELLATION AND REJECTION

GSWA shall have the right to cancel this solicitation in whole or in part at any time, and to reject in whole or in part any or all Proposals or offers which have been submitted in response to this RFP at any time if GSWA determines such to be in the best interest of GSWA and/or the government of Guam.

E. TAXES

Offerors may be subject to taxation, including but not limited to, Gross Receipts Tax, Guam Business Privilege Tax, Guam Income Tax and the payment of any and all taxes which may be due as a result of entering into this agreement are the sole responsibility of the Offeror and its subcontractors and any permitted assignees or successors in interest. Specific information of taxes may be obtained from the Director of the Guam Department of Revenue and Taxation.

F. WITHHOLDING ASSESSMENT FEE

All procurements of professional services are subject to a withholding assessment fee for non-resident persons or companies without a valid Guam Business License, which is equal to four percent (4%) of the total dollar value of any contract awarded for all government of Guam contracts for any professional services provided by a non-resident person or company residing outside of Guam, as a cost of doing business with the government of Guam, in accordance with 11 GCA § 71114 (P.L. 33-166).

G. PERMITS, LICENSING, AND COMPLIANCE WITH LAWS

The selected Offeror shall be required to obtain all permits and comply with all Federal and Territorial laws, ordinances, or rules applicable to its professional licensing and the provision of equipment and services to the government of Guam. Specific information on licenses required by the government of Guam may be obtained from the Director of Revenue and Taxation. The Offeror shall provide a copy of all of its current, valid, appropriate business licenses, and Guam Business License or a statement of exemption pursuant to Title 11 of the Guam Code Annotated, §§ 70126 and 70130, and any required Certificate of Authority ("COA") issued by the Director of Revenue and Taxation, Guam Board of Registration for Professional Engineers, Architects & Land Surveyors (PEALS), or other applicable regulating agency or board, pursuant to applicable Guam laws, including, but not limited to: 22 GCA § 15307; 22 GCA § 15102; 18 GCA § 7102; and 11 GCA § 106213, within 10 days of the issuance of a Notice of Award to the Offeror from the GSWA.

All Offerors agree by submitting a Proposal that they will follow all applicable laws and regulations governing their submissions and performance under any contract issued under this RFP.

H. MANDATORY PROHIBITIONS

1. Prohibition of Gratuities, Kickbacks, and Favors.
Gratuities. It shall be a breach of ethical standards for any person to offer, give, or agree to give any employee or former employee, or for any employee or former employee to solicit, demand, accept, or agree to accept from another person, a gratuity or an offer of employment in connection with any decision, approval, disapproval, recommendation, preparation of any part of a program requirement or a purchase request, influencing the content of any specification or procurement standard, rendering of advice, investigation, auditing, or in any other advisory capacity in any proceeding or application, request for ruling, determination, claim or controversy, or other particular matter, pertaining to any program requirement or a contract or subcontract, or to any solicitation or Proposal therefor.

Kickbacks. It shall be a breach of ethical standards for any payment, gratuity or offer of employment to be made by or on behalf of a subcontractor under a contract to the prime Contractor or higher tier subcontractor or any person associated therewith, as an inducement for the award of a subcontract or order.

Favors to the government of Guam. It shall be a breach of ethical standards for any person who is or may become a contractor, a subcontractor under a contract to the prime contractor or higher tier contractor, or any person associated therewith, to offer, give or agree to give any employee or agent of the government of Guam or for any employee or agent of the government of Guam to solicit or accept from any such person or entity or agent thereof, a favor or gratuity on behalf of the government of Guam whether or not such favor or gratuity may be considered a reimbursable expense of the government of Guam, during the pendency of any matter related to procurement, including contract performance warranty periods.

2. Prohibition of Employment of Sex Offenders. No person convicted of a sex offense under the provisions of Chapter 25 of Title 9 Guam Code Annotated, or an offense as defined in Article 2 of Chapter 28, Title 9 GCA in Guam, or an offense in any jurisdiction which includes, at a minimum, all of the elements of said offenses, or who is listed on the Sex Offender Registry, and who is employed by a business contracted to perform services for an agency or instrumentality of the government of Guam, shall work for his employer on the property of the government of Guam other than a public highway.

3. Prohibition of Contingent Fees. It shall be a breach of ethical standards for a person to be retained, or to retain a person, to solicit or secure a territorial contract upon an agreement or understanding for a commission, percentage, brokerage or contingent fee, except for retention of bona fide employees or bona fide established commercial selling agencies for the purpose of securing business.

4. Ethical Standard. It shall be a breach of ethical standards for an Offeror to knowingly influence a government employee to breach any of the ethical standards set forth in 5 GCA Chapter 5 Article 11 (Ethics in Public Contracting) of the Guam Procurement Law and in Article 11 of the government of Guam Procurement Regulations.

I. MANDATORY WARRANTIES

1. Representation Regarding Gratuities and Kickbacks. The Offeror represents that it has not violated, is not violating, and promises that it will not violate the prohibition against gratuities and kickbacks set forth in §11-206 (Gratuities and Kickbacks) of the Guam Procurement

Regulations. Offeror further agrees to execute and file a Non-Gratuity Affidavit before final payment under the contract is made by GSWA.

2. Warranty against Employment of Sex Offenders. Offeror warrants that: (1) no person in its employment who has been convicted of a sex offense under the provisions of Chapter 25 of Title 9 Guam Code Annotated or of an offense defined in Article 2 of Chapter 28 of Title 9 Guam Code Annotated, or who has been convicted in any other jurisdiction of an offense with the same elements as heretofore defined, or who is listed on the Sex Offender Registry, shall provide services on behalf of Offeror while on government of Guam property, with the exception of public highways; and (2) that if any person providing services on behalf of Offeror is convicted of a sex offense under the provisions of Chapter 25 of Title 9 GCA or an offense as defined in Article 2 of Chapter 28, Title 9 GCA or an offense in another jurisdiction with, at a minimum, the same elements as such offenses, or who is listed on the Sex Offender Registry at any time during the performance of the contract, that such person will be immediately removed from working on government property and Offeror warrants that it will notify the General Manager of the GSWA within twenty-four (24) hours of such conviction. If Offeror is found to be in violation of any of the provisions of this paragraph, then GSWA will give notice to Offeror to take corrective action. Offeror shall take corrective action within twenty-four (24) hours of notice from GSWA, and Offeror shall notify GSWA when action has been taken. If Offeror fails to take corrective steps within twenty-four (24) hours of notice from GSWA, then GSWA in its sole discretion may temporarily suspend this agreement.

3. Covenant Against Contingent Fees. The Offeror warrants that it has not employed any person to solicit or secure any contract resulting from this RFP upon agreement for a commission, percentage, brokerage or contingent fee. Breach of this warranty shall give GSWA the right to terminate the contract, or in its discretion, deduct from the contract price or consideration the amount of such commission, percentage, brokerage, or contingent fees. This warranty shall not apply to commissions payable by the Offeror upon contracts or sales secure or made through bona-fide established commercial or selling agencies maintained by the Offeror for the purpose of securing business.

4. Representation Regarding Ethical Standard. Offeror represents that it has not knowingly influenced and promises that it will not knowingly influence a government employee to breach any of the ethical standards set forth in 5 GCA Chapter 5 Article 11 (Ethics in Public Contracting) of the Guam Procurement Law and in Article 11 of the government of Guam Procurement Regulations.

J. EQUAL EMPLOYMENT OPPORTUNITY

By submitting a Proposal, the Offeror and all subcontractors agree to comply with the following policies: Executive Order 11246, 41 CFR 60, 29 CFR 1625-1627, Title 23 USC Section 140, the Rehabilitation Act of 1973, as amended (29 USC 794), Title VI of the Civil Rights Act of 1964, as amended, and related regulations including 49 CFR Parts 21, 26 and 27; and 23 CFR Parts 200, 230, and 633. The Offeror and all subcontractors must also comply with the requirements of the Equal Opportunity Clause in 41 CFR 60-1.4(b). The Equal employment opportunity (EEO) requirements not to discriminate and to take affirmative action to assure equal opportunity as set forth under laws, executive orders, rules, regulations (28 CFR 35, 29 CFR 1630, 29 CFR 1625-1627, 41 CFR 60 and 49 CFR 27) and orders of the Secretary of Labor as modified by the provisions prescribed herein, and imposed pursuant to 23 U.S.C. 140 shall constitute the EEO and specific affirmative action standards for the project activities and Services under this RFP. The provisions of the Americans with Disabilities Act of 1990 (42 U.S.C. 12101 et seq.) set forth under 28 CFR 35 and 29 CFR 1630 are incorporated by reference in this RFP. The Offeror shall not discriminate against any employee or applicant for employment because of race, religion, sex, color, national origin, age or disability. If awarded the contract, the Offeror will take whatever steps are necessary to ensure that its employees are treated equally during employment without regard to their race, religion, sex, color, national origin, age or disability. Such action shall include: employment, upgrading, demotion, or transfer; recruitment or recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship, pre-apprenticeship, and/or on-the-job training.

K. COMPLIANCE WITH AMERICANS WITH DISABILITIES ACT (ADA)

The Offeror must comply with all applicable ADA regulations and requirements.

L. GUAM DEBARMENT PROVISION

Offeror warrants that it will comply with the provisions of 5 GCA Chapter 5 Articles 9 and 11, subject to debarment or suspension, and that it will not employ any subcontractors who have been federally debarred or debarred by the government of Guam.

M. PROPOSALS

The Offeror is required to read each and every page of its Proposal and by the act of submitting a Proposal shall be deemed to have accepted all conditions contained therein. In no case will failure to review or inspect constitute grounds for a claim or for the withdrawal of a Proposal after opening. Proposals shall be filled out in ink or typewritten and signed in ink. Erasures or other changes in a Proposal must be explained or noted over the signature of the Offeror. Proposals containing any conditions, omissions, unexplained erasures or alterations, items not called for in the Proposal, or irregularities of any kind may be rejected by GSWA in whole or in part.

N. REVIEW OF PROPOSALS

GSWA intends to review the Proposals as soon as possible after the submission due date for Proposals as provided herein. The Proposals submitted will be the primary documents for evaluation. GSWA reserves the right to waive any minor information or irregularity in the Proposals received. GSWA may award, allow amendments, or reject Proposals in whole or in part as permitted by law. GSWA is not responsible for any costs incurred by the Offerors. GSWA reserves the right to retain copies of all Proposals submitted regardless of whether an Offeror is selected for negotiations or awarded a contract. Submission of a Proposal indicates acceptance of these terms and conditions by the Offeror.

O. INDEPENDENT PRICE DETERMINATION

By submitting a Proposal, the Offeror certifies that if selected for negotiations, any price, pricing data, or Price Proposal submitted by the Offeror is independently arrived at without collusion.

P. ACCEPTANCE OF SOLICITATION TERMS AND APPLICABLE LAWS

The Offeror is required to read each and every page of this RFP, and by the act of submitting a Proposal shall be deemed to have accepted all conditions contained herein and to be bound by the laws of Guam and any other applicable laws. This RFP is issued subject to all the provisions of

Guam's Procurement Law (5 GCA §§ 5001, et seq.) and the Guam Procurement Regulations, copies of which are available for inspection at the General Services Agency of Guam.

Guam's Procurement Law and this RFP require all parties involved in the preparation, evaluation, negotiation, performance, or administration of contracts to act in good faith. Proposals may not be withdrawn by Offeror on the basis of Offeror's unfamiliarity with the required terms or applicable laws. Offeror may not propose or negotiate any conditions, omissions, unexplained erasures, irregularities, alterations, or items that are in contravention of the terms and conditions of the RFP or applicable law. GSWA may deem such proposed items to constitute a showing of bad faith, in whole or in part, which may result in debarment or other legal remedies against the Offeror.

If any part, term, or condition of this RFP is found to be contrary to the Guam Procurement Law, the Guam Code, any applicable Guam Administrative Rules and Regulations, or is found to contain ambiguous terms, then such portion of the RFP shall be interpreted or resolved in favor of or according to the provisions of the Guam Procurement Law or other applicable Guam law or rules.

Q. MODIFICATION OR WITHDRAWAL OF PROPOSALS

Proposals may be modified or withdrawn at any time prior to the conclusion of discussions, as provided under Guam's Procurement Law and Guam's Procurement Rules and Regulations. In no case will failure to review or inspect constitute grounds for a claim or for the withdrawal of a Proposal after opening. The government reserves the right to waive any minor informalities in Proposals received, or to have them corrected by the Offeror, in accordance with applicable regulations.

R. CLARIFICATION/DISCUSSION OF PROPOSALS

After the receipt and opening of Proposals and at its option, GSWA or its designee(s), may conduct discussions with Offerors that have submitted timely, valid Proposals for the purpose of clarification, to assure full understanding and responsiveness to the solicitation requirements, as permitted under Guam's Procurement Law and Guam's Procurement Rules and Regulations. Offerors shall be accorded fair and equal treatment with respect to any opportunity for discussion and revision to Proposals and such revisions shall be permitted after submission and prior to award for the purpose of obtaining best and final offers. However, all Proposals should be submitted initially on the Offeror's most favorable terms. In conducting discussions there shall be complete confidentiality of any information derived from Proposals submitted by competing Offerors.

S. EVALUATION FOR SELECTION

Upon the receipt of all Proposals, a selection team will be convened to select the most responsive and qualified Offerors. GSWA may conduct discussions with any Offeror to determine the Offeror's qualifications and/or to explore the scope and nature of the Services, the Offeror's proposed method of performance and the relative utility of alternative methods of approach to the project. Following the validation of qualifications or other discussions, GSWA or its designee(s), will select in the order of their respective qualification and evaluation ranking, no fewer than three acceptable Proposals (or such lesser number if fewer than three acceptable Proposals were received) by Offerors deemed to be qualified to provide the Services, and the Proposals shall be ranked in accordance with their evaluation scores.

T. SELECTION OF BEST-QUALIFIED OFFEROR

Upon the conclusion of the discussion and evaluations procedures as provided under this RFP and Guam's Procurement Law, GSWA shall notify the selected Offerors of their rankings with the intent to begin negotiating a contract with the highest ranked and best-qualified Offeror first.

U. RESPONSIBILITY OF OFFERORS

Before awarding a contract to an Offeror, GSWA must be satisfied that the Offeror is responsible. Offerors shall supply information requested by GSWA concerning the responsibility of the Offeror. The unreasonable failure of an Offeror to promptly supply information in connection with an inquiry with respect to responsibility may be grounds for a determination of non-responsibility with respect to such Offeror. In determining the responsibility of the best-qualified Offeror, GSWA shall be guided by the following:

1. The Offeror's current capability in all respects to perform fully the contract requirements;
2. The Offeror's current integrity and reliability which will assure good faith performance;
3. Whether the Offeror has available the appropriate financial, material, equipment, facility, and personnel resources and expertise, or the ability to obtain them, necessary to indicate its capability to meet all contractual requirements;
4. The Offeror's satisfactory record of integrity with regard to previous contracts and contract awards;
5. The Offeror's satisfactory record of performance with regard to previous contracts and contract awards;
6. Whether the Offeror has qualified legally to contract with the government of Guam; and
7. Whether the Offeror has supplied all necessary information in connection with any inquiry concerning responsibility.

V. NEGOTIATION AND AWARD OF CONTRACT

GSWA shall negotiate a contract with the best-qualified Offeror for the Services at a compensation determined in writing by the GSWA to be fair and reasonable. GSWA reserves the right to contract for the work hereunder in planned phases which is dependent upon need and funding availability. Contract negotiations will be directed toward: (1) making certain that the Offeror has a clear understanding of the scope of work, specifically, the essential requirements involved in providing the Services; (2) determining that the Offeror will make available the necessary personnel and facilities to perform the services within the required time; and (3) agreeing upon compensation which is fair and reasonable, taking into account the estimated value of the Services, and the scope, complexity and nature of such services.

1. Successful Negotiation of Contract with Best-Qualified Offeror: If compensation, contract requirements, and contract documents can be agreed upon with the best-qualified Offeror, the contract will be awarded to that Offeror.

2. Failure to Negotiate Contract with Best-Qualified Offeror: If compensation, contract requirements or contract documents cannot be agreed upon with the best qualified Offeror, a written record stating the reasons therefore shall be placed in the file and GSWA will advise such Offeror of the termination of negotiations which shall be confirmed by written notice within three (3) days. Upon failure to negotiate a contract

with the best- qualified Offeror, GSWA will enter into negotiations with the next most qualified Offeror. If negotiations again fail, negotiations will be terminated as provided in this Section and commence with the next most qualified Offeror.

3. Notice of Award: Written notice of award will be issued to the Offeror with whom a contract is successfully negotiated and will be public information which is made a part of the contract file.

4. Failure to Negotiate Contract with Offerors Initially Selected as Qualified: Should GSWA be unable to negotiate a contract with any of the Offerors initially selected as qualified Offerors, Proposals may be re-solicited or additional Offerors may be selected based on original, acceptable Proposal submissions in the order of their respective qualification ranking and negotiations may continue in accordance with the procedures and process herein specified.

W. ACCESS TO RECORDS, INSPECTION, AND AUDIT REVIEW

The GSWA and any of its authorized representatives must have the right of access to any documents, papers, or other records of the Offeror which are pertinent to the contract, in order to make audits, examinations, excerpts, and transcripts, and to inspect supplies and services and audit records at any Offeror or proposed subcontractor's facility or place of business and perform tests both: prior to award of a contract, to determine the Offeror's responsibility and capability of performing any contract to be awarded under a solicitation, and to determine whether the Offeror's or subcontractor's facilities, supplies, or services conform to solicitation requirements; or after award, to determine whether the awarded Offeror is conforming to contract requirements, and its performance is therefore acceptable. This right also includes timely and reasonable access to the Offeror's personnel for the purpose of interview and discussion related to such documents. By submitting a Proposal in response to this RFP, the Offeror agrees to abide by the following access, audit, and inspection terms:

A. *Access to Records and Retention.* The Offeror, including its subcontractors, if any, agrees that it shall maintain and retain all books, documents, papers, accounting records and other evidence pertaining to costs incurred and relative to its cost or pricing data, and shall make such materials available at all reasonable times after submission of its Proposal, during any awarded contract term, and for three (3) years from the date of final payment under any awarded contract, for inspection in Guam or at any reasonable location designated by the GSWA and authorized representatives, unless the Offeror is notified in writing by the cognizant agency for audit, the oversight agency for audit, the cognizant agency for indirect costs, or the GSWA to extend the retention period. If any litigation, claim, or audit is started before the expiration of the three-year period, the records must be retained until all litigation, claims, or audit findings involving the records have been resolved and final action taken. Records for real property and equipment acquired with the funds from the awarded contract must be retained for three (3) years after final disposition of the real property and equipment. Each subcontract by the Offeror shall include a provision containing the conditions of this Section for any contract awarded under this solicitation.

B. *Right to Audit.* Offeror shall establish and maintain a reasonable accounting system that enables GSWA to readily identify Offeror's assets, expenses, costs of goods, and use of funds. GSWA and its authorized representatives shall have the right to audit, to examine, and to make copies of or extracts from all financial and related records (in whatever form they may be kept, whether written, electronic, or other) relating to or pertaining to its

Proposal or this solicitation which are kept by or under the control of the Offeror, including, but not limited to those kept by the Offeror, its employees, agents, assigns, successors, and subcontractors. Such records shall include, but not be limited to, accounting records, written policies and procedures; subcontract files (including Proposals of successful and unsuccessful bidders, bid recaps, etc.); all paid vouchers including those for out-of-pocket expenses; other reimbursement supported by invoices; ledgers; cancelled checks; deposit slips; bank statements; journals; original estimates; estimating work sheets; contract amendments and change order files; back-charge logs and supporting documentation; insurance documents; payroll documents; timesheets; memoranda; and correspondence. Offeror shall, at all times during the term of any awarded contract and for a period of three (3) years after the date of final payment under any awarded contract, maintain such records, together with such supporting or underlying documents and materials. The Offeror shall at any time requested by GSWA, whether before, during, or after completion of an awarded contract, and at Offeror's own expense make such records available for inspection and audit (including copies and extracts of records as required) by GSWA. Such records shall be made available to GSWA during normal business hours at the Offeror's office or place of business and without prior notice. In the event that no such location is available, then the financial records, together with the supporting or underlying documents and records, shall be made available for audit at a time and location that is convenient for GSWA. Offeror shall ensure GSWA has these rights with Offeror's employees, agents, assigns, successors, and subcontractors, and the obligations of these rights shall be explicitly included in any subcontracts or agreements formed between the Offeror and any subcontractors to the extent that those subcontracts or agreements relate to fulfillment of the Offeror's obligations to GSWA. Costs of any audits conducted under the authority of this right to audit and not addressed elsewhere will be borne by GSWA unless certain exemption criteria are met. If the audit identifies overpricing or overcharges (of any nature) by the Offeror to GSWA in excess of one-half of one percent (.5%) of the total contract billings, the Offeror shall reimburse GSWA for the total costs of the audit. If the audit discovers substantive findings related to fraud, misrepresentation, or non-performance, GSWA may recoup the costs of the audit work from the Offeror. Any adjustments and/or payments that must be made as a result of any such audit or inspection of the Offeror's invoices and/or records shall be made within a reasonable amount of time (not to exceed 90 days) from presentation of GSWA's findings to Offeror.

C. *Right to Enter and Inspect.* GSWA may, at any time, without notice enter and inspect an Offeror's or subcontractor's facilities, place(s) of business, or any place(s) of performance of any awarded contract relating to Offeror's Proposal or this solicitation, or any contract awarded pursuant to this solicitation. GSWA may enter and inspect any plans, supplies, services, equipment, work and records at these locations which are related to the performance of any awarded contract and may conduct any testing deemed necessary to determine the Offeror's or subcontractor's compliance or conformity to the solicitation or contract requirements. The GSWA, the government of Guam and/or any authorized representatives may enter and audit the cost or pricing data, books, and records of the Offeror or any subcontractor, and/or investigate in connection with an action to debar or suspend a person from consideration for award of contracts pursuant to § 9102 (Authority to Debar or Suspend) of the Guam Procurement Rules and Regulations, or any applicable federal debarment provisions.

X. LOCAL PROCUREMENT POLICY

No specification, term, condition, or qualification of this RFP shall exclude any Offeror from consideration on the basis of Guam-only experience provided that the experience of such Offeror is otherwise responsive to the solicitation, in accordance with the requirements of 5 GCA § 5008(e).

Y. RELATIONS WITH OTHER GOVERNMENT AGENCIES

All directions within the scope of the RFP and the awarded contract will be issued by General Manager of the GSWA; Offerors and any awarded Contractor shall not accept such direction from others. Information provided by other government agencies or entities which seemingly conflicts with information provided by the GSWA in this solicitation will be discussed with General Manager of the GSWA immediately. This policy is not intended to prevent the Offerors or any awarded Contractor from obtaining necessary information from other governmental agencies or entities.

Z. OBLIGATIONS OF THE OFFEROR

The Offeror shall be responsible for the professional and technical accuracy of its Proposal and the coordination of all designs, drawings, specifications in its Proposal, and all designs, drawings, specifications, and any other work, services, and materials furnished under any awarded contract. The Offeror shall, without additional cost to the GSWA or the government of Guam, correct and revise all errors or deficiencies in its Proposal, and if awarded a contract, shall correct and revise all errors or deficiencies in its designs, drawings, specifications, and in its work services, or materials furnished by the Offeror, if found to be defective by GSWA.

The Offerors are responsible for securing all approvals for entry onto private property.

Section III.

SCOPE OF SERVICES

PURPOSE

GSWA is soliciting proposals to provide Indefinite Delivery-Indefinite Quantity (IDIQ) professional Landfill Engineering Consulting Services for various matters relating to landfill improvements, construction plans and phase services, procurement processes, and environmental compliance. Completed work must be in compliance with the attached exhibits.

The contract will provide for the issuance of Work Authorizations (WA) requiring a variety of Landfill Consulting Services as needed and determined by GSWA. Each WA will be negotiated with the selected firm. The contract, as noted, is an indefinite delivery indefinite quantity (IDIQ) type contract and GSWA does not guarantee any number of WA to be issued. GSWA also does not guarantee a minimum or maximum dollar value of WA's placed with any firm. WA will be assigned as necessary, which may include, but not be limited to:

1. **LAYON LANDFILL:**
    a. **LANDFILL ENGINEERING TASKS**
        I. Permitting for landfill improvements including, but not limited to, the following activities:
            i. Revisions to operations manuals;
            ii. Revisions to Solid Waste Acceptance of Materials;
            iii. Air and Water regulations as may apply to the landfill design to include, but not limited to, review, permit revisions, and recommendations.
        II. Preparation of preliminary and final construction plans and contract documents as may be required from time to time with activities including, but not limited to:
            i. Contract documents shall include bid forms, notice to bidders, instructions to bidders, advertisements, bid proposal, contract forms, bonding and insurance requirements, and technical specifications for projects less than $400,000 in cost;
            ii. Opinions of Probable Construction Costs based on final construction plans;
            iii. Prepare and submit documents for regulatory review;
            iv. Assist the GSWA in obtaining approvals and permits as necessary to comply with applicable federal, state and local regulations;
            v. Provide environmental site assessment, wetland determination, etc., as appropriate or required for each project.
        III. Bidding services as may be required from time to time with activities including, but not limited to:
            i. Preparation of final bidding documents;
            ii. Assistance with bidding process;
            iii. Evaluation of bids and recommendation to award;
            iv. Other activities as required by procurement or project financing.

IV. Construction Phase Services as may be required from time to time with activities, but not limited to:
  - i. Provision of construction staking and/or CQA surveying in support of requirements of project.
  - ii. Provision of geotechnical services in support of CQA requirements for project.
  - iii. Coordination and oversight of construction including meetings, payment review, RFIs, etc.
  - iv. Review and approval of shop drawings and samples.
  - v. Prepare certification documents for regulatory submittals.
  - vi. Prepare Operations and Maintenance Manuals as may be required
  - vii. Preparation of record drawings, as-builts, plats, etc., as may be required.

V. Environmental services including, but not limited to:
  - i. Groundwater compliance in accordance with the facility permit and applicable
  - ii. RCRA Title 40 Chapter 1, Subchapter 1, Part 258 Subpart E.
  - iii. Leachate control compliance in compliance with facility permit and applicable
  - iv. RCRA Title 40 CFR 265.301
  - v. Post closure care in accordance with facility permit and applicable 40 CFR Part 258 Subpart F Stormwater Management Regulations.
  - vi. Stormwater management in accordance with Title 40 Part 445 Subpart B 445.20
  - vii. Any other regulatory requirements
  - viii. Title V Section 302 support activities as may be required
  - ix. Greenhouse gas reporting activities as may be required

b. LANDFILL GROUNDWATER TASKS

I. Provide routine monitoring in accordance with RCRA Title 40 Chapter 1, Subchapter 1, Part 258 Subpart E and consultation activities relate to groundwater and gas migration.

II. Contract directly with a qualified laboratory in accordance with RCRA Title 40 Chapter 1, Subchapter 1, part 258 Subpart E to perform analytical work. Laboratory must maintain EPA certificate throughout term of contract. Contractor will provide certified laboratory at no additional cost.

III. Perform statistical analysis, report preparation, and any other reporting required.

IV. Install additional groundwater monitoring well (as needed).

2. ORDOT DUMP FACILITY

I. Quarterly leachate sampling and monitoring to be in accordance with Sampling and Analysis Plan for Ordot Leachate Monitoring (Exhibit A).

II. Groundwater sampling and monitoring to be in accordance with Sampling and Analysis Plan Post-Closure Monitoring at Ordot Dump Post-Closure Facility (Exhibit B).
  - i. Collect leachate samples and associated quality control (QC) samples from the leachate tank(s).
  - ii. Analyze the leachate samples for the identified parameters of

concern.

iii. Perform assessment of the collected data and data management and validation.

iv. Prepare quarterly monitoring memoranda to report leachate sample results at Ordot Dump.

Section IV. AFFIDAVIT DISCLOSING OWNERSHIP, INFLUENCE, COMMISSIONS AND CONFLICTS OF INTEREST

(Required by 5 GCA § 5233 as amended by P.L. 36-13 (4/9/2021) (AG Form 002)

RFP No.: GSWA-RFP004-24

Name of Offeror (Firm or Individual): ______________________________________

STATE OF ____________)
) **SS.**
CITY OF ______________)

Preface. As a condition of submitting a Bid/Offer/Proposal or responding to any method of source selection under Guam's Procurement Law for the purpose of entering into a contract with the government of Guam, this Affidavit requires all Bidders/Offerors/Prospective Contractors to make disclosures of ownership, influence, commissions, gratuities, kickbacks, and conflicts of interest occurring **during the 365 calendar days preceding the publication of this solicitation and until award of a contract**. This includes the duty to disclose any changes to the facts disclosed herein throughout the solicitation process; and if the entity submitting this Affidavit is awarded a contract, the duty to disclose **any changes** to the facts disclosed herein **continues throughout the life of the contract, including any extensions or renewals**.

A. I, the undersigned, being first duly sworn, depose and say that I am an authorized representative of the Bidder/Offeror/Prospective Contractor and that (please check all that apply):

[ ] The Bidder/Offeror/Prospective Contractor is an individual with a business license, and all decisions are by, and all profit is for, that same individual, with principal place of business street address being:____
____
__

[ ] The Bidder/Offeror/Prospective Contractor is a business or artificial person (as defined in 1 GCA § 715 or 5 GCA §§ 5030(n) or 5233(b)), and is a sole proprietorship owned entirely (100%) by______________________________________, with principal place of business street address being:____

[ ] The Bidder/Offeror/Prospective Contractor is a business or artificial person (as defined in 1 GCA § 715 or 5 GCA §§ 5030(n) or 5233(b)), and is owned by the following multiple individuals. Note: owners of more than 10% are statutorily required to be listed below, but other owners of smaller percentage are encouraged to be listed as well.

Name of Owner	Principal Place of Business Street Address	% of Interest

[ ] One or more of the more-than-10% owners listed above is a business or artificial person. Any more-than-25% owners of such a business or artificial person are listed below per 5 GCA § 5233. Note: any less-than-25% owners of such a business or artificial person is encouraged to also be listed below.

Name of >10% Owner Business or Artificial Person:

Names of owners of the >10% Owner Business or Artificial Person ("Second Tier Owner")	Owner's Principal Place of Business Street Address	% of Interest

Name of other >10% Owner Business or Artificial Person:

Names of owners of the >10% Owner Business or Artificial Person ("Second Tier Owner")	Owner's Principal Place of Business Street Address	% of Interest

B. If any Second Tier Owner identified above is an artificial person, the natural or artificial owners of such Second Tier Owner who have held more than 49% of the shares or interest in the Bidder/Offeror/Prospective Contractor (Third Tier Owners) are as follows [if none, please so state]:

Second Tier Owner Name____

Name of Third Tier Owner	Principal Place of Business Street Address	% of Interest

C. If the name of no natural person has been identified as an owner, or a Second or Third Owner of the Bidder/Offeror/Prospective Contractor, please identify the name, position, address, and contact information of the natural person having the authority and responsibility for the Bid/Offer/Proposal/Perspective Contract, and the name of any natural person who has the authority and power to remove and replace the designated responsible person.

Name of Natural Person	**Position**	**Street Address of Principal Place of Business**	**Phone Number, Email Address, and other Contact Information**

D. Further, I say that the persons who have received or are entitled to receive a commission, gratuity, contingent fee or other compensation to solicit, secure, or assist in obtaining business related to the Bid/Offer/Proposal/Prospective Contract for which this Affidavit is submitted are as follows (if non, please so state):

Name of Owner	Principal Place of Business Street Address	Amount of Compensation

E. Further, I say that the persons who have directly or indirectly participated in this solicitation and who are also employees of the government of Guam or the government of the United States, if federal funds are to be used in the payment of the contract related to the Bid/Offer/Proposal/Prospective Contract for which this Affidavit is submitted, are as follows (if none, please so state):

Name	Principal Place of Business Street Address

F. Regardless of any ownership interest, the following individuals have the power to control the performance of the contract or to control the Bidder/Offeror/Prospective Contractor, directly or indirectly:

Name	Principal Place of Business Street Address

G. Until award of the contract, and throughout the term of any contract awarded to the Bidder/Offeror/Prospective Contractor represented herein, I agree to promptly make any disclosures not made previously and update changes in ownership, identities of owners and other required information, interests, compensation or conflicts of the persons required to be disclosed. I understand that failure to comply with this requirement shall constitute a material breach of contract.

H. I hereby declare under penalty of perjury under the laws of Guam that the foregoing is true and correct.

Executed on: ________________________
(Date)

____

Signature of individual if Offeror is a sole Proprietorship; Partner, if the Offeror is a Partnership; Officer, if the Offeror is a Corporation.

SUBSCRIBED AND SWORN to before me this _____day of ________________________, 2024.

____
Notary Public
My Commission Expires:______________

THIS AFFIDAVIT <u>MUST</u> BE COMPLETED AND RETURNED IN THE ENVELOPE CONTAINING THE PROPOSAL.

AG Procurement **Form 002** (Rev. Nov. 17, 2021)

Section V. AFFIDAVIT RE: NON-COLLUSION
(AG Form 003)

CITY OF ________________)
) SS.
ISLAND OF GUAM)

_______________________________[state name of affiant signing below], being first duly sworn, deposes and says that:

1. The name of the offering company or individual is [state name of company] ____.

2. The Proposal for the solicitation identified above is genuine and not collusive or a sham. The Offeror has not colluded, conspired, connived or agreed, directly or indirectly, with any other offeror or person, to put in a sham proposal or to refrain from making an offer. The Offeror has not in any manner, directly or indirectly, sought by an agreement or collusion, or communication or conference, with any person to fix the proposal price of Offeror or of any other offeror, or to fix any overhead, profit or cost element of said proposal price, or of that of any other offeror, or to secure any advantage against the government of Guam or any other offeror, or to secure any advantage against the government of Guam or any person interested in the proposed contract. All statements in this affidavit and in the Proposal are true to the best of the knowledge of the undersigned. This statement is made pursuant to 2 GAR Division 4 § 3126(b).

3. I make this statement on behalf of myself as a representative of the Offeror, and on behalf of the Offeror's officers, representatives, agents, subcontractors, and employees.

____

Subscribed and sworn to before me this _____ day of _____________, 20__.

_______________________________________ NOTARY PUBLIC My commission expires _____________, _____.

AG Procurement Form 003 (Jul. 12, 2010)

Section VI. AFFIDAVIT RE: NO GRATUITIES OR KICKBACKS (AG Form 004)

CITY OF ____________________)
) SS.
ISLAND OF GUAM)

__________________________________ [state name of affiant signing below], being first duly sworn, deposes and says that:

1. The name of the offering firm or individual is _______________________________ [state name of Offeror company or Offeror]. Affiant is _______________________________ [state one of the following: the Offeror, a partner of the Offeror, an officer of the Offeror] making the foregoing identified bid or Proposal.

2. To the best of affiant's knowledge, neither affiant, nor any of the Offeror's officers, representatives, agents, subcontractors, or employees have violated, or are violating the prohibition against gratuities and kickbacks set forth in 2 GAR Division 4 § 11107(e). Further, affiant promises, on behalf of Offeror, not to violate the prohibition against gratuities and kickbacks as set forth in 2 GAR Division 4 § 11107(e).

3. To the best of affiant's knowledge, neither affiant, nor any of the Offeror's officers, representatives, agents, subcontractors, or employees have offered, given, or agreed to give, any government of Guam employee or former government employee, any payment, gift, kickback, gratuity, or offer of employment in connection with Offeror's Proposal. violated, or are violating the prohibition against gratuities and kickbacks set forth in 2 GAR Division 4 § 11107(e).

4. I make these statements on behalf of myself as a representative of the Offeror, and on behalf of the Offeror's officers, representatives, agents, subcontractors, and employees.

____
Signature of one of the following:
Offeror, if the Offeror is an individual;
Partner, if the Offeror is a partnership;
Officer, if the Offeror is a corporation.

Subscribed and sworn to before me this ____ day of ______________, 20___.

____
NOTARY PUBLIC
My commission expires: ______________

AG Procurement **Form 004** (Rev. July 12, 2010)

Section VII. AFFIDAVIT RE: ETHICAL STANDARDS
(AG Form 005)

CITY OF ___________________)
) ss.
ISLAND OF GUAM)

_______________________________________[*state name of affiant signing below*], being first duly sworn, deposes and says that:

The affiant is __________________________________ [*state one of the following: the Offeror, a partner of the Offeror, an officer of the Offeror*] making the foregoing identified Bid or Proposal. To the best of affiant's knowledge, neither affiant nor any officers, representatives, agents, subcontractors or employees of Offeror have knowingly influenced any government of Guam employee to breach any of the ethical standards set forth in 5 GCA Chapter 5, Article 11. Further, affiant promises that neither he or she, nor any officer, representative, agent, subcontractor, or employee of Offeror will knowingly influence any government of Guam employee to breach any ethical standards set forth in 5 GCA Chapter 5, Article 11. These statements are made pursuant to 2 GAR Division 4 § 11103(b).

____
Signature of one of the following:
Offeror, if the Offeror is an individual;
Partner, if the Offeror is a partnership;
Officer, if the Offeror is a corporation.

Subscribed and sworn to before me
this _____ day of _____________, 20___.

____
NOTARY PUBLIC
My commission expires _________________, _______.

AG Procurement **Form 005** (Jul. 12, 2010)

Section VIII. DECLARATION RE: COMPLIANCE WITH U.S. DOL WAGE DETERMINATION (AG Form 006)

Procurement No.: ______________________

Name of Offeror Company: ____

I, ____ hereby **certify under penalty of perjury**:

(1) That I am _________________________ [*please select one: the Offeror, a partner of the Offeror, an officer of the Offeror*] making the bid or proposal in the foregoing identified procurement;
(2) That I have read and understand the provisions of 5 GCA § 5801 and § 5802 which read:

§ 5801. Wage Determination Established.

In such cases where the government of Guam enters into contractual arrangements with a sole proprietorship, a partnership or a corporation ("contractor") for the provision of a service to the government of Guam, and in such cases where the contractor employs a person(s) whose purpose, in whole or in part, is the direct delivery of service contracted by the government of Guam, then the contractor shall pay such employee(s) in accordance with the Wage Determination for Guam and the Northern Mariana Islands issued and promulgated by the U.S. Department of Labor for such labor as is employed in the direct delivery of contract deliverables to the government of Guam.

The Wage Determination most recently issued by the U.S. Department of Labor at the time a contract is awarded to a contractor by the government of Guam shall be used to determine wages, which shall be paid to employees pursuant to this Article. Should any contract contain a renewal clause, then at the time of renewal adjustments, there shall be made stipulations contained in that contract for applying the Wage Determination, as required by this Article, so that the Wage Determination promulgated by the U.S. Department of Labor on a date most recent to the renewal date shall apply.

§ 5802. Benefits.

In addition to the Wage Determination detailed in this Article, any contract to which this Article applies shall also contain provisions mandating health and similar benefits for employees covered by this Article, such benefits having a minimum value as detailed in the Wage Determination issued and promulgated by the U.S. Department of Labor, and shall contain provisions guaranteeing a minimum of ten (10) paid holidays per annum per employee.

(3) That the Offeror is in full compliance with 5 GCA § 5801 and § 5802, as may be applicable to the procurement referenced herein;
(4) That I have attached the most recent wage determination applicable to Guam issued by the U.S. Department of Labor. [*INSTRUCTIONS - Please attach!*]

___________________________________ Signature

AG Procurement **Form 006** (Feb. 16, 2010)

Section IX. AFFIDAVIT RE: CONTINGENT FEES
(AG Form 007)

CITY OF _______________)
) ss.
ISLAND OF GUAM)

______________________________ [*state name of affiant signing below*], being first duly sworn, deposes and says that:

1. The name of the offering company or individual is [*state name of company*] _______________________________________.

2. As a part of the offering company's bid or proposal, to the best of my knowledge, the offering company has not retained any person or agency on a percentage, commission, or other contingent arrangement to secure this contract. This statement is made pursuant to 2 GAR Division 4 11108(f).

3. As a part of the offering company's bid or proposal, to the best of my knowledge, the offering company has not retained a person to solicit or secure a contract with the government of Guam upon an agreement or understanding for a commission, percentage, brokerage, or contingent fee, except for retention of bona fide employees or bona fide established commercial selling agencies for the purpose of securing business. This statement is made pursuant to 2 GAR Division 4 11108(h).

4. I make these statements on behalf of myself as a representative of the Offeror, and on behalf of the Offeror's officers, representatives, agents, subcontractors, and employees.

____
Signature of one of the following:
Offeror, if the Offeror is an individual;
Partner, if the Offeror is a partnership;
Officer, if the Offeror is a corporation

Subscribed and sworn to before me

this _____ day of _____________, 20__.

____
NOTARY PUBLIC
My commission expires _____________, _____.

AG Procurement **Form 007** (Jul. 15, 2010)

"REGISTER OF WAGE DETERMINATIONS UNDER
THE SERVICE CONTRACT ACT
By direction of the Secretary of Labor

Daniel W. Simms
Director

Division of
Wage Determinations

U.S. DEPARTMENT OF LABOR
EMPLOYMENT STANDARDS ADMINISTRATION
WAGE AND HOUR DIVISION
WASHINGTON D.C. 20210

Wage Determination No.: 2015-5693
Revision No.: 20
Date Of Last Revision: 12/26/2023

Note: Contracts subject to the Service Contract Act are generally required to pay at least the applicable minimum wage rate required under Executive Order 14026.

If the contract is entered into on or after January 30, 2022, or the contract is renewed or extended (e.g., an option is exercised) on or after January 30, 2022:	Executive Order 14026 generally applies to the contract. The contractor must pay all covered workers at least $17.20 per hour (or the applicable wage rate listed on this wage determination, if it is higher) for all hours spent performing on the contract in 2024.

The applicable Executive Order minimum wage rate will be adjusted annually. Additional information on contractor requirements and worker protections under the Executive Orders is available at www.dol.gov/whd/govcontracts.

States: Guam, Northern Marianas, Wake Island

Area: Guam Statewide
Northern Marianas Statewide
Wake Island Statewide

Fringe Benefits Required Follow the Occupational Listing

OCCUPATION CODE - TITLE	FOOTNOTE	RATE
01000 - Administrative Support And Clerical Occupations		
01011 - Accounting Clerk I		14.27***
01012 - Accounting Clerk II		16.02***
01013 - Accounting Clerk III		17.93
01020 - Administrative Assistant		21.43
01035 - Court Reporter		17.40
01041 - Customer Service Representative I		12.75***
01042 - Customer Service Representative II		14.23***
01043 - Customer Service Representative III		15.62***
01051 - Data Entry Operator I		12.16***
01052 - Data Entry Operator II		13.27***
01060 - Dispatcher, Motor Vehicle		17.39
01070 - Document Preparation Clerk		13.85***
01090 - Duplicating Machine Operator		13.85***
01111 - General Clerk I		11.33***
01112 - General Clerk II		12.36***
01113 - General Clerk III		13.88***
01120 - Housing Referral Assistant		19.39
01141 - Messenger Courier		11.37***
01191 - Order Clerk I		12.57***
01192 - Order Clerk II		13.71***
01261 - Personnel Assistant (Employment) I		15.95***
01262 - Personnel Assistant (Employment) II		17.85

01263 - Personnel Assistant (Employment) III	19.89
01270 - Production Control Clerk	22.97
01290 - Rental Clerk	11.10***
01300 - Scheduler, Maintenance	15.55***
01311 - Secretary I	15.55***
01312 - Secretary II	17.40
01313 - Secretary III	19.39
01320 - Service Order Dispatcher	15.40***
01410 - Supply Technician	21.43
01420 - Survey Worker	16.96***
01460 - Switchboard Operator/Receptionist	10.78***
01531 - Travel Clerk I	13.01***
01532 - Travel Clerk II	14.12***
01533 - Travel Clerk III	15.09***
01611 - Word Processor I	14.53***
01612 - Word Processor II	16.31***
01613 - Word Processor III	18.26
05000 - Automotive Service Occupations	
05005 - Automobile Body Repairer, Fiberglass	17.20
05010 - Automotive Electrician	16.16***
05040 - Automotive Glass Installer	15.11***
05070 - Automotive Worker	15.11***
05110 - Mobile Equipment Servicer	12.96***
05130 - Motor Equipment Metal Mechanic	17.20
05160 - Motor Equipment Metal Worker	15.11***
05190 - Motor Vehicle Mechanic	17.20
05220 - Motor Vehicle Mechanic Helper	11.87***
05250 - Motor Vehicle Upholstery Worker	14.06***
05280 - Motor Vehicle Wrecker	15.11***
05310 - Painter, Automotive	16.16***
05340 - Radiator Repair Specialist	15.11***
05370 - Tire Repairer	12.67***
05400 - Transmission Repair Specialist	17.20
07000 - Food Preparation And Service Occupations	
07010 - Baker	11.10***
07041 - Cook I	14.44***
07042 - Cook II	16.84***
07070 - Dishwasher	9.69***
07130 - Food Service Worker	10.11***
07210 - Meat Cutter	13.34***
07260 - Waiter/Waitress	9.73***
09000 - Furniture Maintenance And Repair Occupations	
09010 - Electrostatic Spray Painter	18.75
09040 - Furniture Handler	11.37***
09080 - Furniture Refinisher	18.75
09090 - Furniture Refinisher Helper	13.77***
09110 - Furniture Repairer, Minor	16.32***
09130 - Upholsterer	18.75
11000 - General Services And Support Occupations	
11030 - Cleaner, Vehicles	9.69***
11060 - Elevator Operator	9.69***
11090 - Gardener	14.28***
11122 - Housekeeping Aide	10.13***
11150 - Janitor	10.13***
11210 - Laborer, Grounds Maintenance	10.79***
11240 - Maid or Houseman	9.67***
11260 - Pruner	9.66***
11270 - Tractor Operator	13.07***
11330 - Trail Maintenance Worker	10.79***
11360 - Window Cleaner	11.32***
12000 - Health Occupations	
12010 - Ambulance Driver	18.96
12011 - Breath Alcohol Technician	18.96
12012 - Certified Occupational Therapist Assistant	26.02
12015 - Certified Physical Therapist Assistant	26.02

12020 - Dental Assistant		18.79
12025 - Dental Hygienist		39.73
12030 - EKG Technician		28.73
12035 - Electroneurodiagnostic Technologist		28.73
12040 - Emergency Medical Technician		18.96
12071 - Licensed Practical Nurse I		16.95***
12072 - Licensed Practical Nurse II		18.96
12073 - Licensed Practical Nurse III		21.14
12100 - Medical Assistant		13.42***
12130 - Medical Laboratory Technician		18.82
12160 - Medical Record Clerk		14.97***
12190 - Medical Record Technician		17.77
12195 - Medical Transcriptionist		16.95***
12210 - Nuclear Medicine Technologist		41.68
12221 - Nursing Assistant I		12.43***
12222 - Nursing Assistant II		13.97***
12223 - Nursing Assistant III		15.24***
12224 - Nursing Assistant IV		17.12***
12235 - Optical Dispenser		18.96
12236 - Optical Technician		16.95***
12250 - Pharmacy Technician		15.49***
12280 - Phlebotomist		16.95***
12305 - Radiologic Technologist		28.73
12311 - Registered Nurse I		23.50
12312 - Registered Nurse II		28.73
12313 - Registered Nurse II, Specialist		28.73
12314 - Registered Nurse III		34.76
12315 - Registered Nurse III, Anesthetist		34.76
12316 - Registered Nurse IV		41.68
12317 - Scheduler (Drug and Alcohol Testing)		23.50
12320 - Substance Abuse Treatment Counselor		23.50
13000 - Information And Arts Occupations		
13011 - Exhibits Specialist I		21.42
13012 - Exhibits Specialist II		26.53
13013 - Exhibits Specialist III		32.45
13041 - Illustrator I		21.42
13042 - Illustrator II		26.53
13043 - Illustrator III		32.45
13047 - Librarian		29.38
13050 - Library Aide/Clerk		17.05***
13054 - Library Information Technology Systems Administrator		26.53
13058 - Library Technician		18.11
13061 - Media Specialist I		19.15
13062 - Media Specialist II		21.42
13063 - Media Specialist III		23.87
13071 - Photographer I		19.15
13072 - Photographer II		21.42
13073 - Photographer III		26.53
13074 - Photographer IV		32.45
13075 - Photographer V		39.27
13090 - Technical Order Library Clerk		21.42
13110 - Video Teleconference Technician		19.15
14000 - Information Technology Occupations		
14041 - Computer Operator I		15.71***
14042 - Computer Operator II		17.22
14043 - Computer Operator III		19.19
14044 - Computer Operator IV		21.33
14045 - Computer Operator V		23.62
14071 - Computer Programmer I	(see 1)	15.73***
14072 - Computer Programmer II	(see 1)	19.50
14073 - Computer Programmer III	(see 1)	23.84
14074 - Computer Programmer IV	(see 1)	
14101 - Computer Systems Analyst I	(see 1)	24.23
14102 - Computer Systems Analyst II	(see 1)	

14103 - Computer Systems Analyst III	(see 1)
14150 - Peripheral Equipment Operator	15.71***
14160 - Personal Computer Support Technician	21.33
14170 - System Support Specialist	21.24
15000 - Instructional Occupations	
15010 - Aircrew Training Devices Instructor (Non-Rated)	24.23
15020 - Aircrew Training Devices Instructor (Rated)	29.32
15030 - Air Crew Training Devices Instructor (Pilot)	34.91
15050 - Computer Based Training Specialist / Instructor	24.23
15060 - Educational Technologist	29.40
15070 - Flight Instructor (Pilot)	34.91
15080 - Graphic Artist	20.47
15085 - Maintenance Test Pilot, Fixed, Jet/Prop	34.91
15086 - Maintenance Test Pilot, Rotary Wing	34.91
15088 - Non-Maintenance Test/Co-Pilot	34.91
15090 - Technical Instructor	17.67
15095 - Technical Instructor/Course Developer	23.78
15110 - Test Proctor	15.70***
15120 - Tutor	15.70***
16000 - Laundry, Dry-Cleaning, Pressing And Related Occupations	
16010 - Assembler	10.83***
16030 - Counter Attendant	10.83***
16040 - Dry Cleaner	12.36***
16070 - Finisher, Flatwork, Machine	10.83***
16090 - Presser, Hand	10.83***
16110 - Presser, Machine, Drycleaning	10.83***
16130 - Presser, Machine, Shirts	10.83***
16160 - Presser, Machine, Wearing Apparel, Laundry	10.83***
16190 - Sewing Machine Operator	12.88***
16220 - Tailor	13.40***
16250 - Washer, Machine	11.34***
19000 - Machine Tool Operation And Repair Occupations	
19010 - Machine-Tool Operator (Tool Room)	19.46
19040 - Tool And Die Maker	24.46
21000 - Materials Handling And Packing Occupations	
21020 - Forklift Operator	15.36***
21030 - Material Coordinator	22.97
21040 - Material Expediter	22.97
21050 - Material Handling Laborer	12.57***
21071 - Order Filler	10.62***
21080 - Production Line Worker (Food Processing)	15.36***
21110 - Shipping Packer	17.12***
21130 - Shipping/Receiving Clerk	17.12***
21140 - Store Worker I	15.83***
21150 - Stock Clerk	22.26
21210 - Tools And Parts Attendant	15.36***
21410 - Warehouse Specialist	15.36***
23000 - Mechanics And Maintenance And Repair Occupations	
23010 - Aerospace Structural Welder	25.04
23019 - Aircraft Logs and Records Technician	19.47
23021 - Aircraft Mechanic I	23.84
23022 - Aircraft Mechanic II	25.04
23023 - Aircraft Mechanic III	26.30
23040 - Aircraft Mechanic Helper	16.58***
23050 - Aircraft, Painter	22.39
23060 - Aircraft Servicer	19.47
23070 - Aircraft Survival Flight Equipment Technician	22.39
23080 - Aircraft Worker	21.03
23091 - Aircrew Life Support Equipment (ALSE) Mechanic I	21.03
23092 - Aircrew Life Support Equipment (ALSE) Mechanic II	23.84
23110 - Appliance Mechanic	19.46
23120 - Bicycle Repairer	15.61***
23125 - Cable Splicer	22.47

23130 - Carpenter, Maintenance	17.58
23140 - Carpet Layer	18.20
23160 - Electrician, Maintenance	19.37
23181 - Electronics Technician Maintenance I	18.20
23182 - Electronics Technician Maintenance II	19.46
23183 - Electronics Technician Maintenance III	20.72
23260 - Fabric Worker	16.94***
23290 - Fire Alarm System Mechanic	16.77***
23310 - Fire Extinguisher Repairer	15.61***
23311 - Fuel Distribution System Mechanic	20.72
23312 - Fuel Distribution System Operator	15.61***
23370 - General Maintenance Worker	13.24***
23380 - Ground Support Equipment Mechanic	23.84
23381 - Ground Support Equipment Servicer	19.47
23382 - Ground Support Equipment Worker	21.03
23391 - Gunsmith I	15.61***
23392 - Gunsmith II	18.20
23393 - Gunsmith III	20.72
23410 - Heating, Ventilation And Air-Conditioning Mechanic	19.27
23411 - Heating, Ventilation And Air Contidioning Mechanic (Research Facility)	20.50
23430 - Heavy Equipment Mechanic	19.50
23440 - Heavy Equipment Operator	18.10
23460 - Instrument Mechanic	20.72
23465 - Laboratory/Shelter Mechanic	19.46
23470 - Laborer	12.57***
23510 - Locksmith	19.46
23530 - Machinery Maintenance Mechanic	23.13
23550 - Machinist, Maintenance	20.72
23580 - Maintenance Trades Helper	11.77***
23591 - Metrology Technician I	20.72
23592 - Metrology Technician II	22.03
23593 - Metrology Technician III	23.33
23640 - Millwright	20.72
23710 - Office Appliance Repairer	19.46
23760 - Painter, Maintenance	17.04***
23790 - Pipefitter, Maintenance	19.96
23810 - Plumber, Maintenance	18.75
23820 - Pneudraulic Systems Mechanic	20.72
23850 - Rigger	20.72
23870 - Scale Mechanic	18.20
23890 - Sheet-Metal Worker, Maintenance	19.55
23910 - Small Engine Mechanic	18.20
23931 - Telecommunications Mechanic I	19.96
23932 - Telecommunications Mechanic II	21.24
23950 - Telephone Lineman	20.62
23960 - Welder, Combination, Maintenance	19.96
23965 - Well Driller	21.13
23970 - Woodcraft Worker	20.71
23980 - Woodworker	15.61***
24000 - Personal Needs Occupations	
24550 - Case Manager	15.01***
24570 - Child Care Attendant	10.09***
24580 - Child Care Center Clerk	13.25***
24610 - Chore Aide	14.06***
24620 - Family Readiness And Support Services Coordinator	15.01***
24630 - Homemaker	16.12***
25000 - Plant And System Operations Occupations	
25010 - Boiler Tender	22.79
25040 - Sewage Plant Operator	22.89
25070 - Stationary Engineer	22.79
25190 - Ventilation Equipment Tender	15.72***
25210 - Water Treatment Plant Operator	22.89

27000 - Protective Service Occupations	
27004 - Alarm Monitor	10.90***
27007 - Baggage Inspector	9.63***
27008 - Corrections Officer	14.59***
27010 - Court Security Officer	14.59***
27030 - Detection Dog Handler	10.90***
27040 - Detention Officer	14.59***
27070 - Firefighter	14.59***
27101 - Guard I	9.63***
27102 - Guard II	10.90***
27131 - Police Officer I	14.59***
27132 - Police Officer II	16.21***
28000 - Recreation Occupations	
28041 - Carnival Equipment Operator	13.24***
28042 - Carnival Equipment Repairer	14.46***
28043 - Carnival Worker	9.78***
28210 - Gate Attendant/Gate Tender	13.18***
28310 - Lifeguard	11.01***
28350 - Park Attendant (Aide)	14.74***
28510 - Recreation Aide/Health Facility Attendant	11.84***
28515 - Recreation Specialist	18.26
28630 - Sports Official	11.74***
28690 - Swimming Pool Operator	17.71
29000 - Stevedoring/Longshoremen Occupational Services	
29010 - Blocker And Bracer	26.02
29020 - Hatch Tender	26.02
29030 - Line Handler	26.02
29041 - Stevedore I	24.21
29042 - Stevedore II	27.82
30000 - Technical Occupations	
30010 - Air Traffic Control Specialist, Center (HFO) (see 2)	43.06
30011 - Air Traffic Control Specialist, Station (HFO) (see 2)	29.69
30012 - Air Traffic Control Specialist, Terminal (HFO) (see 2)	32.70
30021 - Archeological Technician I	18.17
30022 - Archeological Technician II	20.33
30023 - Archeological Technician III	25.19
30030 - Cartographic Technician	25.19
30040 - Civil Engineering Technician	25.19
30051 - Cryogenic Technician I	27.89
30052 - Cryogenic Technician II	30.80
30061 - Drafter/CAD Operator I	18.17
30062 - Drafter/CAD Operator II	20.33
30063 - Drafter/CAD Operator III	22.66
30064 - Drafter/CAD Operator IV	27.89
30081 - Engineering Technician I	16.19***
30082 - Engineering Technician II	18.17
30083 - Engineering Technician III	20.33
30084 - Engineering Technician IV	25.19
30085 - Engineering Technician V	30.80
30086 - Engineering Technician VI	37.27
30090 - Environmental Technician	25.19
30095 - Evidence Control Specialist	25.19
30210 - Laboratory Technician	22.66
30221 - Latent Fingerprint Technician I	27.89
30222 - Latent Fingerprint Technician II	30.80
30240 - Mathematical Technician	25.19
30361 - Paralegal/Legal Assistant I	19.54
30362 - Paralegal/Legal Assistant II	24.21
30363 - Paralegal/Legal Assistant III	29.61
30364 - Paralegal/Legal Assistant IV	35.83
30375 - Petroleum Supply Specialist	30.80
30390 - Photo-Optics Technician	24.92
30395 - Radiation Control Technician	30.80
30461 - Technical Writer I	25.19
30462 - Technical Writer II	30.80

30463 - Technical Writer III		37.27
30491 - Unexploded Ordnance (UXO) Technician I		27.37
30492 - Unexploded Ordnance (UXO) Technician II		33.11
30493 - Unexploded Ordnance (UXO) Technician III		39.69
30494 - Unexploded (UXO) Safety Escort		27.37
30495 - Unexploded (UXO) Sweep Personnel		27.37
30501 - Weather Forecaster I		27.89
30502 - Weather Forecaster II		33.93
30620 - Weather Observer, Combined Upper Air Or Surface Programs	(see 2)	22.66
30621 - Weather Observer, Senior	(see 2)	25.19
31000 - Transportation/Mobile Equipment Operation Occupations		
31010 - Airplane Pilot		33.11
31020 - Bus Aide		8.97***
31030 - Bus Driver		11.73***
31043 - Driver Courier		10.26***
31260 - Parking and Lot Attendant		9.91***
31290 - Shuttle Bus Driver		11.65***
31310 - Taxi Driver		11.41***
31361 - Truckdriver, Light		11.21***
31362 - Truckdriver, Medium		12.16***
31363 - Truckdriver, Heavy		16.11***
31364 - Truckdriver, Tractor-Trailer		16.11***
99000 - Miscellaneous Occupations		
99020 - Cabin Safety Specialist		16.14***
99030 - Cashier		10.01***
99050 - Desk Clerk		9.71***
99095 - Embalmer		27.37
99130 - Flight Follower		27.37
99251 - Laboratory Animal Caretaker I		24.31
99252 - Laboratory Animal Caretaker II		26.56
99260 - Marketing Analyst		21.54
99310 - Mortician		27.37
99410 - Pest Controller		16.07***
99510 - Photofinishing Worker		14.38***
99710 - Recycling Laborer		17.32
99711 - Recycling Specialist		23.38
99730 - Refuse Collector		16.40***
99810 - Sales Clerk		10.63***
99820 - School Crossing Guard		17.96
99830 - Survey Party Chief		23.99
99831 - Surveying Aide		13.65***
99832 - Surveying Technician		17.73
99840 - Vending Machine Attendant		24.31
99841 - Vending Machine Repairer		30.96
99842 - Vending Machine Repairer Helper		24.31

***Workers in this classification may be entitled to a higher minimum wage under Executive Order 14026 ($17.20 per hour). Please see the Note at the top of the wage determination for more information. Please also note that the minimum wage requirements of Executive Order 14026 are not currently being enforced as to contracts or contract-like instruments entered into with the federal government in connection with seasonal recreational services or seasonal recreational equipment rental for the general public on federal lands. The minimum wage requirements of Executive Order 14026 also are not currently being enforced as to any contract or subcontract to which the states of Texas, Louisiana, or Mississippi, including their agencies, are a party.

ALL OCCUPATIONS LISTED ABOVE RECEIVE THE FOLLOWING BENEFITS:

HEALTH & WELFARE: $4.98 per hour, up to 40 hours per week, or $199.20 per week or $863.20 per month

HEALTH & WELFARE EO 13706: $4.57 per hour, up to 40 hours per week, or $182.80 per week, or $792.13 per month*

*This rate is to be used only when compensating employees for performance on an SCA-covered contract also covered by EO 13706, Establishing Paid Sick Leave for Federal Contractors. A contractor may not receive credit toward its SCA obligations for any paid sick leave provided pursuant to EO 13706.

VACATION: 2 weeks paid vacation after 1 year of service with a contractor or successor; and 4 weeks after 3 years. Length of service includes the whole span of continuous service with the present contractor or successor, wherever employed, and with the predecessor contractors in the performance of similar work at the same Federal facility. (Reg. 29 CFR 4.173)

HOLIDAYS: A minimum of eleven paid holidays per year: New Year's Day, Martin Luther King Jr.'s Birthday, Washington's Birthday, Memorial Day, Juneteenth National Independence Day, Independence Day, Labor Day, Columbus Day, Veterans' Day, Thanksgiving Day, and Christmas Day. (A contractor may substitute for any of the named holidays another day off with pay in accordance with a plan communicated to the employees involved.) (See 29 CFR 4.174)

THE OCCUPATIONS WHICH HAVE NUMBERED FOOTNOTES IN PARENTHESES RECEIVE THE FOLLOWING:

1) COMPUTER EMPLOYEES: This wage determination does not apply to any individual employed in a bona fide executive, administrative, or professional capacity, as defined in 29 C.F.R. Part 541. (See 41 C.F.R. 6701(3)). Because most Computer Systems Analysts and Computer Programmers who are paid at least $27.63 per hour (or at least $684 per week if paid on a salary or fee basis) likely qualify as exempt computer professionals under 29 U.S.C. 213(a)(1) and 29 U.S.C. 213(a)(17), this wage determination may not include wage rates for all occupations within those job families. In such instances, a conformance will be necessary if there are nonexempt employees in these job families working on the contract.

Job titles vary widely and change quickly in the computer industry, and are not determinative of whether an employee is an exempt computer professional. To be exempt, computer employees who satisfy the compensation requirements must also have a primary duty that consists of:

(1) The application of systems analysis techniques and procedures, including consulting with users, to determine hardware, software or system functional specifications;

(2) The design, development, documentation, analysis, creation, testing or modification of computer systems or programs, including prototypes, based on and related to user or system design specifications;

(3) The design, documentation, testing, creation or modification of computer programs related to machine operating systems; or

(4) A combination of the aforementioned duties, the performance of which requires the same level of skills. (29 C.F.R. 541.400).

Any computer employee who meets the applicable compensation requirements and the above duties test qualifies as an exempt computer professional under both section 13(a)(1) and section 13(a)(17) of the Fair Labor Standards Act. (Field Assistance Bulletin No. 2006-3 (Dec. 14, 2006)). Accordingly, this wage determination will not apply to any exempt computer employee regardless of which of these two exemptions is utilized.

2) AIR TRAFFIC CONTROLLERS AND WEATHER OBSERVERS - NIGHT PAY & SUNDAY PAY: If you

work at night as part of a regular tour of duty, you will earn a night differential and receive an additional 10% of basic pay for any hours worked between 6pm and 6am. If you are a full-time employed (40 hours a week) and Sunday is part of your regularly scheduled workweek, you are paid at your rate of basic pay plus a Sunday premium of 25% of your basic rate for each hour of Sunday work which is not overtime (i.e. occasional work on Sunday outside the normal tour of duty is considered overtime work).

** HAZARDOUS PAY DIFFERENTIAL **

An 8 percent differential is applicable to employees employed in a position that represents a high degree of hazard when working with or in close proximity to ordnance, explosives, and incendiary materials. This includes work such as screening, blending, dying, mixing, and pressing of sensitive ordnance, explosives, and pyrotechnic compositions such as lead azide, black powder and photoflash powder. All dry-house activities involving propellants or explosives. Demilitarization, modification, renovation, demolition, and maintenance operations on sensitive ordnance, explosives and incendiary materials. All operations involving re-grading and cleaning of artillery ranges.

A 4 percent differential is applicable to employees employed in a position that represents a low degree of hazard when working with, or in close proximity to ordnance, (or employees possibly adjacent to) explosives and incendiary materials which involves potential injury such as laceration of hands, face, or arms of the employee engaged in the operation, irritation of the skin, minor burns and the like; minimal damage to immediate or adjacent work area or equipment being used. All operations involving, unloading, storage, and hauling of ordnance, explosive, and incendiary ordnance material other than small arms ammunition. These differentials are only applicable to work that has been specifically designated by the agency for ordnance, explosives, and incendiary material differential pay.

** UNIFORM ALLOWANCE **

If employees are required to wear uniforms in the performance of this contract (either by the terms of the Government contract, by the employer, by the state or local law, etc.), the cost of furnishing such uniforms and maintaining (by laundering or dry cleaning) such uniforms is an expense that may not be borne by an employee where such cost reduces the hourly rate below that required by the wage determination. The Department of Labor will accept payment in accordance with the following standards as compliance:

The contractor or subcontractor is required to furnish all employees with an adequate number of uniforms without cost or to reimburse employees for the actual cost of the uniforms. In addition, where uniform cleaning and maintenance is made the responsibility of the employee, all contractors and subcontractors subject to this wage determination shall (in the absence of a bona fide collective bargaining agreement providing for a different amount, or the furnishing of contrary affirmative proof as to the actual cost), reimburse all employees for such cleaning and maintenance at a rate of $3.35 per week (or $.67 cents per day). However, in those instances where the uniforms furnished are made of ""wash and wear"" materials, may be routinely washed and dried with other personal garments, and do not require any special treatment such as dry cleaning, daily washing, or commercial laundering in order to meet the cleanliness or appearance standards set by the terms of the Government contract, by the contractor, by law, or by the nature of the work, there is no requirement that employees be reimbursed for uniform maintenance costs.

** SERVICE CONTRACT ACT DIRECTORY OF OCCUPATIONS **

The duties of employees under job titles listed are those described in the ""Service Contract Act Directory of Occupations"", Fifth Edition (Revision 1), dated September 2015, unless otherwise indicated.

** REQUEST FOR AUTHORIZATION OF ADDITIONAL CLASSIFICATION AND WAGE RATE, Standard Form 1444 (SF-1444) **

Conformance Process:

The contracting officer shall require that any class of service employee which is not listed herein and which is to be employed under the contract (i.e., the work to be performed is not performed by any classification listed in the wage determination), be classified by the contractor so as to provide a reasonable relationship (i.e., appropriate level of skill comparison) between such unlisted classifications and the classifications listed in the wage determination (See 29 CFR 4.6(b)(2)(i)). Such conforming procedures shall be initiated by the contractor prior to the performance of contract work by such unlisted class(es) of employees (See 29 CFR 4.6(b)(2)(ii)). The Wage and Hour Division shall make a final determination of conformed classification, wage rate, and/or fringe benefits which shall be paid to all employees performing in the classification from the first day of work on which contract work is performed by them in the classification. Failure to pay such unlisted employees the compensation agreed upon by the interested parties and/or fully determined by the Wage and Hour Division retroactive to the date such class of employees commenced contract work shall be a violation of the Act and this contract. (See 29 CFR 4.6(b)(2)(v)). When multiple wage determinations are included in a contract, a separate SF-1444 should be prepared for each wage determination to which a class(es) is to be conformed.

The process for preparing a conformance request is as follows:

1) When preparing the bid, the contractor identifies the need for a conformed occupation(s) and computes a proposed rate(s).

2) After contract award, the contractor prepares a written report listing in order the proposed classification title(s), a Federal grade equivalency (FGE) for each proposed classification(s), job description(s), and rationale for proposed wage rate(s), including information regarding the agreement or disagreement of the authorized representative of the employees involved, or where there is no authorized representative, the employees themselves. This report should be submitted to the contracting officer no later than 30 days after such unlisted class(es) of employees performs any contract work.

3) The contracting officer reviews the proposed action and promptly submits a report of the action, together with the agency's recommendations and pertinent information including the position of the contractor and the employees, to the U.S. Department of Labor, Wage and Hour Division, for review (See 29 CFR 4.6(b)(2)(ii)).

4) Within 30 days of receipt, the Wage and Hour Division approves, modifies, or disapproves the action via transmittal to the agency contracting officer, or notifies the contracting officer that additional time will be required to process the request.

5) The contracting officer transmits the Wage and Hour Division's decision to the contractor.

6) Each affected employee shall be furnished by the contractor with a written copy of such determination or it shall be posted as a part of the wage determination (See 29 CFR 4.6(b)(2)(iii)).

Information required by the Regulations must be submitted on SF-1444 or bond paper.

When preparing a conformance request, the ""Service Contract Act Directory of Occupations"" should be used to compare job definitions to ensure that duties requested are not performed by a classification already listed in the wage determination. Remember, it is not the job title, but the required tasks that determine whether a class is included in an established wage determination. Conformances may not be used to artificially split, combine, or subdivide classifications listed in the wage determination (See 29 CFR 4.152(c)(1))."

HEALTH & WELFARE EO 13706: $4.23 per hour up to 40 hours per week or $169.20 per week or $733.20 per month*

*This rate is to be used only when compensating employees for performance on an SCA- covered contract also covered by EO 13706 Establishing Paid Sick Leave for Federal Contractors. A contractor may not receive credit toward its SCA obligations for any paid sick leave provided pursuant to EO 13706.

VACATION: 2 weeks paid vacation after 1 year of service with a contractor or successor; and 4 weeks after 3 years. Length of service includes the whole span of continuous service with the present contractor or successor wherever employed and with the predecessor contractors in the performance of similar work at the same Federal facility. (Reg. 29 CFR 4.173)

HOLIDAYS: A minimum of eleven paid holidays per year: New Year's Day Martin Luther King Jr.'s Birthday Washington's Birthday Memorial Day Juneteenth National Independence Day Independence Day Labor Day Columbus Day Veterans' Day Thanksgiving Day and Christmas Day. (A contractor may substitute for any of the named holidays another day off with pay in accordance with a plan communicated to the employees involved.) (See 29 CFR 4.174)

THE OCCUPATIONS WHICH HAVE NUMBERED FOOTNOTES IN PARENTHESES RECEIVE THE FOLLOWING:

1) COMPUTER EMPLOYEES: Under the SCA at section 8(b) this wage determination does not apply to any employee who individually qualifies as a bona fide executive administrative or professional employee as defined in 29 C.F.R. Part 541. Because most Computer System Analysts and Computer Programmers who are compensated at a rate not less than $27.63 (or on a salary or fee basis at a rate not less than $455 per week) an hour would likely qualify as exempt computer professionals (29 C.F.R. 541. 400) wage rates may not be listed on this wage determination for all occupations within those job families. In addition because this wage determination may not list a wage rate for some or all occupations within those job families if the survey data indicates that the prevailing wage rate for the occupation equals or exceeds $27.63 per hour conformances may be necessary for certain nonexempt employees. For example if an individual employee is nonexempt but nevertheless performs duties within the scope of one of the Computer Systems Analyst or Computer Programmer occupations for which this wage determination does not specify an SCA wage rate then the wage rate for that employee must be conformed in accordance with the conformance procedures described in the conformance note included on this wage determination.

Additionally because job titles vary widely and change quickly in the computer industry job titles are not determinative of the application of the computer professional exemption. Therefore the exemption applies only to computer employees who satisfy the compensation requirements and whose primary duty consists of:

(1) The application of systems analysis techniques and procedures including consulting with users to determine hardware software or system functional specifications;

(2) The design development documentation analysis creation testing or modification of computer

systems or programs including prototypes based on and related to user or system design specifications;

(3) The design documentation testing creation or modification of computer programs related to machine operating systems; or

(4) A combination of the aforementioned duties the performance of which requires the same level of skills. (29 C.F.R. 541.400).

2) AIR TRAFFIC CONTROLLERS AND WEATHER OBSERVERS - NIGHT PAY & SUNDAY PAY: If you work at night as part of a regular tour of duty you will earn a night differential and receive an additional 10% of basic pay for any hours worked between 6pm and 6am. If you are a full-time employed (40 hours a week) and Sunday is part of your regularly scheduled workweek you are paid at your rate of basic pay plus a Sunday premium of 25% of your basic rate for each hour of Sunday work which is not overtime (i.e. occasional work on Sunday outside the normal tour of duty is considered overtime work).

** HAZARDOUS PAY DIFFERENTIAL **

An 8 percent differential is applicable to employees employed in a position that represents a high degree of hazard when working with or in close proximity to ordnance explosives and incendiary materials. This includes work such as screening blending dying mixing and pressing of sensitive ordnance explosives and pyrotechnic compositions such as lead azide black powder and photoflash powder. All dry-house activities involving propellants or explosives. Demilitarization modification renovation demolition and maintenance operations on sensitive ordnance explosives and incendiary materials. All operations involving re-grading and cleaning of artillery ranges.

A 4 percent differential is applicable to employees employed in a position that represents a low degree of hazard when working with or in close proximity to ordnance (or employees possibly adjacent to) explosives and incendiary materials which involves potential injury such as laceration of hands face or arms of the employee engaged in the operation irritation of the skin minor burns and the like; minimal damage to immediate or adjacent work area or equipment being used. All operations involving unloading storage and hauling of ordnance explosive and incendiary ordnance material other than small arms ammunition. These differentials are only applicable to work that has been specifically designated by the agency for ordnance explosives and incendiary material differential pay.

** UNIFORM ALLOWANCE **

If employees are required to wear uniforms in the performance of this contract (either by the terms of the Government contract by the employer by the state or local law etc.) the cost of furnishing such uniforms and maintaining (by laundering or dry cleaning) such uniforms is an expense that may not be borne by an employee where such cost reduces the hourly rate below that required by the wage determination. The Department of Labor will accept payment in accordance with the following standards as compliance:

The contractor or subcontractor is required to furnish all employees with an adequate number of uniforms without cost or to reimburse employees for the actual cost of the uniforms. In addition, where uniform cleaning and maintenance is made the responsibility of the employee all contractors and subcontractors subject to this wage determination shall (in the absence of a bona fide collective bargaining agreement providing for a different amount or the furnishing of contrary affirmative proof as to the actual cost) reimburse all employees for such cleaning and maintenance at a rate of $3.35 per week (or $.67 cents per day). However in those instances where the uniforms furnished are made of ""wash and wear"" materials may be routinely washed and dried with other personal garments and do not require any special treatment such as dry cleaning daily washing or commercial laundering in order to meet the cleanliness or appearance standards set by the terms of the Government contract by the contractor by law or by the nature of the work there is no requirement that employees be reimbursed for uniform maintenance costs.

** SERVICE CONTRACT ACT DIRECTORY OF OCCUPATIONS **

The duties of employees under job titles listed are those described in the ""Service Contract Act Directory of Occupations"" Fifth Edition (Revision 1) dated September 2015 unless otherwise indicated.

** REQUEST FOR AUTHORIZATION OF ADDITIONAL CLASSIFICATION AND WAGE RATE Standard Form 1444 (SF-1444) **

Conformance Process:

The contracting officer shall require that any class of service employee which is not listed herein and which is to be employed under the contract (i.e. the work to be performed is not performed by any classification listed in the wage determination) be classified by the contractor so as to provide a reasonable relationship (i.e. appropriate level of skill comparison) between such unlisted classifications and the classifications listed in the wage determination (See 29 CFR 4.6(b)(2)(i)). Such conforming procedures shall be initiated by the contractor prior to the performance of contract work by such unlisted class(es) of employees (See 29 CFR 4.6(b)(2)(ii)). The Wage and Hour Division shall make a final determination of conformed classification wage rate and/or fringe benefits which shall be paid to all employees performing in the classification from the first day of work on which contract work is performed by them in the classification. Failure to pay such unlisted employees the compensation agreed upon by the interested parties and/or fully determined by the Wage and Hour Division retroactive to the date such class of employees commenced contract work shall be a violation of the Act and this contract. (See 29 CFR 4.6(b)(2)(v)). When multiple wage determinations are included in a contract a separate SF-1444 should be prepared for each wage determination to which a class(es) is to be conformed.

The process for preparing a conformance request is as follows:

(1) When preparing the bid the contractor identifies the need for a conformed occupation(s) and computes a proposed rate(s).

(2) After contract award the contractor prepares a written report listing in order the proposed classification title(s) a Federal grade equivalency (FGE) for each proposed classification(s) job description(s) and rationale for proposed wage rate(s) including information regarding the agreement or disagreement of the authorized representative of the employees involved or where there is no authorized representative the employees themselves. This report should

be submitted to the contracting officer no later than 30 days after such unlisted class(es) of employees performs any contract work.

(3) The contracting officer reviews the proposed action and promptly submits a report of the action together with the agency's recommendations and pertinent information including the position of the contractor and the employees to the U.S. Department of Labor Wage and Hour Division for review (See 29 CFR 4.6(b)(2)(ii)).

(4) Within 30 days of receipt the Wage and Hour Division approves modifies or disapproves the action via transmittal to the agency contracting officer or notifies the contracting officer that additional time will be required to process the request.

(5) The contracting officer transmits the Wage and Hour Division's decision to the contractor.

(6) Each affected employee shall be furnished by the contractor with a written copy of such determination or it shall be posted as a part of the wage determination (See 29 CFR 4.6(b)(2)(iii)).

Information required by the Regulations must be submitted on SF-1444 or bond paper.

When preparing a conformance request the ""Service Contract Act Directory of Occupations"" should be used to compare job definitions to ensure that duties requested are not performed by a classification already listed in the wage determination. Remember it is not the job title but the required tasks that determine whether a class is included in an established wage determination. Conformances may not be used to artificially split combine or subdivide classifications listed in the wage determination (See 29 CFR 4.152(c)(1)).

Section XI. SUBCONTRACTOR UTILIZATION FORM

RFP NO.__________________ PROJECT TITLE:

NAME OF PRIME OFFEROR:

E-MAIL ADDRESS:

ADDRESS:

TELEPHONE NO.: FAX NO.:

The following subcontractors[1] (if known at the time of proposal submission) will be used on this Project (continue list on additional page if necessary):

COMPANY NAME, ADDRESS, PHONE NUMBER, AND E-MAIL ADDRESS:	TYPE OF WORK TO BE PERFORMED:	ESTIMATED DOLLAR AMOUNT OF SUBCONTRACT:

I certify under penalty of perjury that the foregoing statements are true and correct. In the event that substitution or replacement of a subcontractor is required, I will adhere to the substitution or replacement requirements of the Government of Guam.

___________________________________ __________________________
Signature of Offeror (Prime Contractor) Date

___________________________________ __________________________
Print Name Title

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[1] Subcontractor is defined as a company, firm, joint venture, or individual who enters into an agreement with a contractor to provide services to a prime contractor or higher tier subcontractor under a contract awarded or to be awarded by the Government of Guam.

Section XII. CERTIFICATION OF NON-EMPLOYMENT OF CONVICTED SEXUAL OFFENDERS

CERTIFICATION OF NON-EMPLOYMENT OF CONVICTED SEXUAL OFFENDERS

Pursuant to Guam Public Law 28-24, as amended by Guam Public Law 28-98, if a contract for services is awarded to an Offeror, then the service provider must warrant that no person in its employment who has been convicted of a sex offense under the provisions of Chapter 25 of Title 9 of the Guam Code Annotated or of an offense defined in Article 2 of Chapter 28 of Title 9 of the Guam Code Annotated, or who has been convicted in any other jurisdiction of an offense with the same elements as heretofore defined, or who is listed on the Sex Offender Registry, shall provide services on behalf of the service provider while on government of Guam property, with the exception of public highways. If any employee of a service provider is providing services on government property and is convicted subsequent to an award of a contract, then the service provider warrants that it will notify the GSWA of the conviction within twenty-four hours of the conviction and will immediately remove such convicted person from providing services on government of Guam property. If the service provider is found to be in violation of any of the provisions of this paragraph, then the GSWA will give notice to the service provider to take corrective action. The service provider shall take corrective action within twenty-four hours of notice from the GSWA, and the service provider shall notify the GSWA when action has been taken. If the service provider fails to take corrective steps within twenty-four hours of notice from the GSWA, then the GSWA in its sole discretion may suspend temporarily any contract for services.

I, ____________________________ being a duly authorized representative of the Offeror,

(Print name)

acknowledge the requirements described above, have ensured that the Proposal as submitted addresses these requirements, and certify that if awarded the contract, the Offeror will follow these mandates.

____

(Company Name)

____

(Title)

_________________________________ ________________________

(Signature) (Date)

EXHIBIT A

SAMPLING AND ANALYSIS PLAN
FOR
ORDOT LEACHATE MONITORING
Ordot/Chalan Pago, Guam

April 2015

Prepared for:

Gershman, Brickner & Bratton, Inc.
Receiver for the U.S. District Court on behalf of
Guam Solid Waste Authority
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Prepared by:

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EA Project No. 62392.15

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Acronyms and Abbreviations

BOD	biochemical oxygen demand
°C	degrees Celsius
cBOD	carbonaceous biochemical oxygen demand
COD	chemical oxygen demand
CRM	certified reference materials
DO	dissolved oxygen
DOT	Department of Transportation
DQO	data quality objective
EA	EA Engineering, Science, and Technology, Inc., PBC
GBB	Gershman, Brickner, & Bratton, Inc.
GC/MS	gas chromatography/mass spectrometry
GSWA	Guam Solid Waste Authority
Guam EPA	Guam Environmental Protection Agency
GWA	Guam Waterworks Authority
H_2SO_4	sulfuric acid
HCl	hydrochloric acid
HDPE	high-density polyethylene
HNO_3	nitric acid
ICP-MS	inductively-coupled plasma mass spectrometry
ID	identification
IS	internal standard
L	liter
LCS	laboratory control sample
LCSD	laboratory control sample duplicate
µg/L	microgram(s) per liter
mg/L	milligram(s) per liter
ml	milliliter
MS	matrix spike
MSD	matrix spike duplicate
NA	not applicable

NELAP	National Environmental Laboratory Accreditation Program
PQO	project quality objective
QA	quality assurance
QC	quality control
RPD	relative percent difference
SAP	Sampling and Analysis Plan
SOP	standard operating procedure
TDS	total dissolved solids
TKN	total Kjeldahl nitrogen
TSS	total suspended solids
USEPA	United States Environmental Protection Agency
USDA	United States Department of Agriculture

1.0 INTRODUCTION

This Sampling and Analysis Plan (SAP) presents the sampling approach, rationale, laboratory analyses, and field procedures for leachate monitoring at the Ordot Dump, Ordot/Chalan Pago, Guam. The SAP will guide the technical and quality aspects of the field, laboratory, and reporting activities. The work will be performed by EA Engineering, Science, and Technology, Inc., PBC (EA) on behalf of the Receiver, Gershman, Brickner, & Bratton, Inc. (GBB) for the Guam Solid Waste Authority (GSWA) in accordance with the requirements under the Consent Decree Order (U.S. District Court of Guam, Civil Case No. 02 00022).

The project scope of work consists of the following tasks:

- Collecting leachate samples and associated quality control (QC) samples from the leachate tank(s).
- Analyzing the leachate samples for the identified parameters of concern.
- Performing assessment of the collected data and data management and validation.
- Preparing quarterly monitoring memoranda to report leachate sample results at the Ordot Dump.

1.1 Site Location

The site is located near the central village of Ordot/Chalan Pago, Guam off Dero Drive (Figure 1).

1.2 Project Organization

The project organizational chart (Figure 2) presents the project personnel and their responsibilities related to the implementation of field activities described in this SAP.

1.3 Project Schedule

The anticipated schedule for tasks associated with Ordot leachate monitoring is shown in Table 1.

Table 1. Monitoring Program Timeline

Task	Anticipated Date of Initiation	Anticipated Date of Completion	Deliverable
Project Award and Notice to Proceed	March 25, 2015	March 25, 2016	--
SAP	March 26, 2015	April 13, 2015	SAP
Leachate Monitoring (1st Quarter)	*April 2015	May 2015	Quarterly Technical Memoranda
Leachate Monitoring (2nd Quarter)	June 2015	July 2015	Quarterly Technical Memoranda
Leachate Monitoring (3rd Quarter)	September 2015	October 2015	Quarterly Technical Memoranda
Leachate Monitoring (4th Quarter)	November 2015	December 2015	Quarterly Technical Memoranda
Water quality database data entry	April 2015	December 2015	Final water quality database

* First Quarter sample will be taken in April (contract awarded March 25, 2015).

2.0 BACKGROUND INFORMATION

The following section presents background information including a site description and operational history.

2.1 Site Area Description

The subject site is located off of Dero Drive in Ordot/Chalan Pago, Guam. The Ordot Dump was established in a ravine that slopes steeply to the Lonfit River. The Ordot Dump's footprint is now sitting at a higher elevation than when it first opened.

The Ordot dump is currently undergoing construction activities to cap the dump. Underground pipes were installed to collect leachate from the bottom of the slopes of the dump and deliver it to the three leachate collection tanks located to the south of the dump. From the leachate tanks the leachate will be sent to the Guam Waterworks Authority (GWA) waste water pump station along Dero Drive and from there will be pumped to the Hagatna Wastewater Treatment Plant.

2.2 Site Operational History

The site has been designated as Guam's primary dumping site for industrial and municipal waste since the 1940s. The site was operated by the Government of Guam through the Guam Department of Public Works until a court ordered Consent Decree Order was put in place to close the dump. The Ordot Dump was closed on August 31, 2011.

2.3 Physical Setting

General Geology - Guam consists of two geologically distinct areas. Northern Guam is comprised of undulating limestone plateau and southern Guam is volcanic highland with some limestone outliers. A major northwest-southeast trending fault is located north of the site. This fault is believed to divide these two geologically distinct areas.

Topography - The topography of the site has been disturbed as a result of landfill development. The site is located in a basin between two ridges in a volcanic upland region in central Guam at an elevation of approximately 200 feet above mean sea level. The slopes of the site are steep to very steep.

Soils - The site is underlain by a few feet of very fine-grained volcanic sediments with high clay content. Review of the United States Department of Agriculture (USDA) Soil Survey of Guam, dated 1988, indicates that the subject site is located in an area of the Agfayan clay, Akina silty clay, and the Akina-Urban land complex soil series (USDA 1988).

Agfayan clay

This is very shallow and well-drained soil with 15 to 30 percent slopes on volcanic uplands. It formed in residuum derived dominantly from marine-deposited tuffaceous sandstone. Slopes are long and plane. The vegetation is mainly grasses and forbs. Some areas are forested. Permeability of this Agfayan soil is moderately slow.

Akina silty clay

This is very deep, well-drained soil with 7 to 30 percent slopes on volcanic uplands. It formed in residuum derived dominantly from tuff and tuff breccia. Slopes are long and plane. The vegetation is mainly grasses and forbs. Some areas are forested. Permeability of this Akina soil is moderately slow.

Akina-Urban land complex

This unit has 0 to 7 percent slopes on volcanic uplands. Most areas have been disturbed by land shaping for urban development. Many areas are covered by roads, buildings, and parking lots. This unit is about 60 percent Akina silty clay and 30 percent Urban land. The components of this unit are so intricately intermingled that it was not practical to map them separately.

Surface Water

The Lonfit River is a surface water feature near the subject site. The Lonfit River flows from west to east to the south of the dump. The Lonfit River flows into the Pago River, which flows to the south and east into Pago Bay.

3.0 PROJECT DATA QUALITY OBJECTIVES

An integral part of the SAP is the formulation of the project quality objectives (PQOs). The PQOs incorporate the elements of the United States Environmental Protection Agency (USEPA) data quality objectives (DQO) process, which in turn consists of a series of seven planning steps that are designated to ensure the type, quantity, and quality of the environmental data used in the decision making are appropriate for their intended application. The DQO process is outlined in the guidance document entitled "Guidance on Systematic Planning Using the Data Quality Objectives Process" (USEPA 2006).

The PQOs for this site are defined by covering the following elements: (1) who will use the data, (2) what are the project action limits, (3) what will the data be used for, (4) what type and matrix of data are needed, (5) how "good" the data need to be in order to support the environmental decision, (6) how much data are needed, (7) where, when, and how should the data be collected/generated, (8) who will collect and generate the data, (9) how will the data be reported, and (10) how will the data be archived.

DQOs have been selected for this project based on the expected data usage and are designed to ensure that accurate, precise, representative, and complete data are collected throughout the monitoring program. The analyses will be performed using procedures outlined in 40 Code of Federal Regulations 136. The DQOs are summarized in Table 2.

Table 2. Ordot Leachate Monitoring Quality Control Limits

Constituents	Method	Laboratory	Reporting Limit	Accuracy Limits (%R)	Precision Limits (RPD)
Inorganic Parameters					
Alkalinity (mg/L)	SM2320B	Accutest	5.0	NA	25
Biochemical Oxygen Demand (BOD) (mg/L)	SM5210B	FQ Labs	2.0	75 – 125	20
Carbonaceous Biochemical Oxygen Demand (cBOD) (mg/L)	SM5210B	FQ Labs	2.0	75 – 125	20
Chemical Oxygen Demand (COD) (mg/L)	Hach Method 8000	Accutest	10	90 – 110	25
Chloride (mg/L)	E300.0	Accutest	0.50	90 – 110	25
Cyanide (total) (mg/L)	SM4500-CN B,C,E	Accutest	0.010	85 – 115	20
Dissolved Oxygen (DO) (mg/L)	Field meter	Field	0.010	NA	20
Fluoride (mg/L)	SW9214	Accutest	0.10	80 – 120	20
Orthophosphate as Phosphorus (mg/L)	SM4500-P E	WERI	0.010	75 – 125	20
Ammonia as Nitrogen (mg/L)	SM4500-NH3 B,D,E	Accutest	1.0	80 – 120	25

Table 2. Ordot Leachate Monitoring Quality Control Limits

Constituents	Method	Laboratory	Reporting Limit	Accuracy Limits (%R)	Precision Limits (RPD)
Nitrate and Nitrite as Nitrogen (mg/L)	SM4500-NO3 E	Accutest	0.10	85 – 115	25
Total Kjeldahl Nitrogen (TKN) (mg/L)	SM4500-Norg C NH3 D/E	Accutest	0.20	75 – 125	25
pH (units)	Field meter	Field	0.010	NA	20
Total Dissolved Solids (TDS)	SM2540C	Accutest	10	75 – 125	25
Total Suspended Solids (TSS)	SM2540D	Accutest	5.0	NA	25
Specific Conductance (mS/cm)	Field meter	Field	0.10	NA	20
Sulfate	E300.0	Accutest	0.50	90 – 110	25
Sulfide	SM4500 S^2-D	Accutest	0.020	80 – 120	20
Temperature (Degrees Celsius)	Field meter	Field	0.10	NA	20
Total Organic Carbon	SM5310C	Accutest	1.0	75 – 125	25
Turbidity (NTU)	Field meter	Field	0.1	NA	20
Metals (µg/L)					
Aluminum	E200.8	Accutest	50	80 – 120	20
Antimony	E200.8	Accutest	0.50	80 – 120	20
Arsenic	E200.8	Accutest	1.0	80 – 120	20
Barium	E200.8	Accutest	1.0	80 ─ 120	20
Beryllium	E200.8	Accutest	0.50	80 ─ 120	20
Cadmium	E200.8	Accutest	0.50	80 ─ 120	20
Chromium (total)	E200.8	Accutest	4.0	80 ─ 120	20
Cobalt	E200.8	Accutest	0.50	80 ─ 120	20
Copper	E200.8	Accutest	4.0	80 – 120	20
Iron	E200.7	Accutest	200	85 – 115	20
Lead	E200.8	Accutest	0.50	80 – 120	20
Manganese	E200.7	Accutest	15	85 – 115	20
Mercury	E245.1	Accutest	0.20	85 – 115	20
Molybdenum	E200.8	Accutest	1.0	80 ─ 120	20
Nickel	E200.8	Accutest	4.0	80 ─ 120	20
Selenium	E200.8	Accutest	1.0	80 ─ 120	20
Silver	E200.8	Accutest	2.0	80 ─ 120	20
Thallium	E200.8	Accutest	0.50	80 ─ 120	20

Table 2. Ordot Leachate Monitoring Quality Control Limits

Constituents	Method	Laboratory	Reporting Limit	Accuracy Limits (%R)	Precision Limits (RPD)
Vanadium	E200.8	Accutest	4.0	80 – 120	20
Zinc	E200.8	Accutest	4.0	80 – 120	20
Organic Chemicals (µg/L)					
Volatile Organic Compounds (µg/L)					
Acetone	E624	Accutest	20	38 – 159	24
Acrolein	E624	Accutest	10	10 – 192	33
Acrylonitrile	E624	Accutest	5.0	69 – 139	20
Benzene	E624	Accutest	1.0	77 – 122	16
Bromodichloromethane	E624	Accutest	1.0	75 – 127	16
Bromoform	E624	Accutest	1.0	69 – 141	17
Carbon disulfide	E624	Accutest	1.0	56 – 137	19
Carbon tetrachloride	E624	Accutest	1.0	71 – 133	19
Chlorobenzene	E624	Accutest	1.0	77 – 122	16
Chlorodibromomethane	E624	Accutest	1.0	75 – 127	16
Chloroethane	E624	Accutest	1.0	69 – 133	18
2-Chloroethyl vinyl ether	E624	Accutest	5.0	51 – 144	22
Chloroform	E624	Accutest	1.0	74 – 126	17
1,2-Dibromo-3-chloropropane	E624	Accutest	2.0	65 – 131	20
1,2-Dibomoethane	E624	Accutest	1.0	75 – 135	17
Dichlorobromomethane	E624	Accutest	1.0	76 – 132	16
trans-1,4-Dichloro-2-butene	E624	Accutest	5.0	60 – 146	20
1,1-Dichloroethane	E624	Accutest	1.0	71 – 125	17
1,2-Dichloroethane	E624	Accutest	1.0	71 – 131	17
1,1-Dichloroethene	E624	Accutest	1.0	66 – 125	20
cis-1,2-Dichloroethene	E624	Accutest	1.0	73 – 126	17

Table 2. Ordot Leachate Monitoring Quality Control Limits

Constituents	Method	Laboratory	Reporting Limit	Accuracy Limits (%R)	Precision Limits (RPD)
1,2-Dichloropropane	E624	Accutest	1.0	78 – 124	17
cis-1,3-Dichloropropene	E624	Accutest	2.0	70 – 130	20
trans-1,3-Dichloropropene	E624	Accutest	1.0	71 – 126	16
Ethylbenzene	E624	Accutest	1.0	76 – 126	17
2-Hexanone	E624	Accutest	10	67 – 150	22
Methyl bromide (Bromomethane)	E624	Accutest	2.0	68 – 132	18
Methyl chloride (Chloromethane)	E624	Accutest	1.0	39 – 150	28
Methylene chloride	E624	Accutest	10	67 – 128	18
Methyl ethyl ketone	E624	Accutest	10	56 – 155	23
Methyl iodide	E624	Accutest	2.0	67 – 131	18
4-Methyl-2-pentanone	E624	Accutest	10	71 – 142	21
Styrene	E624	Accutest	1.0	72 – 134	16
1,1,1,2-Tetrachloroethane	E624	Accutest	1.0	77 – 130	16
1,1,2,2-Tetrachloroethane	E624	Accutest	1.0	77 – 129	17
Tetrachloroethene	E624	Accutest	1.0	69 – 127	20
Toluene	E624	Accutest	1.0	75 – 122	17
1,2-trans-Dichloroethene	E624	Accutest	1.0	71 – 126	18
1,1,1-Trichloroethane	E624	Accutest	1.0	74 – 128	19
1,1,2-Trichloroethane	E624	Accutest	1.0	77 – 125	16
Trichloroethene	E624	Accutest	1.0	78 -123	17
Trichlorofluoromethane	E624	Accutest	1.0	65 – 136	23
1,2,3-Trichloropropane	E624	Accutest	2.0	69 – 126	18
Vinyl acetate	E624	Accutest	5.0	64 – 145	18
Vinyl chloride	E624	Accutest	1.0	57 – 146	22
Xylenes (total)	E624	Accutest	2.0	77 – 125	17
Semivolatile Organic Compounds (µg/L)					

Table 2. Ordot Leachate Monitoring Quality Control Limits

Constituents	Method	Laboratory	Reporting Limit	Accuracy Limits (%R)	Precision Limits (RPD)
2-Chlorophenol	E625	Accutest	5.0	61 – 96	17
2,4-Dichlorophenol	E625	Accutest	5.0	68 – 105	15
2,4-Dimethylphenol	E625	Accutest	5.0	61 – 97	23
2-Methyl-4,6-dintrophenol	E625	Accutest	10	38 – 97	27
2,4-Dinitrophenol	E625	Accutest	20	10 – 135	44
2-Nitrophenol	E625	Accutest	5.0	67 – 108	27
4-Nitrophenol	E625	Accutest	10	17 – 52	27
3-Methyl-4-chlorophenol	E625	Accutest	5.0	66 – 103	18
Pentachlorophenol	E625	Accutest	10	47 – 131	32
Phenol	E625	Accutest	5.0	18 – 59	19
2,4,6-Trichlorophenol	E625	Accutest	5.0	64 – 107	22
Acenaphthene	E625	Accutest	5.0	68 – 105	26
Acenaphthylene	E625	Accutest	5.0	68 – 110	26
Anthracene	E625	Accutest	5.0	71 – 109	14
Benzidine	E625	Accutest	20	32 – 125	39
Benzo(a)anthracene	E625	Accutest	5.0	76 – 118	26
Benzo(a)pyrene	E625	Accutest	5.0	77 – 112	26
Benzo(b)fluoranthene	E625	Accutest	5.0	73 – 117	18
Benzo(g,h,i)perylene	E625	Accutest	5.0	60 – 129	28
Benzo(k)fluoranthene	E625	Accutest	5.0	78 – 121	27
bis(2-Chloroethoxy)methane	E625	Accutest	5.0	70 – 106	27
bis(2-Chloroethyl)ether	E625	Accutest	5.0	57 – 109	20
bis(2-Chloroisopropyl)ether	E625	Accutest	5.0	65 – 108	29
bis(2-Ethylhexyl)phthalate	E625	Accutest	10	69 – 127	26
4-Bromophenyl phenyl ether	E625	Accutest	5.0	67 – 108	26
Butylbenzyl phthalate	E625	Accutest	5.0	72 – 115	26
2-Chloronaphthalene	E625	Accutest	5.0	68 – 103	27
4-Chlorophenyl phenyl ether	E625	Accutest	5.0	67 – 108	16
Chrysene	E625	Accutest	5.0	75 – 123	25
Dibenzo(a,h)anthracene	E625	Accutest	5.0	64 – 125	27

Table 2. Ordot Leachate Monitoring Quality Control Limits

Constituents	Method	Laboratory	Reporting Limit	Accuracy Limits (%R)	Precision Limits (RPD)
1,2–Dichlorobenzene	E625	Accutest	5.0	55 – 97	28
1,3-Dichlorobenzene	E625	Accutest	5.0	53 – 94	30
1,4-Dichlorobenzene	E625	Accutest	5.0	54 – 96	29
3,3'-Dichlorobenzidine	E625	Accutest	10	66 – 121	27
Diethylphthalate	E625	Accutest	5.0	46 – 109	27
Dimethylphthalate	E625	Accutest	5.0	25 – 107	34
di-n-Butylphthalate	E625	Accutest	5.0	63 – 107	27
2,4-Dinitrotoluene	E625	Accutest	5.0	67 – 113	26
2,6-Dinitrotoluene	E625	Accutest	5.0	68 – 112	18
di-n-Octyl phthalate	E625	Accutest	5.0	60 – 125	23
Fluoranthene	E625	Accutest	5.0	72 – 114	28
Fluorene	E625	Accutest	5.0	69 – 108	16
Hexachlorobenzene	E625	Accutest	5.0	67 – 109	26
Hexachlorobutadiene	E625	Accutest	5.0	66 – 110	29
Hexachlorocyclopentadiene	E625	Accutest	5.0	23 – 104	29
Hexachloroethane	E625	Accutest	5.0	51 – 97	29
Indeno(1,2,3-cd)pyrene	E625	Accutest	5.0	62 – 105	28
Isophorone	E625	Accutest	5.0	66 – 105	16
Naphthalene	E625	Accutest	5.0	61 – 114	27
Nitrobenzene	E625	Accutest	5.0	58 – 103	28
Nitroso-N-dimethylamine	E625	Accutest	5.0	44 – 68	27
N-Nitrosodi-n-propylamine	E625	Accutest	5.0	67 – 106	27
Nitroso-N-diphenylamine	E625	Accutest	5.0	68 – 110	26
Phenanthrene	E625	Accutest	5.0	71 – 111	26
Pyrene	E625	Accutest	5.0	64 – 121	28
1,2,4-Trichlorobenzene	E625	Accutest	5.0	64 – 100	29
Organochlorine Pesticides (µg/L)					
Aldrin	EPA 608	Accutest	0.010	40 – 110	22
alpha-BHC	EPA 608	Accutest	0.010	37 – 117	23
beta-BHC	EPA 608	Accutest	0.010	43 – 113	23

Table 2. Ordot Leachate Monitoring Quality Control Limits

Constituents	Method	Laboratory	Reporting Limit	Accuracy Limits (%R)	Precision Limits (RPD)
gamma-BHC	EPA 608	Accutest	0.010	43 – 117	22
delta-BHC	EPA 608	Accutest	0.010	38 – 128	23
Chlordane (total)	EPA 608	Accutest	0.10	60 – 130	20
4,4’-DDT	EPA 608	Accutest	0.010	54 – 117	17
4,4’-DDE	EPA 608	Accutest	0.010	56 – 115	19
4,4’-DDD	EPA 608	Accutest	0.010	63 – 116	17
Dieldrin	EPA 608	Accutest	0.010	52 – 115	17
alpha-Endosulfan	EPA 608	Accutest	0.010	49 – 113	17
beta-Endosulfan	EPA 608	Accutest	0.010	58 – 117	17
Endosulfan sulfate	EPA 608	Accutest	0.010	57 – 130	20
Endrin	EPA 608	Accutest	0.010	58 – 128	17
Endrin aldehyde	EPA 608	Accutest	0.010	51 – 114	22
Heptachlor	EPA 608	Accutest	0.010	58 – 119	18
Heptachlor epoxide	EPA 608	Accutest	0.010	53 – 113	16
Toxaphene	EPA 608	Accutest	0.20	67 – 133	20
Polychlorinated Biphenyls as Aroclors (µg/L)					
Aroclor 1221	E608	Accutest	0.10	40 – 140	20
Aroclor 1232	E608	Accutest	0.1	NA	NA
Aroclor 1242	E608	Accutest	0.1	NA	NA
Aroclor 1248	E608	Accutest	0.1	NA	NA
Aroclor 1254	E608	Accutest	0.1	NA	NA
Aroclor 1260	E608	Accutest	0.1	50 – 121	20

µg/L – microgram(s) per liter

mS/cm – milliSiemens per centimeter

mg/L – milligram(s) per liter

NA – not applicable

NTU – Nephelometric turbidity units

RPD – relative percent difference

TKN - Total Kjeldahl Nitrogen

3.1 Data Users

The data users will include the receiver, regulatory authorities including Guam Environmental

Protection Agency (Guam EPA) and USEPA Region 9.

3.2 Specify Limits on Decision Error

This section evaluates the consequences of making incorrect decisions and considerations and/or actions taken to mitigate decision error.

Total study error potential is equally attributable to sampling and measurement error because of the steps and sample volume associated with the planned sample collection and analysis. Successfully managing the magnitude of total study error is the result of understanding the error sources, generating an appropriate sampling design, and choosing accurate measurement techniques. The planned approach includes collection of leachate as representative grab samples. The sources of decision error for these results are equally attributable to sampling or measurement error. This conclusion is based upon review of the sampling and analysis strategy. The sampling design is straightforward and does not include multiple locations, and the analysis will be performed using the services of a National Environmental Laboratory Accreditation Program (NELAP)-accredited laboratory using standardized analytical methods.

The quality of sampling and analysis will be maintained at a level that generates representative, precise, and reproducible data. The data generated will be sufficient for the intended use. “Good” data will be defined as data that are produced following the specified standard operating procedures (SOPs) and meeting the established criteria in this SAP, including precision, accuracy, comparability, representativeness, completeness, and sensitivity.

The analytical data that are not qualified, or are qualified but not rejected (not R-flagged data) are deemed acceptable for project use. The project data will be assessed by the Project Chemist.

3.3 Summary of Data Quality Indicators

Precision, accuracy, representativeness, comparability, completeness, and sensitivity are the data quality indicators used to assess the data produced during the project. Each data quality indicator is described below, including a definition of the terminology and the referenced process for calculating the indicator.

3.3.1 Precision

Precision describes how well repeated measurements agree. Precision is typically evaluated by comparing analytical results from duplicate (also called replicate) samples and calculating the RPD, where RPD is defined as:

$$RPD = \left(\frac{|C_1 - C_2|}{\left(\frac{C_1 + C_2}{2} \right)} \right) \times 100$$

, where C_1 and C_2 are the analytical results for both duplicates

Precision will be measured using both field and laboratory duplicates in addition to duplicate laboratory control spikes.

3.3.2 Accuracy

Accuracy describes how close an analytical measurement is to its true value. Accuracy is typically measured by analyzing a sample of known concentration (prepared using analytical-grade standards) and comparing the analytical result with the known concentration. Accuracy objectives for all constituents are summarized in Table 2.

3.3.3 Representativeness

The representativeness of the data is mainly dependent on the sampling location (spatial), sampling frequency (temporal), sample collection procedures, and analytical constituents and methods. The sampling approach has been developed to ensure that the data collected during this project are representative to the extent possible.

Leachate samples will be collected manually as grab samples. Leachate quality is not expected to change significantly on a quarterly basis, except as a result of rainfall. The leachate will be recirculated into its storage vessel for 5 minutes prior to sample collection to ensure the leachate is well mixed.

3.3.4 Comparability

Comparability evaluates whether the reported data are comparable with similar data reported by other organizations. The use of approved analytical methods and certified laboratories will provide some level of comparability. Evaluation of performance evaluation samples is another measure of comparability. Certified laboratories are required to analyze performance evaluation samples on a regular basis to evaluate the comparability of their reported results.

3.3.5 Quality Control Limits

The QC limits for precision and accuracy are provided in Table 2. These limits will be used to qualify data and alert the data users of any identified bias or uncertainty in results. Laboratories will follow method criteria and the laboratory’s quality assurance (QA)/QC manual and procedures for corrective action during sample analysis. Laboratories shall report detection limits based on current statistical detection limit studies and reporting limits based on the low standards in their calibration curves. Laboratory reporting limits should not exceed the maximum allowable reporting limits provided in Table 2. Proposed analytical methods shall be used unless written approval for alternative methods is given.

3.3.6 Completeness

Completeness, which is expressed as a percentage, is calculated by subtracting the number of rejected and unreported results from the total planned results and dividing by the total number of planned results. Estimated results do not count against completeness because they are considered usable as long as any limitations are identified. Results rejected because of out-of-control analytical conditions, severe matrix effects, broken or spilled samples, or samples that could not be analyzed for any other reason are subtracted from the total planned number of results to calculate completeness. Though regulations currently do not require a specific percentage of data completeness, it is expected that the measurement techniques selected for use in this project are capable of generating data that is of 90 percent completeness for field and laboratory analyses.

3.4 Training and Certification

The field personnel that participate in sampling will review the SAP for this project, and will be instructed by the Project Manager, QC procedures will be reviewed prior to the beginning of the program and semi-annually thereafter through QC sessions. Field personnel will have been trained prior to the first sampling event in sample collection procedures (including QA/QC, grab sampling techniques, completing laboratory chain-of-custody forms, and proper handling of water samples), and field analysis (including instrument calibration, data recording procedures, and interpretation of collected data).

4.0 SAMPLING RATIONALE

Proper sample collection procedures are essential to ensure that representative and reliable data are being collected. Sample collection will be performed according to the EA SOPs (Appendix A).

In general, the procedures that will be followed during sample collection include the following:

- All samples will be collected from the middle leachate tank (three tanks total) (Figure 1). A hatch located at the top of the tank will be used to access the tank for sampling activities. The tank level will be recorded in feet and inches (to the nearest one inch).

- A grab sample will be collected using a hand bailer or equivalent sampling device to obtain leachate through the top hatch. The sample should be collected from the approximate midpoint of the tanks liquid level. Field measurements will be collected using a portable water quality meter as described in Section 5.0.

- QA/QC samples collected during each sampling event include a blind field duplicate sample, aliquots for the preparation of matrix spike/matrix spike duplicate samples, and a trip blank to be included in the cooler containing aliquots for volatile analysis. Analytical parameters are listed in Table 2.

- Grab samples will be transferred to or placed directly into the sample bottles carefully to minimize exposure to external influences such as wind, dust, or rain. Sample containers will be closed as soon as they are filled, chilled to less than or equal to 6 degrees Celsius (°C) and processed for shipment to the laboratory.

- Sample bottles will be labeled (e.g., date, time, location, method) immediately after collection.

- Sampling date and time and sampler's initials will be added to the chain-of-custody record immediately after sampling.

- Chain-of-custody forms will be generated and sent with the sample bottles to the laboratory. Once the laboratory receives the bottles, they will cross-check them against the chain-of-custody form to identify any discrepancies.

- Loose items should be removed prior to collecting the sample to avoid materials from falling into the tank. If an item falls into the tank the construction Site Superintend will be contacted and informed immediately.

- If problems occur during sampling, the Project Manager will be notified. The source of the problem will be identified and the appropriate corrective action taken. These incidents will be documented in the project folder and filed with the appropriate data package. If the problem compromised the quality of collected data, the data will be flagged within the database.

- The method holding times for BOD, cBOD, and orthophosphate are 48 hours from time of sample collection until analysis. FQ Labs in Honolulu, Hawaii will analyze the water samples for BOD and cBOD to allow compliance with the method-specified holding times. Water Environmental Research Institute of the Western Pacific (WERI) in Guam will analyze the water samples for orthophosphate to meet the method-specified holding time. Accutest laboratories will analyze the remainder of the analytes listed in Table 2.

5.0 REQUEST FOR ANALYSES

The following section describes the preparation and analysis that will be performed on the leachate samples to be collected at the Ordot Dump.

Field measurements will be conducted by EA staff using a portable water quality meter. Field measurements will be taken using the procedures recommended by the manufacturer of the meter, where applicable. Results of the field measurements will be recorded on a field data sheet, included as Appendix B.

The following parameters will be measured in the field using a water quality instrument:

- Dissolved oxygen (DO)
- pH
- Salinity
- Specific conductance
- Temperature
- Turbidity.

Analyses will be conducted by laboratories located in California, Hawaii, and Guam using standardized methodology as presented in Table 2. Major laboratory equipment or instruments that will be utilized include gas chromatography/mass spectrometry (GC/MS), inductively-coupled plasma mass spectrometry (ICP-MS), high performance liquid chromatography, automated colorimetry, ion chromatography, and a carbon detector. If instrument failures occur, the laboratory will take immediate corrective action and notify the QA Officer if the quality of sample results was compromised.

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6.0 FIELD METHODS AND PROCEDURES

The following section describes the methods and procedures to be used during field collection.

6.1 Field Equipment

The field measurement equipment that will be used during this project includes a Horiba water quality meter. This meter is capable of measuring pH, temperature, specific conductance, salinity, turbidity, and DO. The meter will be calibrated as specified by the manufacturer prior to each sampling event and sampling parameters will be checked against standards after each sampling event.

6.1.1 Field Monitoring Equipment Inspection and Preventative Maintenance

Inspection and preventive maintenance will be performed for field equipment in accordance with the manufacturer's specifications prior to each sampling event. This includes battery checks, routine replacement of membranes, and cleaning of conductivity electrodes, among other tasks. Equipment will be re-inspected after each sampling event. If problems occur and/or repair is needed during the sampling event, the field data sheet will be used to document the corrective action taken. If significant damage or equipment malfunctions are noted, the instrument will be sent to the manufacturer for immediate repair. A maintenance/calibration log will be kept by the Project Manager or other designee, which details the dates of instrument and sampling gear inspection, calibrations performed in the lab or field, battery replacement, dates reagents and standards are replaced, and any problems noted with instruments, samplers, or reagents. The logbook will also be used to document corrective action that was taken if equipment deficiencies were noted during an inspection.

6.1.2 Instrument/Equipment Calibration and Frequency

Field instruments will be calibrated according to the schedule presented in Table 3. Standards will be purchased from a chemical supply company or prepared by (or with the assistance of) a professional laboratory. Calibration records will be kept in the maintenance/calibration log at the EA office where it can be easily accessed before and after equipment use. Calibrations that are performed by personnel in the field may also be recorded on the field data sheets to indicate which samples were analyzed pre- and post-calibration for the specific sampling event. If calibration is not successful or other issues pertaining to calibration arise, the equipment manufacturer will be contacted to determine the appropriate corrective action; the problem and corrective action will be documented in the maintenance/calibration logbook.

Table 3. Field Instrument Calibration and Frequency

Parameter	Calibration Frequency	Standard or Calibration Instrument Used
Dissolved oxygen (DO)	Every sampling day	Auto calibration solution buffer
Specific conductance	Every sampling day	Auto calibration solution buffer
Turbidity	Every sampling day	Auto calibration solution buffer
pH	Every sampling day	Auto calibration solution buffer

6.2 Field Sample Collection

The requirements for field sample collection are described below.

- Leachate liquid will be collected as a grab sample using hand bailer or equivalent sampling device. The sample should be collected from the approximate midpoint of the tanks liquid level.

- QA/QC samples collected during each sampling event include a blind field duplicate sample, aliquots for the preparation of matrix spike/matrix spike duplicate samples, and a trip blank to be included in the cooler containing aliquots for volatile analysis. Analytical parameters are listed in Table 2.

- Grab samples will be transferred to or placed directly into the sample bottles. Sample containers will be closed as soon as they are filled, chilled to less than or equal to 6ºC and processed for shipment to the laboratories.

- Sample bottles will be labeled immediately after collection.

- Sampling date and time and sampler’s initials will be added to the chain-of-custody form immediately after sampling.

- If problems occur during sampling, the Project Manager will be notified. The source of the problem will be identified and the appropriate corrective action taken.

7.0 SAMPLE CONTAINERS, PRESERVATION, AND STORAGE

Once sample containers have been filled they will be capped, labeled, placed in re-sealable plastic bags (e.g. Ziploc®), and stored in a cooler on ice to maintain a temperature of ≤6ºC. The identification information for each sample will be recorded on a field data sheet (Appendix B) when the sample is collected. A chain-of-custody form will be completed at the time of sample collection and prior to sample shipment or release. The samples will be transported or shipped to the analytical laboratory in insulated containers within the appropriate holding time and will be accompanied by a chain-of-custody form that identifies the sample bottles, date and time of sample collection, and analyses requested. If shipment is needed, the samples will be packaged and shipped in accordance with U.S. Department of Transportation (DOT) standards. The original chain-of-custody form will be given to the laboratory with the samples and EA will retain a copy for their records. Once received by the laboratory, a sample receipt and storage record will be generated.

The recommended sample container type and volume, initial preservative, and holding time for analytes that may be tested is shown in Table 4. The turn-around time for analytical results from the laboratory will typically be 10 working days from the date of laboratory receipt. After analyses are completed, samples will be disposed of in accordance with Federal, territorial, state, and local requirements.

Table 4. Sample Handling Requirements

Parameter	Container[a]	Volume[b]	Initial Preservative	Holding Time
cBOD	high-density polyethylene (HDPE), glass	1000 mL	Cool ≤ 6 degrees Celsius (°C)	48 hours
COD	HDPE	100 mL[c]	Cool ≤6°C H_2SO_4 to pH<2	28 days
Ammonia-Nitrogen	HDPE	500 mL[c]	Cool ≤6°C H_2SO_4 to pH<2	28 days
TKN	HDPE	500 mL[c]	Cool ≤6°C H_2SO_4 to pH<2	28 days
TSS	HDPE	500 mL	Cool ≤6°C	7 days
Nitrate and Nitrite-Nitrogen	HDPE	200 mL	Cool ≤6°C	48 hours
Orthophosphate	HDPE	100 mL	Cool <6°C	48 hours
Alkalinity	HDPE	200 mL	Cool <6°C	14 days
Chloride	1-L HDPE	50 mL	none	28 days
Metals	HDPE	1000 mL	HNO_3 to pH<2	6 months
Mercury				28 days

Parameter	Container[a]	Volume[b]	Initial Preservative	Holding Time
Volatile Organics	glass, PTFE-lined septum cap	(3) 40 mL	Cool $\leq$6°C HCl to pH<2	14 days
Semivolatile Organics	glass, amber PTFE-lined cap	1000 mL	Cool $\leq$6°C	7 days
Polychlorinated Biphenyls as Aroclors	amber glass, PTFE-lined cap	1000 mL	Cool $\leq$6°C	7 days
Pesticides	amber glass, PTFE-lined cap	1000 mL	Cool $\leq$6°C	7 days

[a] Sample containers, volumes, and preservatives will be reevaluated and may be changed based on recommendations from the lab(s).

[c] Phosphorus, TKN, COD, nitrate/nitrite, and ammonia-nitrogen can be analyzed from the same sample container.

HCl – hydrochloric acid.

HNO_3 – nitric acid.

H_2SO_4 – sulfuric acid.

L – liter.

mL – milliliter.

PTFE - Polytetrafluoroethylene

8.0 SAMPLE DOCUMENTATION AND SHIPMENT

8.1 Field Notes

This section discusses required recordkeeping in the field, which will consist of the use of field logbooks, photographs, and pre-printed form.

8.1.1 Field Logbooks

The information recorded in field logbooks will document sample locations, sampling dates, sampling procedures, and names of field personnel responsible for conducting the sampling activities (EA SOP No. 59, *Field Logbook*; Appendix A). Logbook entries will also include descriptions of the field activities. Logbooks will be bound with consecutively numbered pages. Each page will be dated and the time of entry will be noted in military time. The entries will be legible, written in ink, and signed by the individual making the entries. Language will be factual, objective, and free of personal opinions.

At a minimum, the following information will be recorded, as appropriate, during sampling activities:

- Time of arrival/entry on site and time of departure
- Other personnel on site
- A brief summary of meetings or discussions with any potentially responsible parties, or representatives of any federal, state, or other regulatory agency
- Deviations from sampling plans, safety plans, and QA procedures
- Sample location and description
- Sampler’s name
- Date and time of sample collection
- Designation of sample
- Type of sample (matrix)
- Field observations and details important for laboratory analysis or integrity of samples (e.g., sample color, rain, odors, etc.).

8.1.2 Photographs

Photographs will be taken at the representative sample location and at other areas of interest on site, as appropriate.

8.2 Sample Custody and Documentation

Sampling information will be recorded on a chain-of-custody record and in a permanently bound field logbook. The entries will be legible and recorded in indelible ink. The requirements presented in EA SOP No. 002, *Chain-of-Custody Form* will be followed for completing the chain-of-custody record (Appendix A).

8.3 Sample Identification Protocol

A sample identification (ID) system has been developed to provide uniform classification and to assist project personnel in interpreting data reports and field notes. Sample identification numbers will be affixed to each sample container and entered on the chain-of-custody record. All samples will be uniquely identified, labeled, and documented in the field at the time of collection. The sample identification protocol is provided in Table 5.

Table 5. Sample Identification Protocol

Sample	Sample Label[1]		
	Sample ID	Location[2]	Date Collected[3]
Leachate	LEA	1	031515

[1] Each sample label parameter will be separated by a dash. For example LEA-1-031515

[2] Only one sample will be collected from the leachate tank sample location

[3] The date shown is an example for March 15, 2015

For samples requiring multiple containers, a single sample number will apply to every container for that sample. The sample number along with the date and time of sample collection, and the type of sample collected, will be recorded in the field logbook, on the sample log sheet, and on the sample label affixed to every container, and entered on the chain-of-custody record.

8.4 Sample Packaging and Shipping

The laboratory will supply sample containers and appropriate preservation additives, if needed. On-site personnel will be responsible for ensuring that adequate sample containers are available for the work scheduled at the sample collection point. The sample containers will be bubble-wrapped (if needed), taped for shipping, and placed in coolers with ice and chilled to $\leq$6°C for transport to the laboratory after the appropriate labeling and chain-of-custody records are completed.

Environmental samples from this project will be packaged and shipped in a manner that will ensure the safety and accountability of each sample, and all procedures will be in accordance with applicable federal and local requirements. The persons packing and shipping environmental samples will review and be aware of state, federal, DOT, and International Air Transport Association regulations governing environmental sample packaging. The person(s) shipping the samples is responsible for being in compliance with applicable packaging, labeling, and shipping requirements.

8.5 Chain-of-Custody

Chain-of-custody documentation is required for each sample to track collection, shipment, laboratory receipt, custody, and disposal. The chain-of-custody record is preprinted with appropriate space for the applicable data to be entered.

Each individual who has the samples in their possession will sign the chain-of-custody record. A sample is considered to be in custody under the following conditions:

- It is in actual possession or in view of the person who collected the sample
- It is locked in a secure area
- It is placed in an area restricted to authorized personnel.

Each sample will be assigned a unique sample ID number, which will be entered on the chain-of-custody record. Samples to be transported to an off-site laboratory by a courier service will have the courier name and/or airbill number noted on the chain-of-custody record. As a final step, custody seals are attached to the front and back of the lid of the shipping container (cooler). The samples in the cooler are checked against the chain-of-custody record by laboratory personnel upon arrival at the laboratory. The samples in question will be segregated and field personnel will be immediately notified if discrepancies are noted. The person accepting the delivery will sign and date the chain-of-custody record.

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9.0 QUALITY CONTROL

This section details the QC samples that are to be collected to support the sampling activities. Field QA/QC is intended to provide an assessment of possible field contamination and assessment of field variability. The latter may include variability in sampling techniques and instrument variability. The laboratory used for analysis must be approved by Guam EPA. QC for laboratory analyses will be assessed using the results of both field-collected QC samples and laboratory-prepared QC samples, each of which is discussed below.

9.1 Trip Blanks

Trip blanks will be used to determine whether sample cross-contamination has occurred during sample transportation, delivery, and storage when collecting samples intended for volatile analysis. Trip blanks consist of pre-filled bottles of laboratory reagent water that are transported along with the collected samples in each cooler containing samples intended for volatiles analysis.

9.2 Field Replicates

Field duplicates (also called field replicates) will be collected at the same time and in the same manner as the primary water samples and will be used to assess the precision. Field duplicates will be collected and analyzed at a rate of at least 10 percent.

9.3 Other QC Samples

Other field-collected QC samples may be utilized as-needed throughout the program if analytical results indicate presence of QC error, such as high RPDs between field duplicates, or low precision of analytical results. These additional QC samples that may be used include the following:

9.3.1 Field Split

Field splits may be used occasionally to assess the precision of the selected laboratory’s analytical procedures and/or methods. A field split consists of a sample that is collected and split into two different samples, one of which is shipped to the normal lab for analysis, while the other is shipped to a different lab for similar analysis using either the same or different methods, depending on what information is desired   If split samples are analyzed using the same method, then results from both labs can be compared to assess the precision of the method, whereas if they are analyzed using different methods, results can be compared to assess the accuracy of the methods.

9.3.2 Ambient Blank

Ambient blanks may be used to assess the potential sample contamination that could occur during field sampling and sample processing. Ambient blanks consist of a pre-filled bottle of deionized or distilled water that is taken to the field, opened and exposed to the atmosphere and environment, preserved (if appropriate), and analyzed the same as the corresponding samples.

9.4 Laboratory-Prepared QC Samples

QC samples will be prepared and analyzed in the laboratories to evaluate precision, accuracy, and the potential for laboratory contamination. Descriptions of some of the laboratory-prepared QC samples that will be analyzed are included below. At a minimum, the frequency for analysis of matrix spikes (MS), duplicates, and blanks will meet method requirements.

9.4.1 Method Blanks

Method blanks (also called extraction blanks, procedural blanks, or preparation blanks) are used to assess laboratory contamination during all stages of sample preparation and analysis. Method blanks are prepared by the laboratory from reagent grade water and are processed through the entire analytical procedure in a manner identical to that of the samples. At a minimum, the laboratory should report method blanks at a frequency of one method blank for each batch of up to 20 samples. If the laboratory method blank indicates the presence of contamination, all impacted samples in the analytical batch should be flagged. Subtracting method blank results from sample results is not permitted.

9.4.2 Matrix Spike

MS samples will be used to evaluate the effect of the sample matrix on the recovery of the compound(s) of interest. To prepare a MS, a field sample is first homogenized and then split into two subsamples. One of the subsamples is fortified with the MS solution and one subsample is analyzed to provide a background concentration for each analyte of interest. Recovery is the accuracy of an analytical test measured against a known analyte addition to a sample, and is calculated as follows:

$$Recovery = \left(\frac{C_{matrix+spike} - C_{matrix}}{C_{spike(Exptected)}} \right) * 100 \quad \textit{Where C is the measured concentration}$$

Recovery data for the fortified compound ultimately will provide a basis for determining the accuracy of the measurement and the prevalence of matrix effects in the samples analyzed during the project. Analysis of matrix spike duplicates (MSDs) is also useful for assessing laboratory precision.

9.4.3 Laboratory Control Spike

Laboratory control samples (LCSs) are prepared by adding a known amount of target analyte(s) to reagent-grade water. When compared to the method blank, LCSs can be used to evaluate the accuracy (recovery) of the target analytes excluding any matrix effects.

9.4.4 Replicate Samples

Replicate (also called duplicate) samples are prepared by splitting a sample into two or more aliquots after delivery to the lab, but prior to sample preparation. Analysis of replicates is used to assess precision of an analytical method. Replicates that are typically utilized include:

- Laboratory replicates: These are replicates of the raw material that is extracted and analyzed in the same manner as the original sample to measure laboratory precision.
- MSD: These are used to assess both laboratory precision and accuracy within the sample matrix.
- Laboratory Control Sample Duplicate (LCSD): These are useful for assessing the accuracy and precision of the method, excluding matrix effects.

9.4.5 Internal Standards

Internal standards (IS) are used for organic analyses by GC/MS, some GC analyses, and some metals analyses using ICP/MS. An IS is an analyte included in each standard and added to each sample or extracted just before analysis. ISs should mimic the analytes of interest but not interfere with the analysis. ISs are used to monitor retention time, calculate relative response, and quantify the analytes of interest in each sample or extract.

9.4.6 Surrogates

Surrogates are compounds chosen to simulate the analytes of interest in organic analyses. Surrogates are used to estimate analyte losses during the extraction and cleanup process and must be added to each sample, including QA/QC samples, before extraction. The surrogate recovery data will be carefully monitored; each laboratory must report the percent recovery of the surrogate(s) along with the target analyte data for each sample. If possible, isotopically-labeled analogs of the analytes will be used as surrogates.

9.5 Laboratory Quality Control Requirements

The laboratories providing analytical support for this project will have the appropriate facilities to store, prepare, and process samples and appropriate instrumentation and staff to provide data of the required quality within the time period dictated by the project. Laboratories shall be able to provide information documenting their ability to conduct the analyses with the required level of data quality. Such information may include results from inter-laboratory performance evaluation studies, control charts, and summary data from internal QA/QC checks, and results from analyses of certified reference materials (CRM).

9.6 Assessing Data Quality Objectives

The QC samples described above will be used to evaluate the DQOs specified in Section 3.0. The following sections describe how the DQOs may be evaluated.

9.6.1 Accuracy

The accuracy of field chemical measurements will be checked daily by using standard solutions purchased from chemical or scientific supply companies. Field accuracy measurements will be recorded on a field data sheet.

The accuracy of laboratory measurements will be determined by recoveries of spiked samples (matrix and LCS) and/or through analysis of CRM, continuing calibration checks, or analysis of other similar standard solutions, the results of which will be summarized as part of each data package.

9.6.2 Precision

Precision will be evaluated in the field by conducting field measurements of all instrument parameters at least once during each sampling event. Field precision measurements will be recorded on a field data sheet. If the measurements do not fall within the precision ranges described in Table 2, the instrument will be recalibrated in the field if possible. After the sampling event, the instrument will again be recalibrated, tested, and examined to determine whether replacement is necessary.

Precision of laboratory measurements will be evaluated by comparing results from various duplicate samples listed below, where available:

- Field sample and field duplicate
- Field sample and laboratory replicate
- LCS and LCSD
- MS and MSD.

9.6.3 Representativeness

Representativeness will be reviewed throughout the program by the Project Manager and QA Officer. If the team determines that representativeness should and can be improved, additional samples, or constituents may be considered, or sampling and analytical methods may be altered.

9.6.4 Completeness

Percent completeness will be checked by comparing the number of collected samples with the number of samples from which useable data were generated, as described in Section 3.3.6.

9.6.5 Comparability

Comparability will be addressed by the use of approved drinking water methods and certified laboratories. If the comparability of laboratory results is questioned, split samples and/or performance evaluation samples may be analyzed.

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10.0 FIELD VARIANCES

As conditions in the field may vary, it may become necessary to implement minor modifications to sampling as presented in this plan. When appropriate, the client representative will be notified and a verbal approval will be obtained before implementing the changes. Modifications to the approved plan will be documented in the Quarterly Monitoring Technical Memoranda.

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11.0 FIELD HEALTH AND SAFETY PROCEDURES

EAs Corporate Site Health and Safety Plan will be used to minimize the threat of serious injury to workers engaged in sampling activities while performing site work.

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12.0 REFERENCES

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Figures

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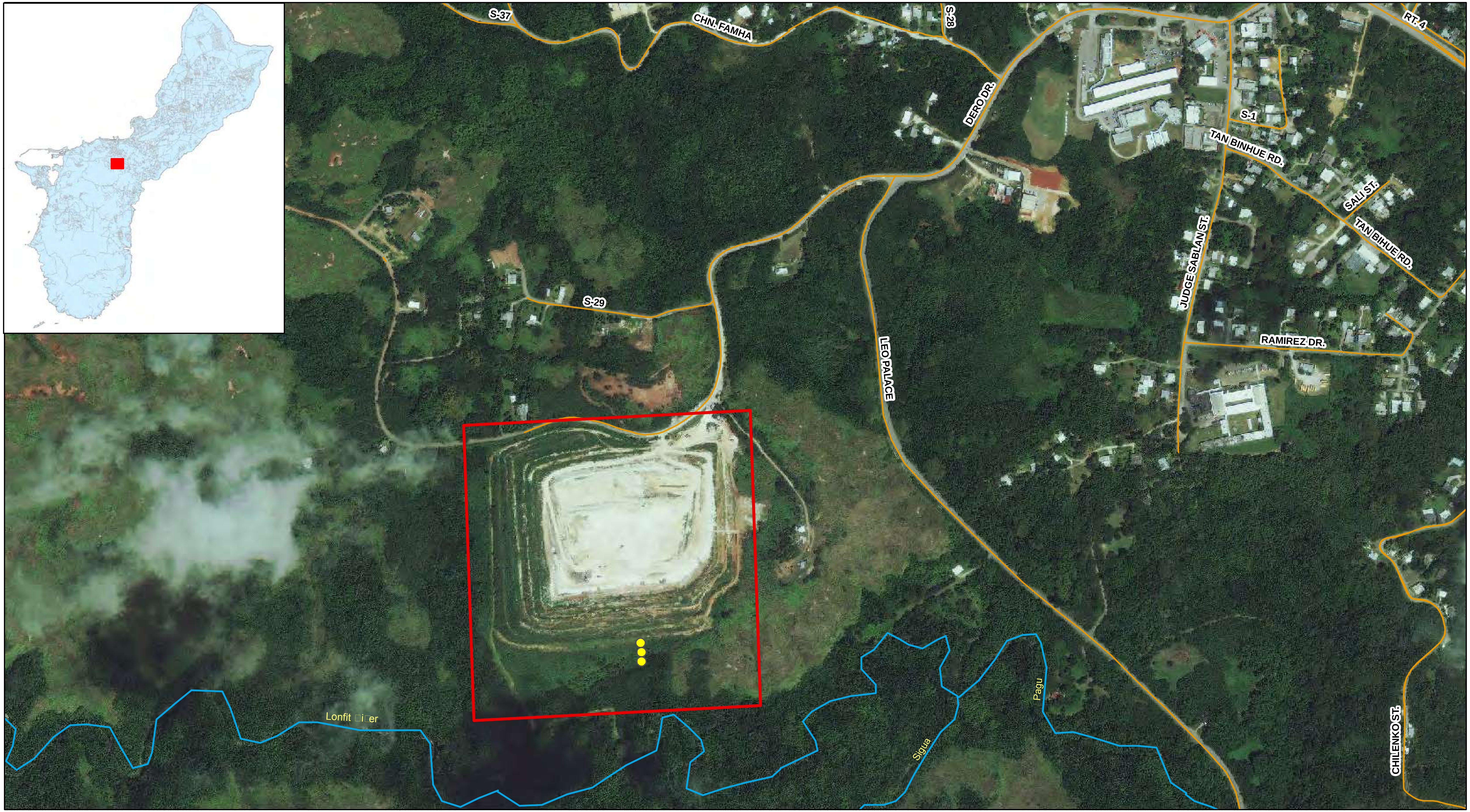

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Figure 1

Ordot Dump Site Location

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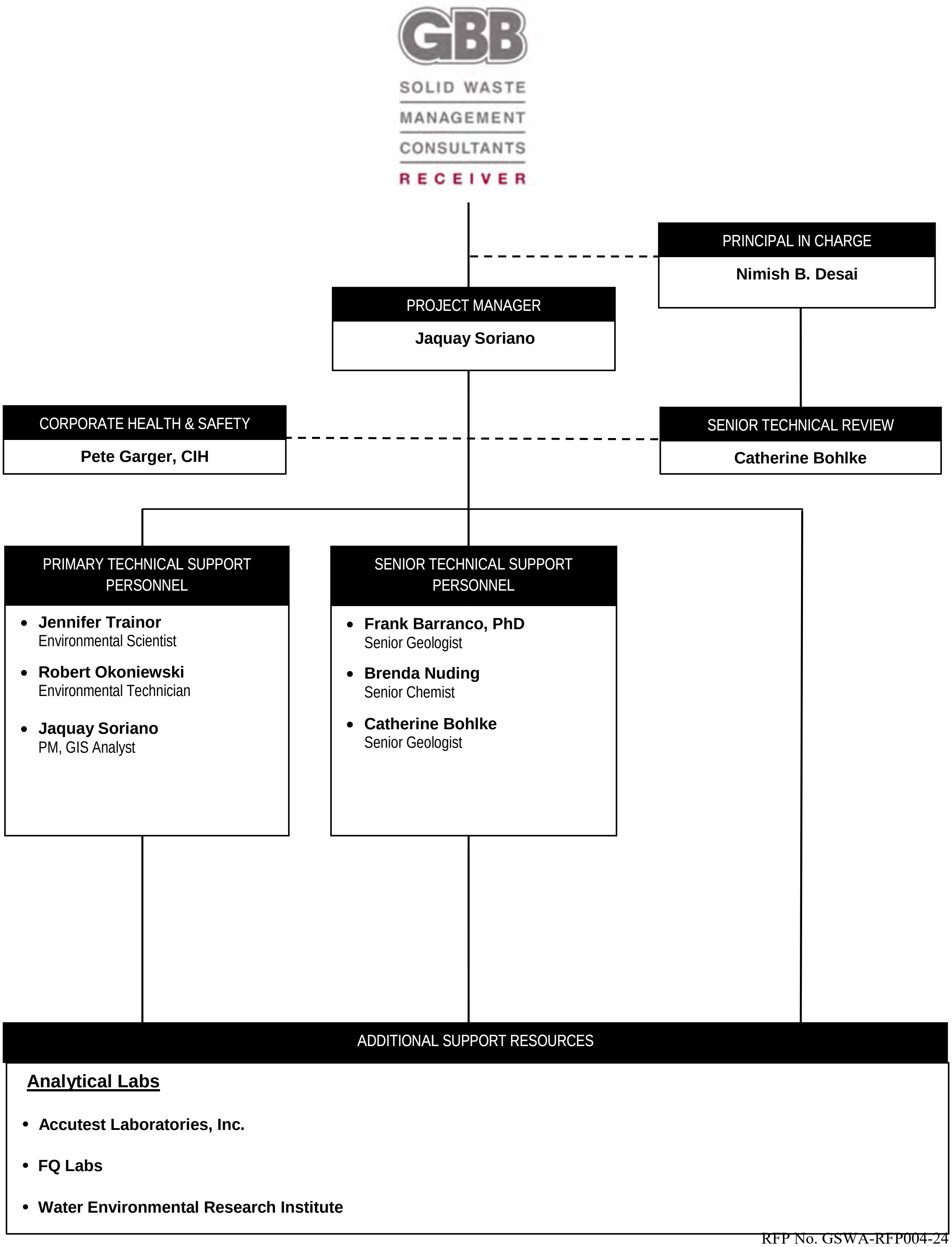
FIGURE 2. PROJECT ORGANIZATIONAL CHART



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Appendix A

Standard Operating Procedures

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Standard Operating Procedure No. 001
for
Sample Labels

Prepared by

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Revision 0
August 2007

CONTENTS

1. SCOPE AND APPLICATION

The purpose of this Standard Operating Procedure is to delineate protocols for the use of sample labels. Every sample will have a sample label uniquely identifying the sampling point and analysis parameters. An example label is provided below. Other formats with similar levels of detail are acceptable.

PROJECT NAME _____________ PROJECT NUM. ___________
SAMPLE LOCATION/SITE ID ____________________________
DATE: ____/____/____ TIME: _____:_____
ANALYTES: METALS VOC EXPLOSIVES ORGANICS OTHER
FILTERED: [NO] [YES]
PRESERVATIVE: [NONE] [HNO_3] [OTHER ______]
SAMPLER: ____________________

2. MATERIALS

The following materials may be required: sample label and indelible laboratory marker.

3. PROCEDURE

The following sections describe how to use the sample labeling system.

3.1 LABEL INFORMATION

As each sample is collected/selected, fill out a sample label. Enter the following information on each label:

- Project name
- Project number
- Location/site identification—Enter the media type (i.e., well number, surface water, soil, etc.) sampling number, and other pertinent information concerning where the sample was taken
- Date of sample collection

- Time of sample collection

- Analyses to be performed (NOTE: Due to number of analytes, details of analysis should be arranged with laboratory *prior to start of work)*

- Whether filtered or unfiltered (water samples only)

- Preservatives (water samples only)

- Number of containers for the sample (e.g., 1 of 2, 2 of 2).

3.2 ROUTINE CHECK

Double-check the label information to make sure it is correct. Detach the label, remove the backing, and apply the label to the sample container. Cover the label with clear tape, ensuring that the tape completely encircles the container.

3.3 RECORD INFORMATION

Record the sample number and designated sampling point in the field logbook, along with the following sample information:

- Time of sample collection (each logbook page should be dated)

- Location of the sample

- Organic vapor meter or photoionization meter readings for the sample (when appropriate)

- Any unusual or pertinent observations (oily sheen on groundwater sample, incidental odors, soil color, grain size, plasticity, etc.)

- Number of containers required for each sample

- Whether the sample is a quality assurance sample (split, duplicate, or blank).

3.3.1 Logbook Entry

A typical logbook entry might look like this:

- 7:35 a.m. Sample No. MW-3. PID = 35 ppm
- Petroleum odor present. Sample designated MW-3-001.

NOTE: Duplicate samples will be given a unique sample designation rather than the actual sample number with an added prefix or suffix. This will prevent any indication to the laboratory that this is a duplicate sample. This fictitious sample number will be listed in the logbook along with the actual location of the sample.

3.4 SHIPMENT

Place the sample upright in the designated sample cooler. Make sure there is plenty of ice in the cooler at all times.

4. MAINTENANCE

Not applicable.

5. PRECAUTIONS

5.1 INCIDENTAL ODORS

Note that although incidental odors should be noted in the logbook, it is unwise from a safety and health standpoint to routinely "sniff test" samples for contaminants.

5.2 DUPLICATE SAMPLE

No indication of which samples are duplicates is to be provided to the laboratory.

6. REFERENCES

U.S. Environmental Protection Agency. 1980. Interim Guidelines and Specifications for Preparing Quality Assurance Project Plans. QAMS-005/80.

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Standard Operating Procedure No. 002
for
Chain-of-Custody Form

Prepared by

EA Engineering, Science, and Technology, Inc.
11019 McCormick Road
Hunt Valley, Maryland 21031

Revision 0
August 2007

CONTENTS

1. SCOPE AND APPLICATION

The purpose of this Standard Operating Procedure is to delineate protocols for use of the chain-of-custody form. An example is provided as Figure SOP002-1. Other formats with similar levels of detail are acceptable.

2. MATERIALS

The following materials may be required: chain-of-custody form and indelible ink pen.

3. PROCEDURE

- Give the site name and project name/number.
- Enter the sample identification code.
- Indicate the sampling dates for all samples.
- List the sampling times (military format) for all samples.
- Indicate “grab” or “composite” sample with an “X.”
- Specify the sample location.
- Enter the total number of containers per cooler.
- List the analyses/container volume.
- Obtain the signature of sample team leader.
- State the carrier service and airbill number, analytical laboratory, and custody seal numbers.
- Sign, date, and time the “relinquished by” section.
- Upon completion of the form, retain the shipper copy, and affix the other copies to the inside of the sample cooler, in a zip-seal bag to protect from moisture, to be sent to the designated laboratory.

4. MAINTENANCE

Not applicable.

5. PRECAUTIONS

None.

6. REFERENCES

U.S. Environmental Protection Agency (U.S. EPA). 1980. Interim Guidelines and Specifications for Preparing Quality Assurance Project Plans, QAMS-005/80.

U.S. EPA. 1990. Sampler's Guide to the Contract Laboratory Program. EPA/540/P-90/006, Directive 9240.0-06, Office of Emergency and Remedial Response, Washington, D.C. December.

U.S. EPA. 1991. User's Guide to the Contract Laboratory Program. EPA/540/O-91/002, Directive 9240.0-01D, Office of Emergency and Remedial Response. January.

Company Name□

Project Manager or Contact□

Phone□

Project No.

Project Name□

Dept.□ □as□□

Sample Storage Location:

□□O Number□

Parameters□Method Numbers for Analysis

Chain of Custody Record

□□ Laboratories
□□ Loveton Circle
Sparks□M□ □□□□□
Telephone□□□□□□□□□□□□□□□□
Fax□□□□□□□□□□□□□□□□

Report Deliverables:
1 2 3 4 D E

EDD: Yes/No

DUE TO CLIENT: __________

Page of

Report #:

Date	Time	Water	Soil	Sample Identification □□ Characters	**No. of Containers**														**EA Labs Accession Number**	Remarks
																				LPM□

Samples by: (Signature)	Date/Time	Relinquished by: (Signature)	Date/Time	Received by: (Signature)	Date/Time
Relinquished by: (Signature)	Date/Time	Received by Laboratory: (Signature)	Date/Time	Airbill Number:	Sample Shipped by: (Circle) Fed Ex. Puro. UPS Hand Carried Other:

Cooler Temp. _______C pH: ___ Yes ___ No Comments: Custody Seals Intact ___ Yes ___ No

NOTE: Please indicate method number for analyses requested. This will help clarify any questions with laboratory techniques.

Standard Operating Procedure No. 004
for
Sample Packing and Shipping

Prepared by

EA Engineering, Science, and Technology, Inc.
11019 McCormick Road
Hunt Valley, Maryland 21031

Revision 0
August 2007

CONTENTS

1. SCOPE AND APPLICATION

The purpose of this Standard Operating Procedure (SOP) is to delineate protocols for the packing and shipping of samples to the laboratory for analysis.

2. MATERIALS

The following materials may be required:

Clear tape	Plastic garbage bags
Custody seals	Sample documentation
Ice	Waterproof coolers (hard plastic or metal)
Metal cans with friction-seal lids (e.g., paint cans)	Zip-seal plastic bags
Packing material[1]	

3. PROCEDURE

Check cap tightness and verify that clear tape covers label and encircles container. Wrap sample container in bubble wrap or closed cell foam sheets. Enclose each sample in a clear zip-seal plastic bag.

Place several layers of bubble wrap, or at least 1 in. of vermiculite on the bottom of the cooler. Line cooler with open garbage bag, place all the samples upright inside a garbage bag, and tie the bag.

Double bag and seal loose ice to prevent melting ice from soaking the packing material. Place the ice outside the garbage bags containing the samples.

Pack shipping containers with packing material (closed-cell foam, vermiculite, or bubble wrap). Place this packing material around the sample bottles or metal cans to avoid breakage during shipment.

Enclose all sample documentation (i.e., Field Parameter Forms, chain-of-custodies) in a waterproof plastic bag and tape the bag to the underside of the cooler lid. If more than one cooler is being used, each cooler will have its own documentation.

Seal the coolers with signed and dated custody seals so that if the cooler were opened, the custody seal would be broken. Place clear tape over the custody seal to prevent damage to the seal.

---

1. Permissible packing materials are: (a) (non-absorbent) bubble wrap or closed cell foam packing sheets, or (b) (absorbent) vermiculite. Organic materials such as paper, wood shavings (excelsior), and cornstarch packing “peanuts” will not be used.

Refer to SOP Nos. 001, 002, 016, and 039.

Tape the cooler shut with packing tape over the hinges and place tape over the cooler drain. Ship all samples via overnight delivery on the same day they are collected if possible.

4. MAINTENANCE

Not applicable.

5. PRECAUTIONS

Any samples suspected to be of medium/high contaminant concentration or containing dioxin must be enclosed in a metal can with a clipped or sealable lid (e.g., similar to a paint can). Label the outer metal container with the sample number of the sample inside.

6. REFERENCES

U.S. Environmental Protection Agency (U.S. EPA). 1980. Interim Guidelines and Specifications for Preparing Quality Assurance Project Plans, QAMS-005/80.

U.S. EPA. 1990. Sampler's Guide to the Contract Laboratory Program. EPA/540/P-90/006, Directive 9240.0-06, Office of Emergency and Remedial Response, Washington, D.C. December.

U.S. EPA. 1991. User's Guide to the Contract Laboratory Program. EPA/540/O-91/002, Directive 9240.0-01D, Office of Emergency and Remedial Response. January.

Standard Operating Procedure No. 039
for
Sample Preservation and Container Requirements

Prepared by

EA Engineering, Science, and Technology, Inc.
11019 McCormick Road
Hunt Valley, Maryland 21031

Revision 0
August 2007

CONTENTS

1. PURPOSE AND SCOPE

The purpose of this Standard Operating Procedure (SOP) is to define the preservatives and techniques to be employed in preserving environmental samples between collection and analysis.

2. MATERIALS

The following materials may be required:

Containers (see Section 3 for description)	NaOH
HNO_3	Ice chests
H_2SO_4	Ice

3. DEFINITION OF CONTAINER TYPES

Type A **Container**: 80 oz amber glass, ring handle bottle/jug, 38-mm neck finish.
Closure: White polypropylene or black phenolic, baked polyethylene cap, 38-430 size, 0.015-mm polytetrafluoroethelyne (PTFE) liner.

Type B **Container**: 40-mL glass vial, 24-mm neck finish
Closure: White polypropylene or black phenolic, open top, screw cap, 15-mm opening, 24-400 size.
Septum: 24-mm disc of 0.005-in PTFE bonded to 0.120-in. silicon for total thickness of 0.125-in.

Type C **Container**: 1-L high density polyethylene, cylinder-round bottle, 28-mm neck finish.
Closure: White polyethylene cap, white ribbed, 28-410 size; F217 polyethylene liner.

Type D **Container**: 120-mL wide mouth glass vial, 48-mm neck finish.
Closure: White polyethylene cap, 40-480 size; 0.015-mm PTFE liner.

Type E **Container**: 250-mL boston round glass bottle
Closure: White polypropylene or black phenolic, open top, screw cap.
Septum: Disc of 0.005-in PTFE bonded to 0.120-in silicon for total thickness of 0.125-in.

Type F **Container**: 8-oz short, wide mouth, straight-sided, flint glass jar, 70-mm neck finish.
Closure: White polypropylene or black phenolic, baked polyethylene cap, 48-400 size; 0.030-mm PTFE liner.

Type G **Container**: 4-oz tall, wide mouth, straight -sided, flint glass jar, 48-mm neck finish.
Closure: White polypropylene or black phenolic, baked polyethylene cap, 48-400 size; 0.015-mm PTFE liner.

Type H **Container**: 1-L amber, Boston round, glass bottle, 33-mm pour-out neck finish.
Closure: White polypropylene or black phenolic, baked polyethylene cap, 33-430 size; 0.015-mm PTFE liner.

Type K **Container**: 4-L amber glass ring handle bottle/jug, 38-mm neck finish.
Closure: White polypropylene or black phenolic, baked polyethylene cap, 38-430 size; 0.015-mm PTFE liner.

Type L **Container**: 500-mL high-density polyethylene, cylinder bottle, 28-mm neck finish.
Closure: White polypropylene, white ribbed, 28-410 size; F217 polyethylene liner.

4. PROCEDURE

All containers must be certified clean, with copies of laboratory certification furnished upon request.

Water samples will be collected into pre-preserved containers appropriate to the intended analyte as given in Quality Assurance Project Plan. Samples taken for volatile organic compounds will be collected in accordance with SOP No. 003, Section 3.3.8. Samples taken for metals analysis will be verified in the field to a pH <2. The container should be tightly capped, then swirled to thoroughly mix the sample. The cap will then be loosened to release any excess pressure this operation may have generated. Samples taken for total phosphorous content will be verified in the field to a pH <2. The container should be tightly capped and swirled to thoroughly mix the sample. The cap will then be loosened to release any excess pressure this operation may have generated. Samples taken for cyanide will be verified for a pH >12. No preservatives will be added to any other water samples. These samples will be immediately placed on ice and cooled to 4°C.

Soil and sediment samples will be collected into containers appropriate to the intended analyte as given in the Quality Assurance Project Plan. Samples taken for volatile organic compound analysis will collected in accordance with the site-specific SOP. Samples taken for metals analysis will be tightly capped, placed on ice, and maintained at a temperature of 4°C. Samples taken for total phosphorous content will be tightly capped, placed on ice, and maintained at a temperature of 4°C. Samples taken for cyanide will be alkalized to a pH > 12 by the addition of NaOH. No preservatives will be added to any other soil samples. These samples will be immediately placed on ice and cooled to 4°C.

5. MAINTENANCE

Not applicable.

6. PRECAUTIONS

Note that acidifying a sample containing cyanide may liberate HCN gas.

- Avoid breathing any fumes emanating from acidified samples.
- Acidify samples only in the open, rather than in closed spaces such as a vehicle.
- Hold suspected HCN-generating sample away from body and downwind while manipulating it.
- See the Health and Safety Plan for other safety measures

7. REFERENCES

U.S. Environmental Protection Agency (U.S. EPA). 1986. Test Methods for Evaluating Solid Waste, SW-845.

U.S. EPA. 1987. A Compendium of Superfund Field Operations Methods, EPA 540-P87-001.

U.S. EPA. 1991. A Compendium of ERT Soil Sampling and Surface Geophysics Procedures.

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Standard Operating Procedure No. 059
for
Field Logbook

Prepared by

EA Engineering, Science, and Technology, Inc.
225 Schilling Circle, Suite 400
Hunt Valley, Maryland 21031

Revision: 1
November 2012

CONTENTS

1. SCOPE AND APPLICATION

The purpose of this standard operating procedure (SOP) is to delineate protocols for recording field survey and sampling information in the Field Logbook.

2. MATERIALS

The following materials may be required:

- Field Logbook (Teledyne 415 Level Book, or equivalent)[1]
- Indelible ink pen (e.g., Sharpie®).

3. PROCEDURE

All information pertinent to a field survey or sampling effort will be recorded in a bound logbook. Each page/form will be consecutively numbered, dated, and signed. All entries will be made in indelible ink, and all corrections will consist of line-out deletions that are initialed and dated. The person making the correction will provide a brief explanation for the change. Entries are factual only. No personal opinions should be entered.

There should be no blank lines on a page. A single blank line or a partial blank line (i.e., at the end of a paragraph) should be lined to the end of the page. If only part of a page is used, the remainder of the page should have an "X" drawn across it. The bottom of each page must be signed and dated by the field personnel entering the information.

At a minimum, entries in the Field Logbook will include but not be limited to the following:

- Date.

- Project number and project name.

- Name and address of field contact.

- Identification of sample crew members.

- Documentation should include model numbers of equipment used (e.g., drilling rigs) and calibration (if applicable). Each day's entry should begin with time onsite, who is onsite (including observers other than the sampling crew), brief description of what work will be performed that day and how, and the weather.

---

[1] Pre-printed, bound forms are approved as well. See SOP No. 016 for recommended content and format.

- If samples are being taken in or near tidal waters, the time of high and low tide for the site should be determined from local gauges or tables and recorded.

- References such as maps of the sampling site.

- Times of key daily milestones should be entered (e.g., time borings began, times personnel arrived and left site, times subcontractors arrived and left site, etc.). Time should be recorded in the left-hand margin on the page in military time.

- Sample-specific information:
  - Unique, sequential field sample number
  - Purpose of sampling
  - Location, description, and log of photographs of each sampling point
  - Details of the sample site (e.g., elevation of the casing, casing diameter and depth, integrity of the casing, etc.)
  - Documentation of procedures for preparation of reagents or supplies which become an integral part of the sample (e.g., filters and absorbing reagents)
  - Type of media of sample (e.g., groundwater, surface water, soil, sediment, and product)
  - Suspected waste composition
  - Number and volume of sample taken
  - Sampling methodology, including distinction between grab and composite sample
  - Sample preservation
  - Date and time of collection
  - Collector's sample identification number(s)
  - Sample shipment (e.g., name of the laboratory and cartage agent: Federal Express, United Parcel Service, etc.)
  - Field observations (e.g., oily sheen on groundwater sample, incidental odors, soil color, grain size, plasticity, moisture content, layering, Unified Soil Classification System classification, etc.)

- Any field measurements made (e.g., pH, conductivity, explosivity, water depth, organic vapor analyzer readings, etc.)

- Signature and date by the personnel responsible for observations

- Decontamination procedures.

Sampling situations vary widely. No general rules can specify the extent of information that must be entered in a Field Logbook. However, records should contain sufficient information so that someone can reconstruct the sampling activity without relying on the sampler's memory. Further, the project work plan or field sampling plan should be reviewed to identify additional specific information or requirements that should be included in the Field Logbook.

The Project Manager will keep a master list of all Field Logbooks assigned to the Sampling Team Leaders. One Field Logbook kept by the Project Manager will be a master site log of daily activities and will contain the list of Field Logbooks assigned to Sampling Team Leaders.

Project name and number should be clearly marked on the outside cover using indelible ink. If more than one Field Logbook exists for the project, then the number of the Field Logbook should also be clearly marked on the outside cover.

4. MAINTENANCE

At the end of the field sampling effort, the Field Logbook should be scanned and filed in the electronic file for the project and maintained according to the EA Records Retention Policy or contract requirements.

5. PRECAUTIONS

None.

6. REFERENCES

EA Engineering, Science, and Technology, Inc. 2007. Standard Operating Procedure No. 016 for Surface Water, Groundwater, and Soil/Sediment Field Logbooks. August.

U.S. Environmental Protection Agency. 1980. *Interim Guidelines and Specifications for Preparing Quality Assurance Project Plans*, QAMS-005/80.

———. 1990. *Sampler's Guide to the Contract Laboratory Program*. EPA/540/P-90/006, Directive 9240.0-06, Office of Emergency and Remedial Response, Washington, D.C. December.

———. 1991. *User's Guide to the Contract Laboratory Program*. EPA/540/O-91/002, Directive 9240.0-01D. Office of Emergency and Remedial Response. January.

Appendix B

Field Data Sheet

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WATER SAMPLE FROM **LEACHATE** TANK LOG SHEET

Sample location: _______________ Media:____________

Company Name: EA	**Sample Data - Field Measurements**						
Completed By:	**pH**	**Temp (°C)**	**Conduct. (mS/cm)**	**DO (mg/L)**	**Tank Level (feet and inches)**	**Turbidity (NTU)**	**Salinity (PPT)**
Water Quality Time:							

Sampled By:	**Sample Description:**	**LEACHATE FLOW (If applicable):**
Sample Date / Time:		**Flow Rate:**
Sample Label ID:		**Total Flow:**
Type of Sample: **Grab**	**Water Color (Visual observation):**	

Analysis	**Method Number**		**Preservative Required**	**Volume Needed**	**# of Bottles**	**Mark an X where it applies**
QUARTERLY SAMPLES						
CBOD, BOD	SM 5210B		NONE	L	1	
TKN /NH3-N	SM4500-Norg C NH3 D/E /SM4500-NO3 E		H2SO4	250 ml	1	
ALK, TSS, TDS, Fl, SO4, CL	SM2320B/SM2540D/SM2540C/ SW9214/E300.0/E300.0		NONE	L (Poly)	2	
Orthophosphate as Phosphorus	SM4500-P E		NONE	500 ml	1	
VOC	EPA 624		HCL	40 ml	3 VOA	
VOC	EPA 624		None	40 ml	3 VOA	
TOC	SM5310C		H2SO4	40 ml	2 VOA	
SVOC, Pesticide, PCB	E625/ EPA 608/ E608		NONE	L	4	
COD	Hach Method 8000		H2SO4	40 ml	2	
Metals, Mercury	200.8/ 245.1		HNO3	250 ml	1	
Sulfide	SM4500 S2-D		ZnAce,NaOH	250 ml	1	
Cyanide	SM4500-CN B,C,E		NaOH	250 ml	1	
Ammonia	SM4500-NH3 B,D,E		H2SO4	L	1	

Notes:	**Chain of Custody #:**
	Date Shipped:
	Time Shipped:
	Laboratory: Accutest, WERI, FQ Labs
	Laboratory Location: California, Guam, Hawaii

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EXHIBIT B

Sampling and Analysis Plan Post-Closure Monitoring at the Ordot Dump Post-Closure Facility

Prepared for

Gershman, Brickner & Bratton, Inc.,
Receiver for the Guam Solid Waste
Authority

October 2021

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Sampling and Analysis Plan
Post-Closure Monitoring at the Ordot Dump Post-Closure Facility

Prepared for

Gershman, Brickner & Bratton, Inc.,
Receiver for the Guam Solid Waste Authority

October 2021

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Table of Contents

Attachments

List of Figures

List of Tables

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List of Abbreviations

AD	Absolute Difference
AGMP	Assessment Groundwater Monitoring Program
ANSI	American National Standards Institute
ARARs	Applicable or Relevant and Appropriate Requirements
BFB	4-bromofluorobenzene
bgs	below ground surface
BC	Brown and Caldwell
°C	Degrees Celsius
CCV	Continuing Calibration Verification
CDT	Central Daylight Time
ChST	Guam Chamorro Standard Time
CLP	Contract Laboratory Program
CoC	Chain-of-Custody
COD	Chemical Oxidation Demand
CSM	Conceptual Site Model
CST	Central Standard Time
CWA	Clean Water Act
DFTPP	Decafluorotriphenylphosphine
DGMP	Detection Groundwater Monitoring Program
DO	Dissolved Oxygen
DOT	Department of Transportation
DQI	Data Quality Indicator
DQO	Data Quality Objective
EB	Equipment Blank
EDD	Electronic Data Deliverable
EDT	Eastern Daylight Time
EPA	Environmental Protection Agency
EST	Eastern Standard Time
Facility	Ordot Dump Post-Closure Facility
ft	feet
GARR	Guam Administrative Rules and Regulations
GBB	Gershman, Brickner & Bratton, Inc.
GovGuam	Government of Guam
GSWA	Guam Solid Waste Authority
GWA	Guam Waterworks Authority
GWMP	Groundwater Monitoring Program
GWMS	Ground Water Monitoring System
GWPS	Ground Water Protection Standards
HASP	Health and Safety Plan
HCl	Hydrochloric Acid
HDPE	High-density Polyethylene
HNO_3	Nitric Acid
H_2SO_4	Sulfuric Acid
IATA	International Air Transport Association
ICV	Initial Calibration Verification
ID	Identification
IDW	Investigation Derived Waste
LCS	Laboratory Control Sample
LCSD	Laboratory Control Sample Duplicate
LD	Laboratory Duplicate
MCL	Maximum Contaminant Level
MDL	Method Detection Limit
MDT	Mountain Daylight Time
mL	milliliter
MQO	Measurement Quality Indicator
MSA	Measurement Systems Analysis
MS	Matrix Spike
MSD	Matrix Spike Duplicate
MST	Mountain Standard Time
MSGP	Multi-Sector General Permit
NA	Not Applicable
NaOH	Sodium Hydroxide
NCP	National Contingency Plan
ND	Not Detected
NPDES	National Pollutant Discharge Elimination System
NS	Not Sampled
OERR	Office of Emergency and Remedial Response
ORP	Oxidation-Reduction Potential
PAH	Polycyclic Aromatic Hydrocarbon
PCB	Polychlorinated Biphenyl
PCCP	Post-Closure Care Plan

PDT	Pacific Daylight Time
PLCT	Perimeter Leachate Collection Trench
PPE	Personal Protective Equipment
PST	Pacific Standard Time
QA	Quality Assurance
QC	Quality Control
QAO	Quality Assurance Officer
QAPP	Quality Assurance Project Plan
RCRA	Resource Conservation and Recovery Act
RL	Reporting Limit
RPD	Relative Percent Difference
SAP	Sampling and Analysis Plan
SOP	Standard Operating Procedure
SVOC	Semivolatile Organic Compound
SWL	Standing Water Level
TB	Trip Blank
TCDD	Tetrachlorodibenzo-p-dioxin
TKN	Total Kjeldahl Nitrogen
TOC	Total Organic Carbon
TSCA	Toxic Substances Control Act
TSS	Total Suspended Solids
USEPA	United States Environmental Protection Agency
USGS	United States Geological Survey
UTC	Coordinated Universal Time
VOC	Volatile Organic Compound

Section 1

Introduction

This Sampling and Analysis Plan (SAP) has been prepared by Brown and Caldwell (BC) on behalf of Gershman, Brickner & Bratton, Inc. (GBB), Receiver for the Guam Solid Waste Authority (GSWA), for the Ordot Dump Post-Closure Facility (Facility)[1].

This SAP is designed to implement the post-closure groundwater monitoring sampling and analysis recommendations proposed in the *RCRA-Compliant Groundwater Monitoring Program Technical Memorandum* (GWMP TM; BC, 2021a). The TM established the following as needed for a Resource Conservation and Recovery Act (RCRA)-compliant Groundwater Monitoring Program (GWMP) as specified in Guam Administrative Rules and Regulations (GARR) Title 22 Chapter 23 (40 CFR 258):

- A groundwater monitoring well system (GWMS) containing the appropriate number and quality of background (upgradient) and compliance (downgradient) wells.
- The Project Analyte List (Attachment A).
- Background concentrations and a summary of exceedances of background concentrations in downgradient monitoring wells.
- Groundwater Protection Standards (GWPSs) and a summary of exceedances of GWPSs in downgradient monitoring wells.

The GWMP TM along with this stand-alone SAP and the Updated Conceptual Site Model (Updated CSM; BC, 2021b) provide the necessary components for the RCRA-compliant GWMP.

This SAP was developed using the *Sampling and Analysis Plan Guidance and Template, Version 4 R9QA/009/1* (United States Environmental Protection Agency [USEPA], 2014) and supersedes all prior versions of the Facility SAP. This SAP is incorporated as an appendix to the Post-Closure Care Plan (PCCP).

This SAP was developed to implement the sampling and analysis recommendations proposed in Section 7 of the GWMP TM (BC, 2021a) for an Assessment Groundwater Monitoring Program (AGMP) for the existing wells in the GWMS per GARR Title 22 § 23506 (40 CFR 258.55) and an Interim AGMP for the new wells in the GWMS. An update of the GWMP TM will be needed upon the completion of the Interim AGMP for the new groundwater monitoring wells. Accordingly, an update of this SAP will be needed to implement the recommendations from the updated GWMP TM.

1.1 Facility Name

The Facility is the Ordot Dump Post-Closure Facility (formerly the Ordot Dump), a closed solid waste disposal facility.

1.2 Facility Location

The Facility is located approximately 2.5 miles south of Guam's capital, Hagatña and approximately one mile west of the intersection of Route 4 and Dero Road in the Village of Ordot, Chalan Pago-Ordot, Guam (see Figure 1-1). As shown on Figure 2-1, the area surrounding the Facility is comprised of grassland and tropical ravine forest characterized by dense brush and interspersed with residential

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[1] See Post-Closure Care Plan for definition.

development. A commercial composting operation is located to the north of the Facility across Dero Road. The Facility is bordered by the Lonfit River to the south and a surface drainage channel to the west. The surface drainage channel receives run-off from the Facility and from areas north of the Facility including the commercial composting operation.

1.3 Responsible Agency

This SAP is incorporated as an appendix to the PCCP. The Guam Environmental Protection Agency (Guam EPA or GEPA) is the agency responsible for accepting the PCCP and issuing a Post Closure Care Operations Permit to the Guam Solid Waste Authority which implements the PCCP under the conditions of the Guam EPA operations permit.

1.4 Project Organization

This SAP requires a Project (SAP) organization chart with key personnel roles and responsibilities, which are shown on Table 1-1 and Figure 1-2 and are as follows:

- **Guam EPA -** Permit Authority, regulatory compliance oversight. Permit Authority to issue a Post-Closure Operations permit and enforce the implementation of the accepted PCCP.
- **Guam Solid Waste Authority**– Owner of the Ordot Dump Post-Closure Facility and contract authority of the Facility Operator.
- **Facility Operator - Site Manager** - Point of Contact, responsible for the PCCP implementation. Directs operations, monitoring, and inspection activities at the Facility and has signatory authority for all reporting required under the PCCP and Operating Permit.
- **Operator Quality Assurance Officer (QAO)** - Confirms compliance with this SAP and data quality objectives (DQOs) and reviews plans and reports for accuracy and completeness.
- **Operator Health and Safety Manager** - Developing and coordinating the overall Operator Health and Safely Plan (HASP), advising the Facility Operator Site Manager on matters relating to health and safety on this project, and recommending appropriate safeguards and procedures. Modifying the HASP, if necessary, and approving changes in health and safety procedures at the Facility.
- **Operator Field Team Leader** – Coordinates with Site Manager and Operator Health and Safety Manager; facilitates site access; schedules and coordinates field activities; ensures compliance with standard operating procedures (SOPs); and coordinates with Operator Chemist to ensure samples are collected in accordance with this SAP.
- **Operator Chemist** - Coordinates with Operator Field Team Leader to ensure samples are collected in accordance with this SAP and Analytical Laboratory Project Manager to provide sample containers and cooler kits for each sampling event; resolves quality control (QC) issues with the laboratory, ensures compliance with this SAP; performs data validation and assesses compliance of validated data with the DQOs to determine data usability.
- **Analytical Laboratory Project Manager** –Coordinates with Operator Chemist to provide bottle kits for sampling events and resolves sample-receipt discrepancies; ensures samples are collected and analyzed in accordance with this SAP; reviews data deliverables to ensure submittals are consistent with requirements in this SAP.
- **Analytical Laboratory Quality Assurance (QA) Coordinator** - Ensures compliance with method requirements and other laboratory procedures laboratory; coordinates with the laboratory staff and Operator Chemist to resolve sample receipt issues, resolves QC issues within the laboratory, oversees the review of data prior to preparation of data report, and approves and submits final laboratory reports to the Operator Chemist.

- **Analytical Laboratory Data Reporting Department** – Prepares laboratory reports in portable document format (PDF) and electronic data deliverables (EDDs) and ensures comparability and completeness of deliverables.

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Section 2

Background

2.1 Facility Description

The Facility location is shown on Figure 1-1 and the site plan and monitoring locations are shown in Figure 2-1. The Facility is a 43.5-acre site that contained an unlined waste disposal facility (or dump) owned and operated by the Government of Guam (GovGuam) from 1950 to 2011 and was closed per a Consent Decree. Closure activities began in 2012, and the as-built construction report and the completion certificate were issued in February 2016 (GHD, 2016). Closure construction features include an engineered final cover system, leachate collection and removal system, landfill gas collection and treatment system, a stormwater management system, groundwater monitoring well network, and a perimeter gas monitoring well network. In 2018, a soil vapor extraction system was constructed to address methane detected in excess of regulatory standards reported at the northern boundary of the Facility (BC, 2017).

2.2 Geological Information

Information related to site geology and hydrogeology is provided in the Updated CSM (BC, 2021b).

2.3 Environmental and/or Human Impact

2.3.1 Groundwater

The updated CSM (BC, 2021b) provides the evaluation for and documents the hydrogeologic conditions of the site and components of the Facility. Included in this assessment were four wells constructed pre-closure (MW-1B, MW-1C, MW-2A, and MW-5A) and six wells constructed post-closure (MW-6, MW-9, MW-10, MW-11, MW-12, and MW-13). The evaluation identified the need for four additional groundwater monitoring wells to be installed: one upgradient well (MW-14), one replacement downgradient well (MW-11R), and two downgradient wells (MW-15 and MW-16).

MW-11R was installed in November 2019 as a replacement for MW-11, because MW-11 had insufficient water volume to sample. MW-11 will be retained for observational purposes but is not part of the RCRA-compliant GMWS. The Updated CSM concluded that upgradient well MW-1B is not a suitable background well because the well screen spans two hydrogeologic units. Likewise, MW-1B will be retained but is not part of the GWMS.

The Updated CSM incorporated the hydrogeological and well-construction data for the four new monitoring wells. With the addition of the four new wells, the existing GWMS consists of 12 monitoring wells: three upgradient wells (MW-1C, MW-2A, and MW-14) and nine downgradient wells (MW-5A, MW-6, MW-9, MW-10, MW-11R, MW-12, MW-13, MW-15, and MW-16) as shown on Figure 2-1. A summary of the groundwater monitoring events conducted to date is provided in Table 2-1.

The GWMS established in the Updated CSM provides a RCRA-compliant system in accordance with GARR Title 22 §23502 (40 CFR 258.51) which requires enough wells, installed at appropriate locations (upgradient and downgradient) and depths, to yield groundwater samples from the uppermost aquifer. Samples collected from these wells should represent the quality of (a) background groundwater that has not been affected by leakage from the landfill (collected from upgradient wells), and (b) groundwater passing relevant points of compliance (collected from downgradient wells). All downgradient detections per event are included in Table 2-2.

The GWMP TM (BC, 2021a) was developed to establish the basis for the post-closure GWMP. It confirms the 12 wells that comprise the GWMS and establishes the Project Analyte List, background concentrations, and the GWPSs.

The Project Analyte List (Attachment A) contains a total of 259 project analytes, as follows:

- **223 GARR Title 22 Chapter 23 (40 CFR 258) Appendix II Analytes:** There are 215 listed Appendix II analytes (which is inclusive of the 58 Appendix I analytes); polychlorinated biphenyls [PCBs] and Chlordane are each listed as one analyte, but these are reported by analytical laboratories as seven Aroclor mixtures and three isomers of Chlordane, respectively.
- **20 Ordot Specific Analytes:** Munitions (also referred to as explosives), radiological parameters (gross-alpha and -beta, radium 226 and 228, and uranium), and perchlorate (a solid rocket fuel propellant) are included because of past military activities on Guam; 1,4-dioxane is included because it is frequently found at Municipal Solid Waste Landfill Facilities; and hexavalent chromium is included because it is the more toxic form of chromium.
- **16 Water Quality Parameters (WQPs):** Alkalinity, aluminum, ammonia as N, calcium, chloride, iron, magnesium, manganese, molybdenum, nitrate+nitrite as N, phosphate as P, potassium, sodium, sulfate, total dissolved solids (TDS), and total suspended solids (TSS) are included to monitor general groundwater quality conditions related to potential landfill impacts.

The GWPSs and the background concentrations for the analytes with GWPSs are summarized on Table 2-3.

The post-closure sampling and analysis recommendations are provided in the GWMP TM and summarized as follows:

- Eight sampling events for the eight existing groundwater monitoring wells in the GWMS (MW--1C, -2A, -5A, -6, -9, -10, -12, and -13) have been sampled and analyzed for the Project Analyte List. Analytical results from these eight events were subjected to Tier 3 validation (EPA, 2001) and statistical review and were used to develop background concentrations and GWPSs for the Facility. The existing wells are in an AGMP and require annual and semi-annual monitoring per GARR Title 22 § 23506 (40 CFR 258.55).
- Four new groundwater monitoring wells in the GWMS (MW-11R, -14, -15, and -16) were installed in late 2019 and are in an Interim AGMP until completion of eight events per GARR Title 22 § 23506 (40 CFR 258.55. Upon completion of the Interim AGMP, the background concentrations and the GWPSs will be reviewed and updated, as necessary. Accordingly, this SAP and the groundwater monitoring DQOs will also be updated at that time finalizing the GWPS and the new wells will complete the AGMP.

These components of the GWMP TM form the basis for the post-closure groundwater monitoring program DQOs discussed in Section 3.2.

Section 3

Project Data Quality Objectives

3.1 Project Objectives and Problem Definition

As discussed in the GWMP TM (BC, 2021a) and summarized in Section 2.5.1, the Facility is currently in an AGMP for eight existing wells in the GWMS (MW-1C, -2A, -5A, -6, -9, -10, -12, and -13) per GARR Title 22 § 23506 (40 CFR 258.55) and Interim AGMP for the four new wells in the GWMS (MW-11R, -14, -15, and -16). The Facility needs to acquire sufficient data to complete the Interim AGMP for the new wells and continue the AGMP for the existing wells. Upon completion of the Interim AGMP, the background concentrations and the GWPSs will be reviewed and updated (as needed) according to the procedures outlined in Section 7 of the GWMP TM.

3.2 Data Quality Objectives

The DQO process (USEPA, 2006) is a series of planning steps based upon a scientific method to produce an outcome such that the type, quantity, and quality of environmental data used in decision-making are appropriate for the intended application.

In general, DQOs provide a qualitative and quantitative framework around which data collection programs can be designed. The qualitative aspect of DQOs seeks to encourage good planning for field investigations. The quantitative aspect of DQOs involves designing an efficient field investigation that minimizes the possibility of making an incorrect decision. The steps in the DQO process and a brief description of each step are presented below:

- **Step 1 - Problem Statement:** Define the problem that necessitates the study; identify the planning team, the schedule of performance, and the available budget.
- **Step 2 - Decision Statements:** State how environmental data will be used to meet the objectives and solve the problem, identify study questions, define alternative outcomes.
- **Step 3 - Inputs to the Decision:** Identify data and information needed to answer the study questions.
- **Step 4 - Study Boundaries:** Specify the target population and characteristics of interest; define spatial and temporal limits and scales of inference.
- **Step 5 - Decision Rules:** Define the parameters of interest, specify the types of inference, and develop the logic for drawing conclusions from findings.
- **Step 6 - Acceptance Limits on Decision Errors:** Specify probability limits for false rejection and false acceptance decision errors. Develop performance criteria for newly collected data.
- **Step 7 - Optimize the Sampling Design:** Summarize Steps 1 through 6 into a sampling and analysis plan that meets the data quality, budget, and schedule objectives.

The Facility-specific DQOs for post-closure groundwater monitoring are discussed as follows.

Step 1 - Problem Statement: The Facility is currently conducting an AGMP for the existing wells and an Interim AGMP for the new wells in the GWMS. Additional data are needed to complete the required eight events needed for new wells in the GWMS for a RCRA-compliant GWMP, and annual and semi-annual sampling are required for the existing wells in the AGMS.

Pursuant to GARR § 23506(f) (40 CFR 258.55(f)), if Appendix II constituents are above background values, but all concentrations are below the GWPS, the owner or operator must continue assessment monitoring. Only when all detected Appendix II constituents are demonstrated to be at or below background can the AGMP be concluded, and the site revert to a detection groundwater monitoring program (DGMP) under GARR § 23504 (40 CFR 258.54). For Ordot, this stipulation also applies to the detected Ordot Specific Analytes.

The planning team and member's roles and responsibilities are discussed in Section 1.4, and the project schedule and budget are specified in the PCCP.

Step 2 - Decision Statement: The groundwater monitoring program will answer the following questions:

- Are constituents in the groundwater downgradient of the Facility above background concentrations established for the Facility?
- Do constituents in the groundwater comply with the GWPSs established for the Facility?
- Are there sufficient data from the new wells to complete the Interim AGMP and to reevaluate background concentrations and update GWPS as needed?
- Have the constituents been at or below background values for two consecutive sampling events so that a DGMP in accordance with GARR § 23504 (40 CFR 258.54) may begin?

Step 3 - Inputs to the Decision: Inputs to making decisions related to groundwater quality include the following:

- Requirements specified in GARR Title 22 Chapter 23 for a RCRA-compliant GWMP.
- The GWPSs for a RCRA-compliant GPMP as specified in the GWMP TM (see Table 2-3 in this SAP).
- The Project Analyte List including Semi-annual Analytes (Attachment A).
- Background concentrations and GWPS specified in the GWMP TM (see Table 2-3 in this SAP).
- Validated data generated from samples collected and analyzed during AGMP for existing wells and Interim AGMP for the new wells. Statistical review and analysis of data from each sampling event.
- Requirements for replacing AGMP with DGMP per GARR Title 22 §23506

Step 4 - Study Boundaries: The spatial boundary is the Facility as shown on Figure 1-1. The temporal boundaries are defined by the number of events (including "wet" and "dry" seasons) needed to fulfill requirements for the completion of AGMP.

Step 5 - Decision Rules: The following decision rules will be applied during AGMP for the existing wells and Interim AGMP for the new wells:

1. If a new Appendix II or Ordot Specific Analyte is detected above background during the annual monitoring of the existing wells, then it needs to be added to the list of detected analytes for the semi-annual event for existing wells. Resampling may be conducted to confirm the presence of a newly detected constituent.
2. If the concentrations of one or more constituents above background are detected at statistically significant levels above the GWPS, then notify Guam EPA and appropriate local officials of each exceedance within 14 days and submit results within 90 days of collection.

The following decision rules will be applied at the end of Interim AGMP for the new wells:

1. Assess all accumulated, validated groundwater monitoring data from all wells in the GWMS. For any unusable data, determine whether resampling is needed, and incorporate any of these data into the validated groundwater monitoring dataset. Perform statistical analysis of both background and downgradient validated data. Update, as needed, the background concentrations and GWPSs

for all Appendix II constituents and Ordot Specific Analytes detected in downgradient monitoring wells.

2. If the concentrations of all Appendix II constituents are above background values but below the GWPS, then continue AGMP in accordance with 40 CFR 258.55.
3. If the concentrations of the Appendix II constituents have been at or below background values for two consecutive sampling events, then begin detection monitoring in accordance with 40 CFR 258.54.[2]

Step 6 - Acceptance Limits on Decision Errors: Per Section 6.1 of the DQO Process (USEPA, 2006):

> Decision-making problems generally are addressed by performing statistical hypothesis tests on the collected data… a decision is made on whether the data provide sufficient evidence to allow a baseline condition ("null hypothesis") to be rejected in favor of a specified alternative condition ("alternative hypothesis"). The limited nature and underlying variability of the collected data can occasionally result in either a "false rejection" of the baseline condition (i.e., rejecting the null hypothesis when, in fact, it is true) or a "false acceptance" of the baseline condition (i.e., failing to reject the null hypothesis when, in fact, it is false).

The baseline condition is that the Facility is in AGMP for the existing wells and Interim AGMP for the new wells until completion of eight rounds of groundwater monitoring data are collected for the new wells (along with annual and semiannual monitoring of the existing wells). Once completed, and after assessment and updates (as needed) of background concentrations, then the alternative condition is the initiation of a DGMP.

The baseline conditions and corresponding decision errors are described below:

- **Baseline condition:** Concentration of a monitored constituent is detected at a statistically significant level above its GWPS, so assessment of corrective measures[3] will be performed for this constituent.
  - False rejection of the baseline condition: not triggering assessment of corrective measures when it should be conducted.
  - False acceptance of the baseline condition: triggering assessment of corrective measures when it is not needed.
- **Baseline condition:** Concentration of a monitored constituent is detected above its background value for two consecutive sampling events, so assessment monitoring will continue for this constituent.
  - False rejection of the baseline condition: triggering a DGMP when AGMP should continue.
  - False acceptance of the baseline condition: not triggering a DGMP when it should be initiated.

Step 7 - Optimization of Sampling Design: Groundwater samples representative of the "dry" and "wet" seasons will be collected at the specified frequency and for the specified analytes consistent with Table 7-1 of GWMP TM (BC, 2021a):

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[2] Detection monitoring at MW-11R, MW-14, MW-15, and MW-16 may not begin until at least eight rounds of samples have been collected from these monitoring wells and analyzed.

[3] If exceedance of a GWPS is confirmed by resampling, the process for establishing an alternative GWPS or assessment of corrective measures will be undertaken in accordance with GARR Title 22 §23506 and §23507 (40 CFR 258.55(i) and 258.56). The processes for both are described in the GWMP TM (BC, 2021a).

- Interim AGMP for the four new wells (MW-11R, -14, -15, and -16): a total of eight monitoring events performed quarterly for the Project Analyte List.
- AGMP annual monitoring for the eight existing wells (MW-1C, -2A, -5A, -6, -9, -10, -12, and -13) for Appendix II, Ordot Specific Analytes, and WQPs (i.e., the Project Analyte List).
- AGMP semi-annual monitoring (i.e., the event in between annual events) for the eight existing wells (MW-1C, -2A, -5A, -6, -9, -10, -12, and -13) for:
  - Appendix I analytes (which is inclusive of the detected Appendix II analytes arsenic, barium, chromium, cobalt, copper, nickel, selenium, and vanadium).
  - The detected Appendix II analytes and the detected Ordot Specific Analytes listed in Table 2-3
  - Any newly detected Appendix II or Ordot Specific Analyte from annual monitoring events.
  - The 16 WQPs from the Project Analyte List.

Upon completion of the Interim AGMP for the new wells, the validated GWMP historical data will be assessed and the background concentrations and GWPSs will be updated, as needed, and documented in an update of the GWMP TM. Additionally, consistent with GARR Title 22 §23506 (40 CRF 258.55), AGMP is replaced with a DGMP when the results for all detected Appendix II are at or below their background concentrations for two consecutive sampling events. The update of the GWMP TM will assess the status of the monitoring program (i.e., whether the AGMP needs to continue or the DGMP can begin), and this SAP will be updated accordingly.

3.3 Data Quality Indicators and Measurement Quality Objectives

Data quality indicators (DQIs) will be assessed using the precision, bias, accuracy, completeness, representativeness, comparability, and sensitivity parameters described within the USEPA Guidance for Quality Assurance Project Plans (USEPA, 2002a). These DQIs are described below. The measurement performance criteria (MPC) provided in Section 5.2 will be implemented for the SAP.

3.3.1 Precision

Precision is the degree of agreement between repeated, independent measurements. Field measurement precision is determined by replicate sample measurements. The precision of laboratory analyses is determined by replicate sample analyses and/or replicate matrix spike (MS) sample analyses. Precision, as relative percent difference (RPD, which is an absolute value), is calculated by dividing the difference of the replicate analytical results by the mean of the replicate analytical results, as shown below.

$$RPD = \frac{X_a - X_b}{X_a + X_b} \times 200$$

Where X_a is the larger of the replicate analytical results and X_b is the smaller of the replicate analytical results. When both replicates are within a factor of five-times the analytical reporting limit (RL), the calculated precision may not be significant.

Data bias is the systematic distortion of a measurement process that causes errors to skew the data in one direction. Data biases are addressed in the field with proper sampling protocols and in the laboratory by calibrating equipment.

3.3.2 Accuracy

Accuracy is the degree to which the sample result agrees with the actual concentration of a parameter. The accuracy of laboratory measurements is determined by analyses of MS samples. Accuracy, as percent recovery, for a MS sample is calculated by subtracting the sample result from the MS sample result and then dividing the outcome by the amount of spike added to the MS sample, as shown below.

$$MSAccuracy = \frac{X_c - X_a}{S} \times 100$$

Where X_a is the sample result, X_c is the MS sample result, and S is the amount of the spike added to the MS sample.

Accuracy, as percent recovery, for a laboratory control sample (LCS) is calculated by dividing the sample result by the amount of spike added to the laboratory control sample, as shown below.

$$LCSAccuracy = \frac{X_c}{S} \times 100$$

Where X_c is the laboratory control sample result and S is the amount of the spike added to the laboratory control sample.

Accuracy, as percent recovery, for a surrogate is calculated by dividing the sample surrogate result by the amount of surrogate spike added to the sample, as shown below.

$$SurrogateAccuracy = \frac{X_c}{S} \times 100$$

Where X_c is the surrogate compound result in the sample and S is the amount of the surrogate spike added to the sample.

3.3.3 Representativeness

Representativeness expresses the degree to which sample data accurately and precisely represent a characteristic of a population, parameter variations at a sampling point, or an environmental condition. Samples must be representative of the environmental media being sampled. Selection of sample locations and sampling procedures will incorporate consideration of obtaining the most representative sample possible.

Field and laboratory procedures will be performed in such a manner as to verify, to the degree that is technically practicable, that the data derived represents the in-place quantity of the material sampled. Every effort will be made to ensure chemical compounds will not be introduced into the sample via sample containers, handling, and analysis. Decontamination of equipment will be performed between samples. Laboratory sample containers will be new certified bottle-ware. Analysis of ambient blanks, equipment blanks, and method blanks will also be performed to monitor for potential sample contamination from field and laboratory procedures.

The assessment of representativeness also must consider the degree of heterogeneity in the material from which the samples are collected. Sampling heterogeneity will be evaluated through the analysis of field duplicate samples. Consistency in sample collection techniques is critical to the significance of field duplicate sample results in evaluating representativeness. If the samples are not properly collected, results outside of the established control limits may be indicative of poor collection technique rather than providing insight into site conditions.

3.3.4 Completeness

Completeness is the degree to which the proposed sampling locations yield usable data (data that was not rejected) of the type requested. Proposed sample collection points may fail to produce usable data for many reasons (e.g., field conditions that prevent collection of samples, sample container breakage, elevated storage temperature, exceeded sample holding time, or data loss). Percent completeness is calculated by dividing the number of usable data points by the number of proposed sample collection points, as shown below.

$$Completeness = \frac{U}{P} \times 100$$

Where U is the number of usable data points and P is the number of proposed method results. In general, the completeness goal for the data is 95 percent for the existing and new wells.

3.3.5 Comparability

Data comparability is the confidence with which one data set can be compared to another data set. Data comparability will be achieved by using standard sampling and analytical techniques and by documenting all QA/QC measures and procedures. QA/QC procedures will be considered when comparing data sets.

3.3.6 Sensitivity

Data sensitivity is the ability for the analytical method to differentiate between various levels of the measured parameter. Results between the analytical RL and the laboratory method detection limits (MDLs) will be reported for all analytes. This is necessary as the analytical RLs for several analytes may be above the associated GWPSs, as depicted in bold italics on Table 2-3. As shown in Table 2-3, the respective MDLs are below the GWPS for all constituents.

3.4 Data Review and Validation

Data validation is a process used to determine if data are accurate, complete, or meet specified criteria (American National Standards Institute [ANSI], 1995). Data validation objectives are as follows:

- Produce data with values that are validated and of a known quality.
- Evaluate the internal, spatial, temporal, and physical consistency of the data.
- Intercompare data to identify errors, biases, or outliers (USEPA, 2002b).

The data validation process will consist of data generation, reduction, and review of both field data and laboratory analytical data. The results of the validation will be included with the original hardcopies of the data and will be maintained in the project file. The data will be recorded in the Facility database.

Eight prior sampling events have been subjected to Region 9 Tier 3 validation. Data validation requirements for future sampling events are discussed in Section 3.4.4.

3.4.1 Field and Technical Data

The field and technical (non-laboratory) data that will be collected during the field effort can generally be characterized as either “objective” or “subjective” data. Objective data (e.g., field test-kit results) include direct measurements of field data such as field screening/analytical parameters and water-level measurements. Subjective data include descriptions and observations such as descriptions of sampling locations and conditions and physical descriptions of samples.

Field data collected during the field activities will be evaluated for usability by conducting a QA review that consists of checking the procedures used and comparing the data to previous measurements. Field QC samples will be evaluated to confirm that field measurements and sampling protocols have been observed and followed. Checks will include, but may not be limited to, the following:

- Calibration method and frequency
- QC lot number
- Date and time sampled
- Preservation
- Sampler Name
- Laboratory Name
- Chain-of-Custody (COC) forms
- Date shipped
- Date and time of sample receipt at the laboratory

Validity of data will be determined by checking calibration procedures used in the field and by comparing the data to previous measurements, if any, at the specific location. Large variations (greater than 50 percent) will be examined for possible re-collection of data or assignment to a lower level of validity.

The subjective data will be formatted into a usable medium, such as a computer database program. The database will allow for the generation of summary tables, graphs, and figures while maintaining the integrity and accountability of the original data.

The QA review for usability of objective field and technical data will be performed at two levels. For the first level, data will be reviewed at the time of collection by following standard procedures and QC checks. For the second level, after data reduction to table format or arrays, the data will be reviewed for anomalous values. Any inconsistencies or anomalies identified by this review will be immediately resolved, if possible, by seeking clarification from the field personnel responsible for collecting the data. Inconsistencies and anomalies will be documented during the validation process.

Subjective field and technical data will be approved for use by review of field reports for reasonableness and completeness. In addition, random checks of sampling and field conditions will be made to check recorded data at that time to confirm the recorded observations.

3.4.2 Laboratory Data Documentation

The laboratory will be requested to retain records of the analytical data and project files for a minimum of 5 years, or longer, from the date of the report.

3.4.2.1 Data Reduction

Data reduction is performed by the individual analysts and consists of calculating concentrations in samples from the raw data obtained from the measuring instruments. The complexity of the data reduction will be dependent upon the specific analytical method and the number of discrete operations (i.e., extractions, dilutions, and levels/concentrations) involved in obtaining a sample that can be measured.

For those methods using a calibration curve, sample response will be applied to the linear regression line to obtain an initial raw result, which will then be factored into equations to obtain the estimate of the concentration in the original sample. Rounding will not be performed until after the final result has been obtained to minimize rounding errors; results will not normally be expressed in more than three significant figures. Copies of raw data and calculations used to generate the final results will be retained on file to allow reconstruction of the data reduction process later.

3.4.2.2 Laboratory Data Review

System reviews will be performed at all levels. The individual analyst will constantly review the quality of data through calibration checks, QC sample results, and performance evaluation samples. These reviews will be performed prior to submission to the Laboratory Project Manager.

Criteria for analytical data review/verification include checks for internal consistency, transmittal errors, laboratory protocol, and laboratory QC. QC sample results and information documented in field notes will be used to interpret and evaluate laboratory data. The laboratory QA personnel will independently conduct a complete review of selected reports to confirm analytical results.

The laboratory will complete standard validation procedures, including:

- Verifying analyses requested were analyses performed.
- Preliminary data proofing for anomalies - investigation and corrections, where possible.
- Reviewing laboratory data sheets for detection limits, holding times, surrogate recovery performance, and spike recovery performance.
- Double-checking computerized data entry, if applicable.

The Laboratory Project Manager will review data for consistency and reasonableness with other generated data and determine whether program requirements have been satisfied. Selected hardcopy output of data (chromatograms, spectra, etc.) will be reviewed to ensure that results are interpreted correctly. Unusual or unexpected results will be reviewed, and a determination will be made as to whether the analyses should be repeated. In addition, the Laboratory Project Manager may recalculate selected results to verify the calculation procedure.

Prior to final review/signoff by the Laboratory Project Manager, the Data Reporting Department will verify that the report deliverable is complete and in proper format, screen the report for compliance to laboratory and client QA/QC requirements, and ensure that the Case Narrative addresses any noted deficiencies. The Laboratory Project Manager will perform the final laboratory review and completeness check prior to reporting the results to the Operator Chemist.

The Laboratory QA Coordinator will independently conduct a complete review of selected projects to determine whether laboratory and client QA/QC requirements have been met. Discrepancies will be reported to the Laboratory Project Manager for communication to Operator Chemist.

3.4.3 Data Reporting/Deliverable Package

The data will be reported in the data package format specified in the contract with the laboratory. The laboratory will be responsible for providing an approved EDD in EQuIS 4 file format to the Operator Chemist within 21 calendar days of sample receipt, as well as analytical data packages in a scanned image format (i.e., PDF). Longer time for data deliverables may be necessary for certain analytical fractions. If resubmittals are required from the laboratory, they will be provided to the Operator Chemist within seven days from the day of request.

The deliverable package will contain final results (uncorrected for blanks and recoveries), analytical methods, MDLs, RLs, surrogate recovery data, method blank data, and results of QC samples (where applicable). In addition, special analytical problems and/or any modifications of referenced methods will be noted. The number of significant figures reported will be consistent with the limits of uncertainty inherent in the analytical method. Data are normally reported in units commonly used for the analyses performed.

QC results reported will include method blanks, LCSs, Matrix Spike/Matrix Spike Duplicate (MS/MSD) samples, laboratory duplicate (LD) samples, and field QC samples. Sample data results (including QC sample results) will also be entered into the program data management system. The laboratory is responsible for reviewing the electronic data to ensure that these data are consistent with the hardcopy reports. The Laboratory Analytical Report (in PDF format) will conform to Level III requirements and will consist of the following:

- Sample identification (ID) Summary
- Analytical Results, including laboratory qualifiers
- Case Narrative
- Surrogate Recoveries, where applicable
- Internal Standard Recoveries, where applicable
- Completed COC Record
- Method Blank
- LCS Summary
- Laboratory Control Sample Duplicate (LCSD), where applicable
- MS Summary
- MSD Summary, where applicable
- Replicate/Duplicate, where applicable
- Post-Digestion Spike Summary, when applicable
- Serial Dilution Summary, where applicable
- Initial Calibration and Initial Calibration Verification (ICV) Summaries
- Continuing Calibration Verification (CCV) Summaries
- Preparation and analytical sequence logs

In addition to all the Level III reporting requirements, the following will be required for Level IV reporting:

- Any QC data not included above (e.g., gas chromatography/mass spectrometry [GC/MS] tunes, Endrin/dichloro-diphenyl-trichloroethane (DDT) breakdown percentages, confirmation column data)
- Raw instrument data, including chromatograms and spectral data

3.4.4 Data Review and Verification/Validation

The purpose of analytical data verification/validation is to qualify data due to data quality limitations and to identify data reduction errors. The verified/validation data are used by the project team to assess whether there are any usability limitations relative to the project DQOs (see Section 3.6). In addition to the laboratory QA review, the fully documented data packages will be evaluated by the Operator Chemist for the following:

- Compliance with requested testing
- Completeness
- Confirmation of receipt of requested items

The Operator Chemist will validate the data or subcontracted data validation to an independent data validation specialist, who will validate the data with guidance from the *USEPA National Functional Guidelines for Superfund Inorganics Methods Data Review* (NFG; USEPA, 2017a); *USEPA National Functional Guidelines for Superfund Organics Methods Data Review* (USEPA, 2017b); and *Region 9 Superfund Data Evaluation/Validation Guidance* (USEPA, 2001). USEPA NFGs, which were developed for the validation of data generated in accordance with the Contract Laboratory Program (CLP), are not completely applicable to the type of analyses/protocols associated with the analyses for this Facility. The Operator Chemist will perform the validation by applying the USEPA guidelines as appropriate; by assessing the data relative to laboratory method QC protocols, DQOs in this SAP; and by using professional judgment.

The data validator(s) will perform Tier 2 data validation/review as specified in *Region 9 Superfund Data Evaluation/Validation Guidance* (USEPA, 2001) on results generated from samples collected from the existing wells. Tier 2 validation is described as:

- Used in conjunction with a Tier 1A/1B review
- Not involving an in-depth review of all raw data
- Identifying significant and noticeable data quality issues/deficiencies and indicating whether data quality is consistent with the intended use.

The Tier 2 validation for the existing wells will require submission of at least one Level IV data package for all methods and Level III data packages for the remaining deliverables. Data validation will include:

- All review items addressed in Tier 1A/1B, including review holding times, method blanks for contamination, surrogate and internal standard recoveries, and summaries of QC samples (e.g., MS/MSD, LCS).
- Initial calibrations, ICVs, and CCVs summaries.
- Random checks of reported results against raw data.

The results generated from samples collected from the three new groundwater monitoring wells and one new replacement well installed in 2019 will be subject to eight rounds of validation using Tier 3 methodologies. Tier 3 validation for the new wells will require submission of Level IV data package for all samples and all methods.

Holding times: The laboratory will factor in time change by using the time zone of collection. The laboratory's system will be set up to correctly calculate holding times from samples from different time zones. For each sample, the dates and times of collection in the time zones for Guam and the receiving laboratory will be recorded on the COC (see Section 9.3). The laboratory's login staff will enter this information within the sample logging software. The sampler will also write the time zone on the COC when collecting the samples, as shown on Figure 3-1.

Field QC samples will be verified as follows.

Field Duplicates: Field duplicates will be collected at a frequency specified in Section 10.1. An RPD or absolute difference (AD) between the primary and field duplicate sample results will be calculated for each analyte that is detected in both samples as follows:

- If results for both the primary and field duplicate are equal to or greater than five times the RL, then an RPD is calculated. For inorganic methods, the control limit is an RPD equal to or less than 20. For organic methods, the control limit is an RPD equal to or less than 30.
- If results for one or both the primary and field duplicate is less than the RL, then an AD is calculated. For all methods, the control limit is an AD of ± 2 times the RL.

RPDs and ADs that exceed control limits will be qualified as follows:

- Estimated and biased high ("JH") if the field duplicate result is less than the primary result.
- Estimated and biased low ("JL") if the field duplicate result is greater than the primary result.

Field Blanks: Trip blanks, ambient blanks, and equipment blanks will be collected at a frequency specified in Section 10.1. The control limit is no detections equal to or greater than one-half the RLs.

Field sample results associated with any blank detection will be evaluated in a similar fashion as specified in the National Functional Guidelines for laboratory method blanks. Field sample results will be qualified as follows:

- Not detected at the RL if the detection in the field sample is less than the RL.
- Estimated and biased high ("JH") if the detection in the field sample is greater than the RL.

Data validation is a process which confirms that reported data values meet the quality goals for the intended use of the data. The full data validation will include the review of the QC measures reviewed during the data verification but will also include the review of the summary forms for all QC procedures and all sample and QC raw data (including instrument calibration) to support the results reported.

The Data Validator will use the following data validation qualifiers:

U	The analyte was analyzed for but was not detected above the level of the reported sample detection limit.
J	The analyte was positively identified but the result is an estimated quantity. The associated numerical value is the approximate concentration of the analyte in the sample.
UJ	The analyte was analyzed for but was not detected above the sample RL. The RL is approximate.
R	The sample results are rejected due to serious deficiencies in the ability to analyze the sample and meet QC criteria. The analyte may or may not be present in the sample.
UR	The analyte was analyzed for but was not detected above the level of the reported sample detection limit; however, the data are unusable. The sample results are rejected due to serious deficiencies in the ability to analyze the sample and meet QC criteria. The analyte may or may not be present in the sample.

In conjunction with the data validation qualifiers, the Data Validator will also use the following "Valid Reason Codes" to further describe data qualifications/limitations:

1	Holding time violation
2	Method blank contamination
3	Surrogate recovery
4	MS/MSD recovery
5	MS/MSD precision outside limits
6	Laboratory control sample recovery
7	Field blank contamination
8	Field duplicate precision outside limits
9	Other deficiencies (including cooler temperature)
A	Absence of supporting QC
S	ICV, CCV, or column performance check problem
Y	Initial and continuing calibration blank problem
M	Interference check samples problem
O	Post-digestion spike outside of 85-115 percent
F	Measurement Systems Analysis (MSA) correlation coefficient <0.995, or MSA not done
G	Serial dilution problem
K	Decafluorotriphenylphosphine (DFTPP) or 4-bromofluorobenzene (BFB) tuning problem
Q	Initial calibration problem
X	Internal standard recovery problem

V	Second source standard calibration verification problem
L	Low bias
Z	Retention time problem
N	Counting time error (radionuclide chemistry)
W	Detector instability (radionuclide chemistry)
C	Co-elution of compounds
E	Value exceeds linear calibration range
I	Interferences present during analysis
T	Trace level compound, poor quantitation
P	1C/2C precision outside of limits
B	LCS/LCSD precision outside limits
D	Lab Dup/Rep precision outside limits
H	High bias

3.5 Data Management

A copy of the COC will be delivered to the Operator Chemist for inclusion in project files. Upon receipt and log-in of the samples at the laboratory, the remaining sections of the field COC will be noted on the field COC. These sections include description of the time and date of sample receipt, sample condition at the time of receipt, assigned laboratory batch number, laboratory ID number, and any special conditions. The laboratory will document discrepancies, and the Operator Chemist will be notified. The field COC information will be initially keyed into and maintained in the laboratory's database.

A copy of the laboratory's COC information, referred to as a sample receipt confirmation, will be sent to the Operator Chemist following sample log-in for verification of properly entered handwritten chain of-custody requests and information such as sample ID numbers, analyses requested, and the quantity of samples. In cases of discrepancies between the field COC and the sample receipt confirmation, the appropriate revisions will be communicated to the laboratory for the COC corrections. Corrected information on the field COC will be recorded into the project database.

The samples received by the laboratory will be analyzed following internal laboratory QC procedures. Following sample analysis, the laboratory will deliver the EDD to the Operator Chemist where it will be uploaded into the project database. If any required information is missing or if database fields are inappropriately filled, the laboratory and Operator Field Team Leader will be notified, and the laboratory will provide a corrected EDD.

3.6 Assessment Oversight

An assessment of the data quality will be made by the Operator Chemist. The assessment should be included with the report in which the data are first presented. During the assessment, the data reviewer may evaluate:

- Whether appropriate sample collection equipment, sampling procedures, and decontamination procedures were used.
- Whether proper sample containers and preservatives were used.
- The completeness of COC documentation.
- The sample condition upon laboratory receipt.

- Whether analytical holding times were exceeded.
- Any contamination suggested by laboratory method, or by field, trip, and equipment blanks.
- The accuracy as indicated by surrogate, LCS, and MS recoveries compared to the method and/or laboratory control limits.
- The precision as indicated by field duplicates, LDs, and laboratory MS duplicates compared to the method and/or laboratory control limits.
- The completeness as indicated by the degree the planned sampling locations yielded usable data compared to the DQOs (see Section 3.3.4 for completeness goals).
- Other laboratory QA issues noted by the analytical laboratory report such as laboratory calibration or internal standard problems, or quantification of analytes outside the calibration range.
- The data reduction calculations.
- The historical data for that location (for example, whether a data point from a groundwater well sample is consistent with past data from that well).

Each data validation report will include a section that provides an assessment of project data. Sensitivity will be evaluated on a sample-by-sample basis and cases where project RLs for specific analytes could not be met by the laboratory (e.g., sample dilutions or matrix interference) will be detailed in this section. It may be determined that additional sample cleanups and/or resampling and reanalysis by a different analytical technique be performed in cases where project RLs for specific analytes could not be met by the laboratory.

3.6.1 Project Assessments

Assessments of project data evaluated have resulted in the following:

3.6.1.1 Method 200.7 Assessment

During the transition to a new laboratory at Event 5, Method 200.7 for metals was changed to Method 200.8. This change was implemented to achieve lower method detection limits and reporting limits for metals. Arsenic and selenium can be subject to interferences in Method 200.8, and after detections of arsenic above the Interim GWPS of 10 ug/L in new monitoring wells, MW-14 and MW-15, Method 200.7 was analyzed for comparison against Method 200.8. During Event 13, Method 200.7 was analyzed for arsenic and selenium with all detected results confirmed within a 20% percent difference. One more event will be completed comparing Methods 200.7 and 200.8 for arsenic and selenium, and if results confirm, Method 200.7 will be removed from sampling and Method 200.8 will be used for all future events.

3.6.1.2 Radium-226 and Radium-228 Method Assessment

During the transition to a new laboratory at Event 5, Radium-226 and Radium-228 methods were changed from Methods 903.0 and 904.0, respectively, to Method 901.1. This change was implemented to reduce sample volume and method costs. After further evaluation, it was noted that Method 901.1 was not sensitive enough to achieve a minimum detectable concentration or reporting limit to evaluate data against the Interim GWPS of 5 pCi/L for combined Radium-226 and 228. Methods 903.0 and 904.0 were re-instated during Event 13. Data confirmed detection levels below the GWPS of 5 pCi/L. Methods 903.0 and 904.0 will be used for Radium-226 and Radium-228, respectively, for all future events. Method 901.1 data will not be used in future background calculations since detection levels are not comparable.

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Section 4

Sampling Rationale

4.1 Rationale for Monitoring Locations

The GWMS established in the Updated CSM (BC, 2021b) and GWMP TM (BC, 2021a) provide the basis of a RCRA-compliant system in accordance with GARR Title 22 §23502 (40 CFR 258.51) which requires enough wells, installed at appropriate locations (upgradient and downgradient) and depths, to yield groundwater samples from the uppermost aquifer. Samples collected from these wells should represent the quality of (a) background groundwater that has not been affected by leakage from the landfill (collected from upgradient wells), and (b) groundwater passing relevant points of compliance (collected from downgradient wells). As discussed in Section 2.5.1, with the addition of the four new wells (MW-11R, -14, -15, and -16) to the eight existing wells (MW-1C, 2A, 5A, -6, -9, -10, -12, and -13), the existing GWMS consists of 12 monitoring wells: three upgradient wells (MW-1C, -2A, and -14) and nine downgradient wells (MW-5A, -6, -9, -10, -11R, -12, -13, -15, and -16) as shown in Figure 2-1 and as summarized on Table 4-1.

Consistent with the Statistical *Analysis of Ground Water Monitoring Data at RCRA Facilities* (USEPA, 2009), background monitoring wells are required to be hydraulically upgradient of the Facility and demonstrated not to be impacted by Facility activities based on eight or more sampling events. Also, the background monitoring wells should satisfy the key statistical assumption of statistical independence of the background measurements, temporal and spatial stationarity, and the lack of statistical outliers.

Monitoring wells MW-1C and MW-2A are upper bedrock water-bearing zone wells and are likely hydraulically upgradient of the Facility based on the equipotential cross-sections and the potentiometric surface maps from wet and dry seasons of 2012. Monitoring well MW-1B was previously included as a hydraulically upgradient well. However, because MW-1B is screened across two hydrogeologic units (saprolite and upper bedrock) it is not considered representative of the upper-most water-bearing zone and therefore should not be included in the GWMS.

MW-1C has exhibited sporadic detections of chlorobenzene during the last eight sampling events and therefore may have been impacted by the Facility and thus should not be used to represent the quality of background groundwater for organics. MW-2A has not been impacted by organics, so it can be used to represent the quality of background groundwater for organics.

MW-1C and MW-2A have likely not been impacted by inorganic constituents (metals and WQPs) from the Dump. Box plots based on the pre-closure data sets (May 2012 through February 2013) for the cations/anions and heavy metals are presented in the Updated CSM (BC, 2021b). The box plots show that concentration ranges and concentration means for sodium, potassium, TDS, sulfate, chloride, and magnesium (all landfill indicator parameters) are consistently lower than observed in the downgradient monitoring wells

Therefore, MW-1C and MW-2A combined represent background groundwater quality for all inorganic constituents but not for organics. These background wells were supplemented with the new upgradient monitoring location, MW-14.

4.2 Rationale for Monitoring Frequency

The sampling and analysis plan is specified in Step 7 of the DQOs (Section 3.2). Groundwater samples representative of the “dry” and “wet” seasons will be collected at the specified frequency and for the specified analytes consistent with Table 4-1 of this SAP and Table 7-1 of GWMP TM (BC, 2021a):

- Interim AGMP for the four new wells (MW-11R, -14, -15, and -16): a total of eight monitoring events performed quarterly for the Project Analyte List.
- AGMP annual monitoring for the eight existing wells (MW-1C, -2A, -5A, -6, -9, -10, -12, and -13) for:
  - Project Analyte List.
- AGMP semi-annual monitoring (i.e., the event in between annual events) for the eight existing wells (MW-1C, -2A, -5A, -6, -9, -10, -12, and -13) for:
  - Appendix I analytes (which includes the detected Appendix II metals arsenic, barium, chromium, cobalt, copper, nickel, selenium, and vanadium).
  - The detected Appendix II analytes and the detected Ordot Specific Analytes listed in Table 2-3
  - Any newly detected Appendix II or Ordot Specific Analyte(s) from annual monitoring events
  - The 16 WQPs from the Project Analyte List.

4.3 Rationale for the Target Analyte List

The Project Analyte List (Attachment A) contains a total of 259 project analytes:

- **223 GARR Title 22 Chapter 23 (40 CFR 258) Appendix II Analytes:**
  - 215 listed Appendix II analytes (which is inclusive of the 58 Appendix I analytes), including the listing of PCBs and Chlordane as one analyte each.
  - 8 additional counted analytes: PCBs and Chlordane are each are listed as one analyte in the list of 215 Appendix II analytes, but these are reported by analytical laboratories as seven Aroclor mixtures and three isomers of Chlordane, respectively. Thus, the eight additional counted analytes are the 10 isomers of PCBs and Chlordane minus the two listed as separate analytes in the list of Appendix II analytes.
- **20 Ordot Specific Analytes:**
  - Munitions, radiological parameters (gross-alpha and -beta, radium 226 and 228, and uranium), and perchlorate (a solid rocket fuel propellant) are included because of past military activities on Guam.
  - 1,4-Dioxane is included because it is frequently found at Municipal Solid Waste Landfill Facilities.
  - Hexavalent chromium is included because it is the more toxic form of chromium.
- **16 WQPs:** Alkalinity, aluminum, ammonia as N, calcium, chloride, iron, magnesium, manganese, molybdenum, nitrate+nitrite as N, phosphate as P, potassium, sodium, sulfate, TDS, and TSS are included to monitor general groundwater quality conditions related to potential landfill impacts.

Section 5

Request for Analysis

5.1 Analysis Narrative

Table 5-1 provides the sampling and analysis table for the quarterly sampling of the new wells, the annual sampling of the existing wells, and the semiannual sampling for the existing wells.

The methods and analytes that comprise the Appendix I and II analytes, the Ordot Specific Analytes, and the WQPs are listed in Attachment A. The distinct list of analytical groups (chemical classifications) and methods are as follows:

- Volatile organic compounds (VOCs) by USEPA Method 8260C
- 1,4-Dioxane by USEPA Method 8260C selected ion monitoring (SIM)
- Semi-volatile organic compounds (SVOCs) by USEPA Method 8270D
- Polycyclic aromatic hydrocarbons (PAHs) by USEPA Method 8270D SIM (PAHs are a subset of SVOCs and require lower RLs than achieved by the routine, full ion monitoring scan, USEPA Method 8270D)
- DEHP by USEPA Method 8270D SIM
- 2,3,7,8-Tetrachlorodibenzodioxin (TCDD) by USEPA Method 1613B
- Pesticides by USEPA Method 8081B
- PCBs by USEPA Method 8082A
- Herbicides by USEPA Method 8151A
- Organophosphorus compounds by USEPA 8141B
- Perchlorate by USEPA Method 6850
- Nitroaromatics and nitramines (munitions or explosives) by USEPA Method 8330B
- Metals by USEPA Method 200.8: includes the 15 Appendix I metals (antimony, arsenic, barium, beryllium, cadmium, chromium, cobalt, copper, lead, nickel, selenium, silver, thallium, vanadium, and zinc); the Appendix II metal tin; eight WQPs (aluminum, calcium, iron, magnesium, manganese, molybdenum, potassium, and sodium); and the radiological constituent uranium.
- Hexavalent chromium by USEPA Method 218.7
- Mercury by USEPA method 245.1
- Cyanide by Standard Methods (SM) 4500-CN-E
- Radiological constituents gross-alpha and gross-beta by USEPA Method 900
- Radiological constituents radium-226+228 by USEPA Method 903.0 and 904.0, respectively
- Alkalinity by SM 2320B
- Ammonia as N by USEPA Method 350.1
- Chloride and sulfate by USEPA Method 300.0
- Nitrate+nitrite as N by USEPA Method 353.2
- Phosphate as P by SM 4500-P-B.5
- Sulfide by SM 4500-S2

- TDS by SM 2540C
- TSS by SM 2540D

As shown on Attachment A, the list of analytes referenced as Appendix I, Appendix II, Ordot Specific, and WQPs are as follows:

- **Appendix I analytes:** 43 VOCs and 15 metals
- **Appendix II analytes:** VOCs (the 43 Appendix I VOCs and 20 additional VOCs), SVOCs/PAHs, TCDD, pesticides, PCBs, herbicides, organophosphorus compounds, metals (the 15 Appendix I metals, tin, and mercury), cyanide, and sulfide.
- **Ordot Specific Analytes:** 1,4-dioxane; perchlorate; munitions; hexavalent chromium; uranium; gross-alpha and -beta; and radium-226 and -228.
- **WQPs:** aluminum, calcium, iron, magnesium, manganese, molybdenum, potassium, and sodium; alkalinity; ammonia as N; chloride and sulfate; nitrate+nitrite as N; phosphate as P; TDS; and TSS.

In some cases, modification of standard methods may be necessary to provide accurate analyses of particularly complex matrices. When modifications to standard analytical methods are performed, the specific deviations, as well as the reason for the deviations, will be documented in the laboratory analytical SOPs or will be reported with the analytical results.

USEPA or GEPA may promulgate regulations for emergent chemicals, such as perfluorooctanoic sulfonate (PFOS), and these should be incorporated, as appropriate, into the groundwater monitoring program and documented in updates to this SAP.

Table 5-2 presents the analytical methods, container type, volume, preservation, and holding times for groundwater monitoring.

5.2 Analytical Laboratory

The Project Chemist will select one or more laboratories to provide analytical services. Selected laboratory(ies) will need to have valid certification for methods listed in Section 5.1 through the National Environmental Laboratory Accreditation Program (NELAP) or approved Federal or State Accreditation Program. Laboratories will need to meet all the analytical and reporting requirements specified in this SAP.

The target list of analytes for each method are provided in Attachment A. The MPC for the DQIs discussed in Section 3.3 are specified on Table 5-3. Laboratory MDLs must be less than the GWPSs listed on Table 2-3. As listed on Table 5-3, the laboratory MDL for DEHP must be less than its GWPS of 6 micrograms per liter (µg/L) and the method blank must be less than the GWPS and less than one-half the RL.

The analytical instrumentation or process for each method is listed on Table 5-4. The laboratory must adhere to any method-specified calibration procedures. In addition to the method-specified calibration procedures, and as applicable for the method, the laboratory must perform multi-point initial calibration with the low-level standard concentration(s) at or below the RL(s). The laboratory must verify the initial calibration with an ICV standard prepared from a source other than that used to prepare standards used in the initial calibration (i.e., second source).

Analytical QC sample requirements and any project specific MPC are summarized on Table 5-5. The acceptance criteria and corrective action for QC samples must be specified in the laboratory SOPs.

The Project Chemist must review the laboratory SOPs to ensure that the method-specified calibration and QC sample criteria are accurately and completely discussed in the SOPs. The Project Chemist must provide the additional calibration requirements specified on Table 5-4 and project specific MPCs listed on Table 5-3 to the laboratory. The Laboratory Project Manager is responsible for communicating these requirements to laboratory personnel. Per Table 5-5, the laboratory analytes, supervisors, and QA coordinator are responsible for ensuring compliance with these requirements.

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Section 6

Field Methods and Procedures

This section provides the requirements for calibration of measuring and test equipment/instruments used in field sampling analysis. The calibration procedures stipulated are designed to ensure that field equipment is calibrated to operate within manufacturer specifications and that the required traceability, sensitivity, and precision of the equipment/instruments are maintained. Measurements that affect the quality of an item or activity will be taken only with instruments, tools, gauges, or other measuring devices that are accurate, controlled, calibrated, adjusted, and maintained at predetermined intervals to ensure the specified level of precision and accuracy. All calibration measurements and maintenance records are documented so that data may be verified and validated during an audit. All documentation will be maintained for the duration of activities associated with the orders. A list of the SOPs included as Attachment B are below:

- SOP-010 – Environmental Sampling
- SOP-011 – Sample Preservation
- SOP-012 – Field Notes and Documentation
- SOP-013 – Instrument Calibration
- SOP-014 – Equipment Decontamination
- SOP-015 – Investigation Derived Waste Handling Procedures
- SOP-016 – Groundwater Monitoring Well Installation and Development
- SOP-017 – Groundwater Sample Collection
- SOP-024 – Monitor Well Water Level Measurement
- SOP-026 – Pre-Sample Purging and Sampling of Low-Yielding Monitoring Wells
- SOP-030 – Sampling Monitoring Wells
- SOP-031 – Chain-of-Custody

6.1 Field Equipment

6.1.1 List of Equipment Needed

Field instruments that may be used during sampling activities include, but are not limited to, those indicated in Table 6-1.

6.1.2 Calibration of Field Equipment

As indicated in Table 6-2, field instruments will be calibrated according to the manufacturer's recommendation, or at a minimum, at the start of each day's field use.

Calibration records will contain the following information:

- Instrument name and ID number
- Name of person performing the calibration
- Date of calibration
- Calibration points
- Results of the calibration

- Manufacturer lot number of the calibration standards
- Expiration dates for the calibration standards, where applicable.

Field equipment will be properly inspected, charged, and in good working condition prior to the beginning of each working day. Prior to the start of each working day, the Contractor Field Team Leader will inspect equipment to verify its proper working condition. Field equipment and instruments will be properly protected against inclement weather conditions during the field work. At the end of each working day, field equipment and instruments will be properly decontaminated, taken out of the field, and appropriately placed for overnight storage and/or charging.

Calibration checks may suggest the need for maintenance or calibration by the manufacturer. Field instruments that do not meet the calibration requirements will be taken out-of-service until acceptable performance can be verified. Maintenance should be performed when the instrument will not adequately calibrate. Maintenance of field equipment should be noted in an instrument logbook or field notebook.

6.2 Groundwater Sampling

6.2.1 Water-Level Measurements

Water level measurements will be obtained at each monitoring well under natural static conditions (SOP-024 Monitoring Well Water Level Measurement, Attachment B). Groundwater level measurements will be made to an established (marked) reference point on the northern side of the casing that has been surveyed to a United States Geological Survey (USGS) benchmark. The monitoring wells have been surveyed by a Guam-licensed surveyor. This reference point will be documented in the field records. A decontaminated water level indicator will be lowered into the well until a reading is obtained. Measurements will be made and recorded to the nearest 0.01 foot and will be repeated twice or until consistent measurements are obtained. All information will be recorded in field logbooks as described in SOP-012 Field Notes and Documentation.

A potentiometric surface map will be prepared after each groundwater monitoring event and the gradient will be used to estimate groundwater velocity at the Facility.

6.2.2 Purging

Groundwater samples will be collected using either low-flow sampling procedures detailed in SOP-017 Groundwater Sample Collection, Attachment B, or the alternate pre-sample purging and sampling methodology for low-yielding monitoring wells detailed in SOP-026.

Low-flow sampling procedures assume the water-bearing zone can sustain flow. Wells where the standing water levels (SWLs) drop rapidly call for procedures outlined in SOP-026 Pre-Sample Purging and Sampling of Low-Yielding Monitoring Wells and possible use of bailers for sampling (SOP-030 Sampling Monitoring Wells with a Bailer, Attachment B). Under these low yielding well conditions water parameters that are field measured may not be recorded and not all laboratory samples may be collected.

The general sampling procedure for low-flow purging is as follows:

- Measure static water level and set water level meter probe at a depth of 0.3 feet (ft.) below the static water level.
- Purge the well using the submersible pump and dedicated tubing:
- Start the pump on lowest speed and increase until discharge occurs. The drawdown should be monitored so that it does not drawdown greater than 0.3 ft.

- Field parameters (pH, specific conductance, temperature, dissolved oxygen [DO], oxidation reduction potential [ORP] or Eh, and turbidity) will be monitored using a flow-through cell and will begin to be recorded at 3 to 5-minute intervals after one pump volume plus one discharge tubing volume have been removed from the well.
- After parameters have stabilized, purging will be considered complete. Stabilization has occurred when three consecutive readings taken at 3 to 5-minute intervals are within the following limits:
  - Turbidity (10% for values greater than 1 nephelometric turbidity unit [NTU])
  - DO (10%)
  - Specific conductance (3%)
  - Temperature (3%)
  - pH (± 0.1 units)
  - ORP/Eh (± 10 mV or 10% between readings)

The general sampling procedure for low-yielding monitoring well purging is as follows:

- Measure static water.
- Purge the well using a submersible or peristaltic pump and dedicated tubing.
- Purge 3-5 volumes of the saturated thickness of the well.
- Field parameters (pH, specific conductance, temperature, DO, ORP, or Eh, and turbidity) will be monitored using a flow-through cell and will begin to be recorded at each well volume.

6.2.3 Sampling

After purging, the flow-through cell will be disconnected, and samples will be collected and placed directly into the appropriately labeled and preserved sample containers. For wells sampled using the low-yielding monitoring well method and peristaltic pumps, the sample must be collected using a disposable bailer. Samples collected from a monitoring well will have the sample designation of the monitoring well name and date. For example, a groundwater sample from MW-1C would be identified as MW1C-*20200101(*Date Sampled YEARMONTHDAY).

Samples will be cooled to 4 degrees Celsius (°C) by placing into coolers with ice. Samples will remain on ice and be transported to the laboratory under standard chain-of-custody protocols.

6.2.4 Monitoring Well Replacement Procedures

If a groundwater monitoring well is dry for two consecutive “wet” season sampling events, the project team will investigate replacement of the well with a new well at a greater depth in the same geologic unit. The replacement well should be installed within close proximity (i.e., 25 feet) to the well being replaced. If it is not possible to install a replacement well at greater depth in the same geologic unit and within 25 feet of the well to be replaced, GEPA will be consulted regarding other options.

6.3 Decontamination Procedures

Tools and equipment decontamination procedures are implemented to prevent cross-contamination of samples and to control potential inadvertent transport of hazardous constituents. Personnel decontamination procedures are designed to prevent personnel exposure to chemicals. Proper tool and equipment decontamination procedures are provided in SOP-014 Equipment Decontamination in Attachment B.

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Section 7

Sample Containers, Preservation, Packaging and Shipping

7.1 Sample Containers and Preservation

The number and type of sample containers, volumes, and preservatives are listed in Table 5-2. Sample containers provided will be new, I-Chem Series 300 or equivalent. The containers will not be rinsed prior to sample collection. Preservatives, when required, will be added by the designated laboratory for analysis to the containers prior to shipment of the sample bottles from the laboratory.

7.2 Packaging and Shipping

Samples will be packed and shipped in accordance with applicable and current US Department of Transportation (DOT) regulations, field consultant guidelines, and International Air Transport Association (IATA) standards (as detailed in the most current edition of IATA Dangerous Goods Regulations for hazardous materials shipments). All sample containers will be placed in a strong-outside shipping container and shipped by FedEx using the shortest possible shipping time (i.e., next day, if possible). For each sample, the dates and times of collection in the time zones for Guam and the receiving laboratory will be recorded on the COC (see Section 9.3).

The following outlines the packaging procedures that will be followed for these samples.

1. Seal the drain plug of the cooler with fiberglass tape to prevent melting ice from leaking out of the cooler.
2. The bottom of the cooler should be lined with bubble wrap to prevent breakage during shipment.
3. Check screw caps on sample containers for tightness.
4. Secure bottle/container tops with clear tape and custody seal all container tops.
5. Affix sample labels onto the containers with clear tape.
6. Wrap all glass sample containers in bubble wrap to prevent breakage.
7. Seal all sample containers in heavy duty plastic zip-lock bags. Write the sample numbers on the outside of the plastic bags with indelible ink.
8. Place samples in a sturdy cooler(s) lined with a large plastic trash bag. Enclose the appropriate COC(s) in a zip-lock plastic bag affixed to the underside of the cooler lid.
9. Fill empty space in the cooler with bubble wrap or Styrofoam peanuts to prevent movement and breakage during shipment. Vermiculite should also be placed in the cooler to absorb spills if they occur.
10. Ice used to cool samples will be double sealed in two zip lock plastic bags and placed on top and around the samples to chill them to the correct temperature.
11. Each cooler will be securely taped shut with fiberglass strapping tape, and custody seals will be affixed to the front, right and back of each cooler.

Prior to shipping the cooler, a Toxic Substances Control Act (TSCA) Certification Form, as shown in Figure 7-1, must be completed. This form must be presented to the shipping company (e.g., FedEx) with the cooler and other shipping documentation.

Section 8

Disposal of Residual Materials

In the process of collecting environmental samples, the sampling team will generate different types of potentially contaminated Investigation-Derived Waste (IDW) that include the following:

- Used personal protective equipment (PPE)
- Disposable sampling equipment
- Decontamination fluids

The USEPA's National Contingency Plan (NCP) requires that management of IDW generated during sampling comply with all applicable or relevant and appropriate requirements (ARARs) to the extent practicable. The sampling plan will follow the Office of Emergency and Remedial Response (OERR) Directive 9345.3-02 (May 1991), which provides the guidance for the management of IDW. In addition, other legal and practical considerations that may affect the handling of IDW will be considered.

- Used PPE and disposable equipment will be double bagged and placed in a municipal refuse dumpster. These wastes are not considered hazardous and can be sent to a municipal landfill. Any PPE and disposable equipment that is to be disposed of which can still be reused will be rendered inoperable before disposal in the refuse dumpster.
- Decontamination fluids that will be generated in the sampling event will consist of dilute nitric acid, pesticide-grade solvent, deionized water, residual contaminants, and water with non-phosphate detergent. The volume and concentration of the decontamination fluid will be sufficiently low to allow disposal with the leachate. The water (and water with detergent) will be poured onto the ground or into the perimeter leachate collection trench (PLCT). Pesticide-grade solvents will be allowed to evaporate from the decontamination bucket. The nitric acid will be diluted and/or neutralized with sodium hydroxide and tested with pH paper before pouring into the PLCT.

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Section 9

Sample Documentation and Shipment

A field logbook will be maintained at the Facility by the Operator Field Team Leader or other designated field team member to record information pertinent to daily activities, the field sampling program, and the equipment preparation efforts. Field logbooks will be bound, with pages sequentially numbered. Entries will be made in permanent, waterproof ink. The Field Team Leader will review field log entries daily and will initial each page of entries. Field logbooks will be transferred to the project files at the end of field activities to provide a record of sampling. The following sections describe the documentation of field records.

9.1 Field Notes

9.1.1 Field Logbooks

A separate entry will be made for each sample collected. At a minimum, the following information will be recorded in a field logbook or on the appropriate sampling forms using indelible ink:

- Sample ID number
- Time and date of collection
- Sample matrix
- Number of sample bottles
- Project number
- Any preservatives added
- Required analyses
- Odors or visual observations
- Any deviations from SOP and/or work plans
- Sample location
- Method of sample collection
- Analyses performed in the field
- General comments (e.g., weather conditions)
- Names and signatures of all sampling personnel
- Condition of the well head, if appropriate
- Any deviations from established protocols or work instructions during sample collection

Corrections to the Field Logbook will be made by drawing a single line through the incorrect entry and writing the correct entry. The person making the correction will date and initial the correction. There will be no erasures or obliterated entries in the field logs.

In addition to the sampling information, the following specific information will also be recorded in the field logbook for each day of sampling:

- Team members and their responsibilities
- Time of arrival/entry on site and time of site departure
- Other personnel on-site
- Summary of any meetings or discussions with tribal, Territorial, or federal agency personnel
- Deviations from this SAP and site safety plans
- Changes in personnel and responsibilities with reasons for the changes

An equipment calibration log will be maintained by the Operator Field Team Leader to record the calibration measurements and frequencies of calibration of equipment. This log may be incorporated into the Field Logbook notes for a specific location/task and date of activity.

9.1.2 Photographs

Photographs taken to visually document a location or procedure will be numbered to correspond to the field-logbook entries. If possible, a reference point (building, sign, etc.) will be included to assist in verifying the location of the photograph and identify an approximate scale. The name of the photographer, date, time, location, direction of the photograph, and a description of what appears in the photograph will be entered sequentially in the logbook as photos are taken.

9.2 Labeling

Sample labeling and identity establishment are of critical importance in the collection of samples. Data for a sample will be keyed to the sample's unique sample designation. This sample designation, which will be used on sample containers and associated field data forms, will be used for data recall from the database system.

Each sample container will be clearly labeled, as soon as possible, after collection. At a minimum, the following information will be written, using permanent ink, on a waterproof sample label:

- A unique sample ID number
- Time and date of collection
- Company name
- COC number
- Any preservatives added

9.3 Sample Chain-of-Custody Forms and Custody Seals

COC procedures will be used to ensure proper handling of samples during sampling and analysis and to provide sample tracking. Samples and sample documentation will be maintained in the physical possession of authorized personnel or under control in a secure area.

The purpose of sample custody procedures is to document the history of samples (and sample extracts or digestates) from the time of sample collection through shipment, analysis, and disposal. A sample is in one's custody if one or more of the following conditions apply:

- The sample is in an individual's actual possession
- The sample is in view after being in an individual's physical possession
- The sample is locked up so that no one can tamper with it after having been in an individual's physical possession.

A COC form will be filled out upon sample collection; refer to Figure 3-1 for an example COC form. At a minimum, the following information will be written on the COC form:

- Sample ID number
- Time and date of collection
- Field sampler's name
- Sample matrix
- Type, quantity, and volume of sample containers
- Project number
- Any preservatives added
- Required analyses
- Requested analytical turn-around-time
- Any additional information the laboratory must know to perform the requested analysis, such as holding time, filtering required, etc.
- Time and date of sample receipt at the laboratory

The following COC procedures will be followed for samples submitted to the laboratory for chemical or physical properties analyses.

- Each individual field sampler is responsible for the care and custody of samples he/she collects until the samples are properly transferred to temporary storage or are shipped to the laboratory.
- A COC form will be completed by the sampler for samples collected and submitted to the laboratory.
- If temperature preservation of the samples required, each cooler will contain a temperature blank used by the laboratory to record the cooler temperature upon receipt at the laboratory.
- After the cooler is sealed, two custody tape seals will be affixed to the cooler prior to delivery pickup by the overnight courier.
- Each time the samples are transferred, the signatures of the person relinquishing and the person receiving the samples, as well as the date and time of transfer, will be documented.
- A copy of any carrier air bill will be retained as part of the permanent COC documentation.
- The laboratory will record the condition of the sample containers and the temperature (if applicable) upon receipt.
- Changes or corrections to the information documented by the COC form (including, but not limited to, field sample ID or requested analyses) must be dated and initialed by the person making the change. If the request for change is by the Operator Site Manager or Field Team Leader, a copy of the COC form will be revised, initialed, and forwarded to the laboratory and will supersede the original COC form.
- A copy of the original COC form and any documented changes to the original will be included as part of the final analytical report. This record will be used to document sample custody transfer from the sampler to the laboratory and will become a permanent part of the project file.

For each sample, the dates and times of collection in the time zones for Guam and the receiving laboratory will be recorded on the COC. The collection dates and times will be calculated based on a time-zone standard using a time-zone converter tool, such the Coordinated Universal Time (UTC; https://www.timeanddate.com/worldclock/converter.html) as follows:

- Guam Chamorro Standard Time (ChST) = UTC+10 hours
- Pacific Standard Time (PST) = UTC -8 hours (18 hours before ChST)
- Pacific Daylight Time (PDT) = UTC -7 hours (17 hours before ChST)
- Mountain Standard Time (MST) = UTC -7 hours (17 hours before ChST)
- Mountain Daylight Time (MDT) = UTC -6 hours (16 hours before ChST)
- Central Standard Time (CST) = UTC -6 hours (16 hours before ChST)
- Central Daylight Time (CDT) = UTC -5 hours (15 hours before ChST)
- Eastern Standard Time (EST) = UTC -5 hours (15 hours before ChST)
- Eastern Daylight Time (EDT) = UTC -4 hours (14 hours before ChST)

For example, if the sample is collected at 0800 on 4/1/2020 in Guam, and the receiving laboratory is in Denver, Colorado, then the collection date and time of 3/31/2020 at 1600 MDT will also be recorded on the COC. The laboratory will login the sample collection date and time for its time zone (3/31/2020 at 1600 MDT).

After the cooler is sealed, sampling personnel will attach two signed/dated custody seals to the outside of the cooler. One seal will be placed on the right front of the cooler and the second seal will be placed on the rear left side of the cooler. Prior to shipping the cooler, a TSCA Certification Form, as shown in Figure 7-1, must be completed. This form must be presented to the shipping company (e.g., FedEx) with the cooler and other shipping documentation.

Section 10

Quality Control

The quality of data will be controlled, monitored, and verified by maintaining logs, by documenting field activities, and by collecting and analyzing QC samples concurrently with investigative samples. Field and laboratory QC samples will be used to assess accuracy and precision to gauge both field and laboratory activities. QC samples will be collected and analyzed in conjunction with samples designated for laboratory analysis.

Standard analytical QC checks that may be instituted by field and laboratory personnel may include, but are not limited to, the following:

- Equipment Blanks
- Ambient Blanks
- Trip Blanks
- Temperature Blanks
- Field Duplicate Samples
- MS/MSDs
- Method Blanks
- LCS/LCSDs
- LD Samples
- Surrogate and internal standards
- Post-digestion spikes
- Serial dilution samples

These above-cited QC checks are discussed in the following subsections. Field and laboratory QC samples may not be applicable to all sample matrices. Field QC samples will be submitted to the laboratory using the same information as that submitted for the associated investigative samples. All field QC samples, (e.g., field and equipment blanks, field duplicate sample, etc.) are submitted “blind” to the project laboratories. The MPC for these samples are provided on Table 5-3.

10.1 Field Quality Control Samples

Field QC samples are used to help evaluate conditions resulting from field activities such as field contamination and assessment of sampling variability. Field contamination is when substances are introduced in the field due to the environment or sampling equipment and will be assessed through ambient blanks and/or equipment rinse blanks. Sampling variability is due to differences in sampling technique and instrument performance as well as the heterogeneity of the groundwater being sampled and will be assessed through field duplicate samples.

10.1.1Assessment of Field Contamination (Blanks)

Field contamination will be assessed through the collection of different types of blank samples. One type of blank sample, at a minimum, will be collected each day samples are collected.

10.1.1.1 Equipment Blanks

Analyses of equipment blanks are used to assess the efficiency of field equipment decontamination procedures in preventing cross-contamination between samples. Sample collection methods will be documented regarding whether shared equipment (equipment that requires decontamination between wells) was used. Equipment blanks need not be collected when dedicated equipment is used for sampling.

Certified analyte-free reagent water shipped from the laboratory to the field team will be poured into/through/over clean (decontaminated) sampling equipment used in the collection of monitoring samples and subsequently collected in prepared sample bottles. Preservatives or additives will be added as required for the analysis unless the laboratory provides pre-preserved containers. The equipment blank will then be shipped with the associated monitoring samples. An equipment blank will be collected and analyzed for at a rate of 1 for every 20 samples (or less) or one per sampling event, per USEPA Region 9 guidance (USEPA, 2002c). Historical data has shown that equipment blanks with two or more detections of a parameter from 2017 to the present have occurred only with VOCs and SVOCs. Based on this historical data, the equipment blanks will be analyzed for VOCs and SVOCs only. If, at some point, there are detections that are suspect or anomalous at a given well or the monitoring data as a whole, then the method(s) associated with the anomalous analyte(s) will be added to the analytical suite for equipment blanks.

In addition to the frequency specified above for each event, equipment blanks will be collected from pre-cleaned disposable/one-use equipment (i.e., disposable bailers/brass stainless steel sleeves) each time a new lot is used to demonstrate cleanliness for that lot of equipment when applicable.

The equipment blanks will be preserved, packaged, and sealed in the same manner described for the environmental samples. A separate sample number will be assigned to each sample, and it will be submitted blind to the laboratory. Sample IDs for equipment blanks will include “EB” plus the date the sample was collected (i.e., EB-20191117 is an equipment blank collected on November 17, 2019).

10.1.1.2 Ambient Blanks

The purpose of an ambient blank is to evaluate whether outside sources such as ambient air or background laboratory contamination are contributing detectable concentrations of target analytes in the laboratory-provided water. Monitoring well MW-1C is located next to Dero Road, near the entrance to the Composting Facility (see Figure 2-1) and is a potential source of volatile compounds in the ambient air. An ambient blank will be collected during each sampling event when this well is sampled, and it will be analyzed for VOCs only. Ambient blanks are collected by pouring laboratory-provided water directly into labeled sample containers just prior to the sampling of a specified location during the sampling event. The ambient blank will be submitted blind to the laboratory (i.e., without the laboratory knowing which sample location the blank was collected at) and is included with the sample set. The ambient blanks will be preserved, packaged, and sealed in the same manner described for the environmental samples. Sample IDs for ambient (field) blanks will include “FB” plus the date the sample was collected (i.e., FB-20191117 is an ambient blank collected on November 17, 2019).

10.1.1.3 Trip Blanks

Trip blanks are volatile organic samples that are prepared in the laboratory using analyte-free water. Trip blanks should be kept by the field team for a maximum of 10 days, and if not used, they should be replaced with fresh trip blanks. The trip blanks must be inspected for air bubbles by both the laboratory (prior to shipping to the field team) and by the field team (prior to shipping trip blanks back to the laboratory with associated samples). Any vials containing air bubbles will be discarded.

The trip blanks will be analyzed for VOCs to assess if the shipping and handling procedures introduce contaminates into the samples collected, as well as if cross-contamination between samples has occurred. Trip blank containers will be the same type of sample container as that used for VOC samples. One trip blank will be included for each cooler of samples collected for analysis of VOCs. At no time after their preparation and before arrival at the laboratory will the trip blanks be opened. The trip blanks will be preserved, packaged, and sealed in the same manner described for the environmental samples. Sample IDs for trip blanks will include “TB” plus the number of the sample, plus the date the sample was collected (i.e., TB-1-20191117 is the first trip blank collected on November 17, 2019).

10.1.1.4 Temperature Blanks

Temperature blanks are aliquots of analyte-free water used by the laboratory to record the cooler temperature upon receipt at the laboratory. Each cooler containing samples that require temperature preservation will contain a temperature blank.

10.1.2 Assessment of Field Variability (Field Duplicates)

Field variability will be assessed through the collection of duplicate samples. An evaluation of percent precision for historical samples (2017 to the present) indicates that precision is greater than 99 percent. This value was obtained by dividing the number of parameters that were not qualified due to a duplicate RPD above control limits by the total number of parameters. Based on this precision and recommendations for duplicate collection by USEPA Region 9 (USEPA, 2002c), duplicate samples will be collected at a rate of 1 for every 20 samples collected. Duplicates will be submitted to the laboratory as “blind” duplicates and analyzed for the same parameters as the parent samples. This will provide an assessment of the laboratory performance through comparison of sample results.

When a duplicate sample is to be collected, all bottles designated for each method for both the primary and duplicate samples will be filled sequentially before bottles for another analysis are filled. In the filling sequence for duplicate samples, bottles with the two different sample designations will alternate (e.g., VOCs for the primary sample collected at MW-1C, then VOCs for the field duplicate sample collected at MW-1C).

Duplicate samples will be preserved, packaged, and sealed in the same manner as other samples of the same matrix. A separate sample number and location number will be assigned to each duplicate, and it will be submitted blind to the laboratory.

10.2 Laboratory Quality Control Samples

Laboratory QC samples will be analyzed as part of standard laboratory practice for the laboratory to monitor the precision and accuracy of the reported results from their analytical methods. These will be assessed through the analysis of method blanks, LCS/LCSDs, LDs, MS/MSD, surrogates, internal standards, post-digestion spikes, and serial dilutions.

10.2.1 Method Blanks

The purpose of the method blank is to determine the presence and concentration of any contamination associated with the processing or analysis of the samples at the laboratory. Common laboratory contaminants include methylene chloride, acetone, methyl ethyl ketone for VOCs and/or any phthalate for SVOCs.

10.2.2 Laboratory Control Samples

LCSs are used to monitor the accuracy of the analysts(s) performing the laboratory method. The LCS should contain all target analytes. LCS/LCSDs are used by laboratories as a substitute to or in addition to MS/MSD. While the LCS is used to evaluate method accuracy, an LCS/LCSD pair can be used to evaluate both precision and accuracy.

10.2.3 Laboratory Duplicates

LD samples are obtained by splitting a field sample in the laboratory into two separate aliquots and performing separate preparation and analysis on the respective aliquots. The analysis of LD samples monitors precision; however, precision may be affected by sample heterogeneity, particularly in the case of non-aqueous samples. LDs will be analyzed and reported for inorganic analyses only. A LD will be analyzed with every batch of 20 (or fewer) samples.

10.2.4 Matrix Spikes

MS/MSD samples are investigative samples to which known amounts of analytes are added in the laboratory before extraction/preparation and analysis. The recoveries for spiked compounds can be used to assess how well the method used for analysis recovers target compounds in the site-specific sample matrices. At least one set of MS/MSD samples will be collected and analyzed for every 20 (or less) samples received, or one per sampling event. This rate of MS/MSD collection is considered representative, since the groundwater matrix is relatively homogeneous. Also, the laboratory will be able to meet the method QC requirement for 1 in 20 MS/MSD for each preparation batch using samples submitted from other sites, if necessary. For general chemistry analyses, an MS and LD (described above) are specified for analysis.

For the environmental samples, extra volumes of samples will be supplied to the laboratory for its use for QC purposes. Extra sets of water sample containers will be filled, and the containers labeled with a single sample number. The MS/MSD samples will be indicated on the COC to identify which samples are to be analyzed for QC analysis.

10.2.5 Surrogate Spikes

A surrogate is an organic compound that is similar to the target analyte(s) in chemical composition and behavior in the analytical process but is not normally found in environmental samples. Spiking the samples (including any batch QC such as method blanks and LCSs) with surrogate compounds prior to extraction and/or analysis and determining the percent recovery of the spiked surrogate compound evaluates sample matrix effects, accuracy, and laboratory performance on individual samples. The surrogate concentration is measured using the same procedures used to measure other analytes in the sample.

10.2.6 Internal Standards

Internal standards are used to determine the existence and magnitude of instrument drift and physical interferences. Internal standard performance criteria ensure that the instrument’s sensitivity and response are stable (i.e., the analytical behavior of compounds is uniform in each analytical run) during each analysis.

10.2.7 Post-Digestion Spikes

Post-digestion spikes are samples prepared for metals analyses that have an analyte spike added to determine if matrix effects may be a factor in the results. The spike addition should produce a method-specific minimum concentration above the method reporting limit.

10.2.8 Serial Dilution Samples

Serial dilutions are used to determine whether physical or chemical interferences exist (on an analyte-specific basis) with the analysis of samples for metals due to the sample matrix. If an analyte concentration is sufficiently high (i.e., minimally, a factor of 10 above a RL) an analysis of a 1:5 dilution should agree within +/- 10 percent of the original sample result. Serial dilutions are required for analyses by ICP and less frequently by ICP/MS.

Section 11

Field Variances

As conditions in the field may vary, it may become necessary to implement minor modifications to sampling as presented in this plan. When appropriate, the Operator Chemist will be notified, and a verbal approval will be obtained before implementing the changes. Modifications to the approved plan will be documented in the sampling project report.

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Section 12

Health and Safety Procedures

A HASP for Operator personnel has been prepared and must be reviewed by all Operator personnel accessing the Facility. The HASP is a separate, stand-alone document.

Operator's HASP will be prepared specifically for this project and is intended to address health and safety issues solely with respect to the activities of Operator's own employees at the Facility.

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Section 13

References

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Tables

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TABLE 1-1
KEY PROJECT PERSONNEL CONTACT INFORMATION AND RESPONSIBILITIES
ORDOT DUMP POST-CLOSURE FACILITY
ORDOT-CHALAN PAGO, GUAM

Title	Name	Phone Number Email Address	Responsibilities
USEPA Project Manager	Karen Ueno	(415) 972-3317 ueno.karen@epa.gov	Project coordinator, regulatory oversight and point of contact
USEPA Quality Assurance Officer (QAO)	TBD	TBD	TBD
Receiver Project Manager	Chris Lund, P.E., PSS Gershman, Brickner & Bratton, Inc.	(703) 573-5800 clund@gbbinc.com	Receiver for the GSWA
Contractor Project Manager	Paul Bourke, P.E. Brown and Caldwell	(671) 747-6094 pbourke@brwncald.com	Project point of contact, project implementation, and directing the preparation of reports
Contractor QAO	Jaclyn Lauer, P.E. Brown and Caldwell	(317) 408-8340 JLauer@brwncald.com	Confirm compliance with the QAPP, oversee the review of data for compliance with DQOs and technical accuracy, provide data validation, resolve with the laboratory QC issues
Contractor Field Team Leader	Paul Bourke, P.E. Brown and Caldwell	(671) 747-6094 pbourke@brwncald.com	Site Manager and Site Safety Officer, facilitate site access, schedule, and coordinate field activities, ensure compliance with SOPs
Laboratory Quality Assurance Officer	Mark Swafford Eurofins TestAmerica Laboratory, Inc.	(850) 471-6207 mark.swafford@testamericainc.com	Analyze the samples submitted in accordance with this CSAP

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TABLE 2-1
SUMMARY OF GROUNDWATER MONITORING EVENTS THROUGH 8/31/2021
ORDOT DUMP POST-CLOSURE FACILITY
ORDOT-CHALAN PAGO, GUAM

Event No.	Timeframe	Existing Wells			New Wells	Analyte List	RCRA-Compliant GWMP Monitoring Wells												Comment
		Historical Sampling Event	Annual	Semi-annual	Quarterly		MW-1C	MW-2A	MW-5A	MW-6	MW-9	MW-10	MW-11R	MW-12	MW-13	MW-14	MW-15	MW-16	
							Bkgd Existing	Bkgd Existing	Compliance Existing	Compliance Existing	Compliance Existing	Compliance Existing	Compliance New	Compliance Existing	Compliance Existing	Bkgd New	Compliance New	Compliance New	
1	Nov. 2017	✓	- -	- -	- -	Entire PAL	x	x	x	x	x	x	--	x	x	--	--	--	--
2	Dec. 2017	✓	- -	- -	- -	Entire PAL	x	NS (dry)	x	x	x	x	--	x	x	--	--	--	--
3	Jan./Feb. 2018	✓	- -	- -	- -	Entire PAL	x	NS (dry)	x	x	x	x	--	x	x	--	--	--	--
4	March 2018	✓	- -	- -	- -	Entire PAL	x	NS (dry)	x	NS (dry)	x	NS (dry)	--	x	x	--	--	--	--
5	October 2018	✓	- -	- -	- -	Entire PAL	x	x	x	x	x	x	--	x	x	--	--	--	--
6	January 2019	✓	- -	- -	- -	Entire PAL	x	NS (dry)	x	x	x	x	--	x	x	--	--	--	--
7	March 2019	✓	- -	- -	- -	Entire PAL	x	NS (dry)	x	x	x	x	--	x	x	--	--	--	--
8	May/June 2019	✓	- -	- -	- -	Entire PAL	x	NS (dry)	x	NS (dry)	x	x	--	x	x	--	--	--	--
9	Sept. 2019	✓	- -	- -	- -	Entire PAL	x	x	x	x	x	x	--	x	x	--	--	--	--
10	Dec. 2019/Jan. 2020		✓	- -	✓	Entire PAL	x	x	x	x	x	x	x	x	x	x	x	x	--
11	Nov. 2020		✓	- -	✓	Entire PAL	x	x	x	x	x	x	x	x	x	x	x	x	--
12	Jan. 2021		- -	- -	✓	Entire PAL	--	--	--	--	--	--	x	--	--	x	x	x	--
13	April 2021		- -	✓	✓	per Table 5-1	x	NS (dry)	NS (dry)	NS (dry)	x	x	x	x	x	x	x	x	Incomplete Event due to shipping contraints. Temperature sensitive methods for most wells were not analyzed.

Footnotes and Abbreviations:

NS - not sampled- dry well

"--" - No data applicable

PAL - Project Analyte List

x - indicates a well was sampled for analyte list listed

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TABLE 2-2
DOWNGRADIENT MONITORING WELL DETECTIONS
ORDOT DUMP POST-CLOSURE FACILITY
ORDOT-CHALAN PAGO, GUAM

Category of Project Analyte	Detected Constituent	Location	Event Name
Ordot Specific Parameter	1,4-Dioxane	MW-5A	5, 8, 9, 10, 11
		MW-6	9, 10
		MW-9	10, 11
		MW-11R	10, 11, 12, 13
		MW-12	8, 9, 10, 11, 13
		MW-15	10, 11, 12
		MW-16	10, 12
Appendix II	2,3,7,8-TCDD	MW-5A	6, 10
		MW-9	6
		MW-10	9
		MW-13	6
Appendix II	2,4-D	MW-9	9
Appendix II	2,6-Dinitrotoluene	MW-15	12
Ordot Specific Parameter	2-Amino-4,6-dinitrotoluene	MW-11R	13
Appendix II	2-Methylnaphthalene	MW-13	5
Appendix II	3-Methylphenol/4-Methylphenol (m,p-cresol)	MW-11R	10
Appendix II	4,4'-DDD	MW-13	5
Appendix II	Acenaphthene	MW-9	1, 5, 11
Appendix II	Acenaphthylene	MW-13	5
Appendix I	Acetone	MW-11R	10
		MW-15	10, 12
		MW-16	10
Appendix II	Aldrin	MW-9	5
		MW-16	12
Appendix II	alpha Endosulfan (Endosulfan I)	MW-5A	5
Appendix II	Anthracene	MW-9	5
		MW-11R	13
		MW-13	5
Appendix I	Antimony	MW-6	1
		MW-15	10
Appendix I	Arsenic	MW-5A	2
		MW-6	2
		MW-9	7, 11, 13
		MW-10	7, 11, 13
		MW-11R	10, 11, 12, 13
		MW-12	2
		MW-15	10, 11, 12, 13
		MW-16	11, 12, 13

TABLE 2-2
DOWNGRADIENT MONITORING WELL DETECTIONS
ORDOT DUMP POST-CLOSURE FACILITY
ORDOT-CHALAN PAGO, GUAM

Category of Project Analyte	Detected Constituent	Location	Event Name
Appendix I	Barium	MW-5A	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11
		MW-6	1, 2, 3, 5, 6, 7, 9, 10, 11
		MW-9	2, 5, 10
		MW-10	5, 7, 8, 9, 10, 11, 13
		MW-11R	10, 11, 12, 13
		MW-12	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 13
		MW-13	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 13
		MW-15	10, 11, 12, 13
		MW-16	10, 11, 12, 13
Appendix II	Benzo(a)anthracene	MW-6	11
		MW-9	5, 11
		MW-12	11
		MW-13	5, 11
		MW-15	12
		MW-16	11
Appendix II	Benzo(a)pyrene	MW-6	11
		MW-12	7
		MW-13	5
		MW-15	11, 12
		MW-16	11, 12
Appendix II	Benzo(b)fluoranthene	MW-6	7, 11
		MW-9	5
		MW-12	7
		MW-13	5
		MW-15	11, 12
Appendix II	Benzo(k)fluoranthene	MW-9	5
		MW-13	5
		MW-15	12
Appendix II	Benzyl alcohol	MW-9	1
Appendix II	Benzyl butyl phthalate	MW-5A	5
Appendix II	BHC, alpha	MW-5A	9
		MW-6	9
		MW-13	5
Appendix II	BHC, beta	MW-5A	9
		MW-6	9
Appendix II	BHC, delta	MW-5A	5, 9
		MW-6	9

TABLE 2-2
DOWNGRADIENT MONITORING WELL DETECTIONS
ORDOT DUMP POST-CLOSURE FACILITY
ORDOT-CHALAN PAGO, GUAM

Category of Project Analyte	Detected Constituent	Location	Event Name
Appendix II	BHC, gamma (Lindane)	MW-5A	**9**
		MW-6	**9**
Appendix II	bis(2-Chloroethoxy)methane	MW-6	**6**
Appendix II	bis(2-Ethylhexyl)phthalate	MW-5A	7, 9, 11
		MW-6	7, 9
		MW-9	5, 9
		MW-10	7, 11
		MW-11R	**11**
		MW-12	5, 6, 11
		MW-13	5, 11
		MW-15	**10**
Appendix I	Cadmium	MW-13	**1**
Appendix I	Chlorobenzene	MW-9	**1**
		MW-11R	11, 13
Appendix I	Chromium	MW-5A	1, 3, 4, 5, 10
		MW-6	1, 5, 10
		MW-9	1, 4, 2
		MW-10	1, 2, 3, 5, 6, 7, 8, 9, 10
		MW-12	1, 5
		MW-13	4, 10
		MW-15	11, 13
		MW-16	11, 13
Ordot Specific Parameter	Chromium, Hexavalent	MW-6	**1**
		MW-9	2, 3, 11
		MW-10	1, 2, 3, 5, 7, 8, 9, 10, 11, 13
		MW-15	**12**
Appendix II	Chrysene	MW-13	**5**
Appendix I	Cobalt	MW-5A	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11
		MW-6	2, 3, 5, 6, 7, 9, 10, 11
		MW-9	**8**
		MW-10	5, 8
		MW-11R	10, 11, 12, 13
		MW-12	5, 8
		MW-13	**2**
		MW-15	10, 11
		MW-16	10, 11, 12, 13

TABLE 2-2
DOWNGRADIENT MONITORING WELL DETECTIONS
ORDOT DUMP POST-CLOSURE FACILITY
ORDOT-CHALAN PAGO, GUAM

Category of Project Analyte	Detected Constituent	Location	Event Name
Appendix I	Copper	MW-5A	2, 5, 7, 8, 9, 11
		MW-6	2, 5, 11
		MW-9	1, 2, 3, 5, 6, 7, 8, 9, 10, 11, 13
		MW-10	1, 2, 3, 5, 8, 10
		MW-12	2
		MW-13	1, 2, 4, 10, 11
		MW-15	10, 11, 12, 13
		MW-16	13
Appendix II	Cyanide	MW-5A	1
		MW-6	5
Appendix II	Dibenz(a,h)anthracene	MW-6	11
		MW-9	7
		MW-12	11
		MW-13	5
		MW-15	11
Appendix II	Diethyl phthalate	MW-6	11
		MW-9	5, 11
		MW-11R	11, 12
		MW-12	8, 11
		MW-13	5
Appendix II	Dimethyl phthalate	MW-9	8
Appendix II	Dinoseb	MW-5A	9
		MW-12	9
Appendix II	Endrin aldehyde	MW-10	5
Appendix II	Fluoranthene	MW-6	11
		MW-12	7
		MW-13	5
Ordot Specific Parameter	Gross Alpha	MW-9	4
		MW-10	5, 9
		MW-11R	10
Ordot Specific Parameter	Gross Beta	MW-5A	1, 2, 3, 4, 5, 9, 10, 11
		MW-6	11
		MW-9	1, 3, 5, 6, 7, 8, 9, 10, 11, 13
		MW-10	1, 5, 6, 7, 11, 13
		MW-11R	10, 11, 12, 13
		MW-12	1, 2, 3, 5, 6, 7, 8, 10, 11, 13
		MW-13	2, 6
		MW-15	10, 11, 12
		MW-16	10, 11
Appendix II	Heptachlor epoxide	MW-11R	12
Ordot Specific Parameter	Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)	MW-12	6

TABLE 2-2
DOWNGRADIENT MONITORING WELL DETECTIONS
ORDOT DUMP POST-CLOSURE FACILITY
ORDOT-CHALAN PAGO, GUAM

Category of Project Analyte	Detected Constituent	Location	Event Name
Appendix II	Indeno(1,2,3-c,d)pyrene	MW-6	7, 11
		MW-9	5, 7
		MW-12	7
		MW-13	5
		MW-15	11
Appendix I	Lead	MW-6	5
		MW-12	5
		MW-16	13
Appendix II	Mercury	MW-5A	8
		MW-10	1
		MW-13	5
		MW-15	10
		MW-16	10
Appendix II	Methyl methanesulfonate	MW-13	7
Appendix II	Naphthalene	MW-5A	3
		MW-9	1
		MW-12	9
Appendix I	Nickel	MW-5A	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11
		MW-6	1, 2, 3, 5, 6, 7, 9, 10, 11
		MW-9	1, 2, 3, 4, 5, 6, 7, 8, 10, 13
		MW-10	1, 2, 3, 5, 6, 7, 8, 9, 10, 11
		MW-11R	10, 11, 12, 13
		MW-12	1, 3, 5, 6, 7, 8, 9, 10, 11, 13
		MW-13	4
		MW-15	10, 11, 12, 13
		MW-16	10, 11, 12, 13
Ordot Specific Parameter	o-Nitrotoluene	MW-10	7
		MW-15	10
Ordot Specific Parameter	Perchlorate	MW-5A	9, 11
		MW-9	9, 11
		MW-10	1, 2, 3, 5, 6, 7, 9, 10, 11
Appendix II	Phenanthrene	MW-13	5, 11
Appendix II	Pyrene	MW-9	5
		MW-11R	13
		MW-13	5
Ordot Specific Parameter	Radium-226	MW-5A	5, 6
		MW-6	1, 2, 5, 9
		MW-9	5
		MW-11R	10
		MW-13	6
		MW-16	12

TABLE 2-2
DOWNGRADIENT MONITORING WELL DETECTIONS
ORDOT DUMP POST-CLOSURE FACILITY
ORDOT-CHALAN PAGO, GUAM

Category of Project Analyte	Detected Constituent	Location	Event Name
Ordot Specific Parameter	Radium-228	MW-5A	**11**
		MW-6	**3**
		MW-9	**4**
		MW-10	7, 11
		MW-12	**3**
		MW-13	**11**
Appendix I	Selenium	MW-5A	1, 2, 3, 4
		MW-6	2, 3
		MW-9	1, 3, 4
		MW-10	2, 6
		MW-12	2, 3
		MW-13	**2**
		MW-15	**10**
		MW-16	**10**
Appendix II	Sulfide	MW-6	**5**
		MW-9	**5**
		MW-15	10, 11, 12
Appendix II	Tin	MW-5A	1, 2, 3, 4
		MW-6	2, 3
		MW-9	1, 3, 4, 2
		MW-10	1, 3, 2
		MW-12	1, 2, 3, 4
		MW-13	1, 2, 3, 4
Appendix I	Toluene	MW-13	1, 10
Ordot Specific Parameter	Uranium	MW-5A	2, 3, 4, 6, 8
		MW-6	2, 3, 5, 6, 9, 11
		MW-9	2, 3, 4
		MW-10	2, 3, 5, 6, 8, 9, 10, 11, 13
		MW-11R	**10**
		MW-13	**2**
		MW-15	10, 11, 12, 13
Appendix I	Vanadium	MW-5A	2, 3, 4, 5, 11
		MW-6	5, 6
		MW-9	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 13
		MW-10	1, 2, 3, 5, 6, 7, 8, 9, 10, 11, 13
		MW-12	**5**
		MW-13	2, 4, 5, 6, 7, 11
		MW-15	10, 11, 12, 13
		MW-16	**13**
Appendix I	Xylenes, total	MW-10	**13**
		MW-15	**12**

TABLE 2-2
DOWNGRADIENT MONITORING WELL DETECTIONS
ORDOT DUMP POST-CLOSURE FACILITY
ORDOT-CHALAN PAGO, GUAM

Category of Project Analyte	Detected Constituent	Location	Event Name
Appendix I	Zinc	MW-5A	**2**
		MW-6	**5**
		MW-9	2, 7, 9
		MW-10	**5**
		MW-13	**2**
		MW-15	**11**

Note: Bold type indicates that analyte was detected during only one event.

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TABLE 2-3
CONTAMINANTS OF CONCERN, LABORATORY REPORTING LIMITS, BACKGROUND CONCENTRATIONS AND GROUNDWATER PROTECTION STANDARDS
ORDOT DUMP POST-CLOSURE FACILITY
ORDOT-CHALAN PAGO, GUAM

Analytical Parameter (Contaminants of Concern)[1]	Units	Laboratory Reporting Limit (RL)	Background	Basis for GWPS[3]	Interim GWPS[2]	
1,4-Dioxane	µg/L	1.0	1.0	RSL	46	
2,3,7,8-TCDD	pg/L	10	0.1165	MCL	30	
2,4-D	µg/L	10	10	MCL	70	
2-Amino-4,6-dinitritoluene	µg/L	0.11	0.11	RSL	1.9	
2-Methylnaphthalene	µg/L	0.2	0.2	RSL	36	
3-Methylphenol/4-Methylphenol	µg/L	20	20	RSL	930	
4,4'-DDD	µg/L	0.02	0.02	RSL	3.2	
Acenaphthene	µg/L	0.2	0.2	RSL	530	
Acenaphthylene	µg/L	0.2	0.2	RSL	530	
Acetone	µg/L	10	10	RSL	14000	
Aldrin	µg/L	0.02	0.02	RSL	0.092	
alpha Endosulfan (Endosulfan I)	µg/L	0.02	0.02	RSL	100	
Anthracene	µg/L	0.2	0.2	RSL	1800	
Antimony	µg/L	5.0	5.0	MCL	6	
Arsenic	µg/L	3.0	4.8	MCL	10	
Barium	µg/L	5.0	274	MCL	2000	
Benzo(a)anthracene	µg/L	0.2	0.2	RSL	3	
Benzo(a)pyrene	µg/L	0.2	0.2	MCL	0.2	
Benzo(b)fluoranthene	µg/L	0.2	0.2	RSL	25	
Benzo(k)fluoranthene	µg/L	0.2	0.2	RSL	250	
Benzyl alcohol	µg/L	10	10	RSL	2000	
Benzyl butyl phthalate	µg/L	10	10	RSL	1600	
BHC, alpha	µg/L	0.02	0.02	RSL	0.72	
BHC, beta	µg/L	0.02	0.02	RSL	2.5	
BHC, delta	µg/L	0.0	0.02	RSL	0.72	
BHC, gamma (Lindane)	µg/L	0.0	0.02	MCL	0.2	
bis(2-Chloroethoxy)methane	µg/L	10.0	10.0	RSL	59	
bis(2-Ethylhexyl)phthalate	µg/L	6.0	6.0	MCL	6	
Cadmium	µg/L	0.5	0.075	MCL	5	
Chlorobenzene	µg/L	1	1	MCL	100	
Chromium	µg/L	5.0	16	MCL	100	
Chromium, Hexavalent	µg/L	1.0	0.1	RSL	3.5	
Chrysene	µg/L	0.2	0.2	RSL	2500	
Cobalt	µg/L	0.5	11.9	Background	11.9	a
Copper	µg/L	5	31	MCL	1300	
Cyanide	µg/L	5	2.5	MCL	200	
Dibenz(a,h)anthracene	µg/L	0.2	0.2	RSL	2.5	
Diethyl phthalate	µg/L	10	10	RSL	15000	
Dimethyl phthalate	µg/L	10	10	RSL	15000	
Dinoseb	µg/L	1	1	MCL	7	
Endrin aldehyde	µg/L	0.02	0.02	RSL	2.3	
Fluoranthene	µg/L	0.2	0.2	RSL	800	
Gross Alpha	pCi/L	3.0	4.6	MCL	15	
Gross Beta	pCi/L	4.0	6.89	MCL	50	b

TABLE 2-3
CONTAMINANTS OF CONCERN, LABORATORY REPORTING LIMITS, BACKGROUND CONCENTRATIONS AND GROUNDWATER PROTECTION STANDARDS
ORDOT DUMP POST-CLOSURE FACILITY
ORDOT-CHALAN PAGO, GUAM

Analytical Parameter (Contaminants of Concern)[1]	Units	Laboratory Reporting Limit (RL)	Background	Basis for GWPS[3]	Interim GWPS[2]	
Heptachlor Epoxide	µg/L	0.02	0.02	MCL	0.2	
Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)	µg/L	0.21	0.21	RSL	97	
Indeno(1,2,3-c,d)pyrene	µg/L	0.2	0.2	RSL	25	
Lead	µg/L	2.5	0.00074	MCL	15	
Mercury	µg/L	0.2	0.035	MCL	2	
Methyl methanesulfonate	µg/L	10	10	RSL	79	
Naphthalene	µg/L	0.2	0.2	RSL	12	
Nickel	µg/L	5.0	0.031	RSL	390	
o-Nitrotoluene	µg/L	0.4	0.4	RSL	31	
Perchlorate	µg/L	0.2	0.041	RSL	14	
Phenanthrene	µg/L	0.2	0.2	RSL	800	
Pyrene	µg/L	0.2	0.2	RSL	120	
Radium-226	pCi/L	1.0	41.9	MCL	5	
Radium-228	pCi/L	1.0	18.65	MCL	5	
Selenium	µg/L	2.5	86	Background	86	a
Sulfide	µg/L	100	100	MCL	250	
Tin	µg/L	5.0	77	RSL	12000	
Toluene	µg/L	1.0	1.0	MCL	1000	
Uranium	pCi/L	0.67	0.135	MCL	20	c
Vanadium	µg/L	10	0.036	RSL	86000	
Xylenes, Total	µg/L	2.0	2.0	MCL	10000	
Zinc	µg/L	20	24	RSL	6000	

Footnotes and Abbreviations:

pCi/L: picocuries per liter

µg/L: micrograms per liter

pg/L: picograms per liter

GWPS: Groundwater Protection Standard

NA: Not Applicable

RL: Reporting Limit

[1] *Parameters shown on this Table are constituents which require GWPS. Groundwater Protection Standards (GWPS) must be established for each Appendix II constituent (GARR Title 22 Chapter 23; 40 CFR 258) detected in one or more downgradient groundwater monitoring wells in accordance with GARR Title 22 §23506 (40 CFR 258.55 (d)(4) and 258.55(h)). For this Facility, GWPS are included for all detected Appendix II constituents, including for the single unconfirmed detected constituents and Ordot Specific Analytes detected above background more than one time at a monitoring well.*

[2] *The Ground Water Protection Standards, as derived in the RCRA-Compliant Groundwater Monitoring Technical Memorandum (BC, 2021a), may be a Maximum Contaminant Level (MCL) promulgated under the Safe Drinking Water Act, or, if an MCL has not been codified, either the site background concentration for that constituent or a health-based GWPS derived according to GARR Title 22 §23506(i) (40 CFR 258.55(i)). In some cases, the GWPS may not be achievable due to laboratory reporting limitations. Refer to discussion on DQOs in Section 3.2. Background for organic constituents is defined as the reporting limit. Refer to Section 3.1. The USEPA Regional Screening Level (RSL) is the Excess Lifetime Cancer Risk (ELCR) of 1E-04 .*

[3] *If the constituent has a promulgated MCL, the GWPS is the MCL, If no MCL has been published for a given Appendix II constituent, the background concentration of the constituent becomes the GWPS. In cases where the background concentration is higher than a promulgated MCL, the GWPS is set at the background level. Page 290 of the Solid Waste Disposal Facility Criteria: Technical Manual.*

a = GWPS is set at background

b = GWPS is based on CA OEHHA conversion from 4 mrem/year to 50 pCi/L. Lab results are reported in pCi/L.

c = GWPS is based on conversion factor of 0.6757 pCi/L = 1 µg/L. Lab results are reported in pCi/L.

TABLE 4-1
SAMPLING DESIGN AND RATIONALE
ORDOT DUMP POST-CLOSURE FACILITY
ORDOT-CHALAN PAGO, GUAM

Well ID	Description	Analytical Parameters and Collection Frequency[1]	Rationale[2]
MW-1C	Existing Well	AGMP[3]: Semi-annual monitoring of Appendix I constituents, detected Appendix II and Ordot Specific constituents[4], and WQPs. Annual monitoring of the Project Analyte List (see Attachment A).	Upgradient location and an established background monitoring well[5] in the GWMS
MW-2A	Existing Well		Upgradient location and an established background monitoring well[5] in the GWMS
MW-5A	Existing Well		Downgradient location and compliance monitoring well in the GWMS
MW-6	Existing Well		Downgradient location and compliance monitoring well in the GWMS
MW-9	Existing Well		Downgradient location and compliance monitoring well in the GWMS
MW-10	Existing Well		Downgradient location and compliance monitoring well in the GWMS
MW-12	Existing Well		Downgradient location and compliance monitoring well in the GWMS
MW-13	Existing Well		Downgradient location and compliance monitoring well in the GWMS
MW-11R	New Well	Interim AGMP[6]: Eight rounds of quarterly monitoring for the Project Analyte List (see Attachment A)	Downgradient location and tentative compliance monitoring well in the GWMS. Installed December 2019 to replace MW-11 because MW-11 did not produce sufficient water to sample. MW-11R was installed to a depth of 44.6 feet bgs with a 20-foot screened interval. The first sample was collected in December 2019 for the Project Analyte List.
MW-14	New Well		Upgradient location and tentative background monitoring well in the GWMS[6]. Installed in December 2019 to collect unimpacted organics for background determination in place of MW-1B. Well was installed to a depth of 41 feet bgs with a 20-foot screened interval. The first sample was collected in December 2019 for the Project Analyte List.
MW-15	New Well		Downgradient location and tentative compliance monitoring well in the GWMS. Installed in December 2019 to supplement the upper bedrock monitoring well network, since spacing between MW-6 and MW-11 was approximately 1,000 feet. Well was installed to a depth of 50 feet bgs with a 20-foot screened interval. The first sample was collected in December 2019 for the Project Analyte List.
MW-16	New Well		Downgradient location and tentative compliance monitoring well in the GWMS. Installed in November 2019 to be coupled with MW-6, adding representation of deeper groundwater at this location. Well was installed within 15 feet of MW-6, to a depth of 42.2 feet bgs with a 10-foot screened interval. The first sample was collected in December 2019 for the Project Analyte List.

Footnotes and Abbreviations:

[1] *See Section 7 of the RCRA-Compliant Groundwater Monitoring Program Technical Memorandum (BC, 2021a) and Section 3.2 of this Sampling and Analysis Plan (SAP) for additional detail.*

[2] *See Section 2.5.2 for a description of the Groundwater Monitoring System (GWMS) and detailed presentation of rationale for the GWMS in the RCRA-Compliant Groundwater Monitoring Program Technical Memorandum (BC, 2021a) and Updated Conceptual Site Model (BC, 2021b).*

[3] *Assessment Groundwater Monitoring Program (AGMP) Annual and Semiannual Monitoring per Guam Administrative Rules and Regulations (GARR) Title 22 § 23506 (40 CFR 258.55) and as described in Section 7 of the RCRA-Compliant Groundwater Monitoring Program Technical Memorandum (BC, 2021a).*

[4] *Semi-Annual sampling events include all analytes listed in Attachment A for Semi-Annual Sampling. Any newly-detected Appendix II and Ordot-Specific analytes from annual monitoring events will be analyzed in addition to the analytes checked.*

[5] *The background concentrations for organic constituents listed on Table 2-3 are set at the reporting limit until a total of eight rounds of the complete list are tested. Once the well has been tested for a total of eight rounds for the Project Analyte List, then the background values can be reassessed as described in the RCRA-Compliant Groundwater Monitoring Program Technical Memorandum (BC, 2021a) and the TM and this SAP will be updated.*

[6] *Upon completion of Interim AGMP, the RCRA-Compliant Groundwater Monitoring Program Technical Memorandum (BC, 2021a) and this SAP will be updated.*

bgs = below ground surface

ID = identification

WQPs = Water Quality Parameters (alkalinity, aluminum, ammonia as N, calcium, chloride, iron, magnesium, manganese, molybdenum, nitrate+nitrite as N, phosphate as P, potassium, sodium, sulfate, total dissolved solids, and total suspended solids)

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TABLE 5-1
ANALYTICAL SERVICES
ORDOT DUMP POST-CLOSURE FACILITY
ORDOT-CHALAN PAGO, GUAM

Well ID	Well Type	VOCs EPA 8260C	VOCs EPA 8260C	1,4-Dioxane EPA 8260C SIM	SVOCsEPA 8270D	Low-Level PAHs EPA 8270D SIM	DEHP EPA 8270DSIM	TCDD EPA 1613B	Pesticides EPA 8081B	PCBs EPA 8082A	Herbicides EPA 8151A	Organophosphorous Compounds EPA 8141B	Perchlorate EPA 6850	Nitroaromatics and Nitramines EPA 8330B	Metals EPA 200.8	Tin EPA 200.8	Hexavalent Chromium EPA 218.7	Mercury EPA 245.1	Cyanide SM4500-CN-E	Uranium EPA 200.8	Gross Alpha Gross Beta EPA 900	Radium-226+228 EPA 903.0 + 904.0	Alkalinity EPA 2320B	Ammonia as N EPA 350.1	Chloride and Sulfate EPA 300.0	Nitrate/Nitrite as N EPA 353.2	Phosphate as P SM 4500-P-B.5	Sulfide SM4500-S2	TDS/TSS SM 2540C/D
	Rationale:	Appendix I	Appendix II	Found at MSWLFs	Appendix II	Appendix II	Appendix II	Appendix II	Appendix II	Appendix II	Appendix II	Appendix II	Solid Rocket Fuel Propellant	Munitions	15 Appendix I Metals and 8 WQPs[4]	Appendix II[4]	More Toxic Form of Chromium	Appendix II	Appendix II	Military Low-Level Radioactive Waste[4]	Military Low-Level Radioactive Waste	Military Low-Level Radioactive Waste	WQP[5]	WQP[5]	WQP[5]	WQP[5]	Water Quality Parameter[6]	Appendix II	WQP[5]
Interim AGMP Quarterly Sampling Events:[1]																													
MW-11R	New		X	X	X	X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
MW-14	New		X	X	X	X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
MW-15	New		X	X	X	X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
MW-16	New		X	X	X	X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Total Number of Samples, excluding QC[2]			4	4	4	4		4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
AGMP Semi-Annual Sampling Events:[3]																													
MW-1C	Existing	X		X	X	X	X	X	X		X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
MW-2A	Existing	X		X	X	X	X	X	X		X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
MW-5A	Existing	X		X	X	X	X	X	X		X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
MW-6	Existing	X		X	X	X	X	X	X		X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
MW-9	Existing	X		X	X	X	X	X	X		X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
MW-10	Existing	X		X	X	X	X	X	X		X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
MW-12	Existing	X		X	X	X	X	X	X		X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
MW-13	Existing	X		X	X	X	X	X	X		X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Total Number of Samples, excluding QC[2]		8		8	8	8	8	8	8		8		8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8
AGMP Annual Sampling Events:																													
MW-1C	Existing		X	X	X	X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
MW-2A	Existing		X	X	X	X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
MW-5A	Existing		X	X	X	X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
MW-6	Existing		X	X	X	X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
MW-9	Existing		X	X	X	X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
MW-10	Existing		X	X	X	X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
MW-12	Existing		X	X	X	X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
MW-13	Existing		X	X	X	X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Total Number of Samples, excluding QC[2]			8	8	8	8		8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8

Footnotes and Abbreviations:

[1] New wells will be sampled for 8 quarterly events under the Interim AGMP.

[2] Equipment blanks will be collected at a rate of 1 per 20 samples or one per sampling event, and will be analyzed for VOCs and SVOCs only.

Ambient blanks will be collected at well MW-1C and will be analyzed for VOCs only.

Trip blanks will be collected at a rate of 1 per every cooler of samples collected for VOC analysis. Number of coolers may vary and depends upon the number of coolers provided by the laboratory and how the coolers are packed at the time of sampling.

Field duplicates will be collected at a rate of 1 per every 20 samples collected, and will be analyzed for all target parameters for each event.

MS/MSDs will be collected at a rate of 1 per every 20 samples collected, and will be analyzed for all target parameters for each event.

[3] Semi-Annual sampling events include all analytes listed in Attachment A for Semi-Annual Sampling. Any newly-detected Appendix II and Ordot-Specific analytes from annual monitoring events will be analyzed in addition to the analytes checked.

[4] Metals by USEPA Method 200.8 includes the 15 Appendix I metals (antimony, arsenic, barium, beryllium, cadmium, chromium, cobalt, copper, lead, nickel, selenium, silver, thallium, vanadium and zinc), the Appendix II metal tin, eight WQPs (aluminum, calcium, iron, magnesium, manganese, molybdenum, potassium and sodium) and the radiological constituent uranium.

[5] The 16 Water Quality Parameters (WQPs) are aluminum, calcium, iron, magnesium, manganese, molybdenum, potassium, and sodium; alkalinity; ammonia as N; chloride and sulfate; nitrate+nitrite as N; phosphate as P; total dissolved solids; and total suspended solids.

DEHP = Bis(2-ethylhexyl)phthalate
MSWLF = Municipal Solid Waste Landfill
N = Nitrogen
PAHs = Polynuclear Aromatic Hydrocarbons
PCBs = Polychlorinated Biphenyls
QC = Quality Control
SVOCs = Semi-volatile Organic Compounds
TCDD = Tetrachlorodibenzo-p-dioxin
TDS = Total Dissolved Solids
TSS = Total Suspended Solids
VOCs = Volatile Organic Compounds
WQPs = Water Quality Parameters

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TABLE 5-2
ANALYTICAL METHOD, CONTAINERS, PRESERVATION, AND HOLDING TIME REQUIREMENTS
ORDOT DUMP POST-CLOSURE FACILITY
ORDOT-CHALAN PAGO, GUAM

Analytical Parameter	Analytical Method	Container (number, type, volume)[1]	Preservation[2]	Holding Time
Volatile Organics (preserved)	EPA 8260C	G 3-40 mL	≤6°C, HCl to pH<2, no headspace[3]	14 days
Volatile Organics (unpreserved)[4]	EPA 8260C	G 3-40 mL	≤6°C, no headspace	7 days
1,4-Dioxane	EPA 8260C SIM	G 3-40 mL	≤6°C, HCl to pH<2, no headspace	14 days
Semivolatile Organics	EPA 8270D	G 1-1 L	≤6°C	7/40 days[5]
Polycyclic Aromatic Hydrocarbons (PAHs)	EPA 8270D SIM	G 1-1 L	≤6°C	7/40 days[5]
Bis(2-ethylhexyl)phthalate (DEHP)	EPA 8270C SIM	G 1-1L	≤6°C	7/40 days[5]
2,3,7,8-TCDD	EPA 1613B	G 1-1 L	≤6°C	1 year[6]
Organochlorine Pesticides	EPA 8081B	G 1-1 L	≤6°C	7/40 days[5]
PCBs	EPA 8082A	G 1-1 L	≤6°C	7/40 days[5]
Herbicides	EPA 8151A	G 1-1 L	≤6°C	7/40 days[5]
Organophosphorus Compounds	EPA 8141B	G 1-1 L	≤6°C	7/40 days[5]
Perchlorate	EPA 6850	P 1-125 mL	Filter sample, ≤6°C	28 days
Nitroaromatics and Nitroamines	EPA 8330B	G 1-1 L	≤6°C	14 days
Metals (total)	EPA 200.8	P 1-250 mL	≤6°C and HNO_3 to pH<2	6 months
Hexavalent chromium	EPA 218.7	P 1-250 mL	≤6°C, ammonium sulfate/ammonium hydroxide	14 days
Mercury (total)	EPA 245.1	P 1-250 mL	≤6°C and Nitric Acid (HNO_3) to pH<2	28 days
Total Cyanide	SM 4500-CN-E	P 1-1 L	≤6°C and NaOH to pH 12	14 days
Uranium	EPA 200.8	P 1-250 mL	≤6°C and HNO_3 to pH<2	6 months
Gross Alpha, Gross Beta	EPA 900.0	P 2-1 L	≤6°C and HNO_3 to pH<2	6 months
Radium 226/228	EPA 903.0/904.0	P 2-1 L	≤6°C and HNO_3 to pH<2	6 months
Alkalinity	SM 2320B	P 125 mL	≤6°C	14 days

TABLE 5-2
ANALYTICAL METHOD, CONTAINERS, PRESERVATION, AND HOLDING TIME REQUIREMENTS
ORDOT DUMP POST-CLOSURE FACILITY
ORDOT-CHALAN PAGO, GUAM

Analytical Parameter	Analytical Method	Container (number, type, volume)[1]	Preservation[2]	Holding Time
Ammonia as N	EPA 350.1	P 1-250 mL	≤6°C, H_2SO_4 to pH<2	28 days
Chloride and Sulfate	EPA 300.0	P 1-125 mL	≤6°C	28 days
Nitrate/Nitrite as N	EPA 353.2	P 1-250 mL	≤6°C, H_2SO_4 to pH<2	28 days
Phosphate as P	SM 4500-P-B.5	G 1-250 mL	≤6°C, H_2SO_4 to pH<223	28 days
Sulfide	SM 4500-S2-D	P 1-125	≤6°C, NaOH and Zn Acetate to pH 9	7 days
Total dissolved solids (TDS), Total suspended solids (TSS)	SM 2540C/D	P 1-1 L	≤6°C	7 days

Footnotes and Abbreviations:

1 *Extra volume must be provided for matrix QC samples. (MS, MSD, and/or field duplicate samples)*

2 *Preservation should be done immediately upon sample collection.*

3 *No preservation is necessary if the sample is analyzed within 7 days of collection.*

4 *Acrolein and acrylonitrile are to be analyzed from unpreserved Volatile Organic Analysis (VOA) vials. The "40-mL" containers are VOA vials.*

5 *Extract sample within 7 days. Analyze extract within 40 days after extraction.*

6 *Extract and analyze sample within 1 year.*

G - Glass container.

P - Polyethylene container.

M - milliliter

L - Liter

°C - degrees Celsius

H_2SO_4 - Sulfuric Acid

HNO_3 - Nitric Acid

HCl - Hydrochloric Acid

NaOH - Sodium Hydroxide

EPA - U.S. Environmental Protection Agency

SM - Standard Methods

TABLE 5-3
MEASUREMENT PERFORMANCE CRITERIA
ORDOT DUMP POST-CLOSURE FACILITY
ORDOT-CHALAN PAGO, GUAM

Data Quality Indicator (DQI)	QC Sample or Measurement Performance Activity	Measurement Performance Criteria
Overall Precision (field and laboratory)	Field duplicates	RPD ≤ 20 for inorganic methods RPD ≤ 30 for organic methods
	MSD from MS/MSD pairs	Per the laboratory SOPs and as listed in reports, but at least: RPD ≤ 35 for inorganic methods RPD ≤ 50 for organic methods
Analytical Precision (laboratory)	LCSD from LCS/LCSD pairs	Per the laboratory SOPs and as listed in reports, but at least: RPD ≤ 25 for inorganic methods RPD ≤ 35 for organic methods
Overall Accuracy/Bias (field and laboratory)	MS/MSD	Per the laboratory SOPs and as listed in reports, but no wider than: %R=50-150 for inorganics and %R=25-175 for organics
Analytical Accuracy/Bias (laboratory)	LCS/LCSD	Per the laboratory SOPs and as listed in reports, but no wider than: %R=75-125 for inorganics and %R=50-150 for organics
Overall Accuracy/Bias (field and/or laboratory contamination)	Equipment blanks	No target analyte ≥ ½ RL and no detection of DEHP ≥ 6 µg/L.
	Field (ambient) blanks	No target analyte ≥ ½ RL
	Trip blanks	No target analyte ≥ ½ RL
Analytical Accuracy/Bias (laboratory)	Laboratory method blanks	No target analyte ≥ ½ RL and MDL < 6 µg/L for DEHP.
Representativeness (field and laboratory)	Preservation	Per Table 5-2. Laboratory to notify Project Chemist of any outlier. Project chemist either facilitates resampling or directs laboratory to continue analysis and discuss outlier in case narrative and flag data.
	Holding times	Per Table 5-2 and Section 9.3 for time zone considerations. Laboratory to notify Project Chemist of any outlier. Project chemist either facilitates resampling or directs laboratory to continue analysis and discuss outlier in case narrative and flag data.
Sensitivity (laboratory)	RL verification samples (spiked at RLs)	Recovery within 75-125% of RL
	Low-level calibration standard ≤ RL	ICAL meets method and/or laboratory SOP acceptance criteria.
Overall Completeness (field and laboratory)	Valid results from planned samples	95% for planned samples collected from new and existing wells

Abbreviations:

µg/L - micrograms per liter
DEHP - bis(2-ethylhexyl)phthalate
ICAL - initial calibration
LCS - laboratory control sample
LCSD - laboratory control sample duplicate
MDL - method detection limit
MS - matrix spike
MSD - matrix spike duplicate
RL - reporting limit
RPD - relative percent difference
SOP - standard operating procedures
%R - Percent Recovery

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TABLE 5-4
ANALYTICAL INSTRUMENT CALIBRATION
ORDOT DUMP POST-CLOSURE FACILITY
ORDOT-CHALAN PAGO, GUAM

Chemical Classification	Analytical Group or Analyte	Method	Instrument or Process	Calibration Procedure	Frequency	Acceptance Criteria	Corrective Action
VOCs	VOCs	EPA SW8260C	GC/MS (Full Scan)	Multipoint ICAL and SS ICV and CCV	Per Method	Per Method	Per Laboratory SOP
	1,4-Dioxane	EPA SW8260C SIM	GC/MS (SIM)	Multipoint ICAL and SS ICV and CCV	Per Method	Per Method	Per Laboratory SOP
SVOCs	SVOCs	EPA SW82670D	GC/MS (Full Scan)	Multipoint ICAL and SS ICV and CCV	Per Method	Per Method	Per Laboratory SOP
	PAHs	EPA SW8270D SIM	GC/MS (SIM)	Multipoint ICAL and SS ICV and CCV	Per Method	Per Method	Per Laboratory SOP
TCDD	TCDD	EPA 1613B	Isotope dilution HRGC/HRMS	Multipoint ICAL and SS ICV and CCV	Per Method	Per Method	Per Laboratory SOP
Pesticides	Pesticides	EPA SW8081B	DCGC-ECD	Multipoint ICAL and SS ICV and CCV	Per Method	Per Method	Per Laboratory SOP
PCBs	PCBs	EPA SW8082A	GC-ECD	Multipoint ICAL and SS ICV and CCV	Per Method	Per Method	Per Laboratory SOP
Herbicides	Herbicides	EPA SW8151A	GC DPD or NPD	Multipoint ICAL and SS ICV and CCV	Per Method	Per Method	Per Laboratory SOP
Organophosphorus Compounds	Organophosphorus Compounds	EPA SW8141B	GC/MS (Full Scan)	Multipoint ICAL and SS ICV and CCV	Per Method	Per Method	Per Laboratory SOP
Munitions	Explosives	EPA SW8330B	HPLC	Multipoint ICAL and SS ICV and CCV	Per Method	Per Method	Per Laboratory SOP
	Perchlorate	EPA SW6850	HPLC/ESI/MS/MS	Multipoint ICAL and SS ICV and CCV	Per Method	Per Method	Per Laboratory SOP
Radiological	Gross-Alpha and -Beta	EPA 900.0	Scintillation detector system	Per Laboratory SOP	Per Laboratory SOP	Per Laboratory SOP	Per Laboratory SOP
	Radium 226+228	EPA 903.0/EPA 904.0	Gamma spectrometry	Per Laboratory SOP	Per Laboratory SOP	Per Laboratory SOP	Per Laboratory SOP
Metals	Metals	EPA 200.8	ICP/MS	Multipoint ICAL and SS ICV and CCV	Per Method and Laboratory SOP	Per Method and Laboratory SOP	Per Laboratory SOP
	Mercury	EPA 245.1	CVAA	Multipoint ICAL and SS ICV and CCV	Per Method and Laboratory SOP	Per Method and Laboratory SOP	Per Laboratory SOP
	Hexavalent chromium	EPA 218.7	Ion chromatography	Multipoint ICAL and SS ICV and CCV	Per Method and Laboratory SOP	Per Method and Laboratory SOP	Per Laboratory SOP
Cyanide	Cyanide	SM 4500-CN-E	Colorimetry	Multipoint ICAL and SS ICV and CCV	Per Laboratory SOP	Per Laboratory SOP	Per Laboratory SOP
Sulfide	Sulfide, total	SM 4500-S2	Methyl blue method or ion-selective electrode	Per Laboratory SOP	Per Method and Laboratory SOP	Per Method and Laboratory SOP	Per Laboratory SOP

TABLE 5-4
ANALYTICAL INSTRUMENT CALIBRATION
ORDOT DUMP POST-CLOSURE FACILITY
ORDOT-CHALAN PAGO, GUAM

Chemical Classification	Analytical Group or Analyte	Method	Instrument or Process	Calibration Procedure	Frequency	Acceptance Criteria	Corrective Action
WQPs	Chloride and sulfate	EPA 300.0	Ion chromatography	Multipoint ICAL and SS ICV and CCV	Per Method and Laboratory SOP	Per Method and Laboratory SOP	Per Laboratory SOP
	Ammonia as N	EPA 350.1	Semi-automated Colorimetry	Multipoint ICAL and SS ICV and CCV	Per Method and Laboratory SOP	Per Method and Laboratory SOP	Per Laboratory SOP
	Nitrate+nitrite as N	EPA 353.2	Automated colorimetry	Multipoint ICAL and SS ICV and CCV	Per Method and Laboratory SOP	Per Method and Laboratory SOP	Per Laboratory SOP
	TDS	SM 2540C	Gravimetric	Per Laboratory SOP for Analytical Balance	Per Method and Laboratory SOP	Per Method and Laboratory SOP	Per Laboratory SOP
	TSS	SM 2440D	Gravimetric	Per Laboratory SOP for Analytical Balance	Per Method and Laboratory SOP	Per Method and Laboratory SOP	Per Laboratory SOP
	Phosphate as P	SM 4500-P-B.5	Persulfate digestion	Per Laboratory SOP	Per Method and Laboratory SOP	Per Method and Laboratory SOP	Per Laboratory SOP
	Sulfide, total	SM 4500-S2	Methyl blue method or ion-selective electrode	Per Laboratory SOP	Per Method and Laboratory SOP	Per Method and Laboratory SOP	Per Laboratory SOP
	Alkalinity	SM 2320B	Titration	Multipoint ICAL and SS ICV and CCV	Per Method and Laboratory SOP	Per Method and Laboratory SOP	Per Laboratory SOP

Abbreviations:

CCV - continuing calibration verification
CVAA - cold vapor atomic absorption
DC - dual column
ECD - electron capture detector
ESI/MS/MS - electrospray ionization/mass spectrometry/mass spectrometry
FPD - flame photometric detector
GC - gas chromatograph
HPLC - high performance liquid chromatograph
HRGC - high resolution gas chromatograph
HRMS - high resolution mass spectrometry
ICAL - initial calibration
ICP/MS - inductively coupled plasma/mass spectrometry
MS - mass spectrometry
N - nitrogen
NPD - nitrogen-phosphorous detector
P - phosphorus
PAH - polycyclic aromatic hydrocarbon
PCB - polychlorinated biphenyls
SIM - selected ion monitoring
SM - Standard Methods
SOP - standard operating procedure
SS ICV - second-source initial calibration verification
SVOC - Semivolatile organic compound
SW - SW-846
TDS - total dissolved solids
TSS - total suspended solids
VOC - volatile organic compound
WQPs - Water Quality Parameters

TABLE 5-5
ANALYTICAL QUALITY CONTROL AND CORRECTIVE ACTION
ORDOT DUMP POST-CLOSURE FACILITY
ORDOT-CHALAN PAGO, GUAM

Quality Control (QC) Sample	Number/Frequency	Acceptance Criteria	Corrective Action	Title/Position of Person Responsible for Corrective Action	Data Quality Indicator (DQI)
Method blank	1 per preparation batch up to 20 samples	No analyte > ½ RL and project-specific MPC per Table 5-3	Per laboratory SOP. If DEHP is detected in method blank and samples ≥ 6 µg/L, then prepare and reanalyze method blank and affected samples.	Analyst/Supervisor/QA Coordinator	Analytical accuracy/bias
LCS or LCS/LCSD	1 per preparation batch up to 20 samples	Per laboratory SOP and project-specific MPC per Table 5-3	Per laboratory SOP	Analyst/Supervisor/QA Coordinator	Analytical accuracy/bias and precision
Laboratory duplicate or MS/MSD	1 per preparation batch up to 20 samples	Per laboratory SOP and project-specific MPC per Table 5-3	Per laboratory SOP	Analyst/Supervisor/QA Coordinator	Overall precision (field and laboratory)
Surrogates	Each sample and standard, as applicable to method	Per method and laboratory SOP	Per laboratory SOP	Analyst/Supervisor/QA Coordinator	Overall accuracy (field and laboratory)/bias
Internal Standards	Each sample and standard, as applicable to method	Per method and laboratory SOP	Per laboratory SOP	Analyst/Supervisor/QA Coordinator	Analytical accuracy/bias
Post-Digestion Spikes	1 per preparation batch up to 20 samples, as applicable to method	Per method and laboratory SOP	Per laboratory SOP	Analyst/Supervisor/QA Coordinator	Overall precision (field and laboratory)
Serial Dilutions	1 per preparation batch up to 20 samples, as applicable to method	Per method and laboratory SOP	Per laboratory SOP	Analyst/Supervisor/QA Coordinator	Overall precision (field and laboratory)

Abbreviations:

LCS - laboratory control sample

LCSD - laboratory control sample duplicate

MPC - measurement performance criteria

MS - matrix spike

MSD - matrix spike duplicate

RL - reporting limit

SOP - standard operating procedures

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TABLE 6-1
FIELD AND SAMPLING EQUIPMENT
ORDOT DUMP POST-CLOSURE FACILITY
ORDOT-CHALAN PAGO, GUAM

Description of Equipment	Material (if applicable)	Dedicated? Yes/No
Photoionization Detector (PID)	NA	No
Multi-Gas Meter	NA	No
Water Level Meter	NA	No
Bailer	HDPE	Yes
Submersible Pump	NA	No
Tubing for Submersible Pump	HDPE	Yes
Multi-Parameter Groundwater Field Instrument	NA	No

Abbreviations:

NA = Not Applicable

HDPE = High-density Polyethylene

TABLE 6-2
FIELD EQUIPMENT/INSTRUMENT CALIBRATION, MAINTENANCE, TESTING AND INSPECTION
ORDOT DUMP POST-CLOSURE FACILITY
ORDOT-CHALAN PAGO, GUAM

Analytical Parameter	Field Equipment/Instrument	Calibration Activity	Maintenance & Testing/Inspection Activity	Frequency	Acceptance Criteria
VOCs	Photoionization Detector	As per Operator's Manual	As per Operator's Manual	As per Operator's Manual	As per Operator's Manual
Methane, oxygen, carbon dioxide	Multi-Gas Meter	As per Operator's Manual	As per Operator's Manual	As per Operator's Manual	As per Operator's Manual
pH, conductivity, temperature, dissolved oxygen, turbidity, ORP	Multi-Parameter Groundwater Field Instrument	As per Operator's Manual	As per Operator's Manual	As per Operator's Manual	As per Operator's Manual
Groundwater elevation	Water Level Meter	NA	As per Operator's Manual	As per Operator's Manual	As per Operator's Manual

Abbreviations:

NA = Not Applicable

ORP = Oxidation-Reduction Potential

VOCs = Volatile Organic Compounds

Figures

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6/1/2020

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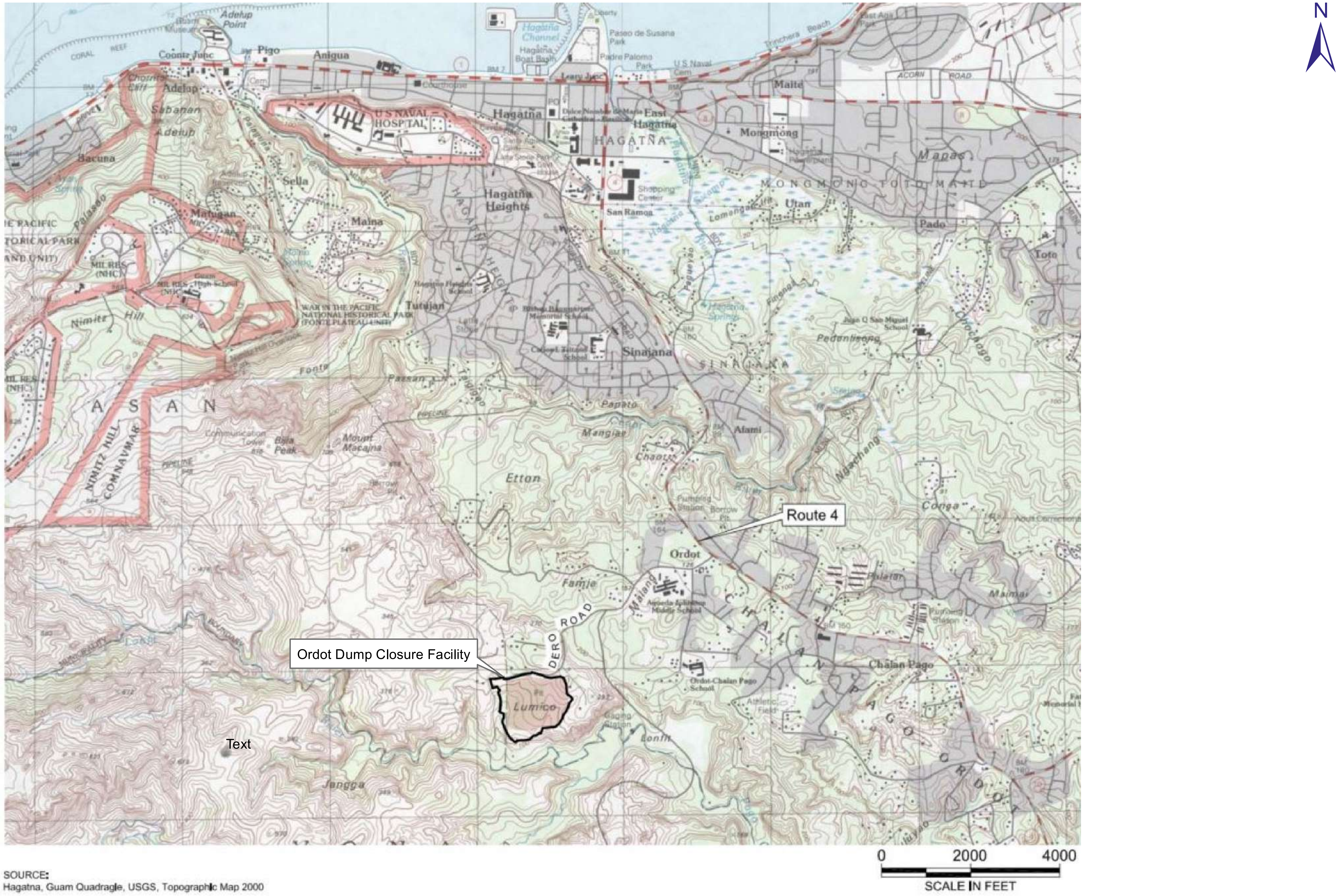

SOURCE:
Hagatna, Guam Quadragle, USGS, Topographic Map 2000

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FIGURE 1-1
REGIONAL SITE MAP
ORDOT DUMP POST-CLOSURE FACILITY
GUAM

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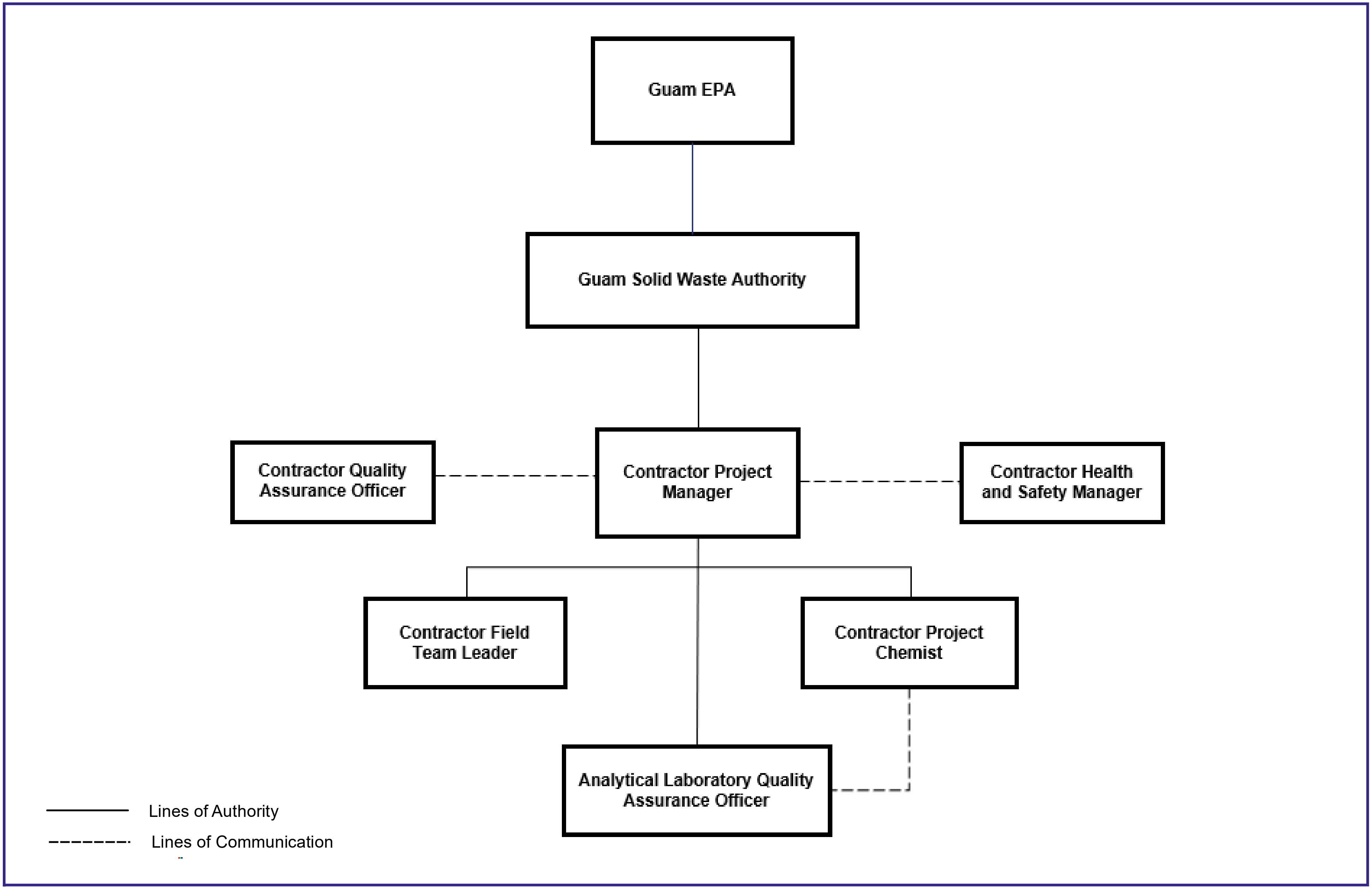

FIGURE 1-2
ORGANIZATIONAL CHART
ORDOT DUMP POST-CLOSURE FACILITY
GUAM

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7/8/2020

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Author: TCaputi Path: V:\Ramsey\Ordot\Fig_2-1_Sample_Locations_REV2.mxd

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FIGURE 2-1
SITE PLAN & SAMPLING LOCATIONS
ORDOT DUMP POST-CLOSURE FACILITY
GUAM

0 150 300
Feet

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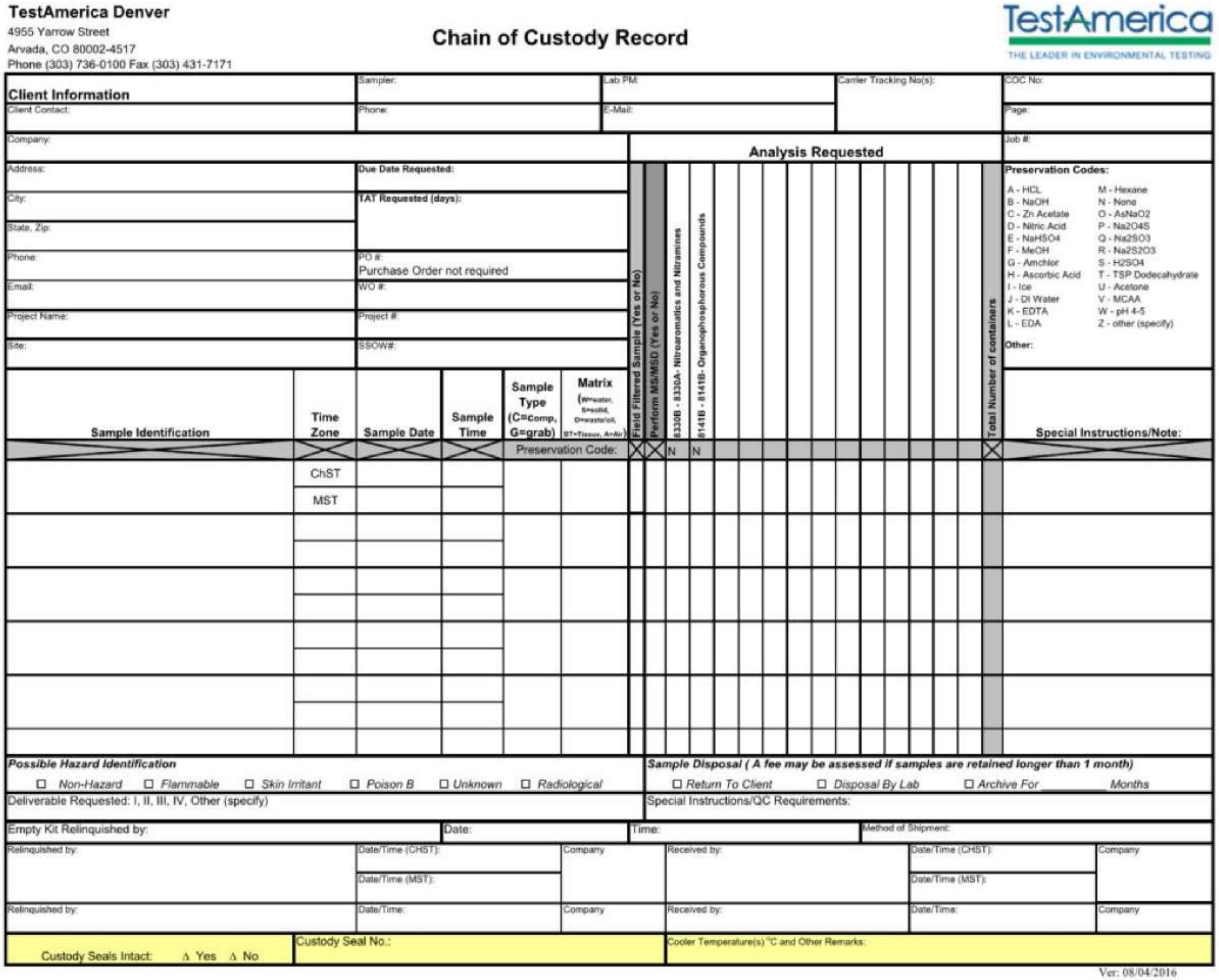
6/1/2020



TestAmerica Denver
4955 Yarrow Street
Arvada, CO 80002-4517
Phone (303) 736-0100 Fax (303) 431-7171

Chain of Custody Record

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

Client Information
Sampler:
Lab PM:
Carrier Tracking No(s):
COC No:
Client Contact:
Phone:
E-Mail:
Page:
Company:
Job #:
Address:
Due Date Requested:
City:
TAT Requested (days):
State, Zip:
Phone:
PO #:
Purchase Order not required
Email:
WO #:
Project Name:
Project #:
Site:
SSOW#:

Analysis Requested

Preservation Codes:

A - HCL	M - Hexane
B - NaOH	N - None
C - Zn Acetate	O - AsNaO2
D - Nitric Acid	P - Na2O4S
E - NaHSO4	Q - Na2SO3
F - MeOH	R - Na2S2O3
G - Amchlor	S - H2SO4
H - Ascorbic Acid	T - TSP Dodecahydrate
I - Ice	U - Acetone
J - DI Water	V - MCAA
K - EDTA	W - pH 4-5
L - EDA	Z - other (specify)

Other:

Sample Identification	Time Zone	Sample Date	Sample Time	Sample Type (C=comp, G=grab)	Matrix (W=water, S=solid, O=waste/oil, BT=Tissue, A=Air)	Field Filtered Sample (Yes or No)	Perform MS/MSD (Yes or No)	8330B - 8330A- Nitroaromatics and Nitramines	8141B - 8141B- Organophosphorous Compounds												Total Number of containers	Special Instructions/Note:
				Preservation Code:		☒	☒	N	N												☒	
	ChST																					
	MST																					

Possible Hazard Identification
☐ *Non-Hazard* ☐ *Flammable* ☐ *Skin Irritant* ☐ *Poison B* ☐ *Unknown* ☐ *Radiological*

Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)
☐ *Return To Client* ☐ *Disposal By Lab* ☐ *Archive For* _________ *Months*

Deliverable Requested: I, II, III, IV, Other (specify)
Special Instructions/QC Requirements:

Empty Kit Relinquished by:
Date:
Time:
Method of Shipment:

Relinquished by:
Date/Time (CHST):
Date/Time (MST):
Company
Received by:
Date/Time (CHST):
Date/Time (MST):
Company

Relinquished by:
Date/Time:
Company
Received by:
Date/Time:
Company

Custody Seals Intact: Δ Yes Δ No
Custody Seal No.:
Cooler Temperature(s) °C and Other Remarks:

Ver: 08/04/2016

FIGURE 3-1
SAMPLE CHAIN OF CUSTODY RECORD
ORDOT DUMP POST-CLOSURE FACILITY
GUAM

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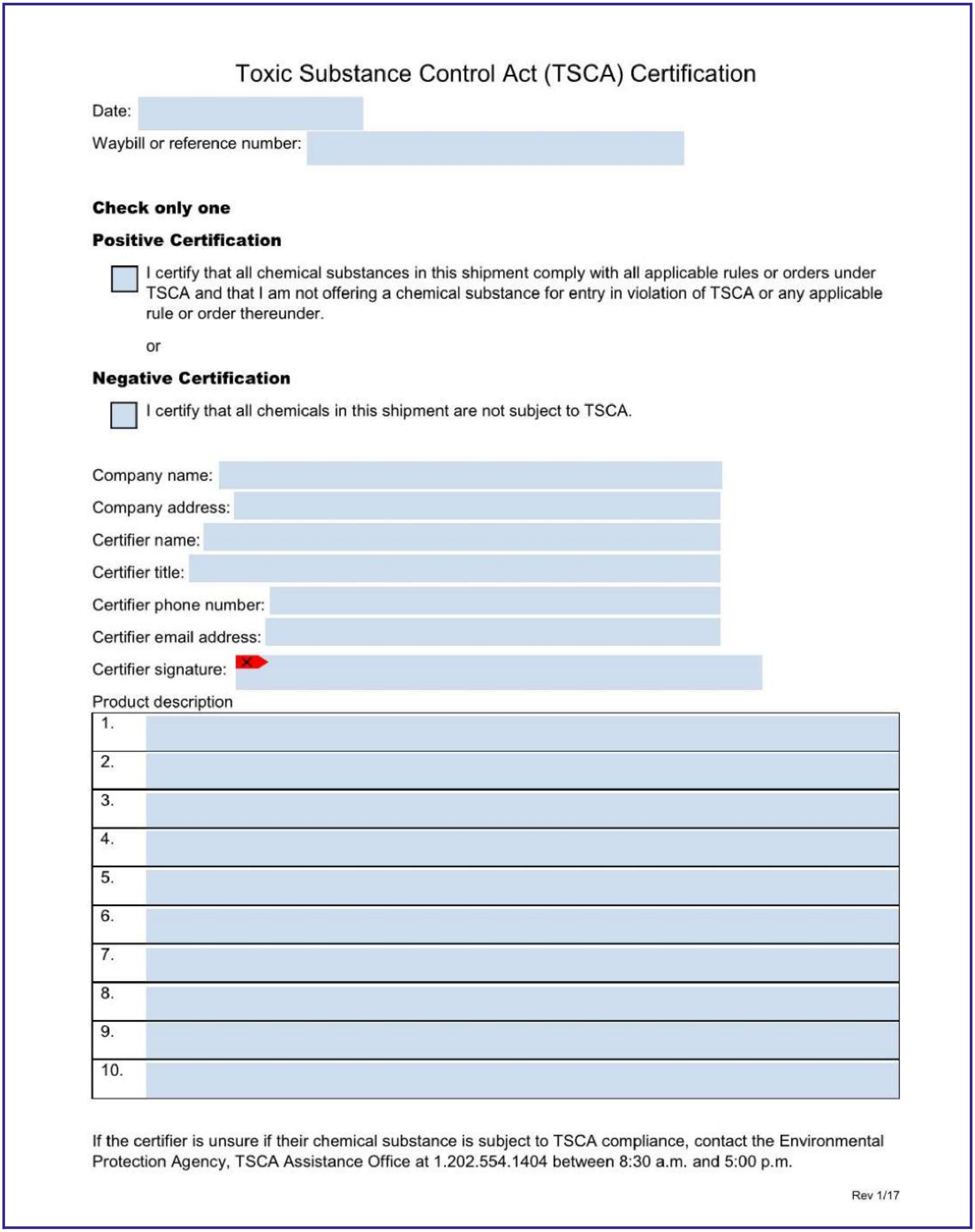
6/1/2020



Toxic Substance Control Act (TSCA) Certification

Date:

Waybill or reference number:

Check only one

Positive Certification

☐ I certify that all chemical substances in this shipment comply with all applicable rules or orders under TSCA and that I am not offering a chemical substance for entry in violation of TSCA or any applicable rule or order thereunder.

or

Negative Certification

☐ I certify that all chemicals in this shipment are not subject to TSCA.

Company name:

Company address:

Certifier name:

Certifier title:

Certifier phone number:

Certifier email address:

Certifier signature:

Product description

1.	
2.	
3.	
4.	
5.	
6.	
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8.	
9.	
10.	

If the certifier is unsure if their chemical substance is subject to TSCA compliance, contact the Environmental Protection Agency, TSCA Assistance Office at 1.202.554.1404 between 8:30 a.m. and 5:00 p.m.

Rev 1/17

Author: TCaputi Path: V:\Ramsey\Ordot\Fig_7-1_TSCA_Form.mxd

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FIGURE 7-1
TSCA CERTIFICATION FORM
ORDOT DUMP POST-CLOSURE FACILITY
GUAM

Attachment A: Project Analyte List

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ATTACHMENT A
PROJECT ANALYTE LIST
ORDOT DUMP POST-CLOSURE FACILITY
ORDOT-CHALAN PAGO, GUAM

Analyte Type	Analyte[a]	CAS No.	Analytical Method	Rationale for Inclusion	
VOCs	1,1,1,2-Tetrachloroethane	630-20-6	SW8260C	40 CFR 258 Appx I and II	d
VOCs	1,1,1-Trichloroethane	71-55-6	SW8260C	40 CFR 258 Appx I and II	d
VOCs	1,1,2,2-Tetrachloroethane	79-34-5	SW8260C	40 CFR 258 Appx I and II	d
VOCs	1,1,2-Trichloroethane	79-00-5	SW8260C	40 CFR 258 Appx I and II	d
VOCs	1,1-Dichloroethane	75-34-3	SW8260C	40 CFR 258 Appx I and II	d
VOCs	1,1-Dichloroethene	75-35-4	SW8260C	40 CFR 258 Appx I and II	d
VOCs	1,1-Dichloropropene	563-58-6	SW8260C	40 CFR 258 Appx II	
VOCs	1,2,3-Trichloropropane	96-18-4	SW8260C	40 CFR 258 Appx I and II	d
VOCs	1,2-Dibromo-3-chloropropane	96-12-8	SW8260C	40 CFR 258 Appx I and II	d
VOCs	1,2-Dibromoethane	106-93-4	SW8260C	40 CFR 258 Appx I and II	d
VOCs	1,2-Dichlorobenzene	95-50-1	SW8260C	40 CFR 258 Appx I and II	d
VOCs	1,2-Dichloroethane	107-06-2	SW8260C	40 CFR 258 Appx I and II	d
VOCs	1,2-Dichloropropane	78-87-5	SW8260C	40 CFR 258 Appx I and II	d
VOCs	1,3-Dichlorobenzene	541-73-1	SW8260C	40 CFR 258 Appx II	
VOCs	1,3-Dichloropropane	142-28-9	SW8260C	40 CFR 258 Appx II	
VOCs	1,4-Dichlorobenzene	106-46-7	SW8260C	40 CFR 258 Appx I and II	d
VOCs	2,2-Dichloropropane	594-20-7	SW8260C	40 CFR 258 Appx II	
VOCs	2-Hexanone (methyl butyl ketone)	591-78-6	SW8260C	40 CFR 258 Appx I and II	d
VOCs	4-Methyl-2-pentanone	108-10-1	SW8260C	40 CFR 258 Appx I and II	d
VOCs	Acetone	67-64-1	SW8260C	40 CFR 258 Appx I and II	d
VOCs	Acetonitrile	75-05-8	SW8260C	40 CFR 258 Appx II	
VOCs	Acrolein	107-02-8	SW8260C	40 CFR 258 Appx II	
VOCs	Acrylonitrile	107-13-1	SW8260C	40 CFR 258 Appx I and II	d
VOCs	Allyl chloride	107-05-1	SW8260C	40 CFR 258 Appx II	
VOCs	Benzene	71-43-2	SW8260C	40 CFR 258 Appx I and II	d
VOCs	Bromochloromethane	74-97-5	SW8260C	40 CFR 258 Appx I and II	d
VOCs	Bromodichloromethane	75-27-4	SW8260C	40 CFR 258 Appx I and II	d
VOCs	Bromoform	75-25-2	SW8260C	40 CFR 258 Appx I and II	d
VOCs	Bromomethane	74-83-9	SW8260C	40 CFR 258 Appx I and II	d
VOCs	Carbon disulfide	75-15-0	SW8260C	40 CFR 258 Appx I and II	d
VOCs	Carbon tetrachloride	56-23-5	SW8260C	40 CFR 258 Appx I and II	d
VOCs	Chlorobenzene	108-90-7	SW8260C	40 CFR 258 Appx I and II	d
VOCs	Chloroethane	75-00-3	SW8260C	40 CFR 258 Appx I and II	d
VOCs	Chloroform	67-66-3	SW8260C	40 CFR 258 Appx I and II	d
VOCs	Chloromethane	74-87-3	SW8260C	40 CFR 258 Appx I and II	d
VOCs	Chloroprene	126-99-8	SW8260C	40 CFR 258 Appx II	
VOCs	cis -1,2-Dichloroethene	156-59-2	SW8260C	40 CFR 258 Appx I and II	d
VOCs	cis -1,3-Dichloropropene	10061-01-5	SW8260C	40 CFR 258 Appx I and II	d
VOCs	Dibromochloromethane	124-48-1	SW8260C	40 CFR 258 Appx I and II	d
VOCs	Dibromomethane	74-95-3	SW8260C	40 CFR 258 Appx I and II	d
VOCs	Dichlorodifluoromethane (CFC-12)	75-71-8	SW8260C	40 CFR 258 Appx II	
VOCs	Ethyl methacrylate	97-63-2	SW8260C	40 CFR 258 Appx II	
VOCs	Ethyl methanesulfonate	62-50-0	SW8260C	40 CFR 258 Appx II	
VOCs	Ethylbenzene	100-41-4	SW8260C	40 CFR 258 Appx I and II	d
VOCs	Isobutyl alcohol	78-83-1	SW8260C	40 CFR 258 Appx II	
VOCs	Methacrylonitrile	126-98-7	SW8260C	40 CFR 258 Appx II	
VOCs	Methyl ethyl ketone	78-93-3	SW8260C	40 CFR 258 Appx I and II	d
VOCs	Methyl iodide	74-88-4	SW8260C	40 CFR 258 Appx I and II	d
VOCs	Methyl methacrylate	80-62-6	SW8260C	40 CFR 258 Appx II	
VOCs	Methylene chloride	75-09-2	SW8260C	40 CFR 258 Appx I and II	d
VOCs	o-Toluidine	95-53-4	SW8260C	40 CFR 258 Appx II	
VOCs	Propionitrile	107-12-0	SW8260C	40 CFR 258 Appx II	
VOCs	Styrene	100-42-5	SW8260C	40 CFR 258 Appx I and II	d
VOCs	Tetrachloroethene	127-18-4	SW8260C	40 CFR 258 Appx I and II	d
VOCs	Toluene	108-88-3	SW8260C	40 CFR 258 Appx I and II	d

ATTACHMENT A
PROJECT ANALYTE LIST
ORDOT DUMP POST-CLOSURE FACILITY
ORDOT-CHALAN PAGO, GUAM

Analyte Type	Analyte [a]	CAS No.	Analytical Method	Rationale for Inclusion	
VOCs	trans -1,2-Dichloroethene	156-60-5	SW8260C	40 CFR 258 Appx I and II	d
VOCs	trans -1,3-Dichloropropene	10061-02-6	SW8260C	40 CFR 258 Appx I and II	d
VOCs	trans -1,4-Dichloro-2-butene	110-57-6	SW8260C	40 CFR 258 Appx I and II	d
VOCs	Trichloroethene	79-01-6	SW8260C	40 CFR 258 Appx I and II	d
VOCs	Trichlorofluoromethane	75-69-4	SW8260C	40 CFR 258 Appx I and II	d
VOCs	Vinyl acetate	108-05-4	SW8260C	40 CFR 258 Appx I and II	d
VOCs	Vinyl chloride	75-01-4	SW8260C	40 CFR 258 Appx I and II	d
VOCs	Xylenes (total)	1330-20-7	SW8260C	40 CFR 258 Appx I and II	d
VOCs	1,4-Dioxane	123-91-1	SW8260CSIM	Found at MSWLFs	d
SVOCs	1,2,4,5-Tetrachlorobenzene	95-94-3	SW8270D	40 CFR 258 Appx II	
SVOCs	1,2,4-Trichlorobenzene	120-82-1	SW8270D	40 CFR 258 Appx II	
SVOCs	1,3,5-Trinitrobenzene (1,3,5-TNB)	99-35-4	SW8270D	40 CFR 258 Appx II	
SVOCs	1,3-Dinitrobenzene (1,3-DNB)	99-65-0	SW8270D	40 CFR 258 Appx II	
SVOCs	1,4-Naphthoquinone	130-15-4	SW8270D	40 CFR 258 Appx II	
SVOCs	1-Naphthylamine	134-32-7	SW8270D	40 CFR 258 Appx II	
SVOCs	2,2'-Oxybis(1-chloropropane)	108-60-1	SW8270D	40 CFR 258 Appx II	
SVOCs	2,3,4,6-Tetrachlorophenol	58-90-2	SW8270D	40 CFR 258 Appx II	
SVOCs	2,4,5-Trichlorophenol	95-95-4	SW8270D	40 CFR 258 Appx II	
SVOCs	2,4,6-Trichlorophenol	88-06-2	SW8270D	40 CFR 258 Appx II	
SVOCs	2,4-Dichlorophenol	120-83-2	SW8270D	40 CFR 258 Appx II	
SVOCs	2,4-Dimethylphenol	105-67-9	SW8270D	40 CFR 258 Appx II	
SVOCs	2,4-Dinitrophenol	51-28-5	SW8270D	40 CFR 258 Appx II	
SVOCs	2,4-Dinitrotoluene	121-14-2	SW8270D	40 CFR 258 Appx II	
SVOCs	2,6-Dichlorophenol	87-65-0	SW8270D	40 CFR 258 Appx II	
SVOCs	2,6-Dinitrotoluene	606-20-2	SW8270D	40 CFR 258 Appx II	
SVOCs	2-Acetylaminofluorene	53-96-3	SW8270D	40 CFR 258 Appx II	
SVOCs	2-Chloronaphthalene	91-58-7	SW8270D	40 CFR 258 Appx II	
SVOCs	2-Chlorophenol	95-57-8	SW8270D	40 CFR 258 Appx II	
SVOCs	2-Methylphenol	95-48-7	SW8270D	40 CFR 258 Appx II	
SVOCs	2-Naphthylamine	91-59-8	SW8270D	40 CFR 258 Appx II	
SVOCs	2-Nitroaniline	88-74-4	SW8270D	40 CFR 258 Appx II	
SVOCs	2-Nitrophenol	88-75-5	SW8270D	40 CFR 258 Appx II	
SVOCs	3,3'-Dimethylbenzidine	119-93-7	SW8270D	40 CFR 258 Appx II	
SVOCs	3,3'-Dichlorobenzidine	91-94-1	SW8270D	40 CFR 258 Appx II	
SVOCs	3-Methylcholanthrene	56-49-5	SW8270D	40 CFR 258 Appx II	
SVOCs	3-Methylphenol	108-39-4	SW8270D	40 CFR 258 Appx II	
SVOCs	3-Nitroaniline	'99-09-2	SW8270D	40 CFR 258 Appx II	
SVOCs	4,6-Dinitro-2-methylphenol	534-52-1	SW8270D	40 CFR 258 Appx II	
SVOCs	4-Aminobiphenyl	92-67-1	SW8270D	40 CFR 258 Appx II	
SVOCs	4-Bromophenyl-phenylether	101-55-3	SW8270D	40 CFR 258 Appx II	
SVOCs	4-Chloro-3-methylphenol	59-50-7	SW8270D	40 CFR 258 Appx II	
SVOCs	4-Chloroaniline	106-47-8	SW8270D	40 CFR 258 Appx II	
SVOCs	4-Chlorophenyl-phenyl ether	7005-72-3	SW8270D	40 CFR 258 Appx II	
SVOCs	4-Methylphenol	106-44-5	SW8270D	40 CFR 258 Appx II	
SVOCs	4-Nitroaniline	100-01-6	SW8270D	40 CFR 258 Appx II	
SVOCs	4-Nitrophenol	100-02-7	SW8270D	40 CFR 258 Appx II	
SVOCs	5-Nitro-o-toluidine	99-55-8	SW8270D	40 CFR 258 Appx II	
SVOCs	7,12-Dimethylbenz[a] anthracene	57-97-6	SW8270D	40 CFR 258 Appx II	
SVOCs	Acetophenone	98-86-2	SW8270D	40 CFR 258 Appx II	
SVOCs	alpha, alpha-Dimethylphenethylamine	122-09-8	SW8270D	40 CFR 258 Appx II	
SVOCs	Benzo(g,h,i)perylene	191-24-2	SW8270D	40 CFR 258 Appx II	
SVOCs	Benzo(k)fluoranthene (PAH)	207-08-9	SW8270D	40 CFR 258 Appx II	d
SVOCs	Benzyl alcohol	100-51-6	SW8270D	40 CFR 258 Appx II	d
SVOCs	bis(2-Chloroethoxy)methane	111-91-1	SW8270D	40 CFR 258 Appx II	d
SVOCs	bis(2-Chloroethyl)ether	111-44-4	SW8270D	40 CFR 258 Appx II	

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PROJECT ANALYTE LIST
ORDOT DUMP POST-CLOSURE FACILITY
ORDOT-CHALAN PAGO, GUAM

Analyte Type	Analyte [a]	CAS No.	Analytical Method	Rationale for Inclusion	
SVOCs	Butylbenzylphthalate	85-68-7	SW8270D	40 CFR 258 Appx II	d
SVOCs	Diallate	2303-16-4	SW8270D	40 CFR 258 Appx II	
SVOCs	Dibenzofuran	132-64-9	SW8270D	40 CFR 258 Appx II	
SVOCs	Diethylphthalate	84-66-2	SW8270D	40 CFR 258 Appx II	d
SVOCs	Dimethylphthalate	131-11-3	SW8270D	40 CFR 258 Appx II	d
SVOCs	di-n -Butylphthalate	84-74-2	SW8270D	40 CFR 258 Appx II	
SVOCs	di-n -Octylphthalate	117-84-0	SW8270D	40 CFR 258 Appx II	
SVOCs	Diphenylamine	122-39-4	SW8270D	40 CFR 258 Appx II	
SVOCs	Disulfoton	298-04-4	SW8270D	40 CFR 258 Appx II	
SVOCs	Hexachlorobenzene	118-74-1	SW8270D	40 CFR 258 Appx II	
SVOCs	Hexachlorobutadiene	87-68-3	SW8270D	40 CFR 258 Appx II	
SVOCs	Hexachlorocyclopentadiene	77-47-4	SW8270D	40 CFR 258 Appx II	
SVOCs	Hexachloroethane	67-72-1	SW8270D	40 CFR 258 Appx II	
SVOCs	Hexachloropropene	1888-71-7	SW8270D	40 CFR 258 Appx II	
SVOCs	Isodrin	465-73-6	SW8270D	40 CFR 258 Appx II	
SVOCs	Isophorone	78-59-1	SW8270D	40 CFR 258 Appx II	
SVOCs	Isosafrole	120-58-1	SW8270D	40 CFR 258 Appx II	
SVOCs	Kepone	143-50-0	SW8270D	40 CFR 258 Appx II	
SVOCs	Methapyrilene	91-80-5	SW8270D	40 CFR 258 Appx II	
SVOCs	Methyl methanesulfonate	66-27-3	SW8270D	40 CFR 258 Appx II	d
SVOCs	Nitrobenzene	98-95-3	SW8270D	40 CFR 258 Appx II	
SVOCs	N-Nitrosodiethylamine	55-18-5	SW8270D	40 CFR 258 Appx II	
SVOCs	N-Nitrosodimethylamine	62-75-9	SW8270D	40 CFR 258 Appx II	
SVOCs	N-Nitroso-di-n -propylamine	621-64-7	SW8270D	40 CFR 258 Appx II	
SVOCs	N-Nitrosodi-n-butylamine	924-16-3	SW8270D	40 CFR 258 Appx II	
SVOCs	N-Nitrosodiphenylamine	86-30-6	SW8270D	40 CFR 258 Appx II	
SVOCs	N-Nitrosomethylethalamine	10595-95-6	SW8270D	40 CFR 258 Appx II	
SVOCs	N-Nitrosopiperidine	100-75-4	SW8270D	40 CFR 258 Appx II	
SVOCs	N-Nitrosopyrrolidine	930-55-2	SW8270D	40 CFR 258 Appx II	
SVOCs	Parathion	56-38-2	SW8270D	40 CFR 258 Appx II	
SVOCs	p-Dimethylamino azobenzene	60-11-7	SW8270D	40 CFR 258 Appx II	
SVOCs	Pentachlorobenzene	608-93-5	SW8270D	40 CFR 258 Appx II	
SVOCs	Pentachloronitrobenzene	82-68-8	SW8270D	40 CFR 258 Appx II	
SVOCs	Phenacetin	62-44-2	SW8270D	40 CFR 258 Appx II	
SVOCs	Phenanthrene	85-01-8	SW8270D	40 CFR 258 Appx II	d
SVOCs	Phenol	108-95-2	SW8270D	40 CFR 258 Appx II	
SVOCs	p-Phenylenediamine	106-50-3	SW8270D	40 CFR 258 Appx II	
SVOCs	Pronamide	23950-58-5	SW8270D	40 CFR 258 Appx II	
SVOCs	Safrole	94-59-7	SW8270D	40 CFR 258 Appx II	
SVOCs	2-Methylnaphthalene (PAH)	91-57-6	SW8270DSIM	40 CFR 258 Appx II	d
SVOCs	Acenaphthene (PAH)	83-32-9	SW8270DSIM	40 CFR 258 Appx II	d
SVOCs	Acenaphthylene (PAH)	208-96-8	SW8270DSIM	40 CFR 258 Appx II	d
SVOCs	Anthracene (PAH)	120-12-7	SW8270DSIM	40 CFR 258 Appx II	d
SVOCs	Benzo(a)anthracene (PAH)	56-55-3	SW8270DSIM	40 CFR 258 Appx II	d
SVOCs	Benzo(a)pyrene (PAH)	50-32-8	SW8270DSIM	40 CFR 258 Appx II	d
SVOCs	Benzo(b)fluoranthene (PAH)	205-99-2	SW8270DSIM	40 CFR 258 Appx II	d
SVOCs	bis(2-Ethylhexyl)phthalate	117-81-7	SW8270DSIM	40 CFR 258 Appx II	d
SVOCs	Chrysene (PAH)	218-01-9	SW8270DSIM	40 CFR 258 Appx II	d
SVOCs	Dibenzo(a,h)anthracene (PAH)	53-70-3	SW8270DSIM	40 CFR 258 Appx II	d
SVOCs	Fluoranthene (PAH)	206-44-0	SW8270DSIM	40 CFR 258 Appx II	d
SVOCs	Fluorene (PAH)	86-73-7	SW8270DSIM	40 CFR 258 Appx II	
SVOCs	Indeno(1,2,3-cd)pyrene (PAH)	193-39-5	SW8270DSIM	40 CFR 258 Appx II	d
SVOCs	Naphthalene (PAH)	91-20-3	SW8270DSIM	40 CFR 258 Appx II	
SVOCs	Pyrene (PAH)	129-00-0	SW8270DSIM	40 CFR 258 Appx II	d
Dioxin	2,3,7,8-Tetrachlorodibenzodioxin (2,3,7,8-TCDD)	1746-01-6	E1613B	40 CFR 258 Appx II	d

ATTACHMENT A
PROJECT ANALYTE LIST
ORDOT DUMP POST-CLOSURE FACILITY
ORDOT-CHALAN PAGO, GUAM

Analyte Type	Analyte [a]	CAS No.	Analytical Method	Rationale for Inclusion	
Pesticides	4,4'-DDD	72-54-8	SW8081B/608	40 CFR 258 Appx II	d
Pesticides	4,4'-DDE	72-55-9	SW8081B/608	40 CFR 258 Appx II	
Pesticides	4,4'-DDT	50-29-3	SW8081B/608	40 CFR 258 Appx II	
Pesticides	Aldrin	309-00-2	SW8081B/608	40 CFR 258 Appx II	d
Pesticides	Alpha-BHC	319-84-6	SW8081B/608	40 CFR 258 Appx II	d
Pesticides	Alpha-Chlordane	5103-71-9	SW8081B/608	40 CFR 258 Appx II [b]	
Pesticides	Beta-BHC	319-85-7	SW8081B/608	40 CFR 258 Appx II	d
Pesticides	Beta-Chlordane	5103-74-2	SW8081B/608	40 CFR 258 Appx II [b]	
Pesticides	Chlordane (see Alpha-, Beta-, and Gamma-)	57-74-9	SW8081B/608	40 CFR 258 Appx II - Listed as "Chlordane" and Reported as 3 Isomers	
Pesticides	Chlorobenzilate	510-15-6	SW8081B/608	40 CFR 258 Appx II	
Pesticides	Delta-BHC	319-86-8	SW8081B/608	40 CFR 258 Appx II	d
Pesticides	Dieldrin	60-57-1	SW8081B/608	40 CFR 258 Appx II	
Pesticides	Endosulfan I	959-98-8	SW8081B/608	40 CFR 258 Appx II	d
Pesticides	Endosulfan II	33213-65-9	SW8081B/608	40 CFR 258 Appx II	
Pesticides	Endosulfan sulfate	1031-07-8	SW8081B/608	40 CFR 258 Appx II	
Pesticides	Endrin	72-20-8	SW8081B/608	40 CFR 258 Appx II	
Pesticides	Endrin aldehyde	7421-93-4	SW8081B/608	40 CFR 258 Appx II	d
Pesticides	Gamma-BHC (Lindane)	58-89-9	SW8081B/608	40 CFR 258 Appx II	d
Pesticides	Gamma-Chlordane	5566-34-7	SW8081B/608	40 CFR 258 Appx II [b]	
Pesticides	Heptachlor	76-44-8	SW8081B/608	40 CFR 258 Appx II	
Pesticides	Heptachlor epoxide	1024-57-3	SW8081B/608	40 CFR 258 Appx II	d
Pesticides	Methoxychlor	72-43-5	SW8081B/608	40 CFR 258 Appx II	
Pesticides	Toxaphene (plus congeners)	8001-35-2	SW8081B/608	40 CFR 258 Appx II	
PCBs	Aroclor 1016	12674-11-2	SW8082A	40 CFR 258 Appx II [c]	
PCBs	Aroclor 1221	11104-28-2	SW8082A	40 CFR 258 Appx II [c]	
PCBs	Aroclor 1232	11141-16-5	SW8082A	40 CFR 258 Appx II [c]	
PCBs	Aroclor 1242	53469-21-9	SW8082A	40 CFR 258 Appx II [c]	
PCBs	Aroclor 1248	12672-29-6	SW8082A	40 CFR 258 Appx II [c]	
PCBs	Aroclor 1254	11097-69-1	SW8082A	40 CFR 258 Appx II [c]	
PCBs	Aroclor 1260	11096-82-5	SW8082A	40 CFR 258 Appx II [c]	
PCBs	Polychlorinated biphenyls; PCBs (see Aroclors)	NA	SW8082A	40 CFR 258 Appx II - Listed as "PCBs" and Reported as 7 Aroclor mixtures	
Herbicides	2,4,5-Trichlorophenoxyacetic acid	93-76-5	SW8151A	40 CFR 258 Appx II	
Herbicides	2,4-Dichlorophenoxyacetic acid	94-75-7	SW8151A	40 CFR 258 Appx II	d
Herbicides	Dinoseb (DNBP)	88-85-7	SW8151A	40 CFR 258 Appx II	d
Herbicides	Pentachlorophenol	87-86-5	SW8151A	40 CFR 258 Appx II	
Herbicides	Silvex (2,4,5-TP)	93-72-1	SW8151A	40 CFR 258 Appx II	
Organophosphorous Compounds	Dimethoate	60-51-5	SW8141B	40 CFR 258 Appx II	
Organophosphorous Compounds	Famphur	52-85-7	SW8141B	40 CFR 258 Appx II	
Organophosphorous Compounds	Methyl parathion	298-00-0	SW8141B	40 CFR 258 Appx II	
Organophosphorous Compounds	o,o',o"-Triethylphosphorothioate	126-68-1	SW8141B	40 CFR 258 Appx II	
Organophosphorous Compounds	Phorate	298-02-2	SW8141B	40 CFR 258 Appx II	
Organophosphorous Compounds	Thionazin	297-97-2	SW8141B	40 CFR 258 Appx II	
Solid Rocket Fuel Propellant	Perchlorate	14797-73-0	SW6850	Solid rocket propellant	d
Munitions	2-Amino-4,6-dinitrotoluene	35572-78-2	SW8330B	Munitions (EPA 8330B list)	d
Munitions	2-Nitrotoluene	88-72-2	SW8330B	Munitions (EPA 8330B list)	d
Munitions	3,5-Dinitroaniline (3,5-DNA)	618-87-1	SW8330B	Munitions (EPA 8330B list)	
Munitions	3-Nitrotoluene	99-08-1	SW8330B	Munitions (EPA 8330B list)	
Munitions	4-Amino-2,4-dinitrotoluene (4-Am-DNT)	19406-51-0	SW8330B	Munitions (EPA 8330B list)	
Munitions	4-Nitrotoluene	99-99-0	SW8330B	Munitions (EPA 8330B list)	
Munitions	HMX	2691-41-0	SW8330B	Munitions (EPA 8330B list)	
Munitions	Nitroglycerin	55-63-0	SW8330B	Munitions (EPA 8330B list)	
Munitions	Picric acid	88-89-1	SW8330B	Japanese munitions (EPA 8330B list)	
Munitions	RDX	121-82-4	SW8330B	Munitions (EPA 8330B list)	d
Munitions	Tetryl	479-45-8	SW8330B	Munitions (EPA 8330B list)	
Munitions	Trinitrotoluene	118-96-7	SW8330B	Munitions (EPA 8330B list)	

ATTACHMENT A
PROJECT ANALYTE LIST
ORDOT DUMP POST-CLOSURE FACILITY
ORDOT-CHALAN PAGO, GUAM

Analyte Type	Analyte [a]	CAS No.	Analytical Method	Rationale for Inclusion	
Metals	Aluminum	7429-90-5	200.8	Water Quality Parameter	d
Metals	Antimony	7440-36-0	200.8	40 CFR 258 Appx I and II	d
Metals	Arsenic	7440-38-2	200.8	40 CFR 258 Appx I and II	d
Metals	Barium	7440-39-3	200.8	40 CFR 258 Appx I and II	d
Metals	Beryllium	7440-41-7	200.8	40 CFR 258 Appx I and II	d
Metals	Cadmium	7440-43-9	200.8	40 CFR 258 Appx I and II	d
Metals	Calcium	7440-70-2	200.8	Water Quality Parameter	d
Metals	Chromium	7440-47-3	200.8	40 CFR 258 Appx I and II	d
Metals	Cobalt	7440-48-4	200.8	40 CFR 258 Appx I and II	d
Metals	Copper	7440-50-8	200.8	40 CFR 258 Appx I and II	d
Metals	Iron	7439-89-6	200.8	Water Quality Parameter	d
Metals	Lead	7439-92-1	200.8	40 CFR 258 Appx I and II	d
Metals	Magnesium	7439-95-4	200.8	Water Quality Parameter	d
Metals	Manganese	7439-96-5	200.8	Water Quality Parameter	d
Metals	Molybdenum	7439-98-7	200.8	Water Quality Parameter	d
Metals	Nickel	7440-02-0	200.8	40 CFR 258 Appx I and II	d
Metals	Potassium	7440-09-7	200.8	Water Quality Parameter	d
Metals	Selenium	7782-49-2	200.8	40 CFR 258 Appx I and II	d
Metals	Silver	7440-22-4	200.8	40 CFR 258 Appx I and II	d
Metals	Sodium	7440-23-5	200.8	Water Quality Parameter	d
Metals	Thallium	7440-28-0	200.8	40 CFR 258 Appx I and II	d
Metals	Tin	7440-31-5	200.8	40 CFR 258 Appx II	d
Metals	Uranium	7440-61-1	200.8	Low-level radioactive waste from military	d
Metals	Vanadium	7440-62-2	200.8	40 CFR 258 Appx I and II	d
Metals	Zinc	7440-66-6	200.8	40 CFR 258 Appx I and II	d
Metals	Hexavalent Chromium (Cr^{+6})	18540-29-9	218.7	More toxic form of chromium	d
Metals	Mercury (total)	7439-97-6	245.1	40 CFR 258 Appx II	d
Cyanide	Cyanide, Total	'57-12-5	SM 4500-CN-E	40 CFR 258 Appx II	d
Sulfide	Sulfide	18496-25-8	SM 4500-S^{-2}	40 CFR 258 Appx II	d
Radioactive Constituents	Gross Alpha	NA	900	Low-level radioactive waste from military	d
Radioactive Constituents	Gross Beta	NA	900	Low-level radioactive waste from military	d
Radioactive Constituents	Radium 226	13982-63-3	903.0	Low-level radioactive waste from military	d
Radioactive Constituents	Radium 228	15262-20-1	904.0	Low-level radioactive waste from military	d
Water Quality Parameters	Chloride	16887-00-6	300.0	Water Quality Parameter	d
Water Quality Parameters	Sulfate	14808-79-8	300.0	Water Quality Parameter	d
Water Quality Parameters	Ammonia (as N)	7664-41-7	350.1	Water Quality Parameter	d
Water Quality Parameters	Nitrate/Nitrite as N	NA	353.2	Water Quality Parameter	d
Water Quality Parameters	Total Dissolved Solids (TDS)	NA	A2540C	Water Quality Parameter	d
Water Quality Parameters	Total Suspended Solids (TSS)	NA	A2540D	Water Quality Parameter	d
Water Quality Parameters	Phosphate (as P)	7723-14-0	SM 4500 P-B.5	Water Quality Parameter	d
Water Quality Parameters	Alkalinity	NA	SM2320B	Water Quality Parameter	d

Footnotes:

[a] *There are a total of 259 project analytes: 223 40CRF258 Appendix II analytes (PCBs and Chlordane are each listed as one analyte, but these are reported as seven Aroclor mixtures and three isomers of Chlordane, respectively), 20 Ordot-specific analytes (munitions; radiological parameters; 1,4-dioxane; hexavalent chromium; and perchlorate), and 16 water quality parameters.*

[b] *Chlordane is listed on the Appendix II analyte list, but the laboratory reports three Chlordane isomers (alpha-, beta-, and gamma-Chlordane).*

[c] *PCB is listed on the Appendix II analyte list, but the laboratory reports seven PCB mixtures (Aroclor-1016, -1221, -1232, -1242, -1248, -1254, and -1260).*

[d] *Analyte Selected for Semiannual Sampling. Any newly-detected Appendix II and Ordot-Specific analytes from annual monitoring events will be analyzed in addition to the analytes checked.*

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Attachment B: Standard Operating Procedures

Attachment B1:	SOP-010 – Environmental Sampling
Attachment B2:	SOP-011 – Sample Preservation
Attachment B3:	SOP-012 – Field Notes and Documentation
Attachment B4:	SOP-013 – Instrument Calibration
Attachment B5:	SOP-014 – Equipment Decontamination
Attachment B6:	SOP-015 – Investigation Derived Waste Handling Procedures
Attachment B7:	SOP-016 – Groundwater Monitoring Well Installation and Development
Attachment B8:	SOP-017 – Groundwater Sample Collection
Attachment B9:	SOP-024 – Monitor Well Water Level Measurement
Attachment B10:	SOP-026 – Pre-Sample Purging and Sampling of Low-Yielding Monitoring Wells
Attachment B11:	SOP-030 – Sampling Monitoring Wells
Attachment B12:	SOP-031 – Chain-of-Custody

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SOP-010
Environmental Sample Handling

Ordot Dump Post-Closure Facility
Standard Operating Procedure

Revision 2
Revision Date: September 20, 2021

SOP-010
ENVIRONMENTAL SAMPLE HANDLING

TABLE OF CONTENTS

1.0 OBJECTIVE

The objective of this procedure is to establish a uniform method for the handling of environmental samples. This includes the procurement of the appropriate sample containers and preservatives, chain of custody procedures and the use of appropriate sample shipment methods.

2.0 SCOPE AND APPLICABILITY

This procedure will be used during the collection of all types of environmental media that include, but are not limited to, groundwater, surface water, leachate, soil, and sediment. Handling of air samples is not addressed in the current version of this procedure.

3.0 RESPONSIBILITIES

The *Project Manager (PM),* or designee, will have the responsibility to oversee and ensure that the handling of samples is in accordance with this SOP and any site-specific or project specific planning documents.

The *field sampling personnel* will be responsible for the understanding and implementation of this SOP during all field activities, as well as, obtaining the appropriate field logbooks, forms, and records necessary to complete the field activities. Field personnel will ensure all field activities are documented completely at the end of each field day. Field personnel are responsible for assuring that the original documentation (or copies of the field log book, if needed for another project at the same site), are filed at the end of the field project, or during a long project (greater than a month) every couple of weeks.

4.0 DEFINITIONS

EnCore® Sampler: Sampler designed for collecting Volatile Organic Carbon (VOC) samples.

PPE: Personal Protective Equipment

5.0 REQUIRED MATERIALS

The materials required for this SOP include the following:

- Bound field log books
- Black waterproof and/or indelible ink pens
- Field forms
- Chain-of-Custody forms
- Sample Labels

6.0 METHOD

The following method outlines general considerations for sample handling in the field and maintaining sample custody after collection.

Environmental samples are collected in the field in order to evaluate whether conditions in soil gas, soil, sediment, leachate, surface water, or groundwater are hazardous. These samples therefore, should be handled with the utmost care to maintain integrity so that analytical data represents as closely as possible, field conditions. In addition, sample chain of custody is extremely important for establishing that sample integrity was maintained between field crew and laboratory.

Details regarding collection of samples are provided in other SOPs. General considerations for handling during sampling are:

- Always wear proper PPE when handling samples.
- Sample receptacles or containers should be wrapped in a way that is protective of both surrounding containers and the container the sample is in.
- Always check and document procedures well in field logbooks or sampling forms. There is never “too much information”.

Samples must be stabilized for transport from the field to the laboratory through the use of the proper sample containers and preservation techniques. This is due to the potential changes in chemical quality that may occur after samples are collected. Sample containers and preservation are discussed in the Sample Preservation SOP.

Great care must be exercised in the sampling and handling of volatile compounds (e.g. VOCs or volatile gases) in order to minimize the introduction of sampling bias. This bias is caused largely through the loss of volatile constituents. Special handling procedures are described in respective sampling SOPs for the handling of aqueous and non-aqueous samples that should be followed in order to minimize the loss of volatile constituents.

Non-aqueous samples for VOC analysis should be placed in the appropriate container as quickly as possible following their collection. Consideration should be given to trimming soil samples that have been in contact with the air and the sampling device in order to minimize the loss of VOCs and inadvertent sample contamination, respectively. Some agencies require the use of USEPA Method 5035 (or similar) that utilizes containerization in a special sampler (EnCore® or equivalent), or field methanol preservation using specially prepared containers. Lastly, the sample container should be cooled immediately after it is filled.

6.1 Sample Labels

Sample labels are required on all sample containers for the primary purpose of sample identification. Specific field data need not be recorded on the labels. The sample labels should contain the following information:

- Sample or location identification number (i.e., well number, boring number/depth, or arbitrary sample number)
- Analysis to be performed
- Preservative (even if only keeping sample chilled)
- Project name and number
- Date and time of sample collection
- Details of samplers (initials, etc.)

It is recommended that the sample label be preprinted in the office on adhesive labels prior to initiation of the sampling program. Tape should NOT be used to cover any label or seal the ends of soil sleeves. Recent studies indicate that most commercially available tapes contain VOCs and that there is the potential for contamination from the tapes.

6.2 Chain-of-Custody

The goal of implementing chain-of-custody procedures is to ensure that the sample is traceable from the time that it is collected until it, or its derived data, are used. Samples would be considered to be "in custody" under the following conditions:

- It is in personal possession.
- It is in personal view after being in personal possession.
- It was in personal possession when it was properly secured.
- It is in a designated secure area.

6.2.1 Chain-of-Custody Forms

A chain-of-custody form may be initiated at the time that the sample containers are filled or, at a minimum, when the sample containers leave the site at which they are prepared, usually that of the analytical laboratory supplying the containers. Additionally, chain-of-custody forms may be specially prepared with some initial information for the project and specific analytical methods listed prior to field work to decrease the amount of information that has to be recorded in the field. However, in this event, actual sample collection information should be recorded only in the field after the sample has been collected.

Samples submitted to project labs may be submitted using the Brown and Caldwell COC form or the laboratory supplied COC form.

The following information should be included on the COC:

- Sample Name
- Date/time of collection, Sampler
- Number of containers
- Preservation
- Analysis requested
- Data Package requested
- Contact Information

It is important that the field personnel completely fill out the applicable sections of the form.

The form should be completed in advance where possible to preprint the project contact information. Field specific sample names, dates and times should be completed by field personnel at the time of sample collection. If single-page form be used it should be photo-copied prior to sample shipping and the original included in the shipping container. If a triplicate COC form is used, the top page original shall be included with the samples and the remainder preserved for project files. Revisions to COC's should be single-lined crossed out, initialed and dated. Chain-of-custody forms should be numerically sequenced with a number clearly indicated on the form. The chain-of-custody forms should be placed in shipping containers, protected from moisture using plastic bags (e.g., Ziploc®), and the original should accompany the containers during shipment to the laboratory. Chain-of-custody forms included in any shipping container should only reflect those samples that are in that container. The field personnel collecting the samples will be responsible for the custody of the samples until transport to the laboratory. Sample transfer requires the individuals relinquishing and receiving the samples to sign, date and note the time of transfer on the chain-of-custody forms. The chain-of-custody is considered to be complete after it has been received and signed in by the analytical laboratory. A copy of the chain-of-custody record should be maintained by the field personnel along with the other field records.

Common carriers (i.e., Federal Express) are not expected to sign the chain-of-custody form. However, the bill of lading or airbill becomes part of the chain-of-custody record in the event that a common carrier is used to transport the samples. Airbill or bill of lading numbers should be recorded on the chain-of-custody forms.

6.2.2 Chain-of-Custody Seals

Custody seals shall be affixed to the outside of each shipping container or cooler. Two seals are required and should be placed at two points along the front of the cooler at the point where the lid meets the body of the cooler. The seals do not necessarily need to be custody tape, but any type of tape that can be used that cannot be easily removed without showing signs of damage. The custody seals or tape shall include the date and initials of the packager.

Chain-of-custody seals or evidence tape may be used, but are not required, on the sample containers in order to demonstrate that the sample containers have not been opened or otherwise tampered with. Chain-of-custody seals or evidence tape, if used, should be affixed to each sample container as soon after sample collection as is possible.

6.3 Sample Shipment

Shipment of samples to an analytical laboratory is usually required upon completion of sample collection. Proper packaging is necessary in order to protect the sample containers, to maintain the samples at a temperature of 6°C or less, and to comply with all applicable transportation regulations.

In general, samples are shipped using packaging that is supplied by the analytical laboratory. The packaging normally includes a shippable insulated box such as an ice cooler and contains protective internal packaging materials such as foam sleeves or bubble wrap. Some laboratories use proprietary sample packaging with integral internal packaging. In either case, provisions need to be made for maintaining the temperature of the samples either with the use of ice packs or ice. Care should be taken to ensure that the sample bottles are adequately protected from breakage during shipments. Samples should be secured tightly with bubble wrap or other suitable packing media and covered with plastic bags. Ice should be added to the shipping container only after the samples have been secured with packing media. Ice should never be used to provide separation between sample bottles. Once packed, the cooler should be secured shut by wrapping fiber reinforced (strapping) tape completely around the cooler.

Samples that are shipped with ice for temperature preservation shall also include a “Temperature Blank”. The temperature blank consists of a small volume (50-100 ml) of tap water in a separate container positioned near the center of the cooler. The laboratory will check the temperature of this blank in order to determine if the sample meets the temperature preservation requirement.

Custody seals shall be placed on the outside of the cooler, and clear tape should be wrapped around the cooler to cover each seal without obliterating signatures or other significant data. The shipping label shall be secured to the outside of the shipping container and, if it is attached to the top of a cooler by adhesive, clear tape shall be used to secure it to the packaging. A valid return address must appear on the shipping label in the event the shipper is unable to deliver to the designated address.

Samples will be delivered to the analytical laboratory so that there is sufficient time for analysis of the constituent with the shortest holding time. For holding times, please see SOP-011, Sample Preservation. Samples preserved at 6°C using ice packs or ice shall be shipped via overnight delivery. If samples are sent on Friday, Saturday delivery will be requested and arrangements must be made with the laboratory to receive the shipment. Chemically preserved samples may be delivered to the laboratory using ground transportation.

Regulations must be observed regarding the shipment of Dangerous Goods. Sample containers and certain field equipment may be defined as Dangerous Goods such that special requirements must be followed for their shipment. Air shipment of Dangerous Goods is regulated by the International Air Transport Association (IATA) as described in "Dangerous Goods Regulations". Shipment by ground is regulated by the U.S. Department of Transportation (DOT). Furthermore, individual shippers (e.g., Federal Express) may have additional requirements for Dangerous Goods shipment. The shipment of Dangerous Goods must be consistent with the instruction and authorization of the analytical laboratory shipping and receiving coordinator and the Health and Safety director.

Environmental samples, including groundwater samples, are currently exempt from Hazardous Goods regulations. 40 CFR 261.40(d) states, "A sample of solid waste or a sample of water, soil, or air which is collected for the sole purpose of testing to determine its characteristics or composition is not subject to this Part or Parts 262 through 267 or Part 124 of this chapter or to the notification requirements of Section 3010 of RCRA." Therefore, no special regulations are required to be followed for the shipment of environmental samples from the field. However, sample containers should be properly packed such that inadvertent spillage does not occur during shipment (e.g., any discharge spouts should be taped closed).

Specific regulations do exist, however, for the shipment of many reagents that are commonly used as preservatives and decontamination agents. Consequently, the shipment to the field site of "empty" sample containers containing small quantities of preservatives must be conducted in accordance with the regulations. The most significant limitations for the shipment of preservatives (IATA, 1992) involve those for nitric acid in which only small quantities (<0.5L) of low concentration (<20%) nitric acid can be shipped in any given shipment.

7.0 QUALITY ASSURANCE/QUALITY CONTROL

Quality assurance for sample handling centers upon following procedures outlined above and double checks as samples are collected. Checks should be performed either by 1) the field personnel, or, preferably, 2) by a project chemist or other personnel that constantly check field chain of custody forms versus laboratory receipt acknowledgment forms, discuss condition of samples as received by laboratory personnel, and communicate constantly with the laboratory project manager to prevent quality assurance issues from starting or becoming significant problems should they occur.

8.0 REFERENCES

United States Environmental Protection Agency, 1984, Soil Sampling Quality Assurance Users Guide, EPA/600/4-84/043.

United States Environmental Protection Agency, 1986, RCRA Ground-Water Monitoring Technical Enforcement Guidance Document, OSWER-9950.1.

United States Environmental Protection Agency, 1987, A Compendium of Superfund Field Operations Methods, EPA/600/P-87/001.

United States Environmental Protection Agency, 1992, RCRA Ground-Water Monitoring: Draft Technical Guidance, EPA/600/R-92/001.

9.0 ATTACHMENTS

None

SOP-011
Sample Preservation

Ordot Dump Post-Closure Facility
Standard Operating Procedure

Revision 2
Revision Date: September 20, 2021

SOP-011
SAMPLE PRESERVATION

TABLE OF CONTENTS

1.0 OBJECTIVES

The objective of this standard operating procedure (SOP) is to establish procedures that allow the chemical integrity of a sample is maintained from time of collection until chemical analysis.

2.0 APPLICABILITY

This SOP documents the procedures and chemicals to be used for the preservation of field samples. The environmental media addressed in this SOP include soil, sediment, solid waste, and aqueous samples. These procedures apply to all Project team personnel and subcontractors involved with the collection, shipping and chemical analysis of environmental samples.

3.0 RESPONSIBILITY

The Project Manager (PM), or designee, shall ensure that the sampling procedures used, including provisions for proper storage, preservation and shipping, are adequate to maintain sample integrity until custody is assumed by the laboratory. The PM shall develop or direct the preparation of a detailed sampling plan for sampling air, water, biota, sediment, soil, or waste, which shall describe the procedures used to preserve samples during the interval from sampling until receipt by the laboratory.

The Project Chemist (PC), or designee, shall ensure that the samples are collected in terms of the analytical methods and compliance with sampling protocols. For smaller projects, the PC and the Field Supervisor may be the same person. The field supervisor or PC also are responsible for maintaining adequate supplies of containers and preservatives. The PM will determine the roles and personnel for each project.

The Field Supervisor or his or her designate shall be responsible for ensuring the competence of field sampling personnel and their training. The field supervisor shall ensure that specified preservation and storage procedures are followed during sampling and during shipment to the laboratory.

The field sampling personnel will be responsible for the understanding and implementation of this SOP during all field activities. Field personnel are also responsible for checking the collected samples, and verifying that they are preserved with prescribed range.

4.0 REQUIRED MATERIALS

The materials required for this SOP include the following:

- Sample Containers
- Field notebook
- Sampling forms (e.g. Chain of Custody Records, sample labels).

5.0 DEFINITIONS

Maximum Holding Time. Maximum Holding Time is the maximum length of time that may elapse before sample preparation (extraction or digestion) or analysis is completed. It is calculated from the date and time of collection in the field. Holding times are usually measured to the nearest day with the exception of those analyses that must be completed within 24 or 48 hours.

Preservation. Preservation refers to temperature control and/or pH adjustment procedures performed to prevent or slow the loss of target analytes through precipitation, volatilization, decomposition, or biodegradation.

Temperature. Temperature is defined as the temperature within the refrigerator, cooler or ice chest that holds the samples. Samples shall be held at 6 degrees Celsius (°C) or less.

6.0 METHODS

Proper communication between the project manager and the analytical laboratory is essential prior to sampling, preferably in writing. This is necessary so that the proper type and number of containers and preservatives can be specified and so that all technical and regulatory requirements can be met regarding the analyses.

Field personnel should coordinate in writing with the laboratory at least two weeks before the sample container kits are to be shipped from the lab to identify the analytes to be requested. The information exchange between lab and field personnel include the project identification, sample kit shipment address, QA/QC regulatory requirements, required turnaround requirements, and the number and type of laboratory analyses.

Most chemical and biological reactions and many physical processes are slowed by lowering the temperature. Therefore, as a general rule, all samples need to be cooled at the time of collection and maintained slightly above freezing until preparation for final analysis. This restriction is not critical in the case of metals analysis since most metals exist in the form of involatile salts with the exception of liquid mercury and organometallic compounds such as tetraethyl lead, which still need to be kept cold. Hexavalent chromium is kept cold to slow its reduction to trivalent chromium.

Soil samples and other solid samples, including sediments, sludges, and solid waste, shall be preserved by cooling to 6° C. Soil and solid samples require no chemical preservatives. However, analysis must be performed within the method-specific holding time requirements.

Aqueous samples may be presumed to be homogenous and amenable to chemical preservation. The following general approaches for chemical preservation shall be employed depending on the analyte(s):

- Volatile acids (HCN, H_2S) are rendered involatile in the presence of strong base (NaOH, $pH>12$)
- Volatile bases (ammonia) are rendered involatile in the presence of strong acid (H_2SO_4, $pH<2$)
- Biodegradation of organic compounds is retarded under strongly acidic conditions (HCl or H_2SO_4, $pH<2$)

- Dehydrohalogenation (loss of HCl) of chlorinated solvents is counteracted in the presence of acid (HCl, pH<2)
- Oxidation of target analytes by the chlorine found in drinking water is eliminated by destroying the chlorine with a reducing agent such as sodium thiosulfate
- Many soluble metal salts tend to adhere to the walls of the container or they form precipitates with time. This can be prevented by the addition of nitric acid to a pH of < 2, which maintains the metals as soluble nitrate salts.

Groundwater samples for dissolved metals analysis are filtered (usually with a 0.45 micron filter) before preservation with the appropriate preservative. The filtrate is added directly to the plastic container, which has been supplied with the proper amount of preservative.

With the exception of the stainless-steel sleeves used to capture soil boring samples, all sample containers will be supplied in advance by the subcontracting laboratories.

The required chemical preservatives for aqueous samples will normally be added to the appropriate containers by the subcontracting laboratories before delivery to the field. There are two reasons why already-preserved containers are preferred. First, the laboratory scheduled to perform the analysis maintains control over sample integrity and container cleanliness and, second, field crews are generally not equipped to "appropriately handle" hazardous chemicals like hydrochloric acid. Laboratories will check the pH of incoming samples to ensure they have been properly preserved. If additional acid must be added to the samples by the lab, they shall notify the Project Chemist or Field Supervisor and the samples must sit for an additional 18 hours before analysis.

Sample preservatives should be identified on the chain of custody (COC).

Solid samples, whether in metal sleeves, wide-mouth glass jars, or other containers, will be labeled and secured appropriately, then placed immediately in an ice chest containing sufficient ice to maintain a temperature range of 6° C through delivery to the laboratory.

Sufficient ice chests and quantities of ice to manage all samples collected during the day (or shift) shall be maintained at the sampling site.

Samples are maintained in ice or, if available, in refrigerators, within a range of 6° C, from the time the sample control manager assumes custody until the samples are packed for shipment and relinquished to the shipper or other transport agent.

All samples are shipped in ice chests packed with sufficient ice to maintain a temperature range of 6° C for at least 24 hours.

One temperature blank shall be placed in the center of each cooler for the laboratory to check the temperature upon arrival at the lab. The temperature blank can be created in the field by pouring deionized water into an empty, unpreserved 40 milliliter VOA or other sample container and should be labeled as a temperature blank and added to the COC to record that it was placed into the cooler.

The receiving laboratory will measure the temperature within the ice chest immediately upon assuming custody of a shipment of samples. This temperature will be noted on the labs sample receipt form. Temperatures in excess of 6° C will be reported immediately to the project chemist. After consultation with the PM, the PC will communicate whether re-sampling is necessary.

Table 1 is a listing of the common analyses with associated containers, preservatives, and holding times. The analyses and associated other data shown in Table 1 give a general background regarding what is required. However, when particular analytical procedures are specified in planning documents, it is best to check directly with the cited method to make sure sample vessels and preservatives are correct.

7.0 REFERENCES

American Public Health Association, 1985. Standard Methods for the Examination of Water and Wastewater, 16th Edition.

40 CFR 136, Code of Federal Regulations, dated July 1, 1990.

United Stated Environmental Protection Agency (USEPA), 1991. Statement of Work for Organics Analysis, Document Number OLMO1.0, USEPA Contract Laboratory Program, June.

United States Environmental Protection Agency (USEPA), 1990a. Statement of Work for Inorganics Analysis, Document Number ILMO1.0, USEPA Contract Laboratory Program, March. November.

EPA (U.S. Environmental Protection Agency), 1990b. Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW-846, Third Edition, Final Update I, USEPA Office of Solid Waste,

United States Environmental Protection Agency (USEPA), 1982. Methods for Chemical Analysis of Water and Wastes, EPA-600/4-82-055, December

8.0 ATTACHMENTS

Table 1. Sample Containers, Preservation Methods, and Analytical Holding Times

Table 1
Sample Containers, Preservation Methods, and Analytical Holding Times (1 of 2)

Parameter	Matrix	Container	Lid	Preservation	Maximum Holding Times	
					Extraction[b]	Analysis[c]
Metals	Water[a]	500 ml polyethylene	Cap with Teflon® seal	HNO3 to pH<2 (Hg: Ice to [6°C)	-	6 months (Hg: 28 days)
	Soil/Sediment	4 oz. glass jar	Teflon®-lined lids	none (Hg: Ice to [6°C)	-	6 months (Hg: 28 days)
	Soil/Sediment	Stainless steel sleeve	Teflon®-lined plastic end-caps	none (Hg: Ice to [6°C)	-	6 months (Hg: 28 days)
Radionuclides	Water	500 ml polyethylene	Cap with Teflon® seal	HNO3 to pH<2	-	6 months
	Soil/Sediment	4 oz. glass jar	Teflon®-lined lids	none	-	6 months
	Soil/Sediment	Stainless steel sleeve	Teflon®-lined plastic end-caps	none	-	6 months
Volatiles	Water	40 ml glass vials X 3	Cap with Teflon® septum	HCl to pH<2; Ice to [6°C	-	14 days
	Soil/Sediment	EnCore sampler X 3	o-ring cap	Ice to [6°C; 48 hours to preserve with methanol or sodium bisulfate	-	14 days
	Soil/Sediment	Stainless steel sleeve	Teflon®-lined plastic end-caps	Ice to [6°C	-	14 days
Purgeable Hydrocarbons	Water	1 liter glass amber jar	Cap with Teflon® septum	HCl to pH<2; Ice to [6°C	-	14 days
	Soil/Sediment	EnCore sampler X 3	o-ring cap	Ice to [6°C	-	14 days
	Soil/Sediment	Stainless steel sleeve	Teflon®-lined plastic end-caps	Ice to [6°C	-	14 days
Extractable Hydrocarbons	Water	1 liter glass amber jar X 2	Teflon®-lined caps	Ice to [6°C	7 days	40 days
	Soil/Sediment	4 oz. glass jar	Teflon®-lined lids	Ice to [6°C	14 days	40 days
	Soil/Sediment	Stainless steel sleeve	Teflon®-lined plastic end-caps	Ice to [6°C	14 days	40 days
Total Recoverable Petroleum Hydrocarbons	Water	1 liter glass amber jar X 2	Teflon®-lined caps	H2SO4 to pH<2; Ice to [6°C	-	28 days
	Soil/Sediment	4 oz. glass jar	Teflon®-lined lids	Ice to [6°C	-	28 days
	Soil/Sediment	Stainless steel sleeve	Teflon®-lined plastic end-caps	Ice to [6°C		28 days
	Soil/Sediment (volatiles)	Encore sampler	o-ring cap	Ice to [6°C; methanol within 48 hr	-	14 days
Phenols	Water	1 liter glass amber jar X2	Teflon®-lined caps	Ice to [6°C	7 days	40 days
	Soil/Sediment	4 oz. glass jar	Teflon®-lined lids	Ice to [6°C	14 days	40 days
	Soil/Sediment	Stainless steel sleeve	Teflon®-lined plastic end-caps	Ice to [6°C	14 days	40 days
Organochloride Pesticides and PCBs	Water	1 liter glass amber jar X2	Teflon®-lined caps	Ice to [6°C	7 days	40 days
	Soil/Sediment	4 oz. glass jar	Teflon®-lined lids	Ice to [6°C	14 days	40 days
	Soil/Sediment	Stainless steel sleeve	Teflon®-lined plastic end-caps	Ice to [6°C	14 days	40 days
Chlorinated Herbicides	Water	1 liter glass amber jar X2	Teflon®-lined caps	Ice to [6°C	7 days	40 days
	Soil/Sediment	4 oz. glass jar	Teflon®-lined lids	Ice to [6°C	14 days	40 days
	Soil/Sediment	Stainless steel sleeve	Teflon®-lined plastic end-caps	Ice to [6°C	14 days	40 days
Semivolatiles	Water	1 liter glass amber jar X2	Teflon®-lined caps	Ice to [6°C	7 days	40 days
	Soil/Sediment	4 oz. glass jar	Teflon®-lined lids	Ice to [6°C	14 days	40 days
	Soil/Sediment	Stainless steel sleeve	Teflon®-lined plastic end-caps	Ice to [6°C	14 days	40 days

Table 1
Sample Containers, Preservation Methods, and Analytical Holding Times (Page 2 of 2)

					Maximum Holding Times	
Parameter	Matrix	Container	Lid	Preservation	Extraction[b]	Analysis[c]
Dioxins and Furans	Water	1 liter glass amber jar X2	Teflon®-lined caps	Ice to [6°C	28 days	40 days[a]
	Soil/Sediment	4 oz. glass jar	Teflon®-lined lids	Ice to [6°C	28 days	40 days
	Soil/Sediment	Stainless steel sleeve	Teflon®-lined plastic end-caps	Ice to [6°C	28 days	40 days
Polynuclear Aromatic Hydrocarbons	Water	1 liter glass amber jar X2	Teflon®-lined caps	Ice to [6°C	7 days	40 days
	Soil/Sediment	4 oz. glass jar	Teflon®-lined lids	Ice to [6°C	14 days	40 days
	Soil/Sediment	Stainless steel sleeve	Teflon®-lined plastic end-caps	Ice to [6°C	14 days	40 days
Nitroaromatics and Nitroamines	Water	1 liter glass amber jar X2	Teflon®-lined caps	Ice to [6°C	7 days	40 days
	Soil/Sediment	4 oz. glass jar	Teflon®-lined lids	Ice to [6°C	14 days	40 days
	Soil/Sediment	Stainless steel sleeve	Teflon®-lined plastic end-caps	Ice to [6°C	14 days	40 days
Nitroglycerine	Water	1 liter glass amber jar X2	Teflon®-lined caps	Ice to [6°C	7 days	40 days
	Soil/Sediment	4 oz. glass jar	Teflon®-lined lids	Ice to [6°C	14 days	40 days
	Soil/Sediment	Stainless steel sleeve	Teflon®-lined plastic end-caps	Ice to [6°C	14 days	40 days
Anions (Cl, nitrate, nitrite, & sulfate)	Water	250 ml polyethylene	Teflon®-lined caps	Ice to [6°C (Cl: none)	-	28 days (NO3 and NO2:48 hrs)
	Soil/Sediment	4 oz. glass jar	Teflon®-lined lids	Ice to [6°C (Cl: none)	d	28 days (NO3 and NO2:48 hrs)
	Soil/Sediment	Stainless steel sleeve	Teflon®-lined plastic end-caps	Ice to [6°C (Cl: none)	d	28 days (NO3 and NO2:48 hrs)
Ignitability	Water	250 ml polyethylene	Teflon®-lined caps	none	none	none
	Soil/Sediment	4 oz. glass jar	Teflon®-lined lids	none	none	none
	Soil/Sediment	Stainless steel sleeve	Teflon®-lined plastic end-caps	none	none	none
Total Cyanide	Water	1 liter polyethylene	Teflon®-lined caps	NaOH to pH>12; Ice to [6°C	d	14 days
	Soil/Sediment	4 oz. glass jar	Teflon®-lined lids	Ice to [6°C	d	14 days
	Soil/Sediment	Stainless steel sleeve	Teflon®-lined plastic end-caps	Ice to [6°C	d	14 days
Hexavalent Chromium	Water	1 liter glass amber jar X2	Teflon®-lined caps	Ice to [6°C	d	24 hours
	Soil/Sediment	4 oz. glass jar	Teflon®-lined lids	Ice to [6°C	30 days	4 days
	Soil/Sediment	Stainless steel sleeve	Teflon®-lined plastic end-caps	Ice to [6°C	30 days	4 days
pH	Water	250 ml polyethylene	Teflon®-lined caps	none	-	immediate
	Soil/Sediment	4 oz. glass jar	Teflon®-lined lids	none	d	immediate
	Soil/Sediment	Stainless steel sleeve	Teflon®-lined plastic end-caps	none	d	immediate
Field Soil gas	Air or Soil gas	Tedlar bag	None	none	-	3 days
	Air or Soil gas	Summa Canister	None	none	-	14 days

Abbreviations:
ml = milliliter
oz = ounce

a = Water samples include groundwater, surface water, and leachate samples
b = Starting from the date of collection
c = Starting from the date of extraction; if no extraction is involved, starting from the date of collection
d = Extraction may occur any time prior to analysis. Only the analysis holding time is monitored.

SOP-012
Field Notes and Documentation

Ordot Dump Post-Closure Facility
Standard Operating Procedure

Revision 2
Revision Date: September 20, 2021

SOP-012
FIELD NOTES AND DOCUMENTATION

TABLE OF CONTENTS

1.0 OBJECTIVES

The objective of this standard operating procedure (SOP) is to establish a consistent method and format for the use and control of documentation generated during daily field activities. Field notes and records are intended to provide sufficient information that can be used to recreate the field activities, as well as, the collection of environmental data. Information placed in these documents and/or records shall be factual, detailed and objective.

2.0 SCOPE AND APPLICABILITY

This procedure will be used during all field activities, regardless of the purpose, by all project team personnel and subcontractors who conduct field investigations. These activities may include, but are not limited to, all types of media sampling (soil vapor, soil, sediment, groundwater, surface water, leachate, etc), utility clearance, well installation, sample point locating and surveys, site reconnaissance, free product removal, remediation, and waste handling.

3.0 RESPONSIBILITY

The Project Manager (PM), or designee, will have the responsibility to oversee and ensure that field documentation is collected in accordance with this SOP and any site-specific or project specific planning documents.

The field sampling personnel will be responsible for the understanding and implementation of this SOP during all field activities, as well as, obtaining the appropriate field logbooks, forms and records necessary to complete the field activities. Field personnel shall ensure all field activities are documented completely at the end of each field day. Field personnel are responsible for tracking the location of all field documentation, including field logbooks. Field personnel are responsible for assuring that the original documentation (or copies of the field log book, if needed for another project at the same site), are filed at the end of the field project or during a long project (greater than month) every couple of weeks.

4.0 REQUIRED MATERIALS

The materials required for this SOP include the following:

- Bound field logbooks
- Black waterproof and/or indelible ink pens
- Field Forms

5.0 METHODS

This SOP primarily includes the documentation procedures for the field logbooks. However, procedures discussed in this SOP are applicable to all other types of field documentation collected, and should be universal in application. Details of other field records and forms (e.g. boring logs, sample labels, chain of custody records, and waste containment labels are discussed in the specific SOP associated with that particular field activity (e.g. borehole drilling, sample handling, investigative derived waste), and not covered in detail in this SOP.

5.1 Field Logbooks

Field personnel will keep accurate written records of their daily activities in a bound logbook that will be sufficient to recreate the project field activities without reliance on memory. This information will be recorded in chronological order. All entries will be legible, written in black waterproof or indelible ink, and contain accurate and inclusive documentation of field activities, including field data observations, deviations from project plans, problems encountered, and actions taken to solve the problem. Each page of the field logbook will be consecutively numbered, signed and dated by the field author(s). Pages should not be removed for any reason.

There should be no blank lines on a page. A single blank line or a partial blank line (such as at the end of a paragraph) should be lined to the end of the page. If only part of a page is used, the remainder of the page should have an "X" drawn across it.

In addition to documenting field activities, field logbooks may include, but are not limited to, the following:

Initial-Start of Event:

- Site location
- Purpose of site visit
- Sampling methodology and information
- Level of health and safety protection
- Wastes generated, containment units and storage location (if not recorded on another form)
- Date and time of activities
- Site and weather conditions
- Personnel present, including sampling crew, facility/site personnel and representatives (including site arrival and departure times)
- Subcontractors present
- Regulatory agencies and their representatives (including phone numbers, site arrival and departure times)
- Sample Locations (sketches are very helpful)
- Source of sample(s), sample identifications, sample container types and preservatives used, and lot numbers for bottles and preservatives (if applicable and if not recorded on other forms or in a sample control logbook)
- A chronological description of the field observations and events
- Specific considerations associated with sample acquisition (e.g., field parameter measurements, field screening data, HASP monitoring data, etc.) (if not recorded on another form)

- Field quality assurance/quality control samples collection, preparation, and origin (if not recorded on other forms or in a sample control logbook)
- The manufacturer, model and serial number of field instruments (e.g., OVM, water quality, etc.) shall be recorded, if not using a calibration form. Also, source lot # and expiration date of standard shall be recorded if calibrated in the field.
- Well construction materials, water source(s), and other materials used on-site (if not recorded on another form).
- Sample conditions that could potentially affect the sample results
- If deviating from plan, clearly state the reason(s) for deviation
- Persons contacted and topics discussed
- Documentation of exclusion zone set-up and location, as needed
- Documentation of decontamination procedures
- Daily Summary.

Field situations vary widely. No general rules can specify the extent of information that must be entered in a logbook. However, records should contain sufficient information so that someone can reconstruct the field activity without relying on the collector's memory. Language used shall be objective, factual, and free of personal opinions. Hypothesis for observed phenomena may be recorded, however, they must be clearly indicated as such and only relate to the subject observation.

Logbooks will be assigned to a specific sampling team. If it is necessary to transfer the log book to alternative team member during the course of field work, the person relinquishing the log book will sign and date the log book at the time of transfer.

Field logbooks should consist of a bound book, in which the insertion or removal of pages will be visibly noticeable after the logbook has been assembled. Logbooks can be prepared by gluing or laminating pages together either at the left side or top of the page. If inclement weather is expected, logbooks may have plastic laminated front and back covers to protect the interior pages, and should not be broken apart for coping. Loose-leaf binding, such as comb binding is not considered hard binding. To maintain the integrity of the logbook, pages should be consecutively numbered prior to use. Logbook pages can be of any format, and may include blank pages for recording or field forms that are used for specific tasks. As an alternative, commercially bound and consecutive page numbered field logbooks may also be used.

5.2 Photographs

Photographs provide the most accurate demonstration of the field worker’s observations. They can be significant to the field team during future inspections, informal meetings, and hearings. Photographs should be taken with a camera-lens system having a perspective similar to that afforded by the naked eye. Telephoto or wide-angle shots cannot be used in enforcement proceedings. Some industrial clients do not permit photographs on their sites. In industrial settings, confirm with the Project Manager that photographs are allowed.

A photograph must be documented if it is to be a valid representation of an existing situation. Therefore, for each photograph taken, several items shall be recorded in the field logbooks:

- Date and time photograph taken
- Name of photographer
- Site name, location, and field task
- Brief description of the subject and the direction taken
- Sequential number of the photograph.

5.3 Additional Field Forms/Records

Additional field records may be required for each specific field event. The use of these records and examples are described in other SOPs specific for the activity (e.g. Borehole Logging SOP, Groundwater Sampling and Purging SOP, etc.). These other records may include:

- Borehole Logs during drilling
- Well Construction and Development records
- Groundwater Purge and Sample Collection Records
- Water Level Monitoring
- Investigation Derived Waste (IDW) Tracking Records
- Instrument Calibration Records
- Health and Safety Monitoring Records and sign-off sheets.

Prior to field activities, the field sampling personnel will coordinate with the Project Manager, or designee, to determine which additional records will be required for the specific field task. These additional records will be maintained in a field file or a three-ring notebook throughout the duration of the field activities, or included in a specially prepared site-specific notebook. If the field notebook is being created, the forms may be part of the laminated book.

6.0 CORRECTIONS

If an error is made in the field, logbook corrections will be made by drawing a single line through the error, entering the correct information, and initialing and dating the change. Materials that obliterate the original information, such as correction fluids and/or mark-out tapes, are prohibited. All corrections will be initialed and dated. Some projects require that a brief reason for the change must also be added where the correction was made. Ask the Project Manager if this requirement is necessary.

7.0 DOCUMENTATION REVIEWS

Periodically, the Project Manager, or designee, will review the field logbooks pertaining to the activities under their supervision. The elements of this review will include technical content, consistency, and compliance with the project plans and SOPs. Discrepancies and errors identified during the review should be resolved between reviewer and author of the field documentation. Corrections and/or additions of information shall be initialed and dated by the field author or reviewer.

8.0 FIELD RECORD BACKUP

Periodically, the Project Manager, or designee, will determine if and when field logbooks and records need to be photocopied. Photocopies will be maintained in the project files, and can be used as backup in the event that the original field logbook or records are lost or damaged.

9.0 DOCUMENTATION ARCHIVE

At the completion of the project, all original field logbooks and records will be stored in the project files in accordance with project procedures. Project files lifetimes may be controlled and spelled out in contractual agreements with clients. Typically, project files are archived after project finalization and kept indefinitely in archive.

10.0 REFERENCES

None

11.0 ATTACHMENTS

None

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SOP-013
Groundwater Monitoring Instrument Calibration

Ordot Dump Post-Closure Facility
Standard Operating Procedure

Revision 2
Revision Date: September 20, 2021

SOP-013
GROUNDWATER MONITORING INSTRUMENT CALIBRATION

TABLE OF CONTENTS

1.0 OBJECTIVES

The objective of this Standard Operating Procedure (SOP) is to provide general procedures for the calibration of field instruments used during groundwater field investigations. These instruments are used for field screening and field measurements.

2.0 APPLICABILITY

This general procedure will be used during all field activities when field instruments are used for the collection of field data. The general use and calibration of these instruments are discussed in this SOP and always should be supplemented (or superseded, if necessary) with the manufacturer's calibration and maintenance instructions.

3.0 RESPONSIBILITIES

The *Project Manager*, or designee, will have the responsibility to oversee and ensure that field instruments are calibrated and that written documentation of calibration is maintained.

The *field sampling personnel* will be responsible for understanding and implementing this SOP during all field activities, as well as, obtaining the appropriate field logbooks, field records, instruments, materials and calibration standards necessary to complete the field task.

4.0 DEFINITIONS

Calibration: Procedure used to demonstrate that instrument is reading correctly.

5.0 REQUIRED MATERIALS

The materials required for this SOP include the following:

- Bound field log books
- Black or blue water proof and/or indelible ink pens
- Instrument Calibration Form(s)
- Standard solutions, and materials and secondary collection containers
- Replacement batteries and parts (if applicable)
- Steel Surveyor's Tape.

Instruments used during field activities may include, but are not limited to, the following:

- Water Quality Instruments (e.g., pH, temperature, conductivity, dissolved oxygen, turbidity, oxidation reduction potential)
- Water level indicators

6.0 METHODS

This SOP includes the general methods for field instrument calibration, calibration documentation and corrective action procedures that will be implemented during field activities. Detailed instrument calibration procedures should be provided by the manufacturer and will be different for each field instrument used. Field personnel should be familiar with the calibration procedures prior to using the equipment in a field setting.

Prior to field activities, a determination will be made as to which instruments will be needed for the field activities. Some instruments may be available from an office equipment pool or from an equipment rental/supply company. Field personnel should locate, order and coordinate delivery of the necessary instruments, standard solutions, and other necessary equipment and materials at least three days before the beginning of the field activities. Consideration should be made for specialty instruments and materials that may take longer to obtain.

Prior to field mobilization, instruments that will be used during the field activities will be checked for possible malfunctions, cleaned and calibrated. Some equipment provided by a rental company is shipped pre-calibrated and a completed calibration sheet is sent with the equipment. These activities will be conducted in accordance with manufacturer's procedures, where applicable. In the event that manufacturer procedures are not available, standard acceptable calibration procedures will be used.

Calibration verification will be performed on field instruments prior to their initial use, at least once daily, or whenever indications of instrument malfunction or questions in readings are observed. Some instruments, such as field water quality meters, may require more frequent calibration verification depending upon project quality objectives. In general, instrument identification and calibration will include the following steps:

1. Determine which instruments are needed for the specific field tasks
2. Obtain the necessary instruments and standard solutions for calibration
3. Check expiration dates on standard solutions, replace if out of date
4. Assemble the instrument and turn it on, allowing the instrument to warm up
5. Check battery charge, charge or replace if necessary
6. Clean the instrument (if necessary)
7. Calibrate the instrument prior to field use in accordance with manufacturer's procedures, and if necessary adjust the instrument to meet calibration specifications (this step is sometimes referred to as the initial calibration)
8. If the instrument malfunctions and can not be corrected, obtain another instrument and have the other repaired
9. Clean and decontaminate the instrument after use, and before storage
10. Conduct final calibration verification at the end of each day, or at completion of field measurement collection for the day
11. Document all calibration activities and results
12. Recharge batteries at the end of each day or as needed. This should be carried out in a non-hazardous area.

Some manufacturers recommend field calibration procedures that are inadequate for verifying instrument linearity and calibration range. Some commercially available water quality meters sometimes have a stock calibration mixture that is used during an "easy to conduct" calibration which consists of pressing a "calibrate" button on the instrument while the probes are in stock solution. The problem with this calibration method is that it only provides a one point calibration. This is inadequate for the field measurements collected during water quality monitoring because of the wide range of conditions that may be encountered. Instrument calibration and accuracy should be checked by using at least two different, commercially-available standard solutions over a range of values (e.g., pH buffers at 4, 7 and 10) to check that the meter is providing accurate readings over a range of conditions. These solutions should be separate from any solution provided by the manufacturer.

6.1 Accuracy Requirements

In order for an instrument to be considered calibrated and ready for use, the instrument must read within at least 10% of the calibration standard. If the instrument reads >10% difference from the standard it should be recalibrated or taken out of service. Consult the manufacturer's instruction manual for more specific details on the instrument in use.

Personnel responsible for the use of these instruments will read the manufacturer's instruction manual and will be trained for the use, calibration, and maintenance of the instrument prior to instrument use. The calibration, maintenance and use of these instruments will be conducted in accordance with the manufacturer's specifications and procedures. If instrument calibration cannot be met or if the instrument is malfunctioning, obtain another instrument and repair the malfunctioning instrument immediately.

6.2 Records

A record will be maintained of the calibrations and calibration verification. The records will include the following information, where applicable:

- Date and time of activities
- Project name and number
- Personnel conducting the calibration
- Serial and/or meter numbers
- Instrument name and model number
- Standard solutions used, including concentration lot numbers and expiration dates.
- Instrument readings after calibration
- Instrument readings of calibration standards at the end of the day or working period.

Calibration activities will be recorded in the field logbooks or on the Calibration Form. An example of this calibration record is included as an attachment. This record can be modified as necessary to accommodate specific instruments. Record of equipment repair and maintenance shall be recorded in the Instrument Calibration Field Book.

6.3 Equipment Specific Procedure Water Level Indicator

A calibration/comparison of water level indicator should be done annually. A visual examination of the indicator cable should be done with each use.

Equipment necessary:

- Steel surveyors graduated tape
- Water level indicator
- Clean tarp or sheeting
- Electrical tape or zip ties.

Calibration Procedure:

1. Clean indicator and replace batteries if necessary.
2. Lay down tarp or sheeting.
3. Unwind water level indicator on tarp. Unwind steel tape next to indicator, line-up the one foot mark on the indicator cable with the one foot mark on the surveyor's tape and bind together using electrical tape or zip ties. Continue unwinding and comparing the indicator cable and the surveyor's tape.
4. Make note of any discrepancies or differences in field book.
5. If discrepancy is > one foot at any point, the water level indicator shall be taken out of service and discarded.

6.4 Equipment Specific Procedure Micro TPW Turbidity Meter

Equipment necessary:

- Micro TPW Turbidity Meter
- 0.02, 10 and 1,000 NTU Manufacture's standard calibration solutions
- Daily Instrument Calibration form.

Calibration Procedure:

1. Examine and clean (if necessary) cuvette to make sure that cuvette is free of smudges, scratches etc.
2. Record the expiration dates of each of the three standard solutions to be used on Daily Calibration Form.
3. Index the three standard solutions by holding down the (↵) button and slowly rotating the calibration standard one complete revolution (360°) pausing between increments to allow the display to update.
4. While rotating the standard, observe the turbidity reading and locate the cuvette position with the lowest turbidity reading.

5. With the calibration standard positioned at the location having the lowest turbidity reading, install the Indexing Ring over the black light shield on the standard so that the pointer of the Ring aligns with the reference arrow on the instrument.
6. Select the calibration function of the instrument by pressing the "CAL" button once. The "CAL" icon will be illuminated on the display with "1000" flashing indicating the standard required for this step of the calibration.
7. Insert the 1000 NTU standard into the sample well and press down until the cuvette snaps fully into the instrument. Align the indexing ring with the arrow on the instrument.
8. Press and hold down the (↵) button while making fine adjustments to the indexing. Release the button to initiate the calibration.
9. When the instrument has completed the calibration on the 1000 standard, it will briefly display 1000 to indicate that it was calibrated and then prompts for the 10 NTU standard
10. Repeat steps for 10 and 0.02 NTU standards.
11. When instrument has completed all calibration standards, the instrument returns to the read mode and is ready to be read.
12. After calibration, read the standard solutions and record readings on daily Calibration Form.

6.5 Equipment Specific Procedure- YSI 556 MPS

Equipment necessary:

- YSI 556 MPS Water Quality Instrument
- 4.0, 7.0, 10.0 pH Buffer Solutions-pH
- 447, 1413, 8974, 15,000 Conductivity Solutions-SC
- 220 millivolt Standard Solution-ORP
- Zero Oxygen Solution-DO
- Rinse water
- Daily Instrument Calibration form
- Batteries
- Conditioning solution containers
- Waste Solution Collection container

General Calibration Procedure:

1. Plug data cable into port located on the bottom of YSI, turn on instrument by pressing ON button, allow instrument to warm up for approximately 5 minutes. Observe battery status and change batteries if necessary.

2. Fill out daily calibration form. Record date and time of calibration and expiration dates of the standard solutions used in calibration. Record the Unit ID, Serial Number, assigned user and person conducting the calibration.
3. Use the transport/calibration cup that comes with the probe module as a calibration chamber for all calibrations. Ensure that an o-ring is installed in the o-ring groove of the transport/calibration cup bottom cap, and that the bottom cap is securely tightened. Do not over-tighten as this could cause damage to the threaded portions.
4. For maximum accuracy, use a small amount of previously used calibration solution to pre-rinse the probe module. Old calibration standards are saved during the course of the event for the purpose of conditioning the probe before calibration. Insert YSI probe module into calibration cup and swish. Do not rinse the cup between the conditioning step and the calibration step. The conditioning solution should **never** be used as calibration solution.
5. Pour new calibration solution into calibration cup and ensure that there is enough solution to cover the probe that you are calibrating. Many of the calibrations factor in readings from other sensors (ie: temperature sensor). The top vent hole of the conductivity sensor must also be immersed during some of the calibrations. Insert YSI probe module into the calibration cup with the calibration solution, tighten the cup and follow calibration steps below for each parameter.
6. Rinse calibration solution cup, and probe module, at least three times with ambient temperature rinse water between each solution.
7. Have several clean, absorbent paper towels or cotton cloths available to dry the probe module between rinses and calibration solutions.
8. When calibration is finished, discard the last solution into glassware (to be saved as conditioner for next calibration or drift check) and add a small amount of water or pH 4 solution to calibration cup. Place probe module into calibration cup. Damage may occur if the probes are allowed to dry. Do not use distilled water.
9. The key to successful calibration is to ensure that the sensors are completely submersed when calibration values are entered. Use recommended volumes when performing calibrations.

pH Probe

PH is calibrated using three point calibration standard solutions, usually 4.0, 7.0 and 10.00. In very low pH situations, 2.0, 4.0 and 7.0 solutions can be used.

1. Press the On/off key to display the run screen.
2. Press the Escape key to display the main menu screen.
3. Use the arrow keys to highlight the Calibrate selection.
4. Press the Enter key (↵). The Calibrate screen is displayed.
5. Use the arrow keys to highlight the pH selection and press Enter.
6. Select “3 point”. Press Enter

7. For maximum accuracy, use a small amount of previously used calibration solution to pre-rinse the probe module.
8. Place the correct amount of pH buffer into a clean dry or pre-rinsed calibration cup. For pH, the approximate volume used is 30 ml.
9. Carefully immerse the sensor end of the probe module into the solution and gently rotate and/or move the probe module up and down to remove any bubbles from the pH sensor. The sensor must be completely submerged.
10. Screw the calibration cup on the threaded end of the probe module and securely tighten.
11. Use the keypad to enter the calibration value of pH 7.0 solution **at the current temperature** and press Enter. See table below for calculated pH values verses temperature.
12. Allow at least one minute for temperature equilibration before proceeding.
13. Observe the reading under pH, when the reading shows no significant change for approximately 30 seconds, press Enter. The screen will indicate that the calibration has been accepted and prompt you to press Enter again to continue.
14. Press Enter. This returns you to the specified pH Calibration Screen.
15. Rinse the probe module, calibration cup and sensors in tap or purified water and dry.
16. Repeat steps above for pH 4.0 and 10.0.
17. After the YSI has been calibrated for all three points of pH, press the Escape key until the main menu screen is displayed. Select Run.
18. Add 30 ml of pH 7.0 solution and observe the reading under pH when the reading shows no significant change for approximately 30 seconds. Record the reading on the field form.
19. Repeat this step for pH 4.0 and 10.0.

Calculated pH					
Temperature	pH	Temperature	pH	Temperature	pH
ºC	4.00	ºC	7.00	ºC	10.00
0	4.01	0	7.12	0	10.20
10	4.00	10	7.06	5	10.06
20	4.00	20	7.02	10	10.12
25	4.00	25	7.00	15	10.08
30	4.01	30	6.99	20	10.04
35	4.01	35	6.98	25	10.00
40	4.03	40	6.97	30	9.96
60	4.09	60	6.98	35	9.92
80	4.16	80	7.04	40	9.88
90	4.22	90	7.09	50	9.80

Specific Conductivity Probe

Specific Conductivity is calibrated to a single calibration solution. A standard solution below the calibrated solution and a standard solution above the calibrated solution are read and recorded on the daily calibration form. For instance, calibrate to a 1413 solution and read/record a 447 solution and an 8974 solution.

1. Press the Escape key to display the main menu screen.
2. Use the arrow keys to highlight the Calibrate screen.
3. Press the Enter key. The Calibrate screen is displayed.
4. Use the arrow keys to highlight the Conductivity selection. Press Enter. The Conductivity Calibration Selection Screen is displayed.
5. Use the arrow keys to highlight the Specific Conductance selection. Press Enter. The Conductivity Calibration Entry Screen is displayed.
6. For maximum accuracy, use a small amount of previously used calibration solution to pre-rinse the probe module.
7. Place the correct amount of conductivity standard into a clean, dry or pre-rinsed calibration cup. For conductivity, the approximate volume is 55 ml. The sensor must be completely immersed past its vent hole.
8. Before proceeding, make certain that there are no salt deposits around the oxygen and pH/ORP sensors, particularly if you are employing standards of low conductivity.
9. Carefully immerse the sensor end of the probe module into the solution and gently rotate and/or move the probe module up and down to remove any bubbles from the conductivity cell.
10. Screw the calibration cup on the threaded end of the probe module and securely tighten.
11. Use the keypad to enter the calibration value of the standard you are using. Be sure to enter the value in mS/cm at 25ºC (1413 would be entered as 1.413).
12. Press Enter. The Conductivity Calibration Screen is displayed.
13. Allow at least one minute for temperature equilibration before proceeding.
14. When the reading shows no significant change for approximately 30 seconds, press Enter. The screen will indicate that the calibration has been accepted and prompt you to press Enter again to continue.
15. After the YSI has been calibrated for conductivity, press the Escape key until the main menu screen is displayed. Select Run.
16. Add 55 ml of the standard solution that was used to calibrate and observe the reading under specific conductivity when the reading shows no significant change for approximately 30 seconds. Record the reading on the field form.
17. Repeat this step with a standard solution higher than the point that was calibrated and with a standard solution lower than the point that was calibrated. Record the readings on the field form.

ORP Probe

ORP is temperature sensitive so the temperature reading will also be recorded on the Daily Calibration form. The ORP solution standard has a chart on the side of the bottle relating ORP values to Temperature. It is the corresponding Temperature-ORP value that should be entered.

1. Press the Escape key to display the main menu screen.
2. Use the arrow keys to highlight the Calibrate screen.
3. Press the Enter key. The Calibrate screen is displayed.
4. Use the arrow keys to highlight the ORP selection. Press Enter. The ORP calibration screen is displayed.
5. Place approximately 30 ml of ORP solution into a clean, dry or pre-rinsed calibration cup.
6. Carefully immerse the sensor end of the probe module into the solution and gently rotate and/or move the probe module up and down to remove any bubbles from the ORP sensor. The sensor must be completely immersed.
7. Screw the calibration cup on the threaded end of the probe module and securely tighten.
8. Use the keypad to enter the correct value of the calibration solution you are using at the current temperature. See table below for ORP values verses temperature (i.e. - 220 mV ORP standard @ 22° C = 223mV).
9. Press Enter. The ORP calibration screen is displayed.
10. Allow at least one minute for temperature equilibration before proceeding. Verify that the temperature reading matches the value that was used in the table.
11. Observe the reading under ORP, when the reading shows no significant change for approximately 30 seconds, press Enter. The screen will indicate that the calibration has been accepted and prompt you to press Enter again to continue.
12. Press Enter. This returns you to the calibrate screen.
13. After the YSI has been calibrated for ORP, press the Escape key until the main menu screen is displayed. Select Run.
14. Add 30 ml of ORP solution and observe the reading under ORP when the reading shows no significant change for approximately 30 seconds. Record the reading on the field form.

ORP verses Temperature	
Temperature °C	**ORP**
-5	270.0
0	263.5
5	257.0
10	250.5
15	244.0

20	237.5
25	231.0
30	224.5
35	218.0
40	211.5
45	205.0
50	198.5

Dissolved Oxygen (DO) Probe

DO is calibrated to Open Air and then a Zero Oxygen Solution is read. DO is pressure sensitive so the barometric pressure (found in the lower right side of instrument) reading will also be recorded on the Daily Calibration form. The instrument must be on for at least 20 minutes to polarize the DO sensor before calibrating so this parameter is calibrated last.

1. Press the Escape key to display the main menu screen.
2. Use the arrow keys to highlight the Calibrate screen.
3. Press the Enter key. The Calibrate screen is displayed.
4. Use the arrow keys to highlight the Dissolved Oxygen selection. Press Enter. The dissolved oxygen calibration screen is displayed.
5. The current barometric pressure in mmHg will be visible on “Enter baro mmHg line”. Press Enter to accept this value.
6. Use the arrow keys to highlight the DO% selection. Press Enter. The DO Barometric Pressure Entry Screen is displayed.
7. Place approximately 3 mm (1/8 inch) of water in the bottom of the calibration cup.
8. Place the probe module in the calibration cup. Make sure that the DO and temperature sensors are NOT immersed in the water.
9. Engage only 1 or two threads of the calibration cup to ensure that the DO sensor is vented to the atmosphere. Do not completely tighten the cup as the DO probe should be in a moisture saturated environment and still be allowed to equalize to atmospheric pressure.
10. Press Enter. The DO% saturation calibration screen is displayed.
11. Allow approximately ten minutes for the air in the calibration cup to become water saturated and for the temperature to equilibrate before proceeding.
12. Observe the reading under DO%. When the reading shows no significant change for approximately 30 seconds, press Enter. The screen will indicate that the calibration has been accepted and prompt you to press Enter again to continue.
13. Place a small amount of Zero Oxygen Solution in calibration cup. Place the probe module into the calibration cup. Securely tighten and turn upside down so that the DO probe is submerged.
14. Observe the reading under DO when the reading shows no significant change for approximately 30 seconds, press Enter. The screen will indicate that the calibration

has been accepted and prompt you to press Enter again to continue. Record the reading on the field form. Take care to keep the cap on the DO Zero Oxygen Solution to minimize contact with air. Discard opened Zero Oxygen solution > 2 weeks.

7.0 CORRECTIVE ACTION PROCEDURES

If an instrument can not be successfully calibrated or if it is malfunctioning, the instrument will be repaired immediately. In the event that this occurs during the course of the field activities, it will be the field personnel's responsibility to ensure that a replacement instrument is obtained as quickly as possible and that the Project Manager, or designee, is immediately notified. Under no circumstances should field personnel continue with activities until a replacement is obtained or approval from the PM or their designee is obtained. Instances of instrument failure and corrective actions taken will be documented in the field logbook.

Field instruments can be affected by changes in temperature, humidity, and barometric pressure. Instrument calibration should be checked when significant changes in weather occur. In addition, instrument calibration should be checked if maintenance activities (e.g. battery replacement or probe replacement) are required, if instrument malfunctions occur, or when questionable readings are observed. Calibration verification and recalibration activities shall be conducted and documented.

Verification readings (drift check) shall be completed at the end of each day or work period. When parameters ORP, DO, Turbidity and Specific Conductivity read ± 10 % different from the calibration standard, or when pH reads $\Delta > 0.20$, they will be flagged on field data forms "R" flagged as rejected and the data shall not be used in data reports.

8.0 CORRECTIONS AND REVIEWS

Corrections and reviews of calibration records will be completed in accordance with the SOP (SOP-012) for Field Notes and Documentation. Errors will be corrected by drawing a single line through the error, entering the correct information, initialing and dating the change. Materials that obliterate the original information, such as correction fluids and/or mark-out tapes, are prohibited. All corrections will be initialed and dated.

Periodically, the Project Manager, or designee, will review the calibration records pertaining to the activities under their supervision. This review will be conducted to confirm that instrument calibrations are being conducted and documented. Discrepancies and errors identified during the review should be resolved between reviewer and author of the calibration records. Corrections and/or additions of information shall be initialed and dated by the field author or reviewer.

9.0 DOCUMENTATION ARCHIVE

At the completion of the project, all original calibration records will be stored in the project files in accordance with project procedures.

10.0 REFERENCES

YSI Incorporated, 2004. YSI 556 MPS Multi Probe System Operations Manual.

HF Scientific Incorporated, December 2009. Owner's Manual MicroTPI and MircroTPW Field Portable Turbidimeters. Manual Part No. 24378 (1/09), Rev. 1.8.

11.0 ATTACHMENTS

Water Quality Equipment Calibration Form

YSI Probe Diagram

pH verses Temperature Table

ORP verses Temperature Table

Water Quality Equipment Calibration Form

Project: ____ Date: _______________________

Water Quality Parameter Meter

Unit Name/ID: _______________________ Serial Number: __________________________________
Calibrated By: ________________________ Assigned User: __________________________________

	Cal Std. Expiration Date	Initial Calibration		Re-Calibration		Drift Check	
		Time:		Time:		Time:	
		Cal	Read	Cal	Read	Read	Acceptable Performance
pH (3-point)							±Δ 0.20
Buffer 2.0							
Buffer 4.0							
Buffer 7.0							
Buffer 10.0							
Conductivity							±10%
447 uS/cm							
1413 uS/cm							
8974 uS/cm							
15,000 uS/cm							
ORP							±10%
220 mv							
Dissolved Oxygen							±10%
Open Air mg/L							
Zero Oxy Std mg/L							
Barometer (mm Hg)							

Turbidity Meter

Unit Name/ID: ______________________________ Serial Number: ___________________________________
Calibrated By: _______________________________ Assigned User: ___________________________________

	Cal Std. Expiration Date	Initial Calibration		Re-Calibration		Drift Check	
		Time:		Time:		Time:	
		Cal	Read	Cal	Read	Read	Acceptable Performance
Turbidity							±10%
0.02 Standard							
10.0 Standard							
1,000 Standard							

3.3 Features of the YSI 5563 Probe Module

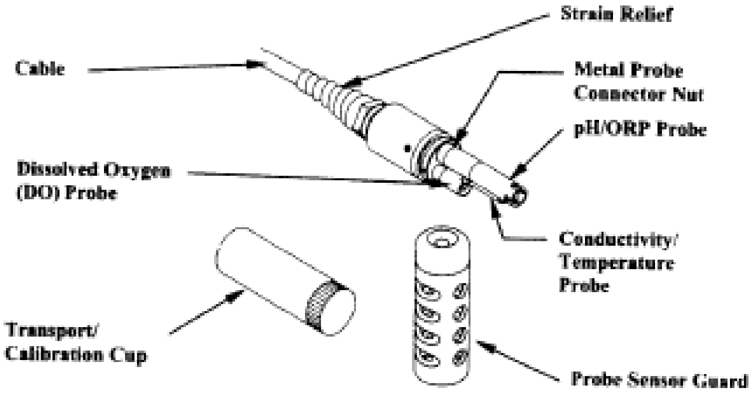

Figure 3.1 Probe Module

pH verses Temperature

Temperature	pH	Temperature	pH	Temperature	pH
°C	**4.00**	**C**	**7.00**	**C**	**10.00**
0	4.01	0	7.12	0	10.20
10	4.00	10	7.06	5	10.06
20	4.00	20	7.02	10	10.12
25	4.00	25	7.00	15	10.08
30	4.01	30	6.99	20	10.04
35	4.01	35	6.98	25	10.00
40	4.03	40	6.97	30	9.96
60	4.09	60	6.98	35	9.92
80	4.16	80	7.04	40	9.88
90	4.22	90	7.09	50	9.80

ORP verses Temperature

Temperature °C	ORP
-5	270.0
0	263.5
5	257.0
10	250.5
15	244.0
20	237.5
25	231.0
30	224.5
35	218.0
40	211.5
45	205.0
50	198.5

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SOP-014
Equipment Decontamination

Ordot Dump Post-Closure Facility
Standard Operating Procedure

Revision 2
Revision Date: September 20, 2021

SOP-014
EQUIPMENT DECONTAMINATION

TABLE OF CONTENTS

1.0 OBJECTIVES

The objective of this standard operating procedure (SOP) is to establish consistent methods to reduce or eliminate:

- Contamination and cross-contamination of environmental samples by sample equipment, other samples, or personnel.
- Health and environmental risk caused by the spread of contaminants.

2.0 APPLICABILITY

Decontamination should occur any time a sampling tool or instrument used in field investigations may contact sampled media, or personnel using the equipment. This procedure will be used in conjunction with reusable equipment, but is not required for dedicated equipment, used during field activities associated with handling, sampling or measuring environmental media such as soil, sediment, groundwater, surface water, leachate, soil gas, or air. These procedures are to be implemented primarily on-site such as at the point of use or at a designated equipment decontamination station at the project site. Equipment decontamination should be completed before each use and prior to transporting off-site.

Examples of soil and groundwater sample collection equipment usually requiring decontamination includes pumps, stainless steel bailers, hand augers, split spoon samplers, and other related equipment used for the collection of samples or the measurement of field parameters.

These procedures are general minimum standards. They may be modified or supplemented for a specific project by site-specific work plans or health and safety plans.

3.0 RESPONSIBILITY

The *Project Manager*, or designee, will have the responsibility to oversee and ensure that equipment decontamination procedures are implemented in accordance with this SOP and any site-specific work plan, field sampling plan (FSP), quality assurance project plan (QAPP), and site health and safety plan (SHSP).

The *field personnel* will be responsible for the understanding and implementation of this SOP during all field activities, as well as, obtaining the appropriate field logbooks, forms and records necessary to complete the field activities.

4.0 REQUIRED MATERIALS

The equipment and supplies required for this SOP include the following:

- Clean buckets or tubs to hold wash and rinse solutions of a size appropriate to the equipment to be decontaminated.
- Tap water.
- Deionized or distilled water (grade determined by project requirements).

- Nitric acid.
- Long-handled brushes for scrubbing. Flat-bladed scrapers, garden type spray bottles (no oil lubricated parts).
- Non-phosphate detergent such as Alconox® or Liqui-Nox®.
- Plastic sheeting for the decontamination area.
- Plastic bags and/or aluminum foil to keep decontaminated equipment clean until the next use.
- Gloves, aprons, safety glasses, and any other PPE required in the Site Health and Safety Plan (SHSP).
- Towels and wipes.
- Dispensing bottles.
- Methanol and/or Hexane (if required by the project work plan or quality assurance plan).

Some Work Plans may include additional equipment rinses based on the contaminants being investigated. Examples of this are 0.1N nitric acid when cross-contamination from metals is a concern, and solvents such as methanol, isopropanol, or hexane, when cross-contamination from organics is a concern. If these are required, labeled inert dispensing bottles and Material Safety Data Sheets (MSDS) for these rinses will be necessary. Labels should be well marked. MSDS' should be filed on site and hazard communication needs to occur as outlined in the Site Safety Plan.

5.0 METHODS

Decontamination consists of physically removing contaminants from personnel or equipment. To prevent the transfer of harmful materials, procedures have been developed and are implemented before anyone enters a site and continue throughout site operations.

A decontamination plan should be based on the worst-case scenario (if information about the site is limited). The plan can be modified, if justified, by supplemental information. Initially, the decontamination plan assumes all protective clothing and equipment which leave the exclusion zone are contaminated. Based on this assumption, a system is established to wash and rinse all non-disposable equipment. Decontamination plans will be site-specific and presented in the SHSP for each site.

The decontamination area should be located, if possible, where decontamination fluids and soil wastes can be easily discarded or discharged. Decontamination wastewater should be managed in accordance with the Investigation Derived Waste SOP or as directed in the work plan or quality assurance plan. Wastewater will be collected and stored onsite until it can be properly disposed.

5.1 Decontamination Station Set-up

Large equipment. A decontamination pad should be established for cleaning of heavy equipment or large sampling tools. This pad can be a prefabricated area that already exists on site for washing large equipment, or can be constructed. If a prefabricated area exists, it needs to have characteristics that allow for collecting fluids and solids that will fall off the large equipment. Decontamination pads can be constructed in a variety of ways, but things to consider during construction are the following:

- The pad will need to be constructed so it provides complete secondary containment. Hence all sides will require berms to prevent off pad migration of fluids. The berms need to be constructed by considering the balance between sump pump removal rates and the amount of fluid that will be generated.
- Fluids from decontamination processes cannot escape and be directly discharged vertically into the ground; hence if plastic sheeting is used it should be minimally double layered and thick (greater than 8 mil).
- The pad will have to drain in one general direction where a sump pump can collect fluids.
- The pad will need to be located near power and water, if possible. However, a generator can supply power and water can be trucked in.

The decontamination area for the Ordot Dump site will consist of a designated area on top of the Ordot waste pile where heavy equipment will be decontaminated using a power washer. The washer liquids will be allowed to disperse on the top surface of the waste pile.

Small equipment. For small equipment decontamination and PPE decontamination, a smaller station is established, either in the contaminant reduction zone or at the sampling location or well if contamination zones are not established. For this station, clean buckets or tubs (5 gallon buckets are most common) should be used. Buckets should be placed on plastic sheeting to prevent spillage to the ground, and to help keep the decontamination area and equipment as clean as possible. The buckets should be filled half to three-quarters full as follows:

Step 1 Tap water with non-phosphate detergent such as Liqui-Nox made up as directed by the manufacturer.

Step 2 Tap water for rinsing.

Step 3 If practicable use a 2% nitric acid solution mixed with deionized or distilled water for the second rinsing. Some equipment can be damaged by nitric acid (i.e. Geosquirt pump, water level meters), check equipment Operating Manual before using a nitric acid solution.

Step 4 Deionized or distilled water for the final rinsing

A clean area, generally covered with plastic sheeting or large clean plastic bags, is also needed to set down decontaminated equipment prior to reuse or air drying and packaging for later use.

5.2 Procedure

After the decontamination area is set up, equipment decontamination is comprised of four general steps:

1. Removal of gross (visible) contamination
2. Removal of residual contamination
3. Prevention of recontamination, and
4. Disposal of wastes associated with the decontamination

5.2.1 Remove Gross Contamination

Gross contamination generally applies to soil sampling equipment, which may have significant residue clinging to the piece of equipment. This can be removed by dry brushing or scraping or by a high-pressure steam or water rinse often, in areas not grossly contaminated, steam washes may be all that is applied to larger equipment, such as drill casings. If utilizing high-pressure steam or water, the rinse water should be managed as investigation derived waste.

5.2.2 Remove Residual Contamination

All sampling equipment used at the site must be cleaned prior to any sampling effort, after each sample is collected, and after the sampling effort is accomplished.

Removal of residual contamination consists of the following steps:

1. Place the item in the first bucket (detergent wash) and scrub the entire surface area of each piece of equipment to be decontaminated. Utilize scrub brushes to remove all visible contamination. Change the water periodically to minimize the amount of residue carried over into the second rinse.
2. Place the item in the second bucket (clear water rinse – tap or deionized water) and rinse. Change the water periodically to minimize the amount of residue carried over into the third rinse.
3. Rinse the item with a weak nitric acid solution, either in a bucket or with a squeeze bottle. The purpose of the nitric acid wash is to remove any remaining metals that may contaminate the equipment. The acid solution is very weak but use extra caution to minimize contact with the solutions, including heavier gloves and goggles. Change water as necessary.
4. Place the item in the fourth bucket (deionized or distilled water) and repeat the rinsing procedure. Change water as necessary.
5. Unless the Work Plan directs additional rinses, place the item on a clean surface such as plastic sheeting to await reuse or packaging for storage (e.g., wrapping foil).

Additional rinses for field sampling equipment are sometimes called for in the Work Plan. This may include a pesticide-grade solvents (e.g., methanol, isopropanal, or hexane) when organic contamination may be present. These rinses are applied with a wash bottle so that the stream of liquid has completely covered the area of surface of the equipment that may come in contact with the sample. The rinse should be conducted over a container to catch the runoff from the equipment.

Solvent rinses should be conducted from more polar (i.e., methanol) to less polar (i.e. hexane or methylene chloride), and allowed to air dry if at all possible. Application of the methanol and hexane rinses requires liberal amounts of hexane to remove the methanol. Under some circumstances (e.g., poor weather), complete air drying of equipment is impractical. In such a case, allowing the equipment to dry as long as practical followed by an organic free water rinse can be used.

5.2.3 Contamination Removal for Non-Dedicated Bladder Pump and Tubing

Removal of contamination for a non-dedicated bladder pump with non-dedicated tubing consists of the following steps:

1. Set-up plastic sheeting for your decontamination area. Disassemble the cover and head from the body of the pump to remove the bladder. A new bladder will be installed after pump and tubing is decontaminated.
2. Place the cover and head unit, with the tubing still attached, into the first 5-gallon bucket (detergent wash). Attach approximately 2 feet of silicon tubing to the end of the air line tube on the pump. Connect the silicon tubing to a peristaltic pump.
3. With the cover and head unit in the detergent wash, turn on peristaltic pump and pump out three times the volume of the tubing. For example, if the tubing is 50 feet in length, pump out 2 liters of the detergent wash through the tubing. See formula below to calculate the amount of solution to purge through tubing. Containerize all solutions used in the decontamination process. Change water periodically to minimize the amount of residue carried over into the next rinse.

The tubing volume may be calculated using the formula $V = CF*d^2h$, where

V = volume of water (gallons)

d = diameter of well (inches)

h = height of water column (feet)

CF = conversion factor (0.0408) that includes conversion of cubic feet to gallons, inches to feet, and diameter to radius.

Once the volume in gallons is known, it can easily be converted to liters using the following conversion factor: 1 US gallon = 3.78541178 liter

1. Repeat this step with tap water followed by a weak nitric acid solution and finally with deionized or distilled water.
2. Use a scrub brush to wash the body of the pump, and a clean rag to wipe the outside of the tubing, through all four decontamination solutions.
3. Apply a new bladder to the pump head and re-assemble pump. Place clean pump and tubing in plastic bag to avoid recontamination.

5.2.4 Contamination Removal for Non-Dedicated Bladder Pump and Dedicated Tubing

Removal of contamination for a non-dedicated bladder pump with dedicated tubing consists of the following steps:

1. Set-up plastic sheeting for your decontamination area. Disassemble the cover and head from the body of the pump to remove the bladder. Disconnect tubing from pump. A new bladder will be installed after pump is decontaminated.

2. Place the disassembled, non-dedicated pump (with bladder removed) into the first 5-gallon bucket (detergent wash). Use a scrub brush to wash the body of the pump
3. Repeat this step with tap water followed by a weak nitric acid solution and finally with deionized or distilled water.
4. Change water periodically to minimize the amount of residue carried over into the next rinse.
5. Apply a new bladder to the pump head and re-assemble the pump. Place clean pump in clean plastic bag and dedicated tubing in dedicated plastic bag to avoid recontamination.

5.2.5 Prevent Recontamination after Decontamination

After the decontamination process, equipment should be stored to preserve its clean state to the extent practical. The method will vary by the nature of the equipment. Protection measures include covering or wrapping in plastic or sealable plastic bags, or wrapping with oil-free aluminum foil.

5.2.6 Disposal of Contaminants and Spent Rinse Fluids

All washing and rinsing solutions are considered investigation derived waste and will be handled as outlined in SOP-015. After use, gloves and other disposable PPE should also be containerized and handled as investigation derived waste. See SOP-015 on Investigation Derived Waste Handling Procedures.

5.3 Record Keeping

The decontamination method should be documented within the field documentation designated for the project. Entries documenting the procedure used, fluids used, lot numbers for fluids, and any changes and approval for changes should be entered into a bound field notebook or on project-specific forms. Upon completion of the field activity, it is the responsibility of the field personnel to ensure the project/task manager receives copies of all of the field documentation.

6.0 REFERENCES

Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities. October 1985.

United States Environmental Protection Agency (U.S. EPA), 1990. Procedures to Schedule and Complete Sampling Activities in Cooperation with EPA Region VII Environmental Services Division. February.

U.S. EPA Region VII, 1991. Environmental Services Division Operations and Quality Assurance Manual. February.

U.S. EPA, 1987. A Compendium of Superfund Field Operations Methods, Volumes I and II. EPA/540/P-87/001a&b.

U.S. EPA, 1992. Standard Operating Safety Guidelines; Publication 9285.1-03. June.

The Code of Federal Regulations, 1993. Title 29, 1910.120. July.

7.0 ATTACHMENTS

None

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SOP-015
Investigation-Derived Waste Handling Procedures

Ordot Dump Post-Closure Facility
Standard Operating Procedure

Revision 2
Revision Date: September 20, 2021

SOP-015
INVESTIGATION-DERIVED WASTE HANDLING PROCEDURES

TABLE OF CONTENTS

1.0 OBJECTIVES

The objective of this standard operating procedure (SOP) is to establish consistent methods to handle and manage all Investigation-Derived Waste (IDW), including:

- Solid waste, both hazardous and non-hazardous (e.g., soil cuttings, contaminated debris or equipment)
- Liquid waste both hazardous and non-hazardous (e.g., purge water, rinse water from decontamination, product removal)
- Personal Protective Equipment (e.g., gloves, spent respirator cartridges, chemical-resistant coveralls)

This SOP provides procedures and standards that are in addition to applicable regulatory requirements and industry standards.

IDW generated at the Ordot Dump will be placed on top of the current waste pile and will be incorporated into the final closure design. RCRA hazardous waste is not anticipated to be in countered at the Ordot Dump. This SOP covers both Ordot IDW and IDW that may occur in the future as characterization continues.

2.0 APPLICABILITY

Investigation sampling activities may generate solid, liquid, and Personal Protective Equipment (PPE) waste. The IDW Handling Procedures SOP will be implemented primarily on-site.

3.0 RESPONSIBILITY

The *Project Manager*, or designee, will have the responsibility to oversee and ensure that the IDWs are properly handled and managed in accordance with this SOP and any site-specific or project-specific planning documents.

Field personnel will be accountable for the comprehension and implementation of this SOP during all field activities, as well as obtaining the appropriate field logbooks, forms, labels, records and equipment needed to complete the field activities.

4.0 DEFINITIONS

Designated Waste: A solid or liquid waste which is not defined as hazardous, but which still may present a threat to groundwater, and which requires handling differently than a non-hazardous inert waste.

D.O.T.: Department of Transportation. Typically referred to when specifying a type of container that is approved for transporting hazardous substances, either materials or waste, on streets.

Hazardous Waste: Soil, liquid or other wastes generated from site investigations that exhibit toxic (human or ecological effects), ignitable, corrosive, or reactive characteristics as defined by applicable state or federal regulation or which is otherwise classified as hazardous. Such waste requires special handling and documentation of disposal.

IDW: Investigation Derived Waste. Typically solid (e.g., soil) or liquid (e.g. groundwater, decontamination fluids) wastes resulting from field activities.

Non-hazardous Waste: A waste that does not exhibit characteristics of a hazardous waste and which is not otherwise classified as hazardous. Non-hazardous waste can be designated as inert waste.

PPE: Personal Protective Equipment. Worn by workers when potential for exposure to hazardous materials exists.

SHSP: Site Health and Safety Plan. A Plan written to coordinate and outline precautions that will be taken to initiate and monitor worker safety.

5.0 REQUIRED MATERIALS

The equipment and supplies required for implementation of this SOP include the following:

- Containers for waste (e.g., 55-gallon open and closed top drums) and material to cover waste to protect from weather (e.g., plastic covering)
- Equipment (i.e., pumps, generators, water/interface level indicators, safety monitoring equipment)
- Permanent marking pens
- Inventory forms for project file
- Plastic garbage bags, zip lock storage bags, roll of plastic sheeting
- Steel-toed boots, chemical resistant gloves, coveralls, safety glasses, and any other PPE required in the site-specific SHSP.

6.0 METHODS

The following methods are used to handle the IDW.

6.1 Labeling

Containers used to store IDW must be properly labeled. Two general conditions exist: 1) from previous studies or on-site data, waste characteristics are known to be either hazardous or non-hazardous; or 2) waste characteristics are unknown until additional data are obtained.

For situations where the waste characteristics are known, the waste containers should be packaged and labeled in accordance with Guam Regulations and any federal regulations that may govern the labeling of waste.

The following information shall be placed on all non-hazardous waste labels:

- Description of waste (i.e., purge water, soil cuttings)
- Contact information (i.e., contact name and telephone number)
- Date when the waste was first accumulated.

The following information shall be placed on all hazardous waste labels:

- Description of waste (i.e., purge water, soil cuttings)
- Generator information (i.e., name, address, contact telephone number)
- EPA identification number (supplied by on-site client representative)
- Date when the waste was first accumulated.

When the final characterization of a waste is unknown, a notification label should be placed on the drum with the words "waste characterization pending analysis" and the following information included on the label:

- Description of waste (i.e., purge water, soil cuttings)
- Contact information (i.e., contact name and telephone number)
- Date when the waste was first accumulated.

Once the waste has been characterized (if required), the label should be changed as appropriate for a non-hazardous or hazardous waste.

Waste labels should be constructed of a weatherproof material and filled out with a permanent marker to prevent being washed off or becoming faded by sunlight. It is recommended that waste labels be placed on the side of the container, since the top is more subject to weathering. However, when multiple containers are accumulated together, it also may be helpful to include labels on the top of the containers to facilitate organization and disposal.

Each container of waste generated shall be recorded in the field notebook used by the person responsible for labeling the waste. After the waste is disposed of, either by transportation off-site or disposal on-site in an approved disposal area, an appropriate record shall be made in the same field notebook to document proper disposition of IDW.

6.2 Types of Site Investigation Waste

Several types of waste are generated during site investigations that may require special handling. These include solid, liquid, and used PPE, as discussed further below.

6.2.1 Solid Waste

Soil cuttings from boreholes will typically be shoveled back into the borehole after drilling is complete and do not require special handling. Drilling mud generated during investigation activities and excess sediments shall be collected and transported to the top of the waste pile and placed on the top surface of the dump. An inventory containing the source, volume, and description of material put on the waste pile shall be logged on prescribed forms and kept in the project file. Non-hazardous solid waste can be disposed on-site in the designated Ordot Dump location. Hazardous wastes must be disposed off-site at an approved hazardous waste landfill.

6.2.2 Liquid Waste

Groundwater, surface water, and leachate generated during monitoring well development, purging, and sampling can be collected in truck-mounted containers and/or other transportable containers (i.e., 55-gallon drums). Lids or bungs on drums must be secured at all times and only open during filling or pumping activities. The non-hazardous liquid waste can be disposed of in one of the designated IWD waste disposal sites on top of the waste pile. Hazardous wastes must be handled separately and disposed off-site at an approved hazardous waste facility.

6.2.3 Personal Protective Equipment (PPE)

PPE that is generated throughout investigation activities shall be placed in plastic garbage bags. If the solid or liquid waste that was being handled is characterized as hazardous waste, then the corresponding PPE should also be disposed as hazardous waste. If not, all PPE should be disposed as non-hazardous waste either in a designated on-site IWD disposal site on top of the waste pile or in an acceptable waste disposal container.

6.3 Waste Accumulation On-Site

Solid, liquid, or PPE waste generated during investigation activities that are classified as non-hazardous shall be disposed of on the top of the Ordot waste pile.

Solid, liquid, or PPE waste generated during investigation activities that are classified as hazardous shall not be accumulated on-site longer than 90 days. All hazardous waste containers shall be stored in a secured storage area. The following requirements for the hazardous waste storage area must be implemented:

- Proper hazardous waste signs shall be posted as required by any state or federal statutes that may govern the labeling of waste
- Secondary containment to contain spills
- Spill containment equipment must be available
- Fire extinguisher
- Adequate aisle space for unobstructed movement of personnel.

Weekly storage area inspections shall be performed and documented to ensure compliance with these requirements. Throughout the project, an inventory shall be maintained to itemize the type and quantity of the waste generated.

6.4 Waste Disposal

Solid, liquid, and PPE waste will be characterized for disposal through the use of client knowledge, laboratory analytical data created from soil or groundwater samples gathered during the field activities, and/or composite samples from individual containers.

All waste generated during field activities will be stored, transported, and disposed of on the top deck of the Ordot waste pile. All wastes classified as hazardous will be disposed of at a licensed treatment storage and disposal facility or managed in other approved manners according to applicable Guam, federal, and local regulations..

In general, waste disposal should be carefully coordinated with the facility receiving the waste. Facilities receiving waste have specific requirements that vary even for non-hazardous waste, so characterization should be conducted to support both applicable regulations and facility requirements.

6.5 Regulatory Requirements

The following federal and state regulations shall be used as resources for determining waste characteristics and requirements for waste storage, transportation, and disposal:

- Code of Federal Regulations (CFR), Title 40, Part 261;
- CFR, Title 49, Parts 172, 173, 178, and 179.

6.6 Waste Transport

A state-certified hazardous waste hauler shall transport all wastes classified as hazardous. Typically, the facility receiving any waste can coordinate a hauler to transport the waste. Shipped hazardous waste shall be disposed of in accordance with all RCRA/USEPA requirements. All waste manifests or bills of lading will be signed either by the client or the client's designee, which can in special circumstances be the project manager if acting as an authorized agent for the client. Any such agreements where a Brown and Caldwell employee acts as an agent for the client shall be reviewed and approved by corporate legal.

7.0 REFERENCES

U.S. EPA Guide to Management of Investigative-Derived Waste, Publication: 9345.3-03FS, April 1992.

Code of Federal Regulations, Title 40, Section 262.32, Standards Applicable to Generators of Hazardous Wastes, Subpart C – Pre-transport Requirements, Marking, periodically updated – use most current version.

8.0 ATTACHMENTS

None

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SOP-016
Groundwater Monitoring Well Installation and Development

Ordot Dump Post-Closure Facility Standard Operating Procedure

Revision 2
Revision Date: September 20, 2021

SOP-016
GROUNDWATER MONITORING WELL INSTALLATION AND DEVELOPMENT

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1.0 OBJECTIVES

The objective of this standard operating procedure (SOP) is to provide the methods to be used for the installation and development of groundwater monitoring wells and to provide standardized reporting formats for documentation of data. This SOP has been specifically designed with the objective of installing and developing wells for environmental investigations.

2.0 SCOPE AND APPLICABILITY

This procedure is intended for use for the installation, development, and documentation of monitoring wells that will be used for environmental investigations.

Specific monitoring well design and installation procedures depend on project-specific objectives and subsurface conditions and should be discussed in project-specific planning documents. The following aspects will need to be determined when planning a well installation:

- Borehole drilling method
- Construction materials
- Well depth
- Screen length
- Well construction materials
- Location, thickness, and composition of annular seals
- Well completion and protection requirements.

Groundwater monitoring well installation and development will be performed in accordance with applicable well standards for the area of the investigation, this SOP and the project-specific planning documents. Drilling methods employed to pilot the borehole for monitoring well installation will be dependent on the physical nature of the subsurface materials (unconsolidated materials and/or consolidated materials) at the site. The drilling contractor shall be a licensed water well driller, in accordance with local and Guam requirements, and a qualified drilling contractor for the installation of groundwater monitoring wells for environmental investigations.

2.1 Health and Safety

Potential physical and chemical hazards will need to be addressed when planning monitoring well installation. A health and safety plan that addresses known and anticipated field conditions must be prepared prior to field work and be followed during well installation.

3.0 RESPONSIBILITES

The *Project Manager* is responsible for ensuring that the project involving monitoring well installation is properly planned and executed and that the safety of personnel from chemical and physical hazards associated with drilling and well installation is provided for.

The *Field Geologist or Engineer* is responsible for directly overseeing the construction and installation of the monitoring wells by the driller and to ensure that the project specific well-installation specifications defined in the project-specific planning documents are followed and that pertinent data are recorded on appropriate forms and in the field notebook. Monitoring well construction and boring completion will be conducted under the supervision of an appropriately qualified and registered person as defined by local regulations.

The *Site Safety Officer (SSO)*, typically the field geologist or engineer, is responsible for overseeing the health and safety of employees and for stopping work if necessary to fix unsafe conditions observed in the field. If a subcontracted firm conducts installation and documentation activities, then the firm will designate a site safety officer.

4.0 REQUIRED MATERIALS

Many materials are required for successfully completing the installation and development of monitoring wells. The drilling Subcontractor often supplies much of the material. However, the field personnel should be aware of what is required to conduct the work so they have their own supplies and can provide complete Subcontractor oversight. The following is a general list of materials that are needed for performing the tasks outlined in this SOP.

Geologist

- Hand lens
- Health and Safety supplies (e.g., steel toed boots, gloves, hard hat, etc.)
- Lithologic Logs and Well completion forms
- Logbook
- Logging assistance tools (e.g., grain size charts, color charts)
- Measuring tapes (both long weighted cloth type and small measuring tape, preferably marked in tenths and hundredths of a foot)

Drilling Subcontractor

- Drilling equipment (depends upon the type of drilling, e.g., drill stem, auger, generators, compressors, steam cleaners, etc.)
- Well drilling supplies (drilling mud)
- Decontamination Pad construction supplies
- Well construction supplies (screen, well casing, sand pack, bentonite chips, bentonite, cement mixture, water).
- Health and safety records required for working on site
- Ancillary support vehicles

5.0 METHODS

The borehole diameter must be a minimum of four (4) inches greater than the outside diameter of the well screen or riser pipe used to construct the well. This is necessary so that sufficient annular space is available to install filter packs and grout seals. All boreholes will be cleared for shallow obstructions by following the SOP for Utility Clearance.

5.1 Drilling Methods

Several drilling methods are available for use in creating a borehole for well installation. These methods include hollow stem, air rotary, mud rotary, among others. The drilling method selected will be based on the physical properties of the subsurface materials.

5.1.1 Hollow Stem Auger Methods

Hollow stem auger uses continuous flight hollow stem auger with a bit on the bottom to drill and maintain an open borehole. The continuous flight auger drives the drill cuttings to the surface as drilling progresses. The walls of the auger minimize the amount of unconsolidated materials entering into the space inside the casing. Intact soil samples are collected by pounding a sampler ahead of the auger. The well casing, filter pack and seal are installed inside the auger. The auger is removed slightly ahead of backfilling as filter pack and grout are added. Careful recording of the amount of each material used should be recorded in the field logbook.

5.1.2 Mud Rotary Methods

Mud rotary drilling uses drilling fluids to circulate drill cuttings to the surface. Drilling fluid will consist of only uncontaminated air, water or uncontaminated water mixed with bentonite. Powdered bentonite or an approved equivalent will be used as an additive in the drilling fluid. Bentonite will be mixed into the drilling fluid using a mud mixer and a portable mud tank. Drilling fluid density and viscosity will be maintained at appropriate levels for the various lithology encountered and in accordance with material specifications.

A shale-shaker and de-sanding system will be used to maintain the density and viscosity of the drilling fluid. Sand content will be minimized to the degree possible by maintaining no greater than 4 percent sand by mud volume.

If water or other drilling fluids have been introduced into the borehole during drilling or well installation, samples of these fluids should be obtained and analyzed for chemical constituents that may be of interest at the site. In addition, an attempt should be made to recover the quantity of fluid or water introduced by flushing the borehole before well installation and/or by pumping the well during development.

5.1.3 Air Drilling Methods

The following are descriptions of air rotary, “down-the-hole”, and dual-wall reverse circulation air rotary methods. Air rotary uses air as a primary means of transporting drill cuttings to the surface. A large compressor provides filtered air that is piped to the swivel hose connected to the top of the Kelly bushing or drill pipe. The air, forced down the drill pipe, escapes through small ports at the bottom of the drill bit, thereby lifting the cuttings and cooling the bit. The cuttings are blown out the top of the hole and are collected at the surface in a cyclone unit and a two- to four-yard roll-off container. Injection of a small volume of clean water into the air system controls dust and lowers the temperature of the air so that the swivel is cooled. Air drilling is effective in semi-consolidated or consolidated materials.

A second direct rotary method using air is called the "down-the-hole" or percussion down hole hammer drilling system. A pneumatic drill operated at the end of the drill pipe rapidly strikes the rock while the drill pipe is slowly rotated. The percussive effect is similar to the blows delivered by a cable tool bit. Cuttings are removed continuously by the air used to drive the hammer.

A third direct air rotary method is called the Air Rotary Casing Hammer (ARCH) method is used where an outer steel casing is advanced slightly behind the drill bit. The drill bit reams material in front of the casing and then the casing is advanced with a pneumatic hammer down the hole to prevent hole collapse. Cuttings are collected in a tube system that conveys them into a cyclone at the surface.

Dual-wall reverse circulation air rotary method uses flush-jointed, double wall pipe in which the air moves by reverse circulation. The airflow is contained between the two walls of the dual-wall pipe and only contacts the walls of the borehole near the bit. Dual-wall pipe can be driven into place in loosely consolidated materials by a pile hammer as a drive bit is cutting the formation. Downhole air hammers and tricone bits can also be used to cut the formation. The air lifts the cuttings to the surface through the inner pipe. Dual-wall methods can be applied in consolidated and unconsolidated formations.

5.2 Borehole logging

Boreholes will be logged using cuttings and samples collected during drilling activities. Soil or rock samples will be collected as described in the SOP for Soil Sampling. Cuttings and soil and rock samples will be described at the frequency presented in the project-specific planning documents following the procedures outlined in SOP for Field Classification and Description of Soil and Rock.

After drilling has been completed, the field geologist/engineer will measure the total open depth of the borehole with a weighted, calibrated tape measure and document the depth. The field geologist will then collaborate with the supervising geologist by reviewing lithologic units encountered, water levels, if any, and other logged information to determine the well construction details.

Boreholes/well locations should be clearly designated in the field notes using notes and a hand sketched layout and should include the following information:

- Measurements of each boring/sample point relative to fixed objects (building, structures, etc)
- Boring/sample location with their identification number noted
- North arrow or other compass directional indicator
- Other essential site features and/or investigation features (underground storage tanks, piping, above ground tanks, etc.).

5.3 Monitoring Well Construction Procedures

Monitoring wells will be constructed in accordance with Guam requirements, and will include at a minimum the following materials:

- Borehole backfill for over-drilled boreholes prior to well installation,
- Well casing and screen
- Filter pack materials
- Well sealing materials (e.g., bentonite pellets, cement, powdered bentonite), and
- Surface seals and materials for well surface completion (e.g., concrete, protective steel casing, steel posts, surface boxes).

A discussion of these materials and how they are used is provided in more detail in the following sections.

5.3.1 Backfilling

If backfilling the borehole to the appropriate well installation depth is necessary, neat cement, bentonite grout, bentonite pellets or filter pack sand may be used. The backfill material selected for use will depend on site conditions, lithology, and project-specific requirements. Most often the borehole requires complete sealing with lower layers, so neat cement, bentonite grout, or bentonite pellets are used. The setup time should be a minimum of 48 hours for neat cement and 24 hours for bentonite grout and bentonite pellets prior to beginning well construction. Field personnel should remeasure and verify that the bottom of the bore hole is exactly where it should be set before proceeding with well construction. The necessary setup times may be reduced if manufacturer- approved additives are mixed with the grout to accelerate the cure time.

If neat cement or bentonite grout is used, a tremie pipe will be required to place the grout in the bottom of the hole. Grouting the borehole may be difficult to accomplish, if the portion of the borehole to be grouted is significantly lower than the groundwater level. Provisions will be necessary to support the screen and riser pipe to prevent them from sinking into the grout. Care will be taken to frequently measure the total borehole depth when adding grout to the bottom of the hole. Grout should have thickened to a hardened state before proceeding. The thickness of the grout will be calculated based on depth readings and recorded. If a well has been backfilled too much it may require reaming to clear out the overfilled material.

Depending upon the lithology some distance should be planned between the fill in a borehole and the bottom of the screened interval. Unless this distance would result in a breach confining layer, or the well screen requires setting directly on the impermeable zone due to site requirements, the bottom of the well screen should be set at a maximum of 6 inches above the top of any backfill. The distance between the top of fill and the bottom of the well screen should be filled with a fine sand buffer.

Bentonite pellets should be carefully dropped into the borehole to minimize the risk of pellets sticking to the side of the borehole when dropped through a water column. Pellets are generally easier to place than bentonite chips because pellets do not hydrate as quickly, hence pellets are the preferred method for small backfill jobs where significant confining zones have not been breached.

5.3.2 Well Casing and Screen

The monitoring well will consist of factory-sealed commercially available well screen and casing. Well screens and casing will typically be constructed of polyvinyl chloride (PVC), a type of plastic, but may also be constructed of stainless steel or Teflon depending on subsurface conditions or other project requirements. Stainless steel casing shall meet one of the following standards: American Society For Testing Materials (ASTM) A-53-10, A-589-06, or American Petroleum Institute 5L, March 1982 Edition to conform to the minimum standards given in Table A of that document.

Plastic casing and liners shall meet the requirements of ASTM Standard F480-06B and the National Sanitation Foundation (NSF) International Standard Number 14-1990, Plastic Piping System Components and Related Materials. Evidence of compliance shall be included in the current NSF listing and display of the NSF seal on each section of casing, and marking the casing in accordance with the requirements of ASTM Standard F-480-06B. Plastic well casing and liners must be Standard Dimension Ratio (SDR)-rated and conform to the minimum requirements given in Table 2 of the above-referenced document.

Well screens shall be constructed of non-corrosive and non-reactive material. Well screens shall be permanently joined to the well casing and shall be centered in the borehole. The anticipated length of screen and the reasoning behind choosing the length of screen will be determined when developing the project-specific planning documents. Modification can be made in the field, but will be done in consultation with the PM, or their designee such as the Project Technical Manager or Responsible Geologist.

Screen slot type and size will be dependent on the sand pack material and the aquifer formation material. Casing will be connected by flush-threaded or coupled joints and will be completed with a bottom cap. A collection sump may be installed below the screen and will vary in length depending on lithology and project needs. The collection sump and bottom cap will be connected to the well screen by flush threaded or coupled joints. Plastic casing must have threaded joints and O-ring seals. Solvent, glue, or anti-seize compounds will not be used on the joints.

For water table wells, well screens should be placed such that some of the screened interval is above the water table, and some section is below the water table. This allows for seasonal fluctuations. The amount of split should be determined by the lead responsible geologist and be based upon local conditions.

Casing and screen (well string) must be clean, free of rust, grease, oil or contaminants and be composed of materials that will not affect the quality of the water sample. All casing shall be watertight. The casing shall be plumb and centered in the borehole, be free of any obstructions and allow sampling devices to be lowered into the well. The well string shall be hung in the borehole during installation so that the well is sufficiently plumbed and straight after completion.

5.3.3 Filter Pack

Monitoring wells installed in unconsolidated material will be constructed with filter packs. When used, the filter pack will be the only material in contact with the well screen. The filter pack will consist of sand or gravel. The sand or gravel used for filter pack material shall be sized to match the screen slot size and the surrounding lithology to prevent subsurface materials from penetrating through the sand or filter pack, and preventing the sand or filter pack from entering the well. Sizing of the filter pack material is often conducted using sieve analysis and following interpretative procedures outlined in Driscoll (1986). The sand or gravel shall be free of clay, dust, and organic material. Crushed limestone, dolomite, or any material containing clay or any other material that will adversely affect the performance of the monitoring well shall not be used as filter pack. The filter pack will extend a maximum of six (6) inches below the bottom of the screen to two (2) to three (3) feet above the top of screen. The filter pack material may be placed in the well by pouring the sand into the open borehole, or tremied into place depending upon site-specific criteria. However, in all cases, filter pack material should be added carefully with continuous measurements by the field geologist to prevent bridging of the filter pack material.

Groundwater wells completed into competent bedrock material are often not completed with filter pack material, and can be completed as an open hole over the screened interval. Completion in this manner should be carefully considered and approved by regulatory agencies prior to field mobilization.

The well will be gently bailed and surged with a bailer and surge block after the filter pack has been added to the borehole and before the seal is placed in the annular space. A surge block consists of a rubber or leather and metal plunger attached to a rod or pipe of sufficient length to reach the bottom of the screen. Surging should be maintained for at least five minutes and the entire length of saturated screen will be surged to help settle the filter pack. The top of the filter pack will need to be gauged after surging and additional filter pack material may need to be added if settling has occurred.

Sometimes project specific requirements may identify that transition sand be emplaced above the main filter pack. This transition sand is usually much smaller grain size than the filter pack, and is emplaced to provide added protection that grout invasion into the filter pack will not occur when deep wells (greater than 200 feet deep) are installed. Transition sands can be emplaced up to 10 or 20 feet above the regular sand pack interval. An alternative to transition sands is to use additional well seal material such as bentonite pellets.

5.3.4 Well Sealing Material

The wells will have an annular space seal that extends from the top of the filter pack to the surface. The annular sealing material above the filter pack will prevent the migration of fluids from the surface and between aquifers. Sealing material will be chemically compatible with anticipated contaminants. Hydrated bentonite chips or pellets are typically used as an annular seal directly above the filter pack. The annular seal should be a minimum of 3 feet thick unless site-specific requirements dictate otherwise. For example, as mentioned above, deep wells may require additional sealant material (10 to 20 feet thick versus 3 feet) between the sand pack and cement ground annular fill above to prevent grout invasion into the filter pack interval. Cement and/or bentonite grout are typically used as annular fill above the seal. Above the sealant material a bentonite grout mixture is often used as an annular fill to complete the well installation to within 2 feet of the surface. Grouting emplacement will occur using a tremie pipe so that the grout fills the annular space from the bottom to the surface without allowing air pockets to form in the filled zone.

5.3.5 Surface Completions

Above Grade or Monument Surface Well Head Completion

With above-grade well completions, the well casing will extend to 1 to 3 feet above the ground surface. A well cap will be placed at the top of the casing and the cap will be watertight. The section of well casing that sticks up above ground will be protected by a steel or Schedule 80 PVC protective pipe, set at least 2 feet deep into a concrete surface seal. A concrete pad should be constructed around the protective steel pipe. The pad should be square, approximately 1.5-by-1.5 to 2-by 2 feet, sloped slightly away from the well, and the top of the pad should be approximately 4 inches off the ground. Specific client needs may differ from this construction, and such requirements should be outlined in project specific planning documents. The top of the protective pipe will have a vented lockable cap. Protective steel posts will be installed in areas where the well could be struck by vehicles or heavy equipment. In addition, a “weep” hole should be drilled in the bottom of the protective pipe. A “V” notch or other permanent mark will be placed at the north edge of the top of the well casing that will be used as the reference point for well elevation surveying and water level monitoring.

Ground or Grade Surface Well Head Completion

Monitoring well casing may terminate at the ground surface with a flush mounted traffic-rated road box. Road box installations must use a watertight well cap for the well riser pipe in addition to a watertight road box to prevent surface water from entering the well. The well casing should extend approximately 3 inches above the sealant in the bottom of the well box. The traffic-rated road box and surface concrete completion should meet Class A specifications, which meet a minimum 4000-pound compressive strength. The surface completion should provide positive drainage away from the well box to prevent ponding around the well. In traffic areas and sidewalks, this positive drainage slope away from the box should be minimized to prevent physical hazards. The surface seal around the box should be a minimum of 12 inches around the perimeter of the box. As discussed above a reference mark should be placed on the top of the well casing for well elevation surveying and water level monitoring.

5.3.6 Monitoring Well Location and Surveying

Monitoring wells will be located by parcel coordinates required by local permit requirements. Each well will be surveyed by a licensed surveyor in the Territory of Guam where the well has been installed and tied to an established local benchmark, site conditions permitting. The vertical survey will be accurate to 0.01 foot relative to mean sea level. Both the top of casing and ground surface elevation near the well will be surveyed for vertical control. The "V" notch cut on the north side of each well casing will be used as the surveyor's reference mark. For horizontal control, each well will be tied to an existing site coordinate system and will be surveyed to a horizontal accuracy of 0.1 foot.

5.4 Well Development

Monitoring well development is necessary to ensure that complete hydraulic connection is made and maintained between the well and the aquifer material surrounding the well screen and filter pack. The appropriate development method will be selected for each project on the basis of the circumstances, objectives, and requirements of that project.

The appropriate development method will be selected for each project based on the lithology, objectives, and requirements of that project. Project-specific planning documents will identify the specific development method to be used. In general, most wells will be developed by using surge block and bailing methods to draw the coarse and/or fine material out of the sand pack. Other development methods that may be used include jetting, airlift, and submersible pump methods. These methods are discussed further below. Jetting is typically not used as a development method for environmental investigations, but is commonly used for water resource monitoring wells or production wells.

Well development should begin no sooner than 48 hours after well installation. However, if drilling muds are used during well installation, well development should occur approximately 24 hours following well installation so that the drilling mud does not set up in the well screen section.

Generally a phased process is used to develop wells, starting with a gentle bailing phase to remove sand, followed by a surging phase, then a pumping phase after the well begins to clear up. The following paragraphs provide more detailed information.

After a well is first installed, and in fact, often before the bentonite pellet seal is set, gentle bailing is used to remove water and sand from the well. The purpose of this technique is used to settle the sand pack. After further well sealant materials have been added and allowed to set for approximately 48 hours, bailing is resumed as part of well development. The purpose of bailing is to remove fine material that may have accumulated in the well, and start pulling in natural material into the sand pack. Bailing is often conducted until the sand content in the removed water begins to decrease.

After the sand content begins to decrease, surging is conducted. A surge block is used to move sediments from the filter pack into the well casing. A surge block consists of a rubber (or leather) and metal plunger attached to a rod or pipe of sufficient length to reach the bottom of the well. All surge blocks will be constructed of materials that will not introduce contamination into the well. Surge blocks should have some manner of allowing pressure release to prevent casing collapse. The surge block is moved up and down the well screen interval and then removed, followed by a return to bailing to remove any sand brought into the well by the surging action. Care should be taken to not surge too strongly with subsequent casing deformation or collapse; the well screen interval is often the weakest part of a well. Surging should be followed by additional bailing to remove fine materials that may have entered the well during the surging effort.

After surging has been completed and the sand content of the bailed water has decreased, a submersible pump is used to continue well development. The pump should be moved up and down the well screen interval until the obtained water is relatively clear. Well development will continue until the water in the well clarifies and monitoring parameters such as pH, specific conductivity, and temperature stabilize as defined in the project-specific planning documents. It should be noted that where very fine-grained formations are opposite the screened interval, continued well development until clear water is obtained might be impossible. Decisions regarding when to cease development where silty conditions exist should be made between the field supervisor and PM.

During well development pH, specific conductivity, temperature, and turbidity should be monitored frequently to establish natural conditions and evaluate whether the well has been completely developed. The main criteria for well development is clear water (Nephelometric turbidity units or NTU of less than 5). As mentioned above, clear water can often be impossible to obtain with environmental monitoring wells. A further criteria for completed well development is that the other water quality parameters mentioned above stabilize to within 10 percent between readings over one well volume.

The minimum volume of water purged from the well during development will be approximately a minimum of 3 borehole volumes (wells will typically not reach stabilization of water quality parameters before this condition is achieved and may not have reached stability even after this threshold has been achieved). The above is a general guideline for difficult well development - project-specific planning documents should address project constraints on well development. Development water will be handled the manor described in SOP-015.

5.5 Disposal and Decontamination

All drill cuttings and fluids generated during well installation and development will be containerized as outlined in the Investigation-Derived Waste Handling SOP-015 unless project-specific requirements specify otherwise. Waste containment and disposal will occur in a manner that will not result in contamination of the immediate area or result in a hazard to individuals who may come in contact with these materials.

All drilling and well construction equipment that comes into contact with the borehole will be decontaminated by following the Equipment Decontamination SOP-014.

6.0 QUALITY ASSURANCE/QUALITY CONTROL

Borehole drilling and well construction details will be documented in detail in the field. Field documentation forms will consist of a lithologic borehole log, a well construction log, and daily field note forms. Deviations from project-specific planning documents will be documented and explained in daily field notes. The program manager will be contacted to discuss project deviations.

Field quality control can be maintained through 1) making sure employees are properly trained to conduct the work being implemented, and 2) performing routine field audits to evaluate how well employees are following procedures. These two aspects of QA/QC are detailed in the Quality Assurance Project Plan (QAPP).

7.0 RECORDS

Field notes and logs will be submitted to the Project Manager or designate immediately following the field event for checking and revision purposes. The Project Manager or designate shall review and transmit the completed forms for incorporation into the project file.

8.0 REFERENCES

California Department of Water Resources, 1981, State of California Water Well Standards, Bulletin 74-81.

California Department of Water Resources, 1990, State of California Water Well Standards (modified), Bulletin 74-90.

Driscoll, F.G., 1986, Groundwater and Wells, Second Edition, Johnson Filtration Systems, Inc., St. Paul, MN.

United States Environmental Protection Agency, 1989, Handbook for Suggested Practices for the Design and Installation of Monitoring Wells, EPA 600/4-89/034, Reprinted by the National Ground Water Association.

9.0 ATTACHMENTS

None

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SOP-017
Groundwater Sample Collection

Ordot Dump Post-Closure Facility
Standard Operating Procedure

Revision 2
Revision Date: September 20, 2021

SOP-017
GROUNDWATER SAMPLE COLLECTION

TABLE OF CONTENTS

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1.0 OBJECTIVES

The primary objective of this standard operating procedure (SOP) is to establish a uniform method for the collection of representative groundwater samples from monitoring wells, and to reduce the potential variability associated with purging and sampling.

2.0 SCOPE AND APPLICABILITY

This SOP will be used to support groundwater monitoring programs and conducting the field groundwater sampling activities. Groundwater sampling involves two primary operations, purging stagnant water from a well followed by the collection of a sample from the same well. Groundwater sampling variables can be significantly controlled through the appropriate selection and use of purging and sampling equipment, and through the use of procedures that are described in this SOP.

3.0 REQUIRED MATERIALS

Materials required for conducting groundwater sampling are variable depending upon the method chosen to conduct the sampling. Therefore the listing of materials will be separated into two parts in this SOP. This section will present materials that are general in applicability – things that should be included regardless of purge or sampling method. In Section 5, where specific methods and approaches are discussed, additional materials will be listed. General materials that should be considered regardless of method are as follows:

- Personal protection equipment (as required by the Site Health and Safety Plan)
- Health and safety monitoring equipment (e.g., PID)
- Well Completion Forms and Data from previous sampling efforts (if available)
- Water level indicator
- Decontamination supplies (5 gallon buckets, decontamination fluids, squirt bottles)
- Water quality monitoring equipment
- Purge pumps and control boxes
- Purge water collection containers
- Generator
- Compressed nitrogen and/or carbon dioxide bottles
- Permanent marking pens
- Notebook
- Calculator
- Measuring tape
- Garbage bags
- Shipping labels and Chain of Custody records
- Shipping coolers and ice

- Filters (0.45 µm), if appropriate
- Tubing

4.0 RESPONSIBILITIES

The *Project Manager*, or designee, will have the responsibility to oversee and ensure that groundwater purging and sampling procedures are implemented in accordance this SOP and any project- or site-specific planning documents.

The *field personnel* will be responsible for the understanding and implementation of this SOP during groundwater sampling activities, as well as, obtaining the appropriate field logbooks, forms and records necessary to complete the field activities.

5.0 METHODS

5.1 General Considerations

Groundwater sampling involves two primary operations. These include the purging of stagnant water from the well followed by the collection of a sample. Groundwater sampling variables can be significantly controlled through the appropriate selection and use of purging and sampling equipment, and through the use of procedures that are described below.

Good communication is essential to the ultimate success of a groundwater sampling project. This includes communication within the project team, as well as communication with the client and analytical laboratory, when establishing project objectives.

Good communication with the project team, laboratory, client, and, if appropriate, regulatory agencies, includes complete project specific planning documents such as field sampling plans, quality assurance plans, and scope of work documents for subcontracted laboratories. Plans should include detailed information with respect to site-specific requirements, with reference to SOPs wherever possible, and risk criteria that will be used to assess the data. The quality assurance plan and laboratory scope of work (of which the quality assurance plan can be part) should contain detailed information regarding what is expected from the laboratory regarding the methods to be used, quality assurance measures and calibrating corrective measures, and deliverables (especially electronic deliverable formats). A detailed quality assurance plan is even more important in light of EPA's Performances Based Measurement Standard (PBMS) initiative.

In addition to good communication, the project plans should consider equipment decontamination, sampling equipment, sampling sequence, and field quality assurance/quality control (QA/QC) samples. These are described in the following sections.

5.1.1 Dedicated and Disposable Equipment

Use of dedicated and new, disposable purging and sampling equipment are preferable to decontamination of reusable sampling equipment. Dedicated equipment, and use of new, disposable equipment, can virtually eliminate cross-contamination between samples caused by incomplete decontamination. Dedicated equipment can also increase sampling efficiency through the elimination of the need to decontaminate equipment for successive sampling. Furthermore, dedicated equipment can also help to reduce the physical handling of the equipment that can cause sample contamination through contact with potentially contaminated surfaces. New, disposable equipment may need to be decontaminated before use. Review project-specific planning documents regarding decontamination of disposable equipment.

5.1.2 Equipment Decontamination

Equipment that will be in contact with the sample must be decontaminated prior to or after each use. This is necessary to minimize inadvertent contamination of the sample. Specific methods for equipment cleaning are dependent upon a number of factors including the sample media, analytical parameters, the purpose of the investigation, the equipment to be cleaned, and the specific regulatory guidelines that may apply.

Equipment decontamination procedures are described in the Equipment Decontamination SOP (SOP-014). Any site specific decontamination procedures can be specified in the field sampling plan for each project.

5.1.3 Sequence of Sampling

Wells that are sampled with non-dedicated equipment should always be conducted in a sequence that proceeds from wells containing the lowest concentrations to wells containing the highest concentrations, where feasible. Sampling in this order will further minimize the likelihood of sample cross-contamination that can be caused through improper handling or equipment cleaning. If water quality is not known, the wells up-gradient of a suspected source area should be sampled first, followed by the wells furthest away and cross-gradient or down-gradient.

5.2 Purging and Sampling Procedures

This section provides a description of the procedures to be used for groundwater sampling. These procedures include planning, preparatory office activities, preparatory field activities, well purging, well sampling, and post sampling activities. These activities are listed on Attachment A and are described in detail in the following sections. Many of these steps have record keeping components.

5.2.1 Planning

The planning phase should include the selection of specific field methods, including the well purging strategy and planning for the proper disposal of the purge water. The sampling program should be discussed in project-specific planning documents.

Good communication with the analytical laboratory is essential to the success of a groundwater sampling project. The analytical requirements must be well defined and clearly communicated, prior to conducting the field work. Written communication is encouraged, in particular to document requirements for specific analytical methods, low detection limits, and other special needs. Written communication should include a detailed scope of work that includes the quality assurance plan for the project. These plans should specifically identify detection limits, with particular emphasis placed on how these limits relate to regulatory criteria or risk based criteria that have been developed for the project.

Sampling Equipment Selection

Some of the factors that should be considered in the selection of sampling devices include:

- Well yield
- Depth to water
- Well diameter and depth
- Required material of construction
- Analytical parameters
- Regulatory requirements
- Cost

Purging Strategies

The strategy that will be employed for well purging should be determined prior to sampling and presented in project-specific planning documents. Several different strategies are commonly used in order to assess the completeness of well purging. The most common purging strategies are listed below.

- Purging is continued until stabilization of certain indicator parameters is observed in successive measurements over a specified time or volume. The most commonly used indicator parameters include pH, specific conductivity, turbidity, temperature, oxidation/reduction potential (ORP), and dissolved oxygen (DO). This purging method is commonly used for low-flow sampling methods where the well is pumped at rates of < 500ml/min that do not induce drawdown and ostensibly mirror flow rates in the aquifer.
- Purging 3 to 5 well volumes of water from the well.
- Purging low yield wells until the water level reaches the top of the well screen or until dry, and then allowing the well to partially recover. After partial recovery, the well is re-purged to the top of the well screen and allowing the well to partially recover a second time. It is recognized, however, that it may not be possible to avoid dewatering the well screen in many shallow wells.
- Wells that are operated continually or very frequently (e.g. pump back wells, domestic wells or irrigation wells) require minimal purging only to ensure the sample line is cleared of stagnant water and fresh water is pumping from the well (typically 20-50 gals).

Purge Water Disposal

The methods and responsibility for collection, containerization, treatment and disposal of purge water should be determined prior to initiation of any sampling project. Much of how to handle purge water is discussed in SOP-015 for Investigation Derived Waste. However, additional considerations for groundwater purging and sampling are included below.

Collection and containment if required is often accomplished through use of 5 gallon containers, 55 gallon drums, mobile storage tanks, or through use of vacuum trucks which can directly transport to a treatment facility or to an evaporation pond on site. If specifically allowed by the responsible agency, purge water may be reapplied to the ground surface. Treatment of purge water may be accomplished on site at facilities that have wastewater treatment plants, or by using a mobile treatment unit. Responsibility for off-site disposal of containerized purge water must be determined prior to conducting the work.

5.2.2 Preparatory Office Activities

Equipment and containers should be organized in the office prior to embarking on a field sampling project to the extent practicable. The time spent in the field should be spent on sample collection, making field measurements and recording data.

Prepare Sampling and Purging Equipment

The purging and sample collection equipment and all required hardware should be obtained, organized and decontaminated prior to the initiation of the field sampling program. To accommodate waste generated during decontamination, these activities may be completed at the site prior to sampling.

Sample Containers and Preservatives

The appropriate sample containers and associated preservatives must be obtained. The containers and preservatives are normally, but not always, supplied by the laboratory that will be responsible for the analyses. Sample containers should be organized and inventoried several days prior to initiation of the sampling program in order to provide sufficient time to rectify any problems, should they occur. Whenever possible, pre-printed sample labels should be created prior to mobilization, if possible. Sample containers with acid preservatives should not be more than 6 months old and should have been stored in a clean secure location. Some preservatives may have an even shorter shelf life.

Initiation of Field Data Records

Field data sheets may be initiated prior to the start of sampling. Examples of initial data to be recorded include site and sampling location identification, well depth, purging and sampling collection methods and previous field data.

5.2.3 Preparatory Field Activities

The following procedures should be conducted in the field prior to well purging and sampling.

Well Maintenance Check

A well maintenance check should be performed that includes a visual inspection of the condition of the protective casing and surface seal. In addition, the well should be inspected for other signs of damage or unauthorized entry. Any problems should be documented.

It is recommended that the bottom of the well not be sounded each time the well is sampled. Routine sounding of the well can increase the risk of inadvertent well contamination because it is difficult to adequately decontaminate the tapes used for this purpose. Well depths obtained from well completion records are generally adequate for the purpose of the determination of well volume. Generally, the only reason to sound well depth is if a need to verify the depth arises, or if you suspect that sediment/soil has collected in the bottom of the well.

Preparation of Well Area

A suitable work area should be established around the perimeter of the well. Sampling equipment should be placed on a clean surface such that it will not become inadvertently contaminated. Remember – a clean work area leaves a much more favorable impression than a dirty work area.

Water Level Measurements

The depth to water should be measured and recorded prior to initiation of all sampling activities. The water level measurements should be made from the same marked point on the inner well casing each time. See SOP, Monitoring Well Water Level Measurements.

Calculation of Well Purge Volume

The volume of water standing in the well should be calculated through the application of the depth to water data, the known well depth, and the well diameter using the constants presented below. Well depth information obtained from the well completion records are generally sufficiently precise for the purpose of well volume calculations that would be used for subsequent purging determinations.

The following conversions allow quick calculation of well casing volumes:

Well Casing Diameter (inches)	Gallons per foot of water
1.0	0.041
2.0	0.163
3.0	0.367
4.0	0.653
6.0	1.469

Alternatively, the well casing volume may be calculated using the formula $V = CF*d^2h$, where

V = volume of water (gallons)

d = diameter of well (inches)

h = height of water column (feet)

CF = conversion factor (0.0408) that includes conversion of cubic feet to gallons, inches to feet, and diameter to radius

5.2.4 Well Purging

Monitoring wells and domestic wells must be purged prior to the collection of aqueous phase samples. Specific instructions for the use of purging equipment are presented in individual work plans.

The placement of a device (in most cases a pump or bailer) that will be used for well purging is critical in order to ensure a complete exchange of the entire water column. The intake of a device used for purging should be placed as high in the water column as is possible under pumping conditions. Optimum placement is to have the pump at the top of the water column. This is done so that purging will draw water from the formation into the screened area of the well, and up through the casing, so that the entire static water column can be removed. In monitoring wells, there is the flexibility to raise or lower the pump in the well to achieve optimum placement.

If the monitoring well is a slow recharging well, then the pump should be placed near the surface and slowly lowered at a rate similar to groundwater withdrawal. As an alternative approach the pump could be set at no more than three to five feet below the water surface. If the recovery rate of the well is faster than the pump rate and no observable drawdown occurs, the pump can be raised until the intake is within one foot of the top of the water column for the duration of purging. If the pump rate exceeds the well recovery rate, the pump will have to be lowered as needed based upon the amount of drawdown.

Low Stress or Low Flow Groundwater Purging

Sometimes it is desirable to collect representative samples while exerting minimum stress on the water-bearing formation. Typically this is accomplished by limiting the flow rate during purging to the range of 100 to 500 ml/min (0.025 to 0.13 gallons/min). For this procedure, the goal is to induce a steady flow rate while minimizing the drawdown.

It is important to insert the sampling equipment carefully, so as to prevent the re-suspension of silt and clay particles in the well. In order to minimize turbidity, it is preferable to use dedicated equipment, or to allow sufficient time after the installation of non-dedicated equipment to allow soil particles to re-settle before purging and sampling. Sufficient time for settling should be verified by turbidity measurements.

Initially, the purge flow rate should start at approximately 200 ml/min (0.053 gallons/min), and water level should be frequently monitored,(approx. once per minute for 5 minutes). Flow rate should be adjusted so that drawdown will not exceed 0.3 ft, or approximately 2 percent of the saturated thickness of low permeability formations, whichever is greater. If historical data from the well indicates there is no drawdown of the aquifer at the higher pumping rate of 500ml/min, then the purge rate can be established at this higher rate.

Groundwater parameters will be monitored in an air-tight flow cell equipped with a YSI-556 multi probe field meter (or equivalent). Field parameters will be monitored every five minutes, a frequency established to ensure a full volume change of water in the flow cell. Parameter based criteria include three consecutive readings that meet the following:

Temperature:	± 3% RPD
Conductivity:	± 3% RPD
pH:	± 0.1 pH unit
ORP:	± 10% RPD or ± 10 mV

- DO:	± 10% RPD or ± 0.1 mg/L if < 2mg/L (± 0.3 when < 1.0)
- Turbidity:	< 10 NTU or ± 10% RPD if > 10 NTU

If these parameters have not stabilized after one hour, the sample may be collected and a note will be made in the field book or on the field data form.

Standard Purging Approach

Initially, groundwater withdrawal should occur no more than three to five feet below the water surface. If the recovery rate of the well is faster than the pump rate and no observable drawdown occurs, the pump should be raised until the intake is within one foot of the top of the water column for the duration of purging. If the pump rate exceeds the well recovery rate, the pump will have to be lowered as needed based upon the amount of drawdown.

An adequate purge is normally achieved when three to five times the volume of standing water in the well has been removed. After three well volumes have been removed, if the chemical parameters have not stabilized according to the criteria given below, additional well volumes may be removed. If the parameters have not stabilized within five volumes, it is at the discretion of the project manager whether or not to collect a sample or to continue purging. If a sample is taken after five volumes and the field parameters have not stabilized, this situation will be noted in the field book.

Considering groundwater chemistry, an adequate purge is achieved when the pH, specific conductance, and temperature of the groundwater have stabilized and the turbidity has either stabilized or is below 10 Nephelometric Turbidity Units (NTUs). In very silty formations, the turbidity stabilization criteria given above may be impossible to reach and should be disregarded. Other parameters such as salinity, dissolved oxygen, and oxidation reduction potential also may be important criteria for stabilization, especially under low flow purging. Stabilization occurs when parameter measurements are within 10 percent between two readings spaced approximately one well volume apart, or under low flow purging, between two readings determined in project planning documents. A water quality meter fitted with a flow through cell, which allows continuous monitoring of the above parameters is recommended for these measurements.

Attempts should be made to avoid purging wells to dryness, as previously described. However, even with slow purge rates, a well may be purged dry. In those cases, this constitutes an adequate purge and the well can be sampled when recovery is sufficient (enough volume to fill the sample containers). Recovery criteria are often cited as 80 percent of the original well column height. The maximum recovery time prior to sampling should be 24 hours.

Well Purging Using a Bailer

Necessary equipment:

- Bailer (Disposable Bailer preferred), Peristaltic Pump, or Electric Submersible Pump
- Nylon Rope
- Water Quality Meter

- Water Level Meter
- Field Sampling Data Sheet
- Field Log

Procedures:

1. Be aware of Safety. Wear appropriate PPE as prescribed by the Health and Safety Plan.
2. Locate the desired monitoring well using a current Site Map if necessary. Note the following information in the Field Log Sheet (**Attachment A**): date, time, well identification number, ambient weather conditions, name of sampling personnel, purge method and equipment, and any other field observations such as well box condition, standing water, etc.
3. Remove well box cover, lock, and well cap. Measure depth to water with a water level meter (see SOP-024). This meter will sound a tone when the probe interfaces with water. Measure this depth; record this depth in the Field Log Sheet.
4. Calculate the total volume of standing water within the well casing, using the following equation: ([Depth of well in feet] – [Depth to water surface in feet]) x (0.653 for 4-in. diameter wells, or 0.163 for 2-in. diameter wells). This calculated value is the number of gallons representing one well volume.
5. Calibrate specific conductance, pH, and temperature meter(s) prior to beginning fieldwork.
6. Begin to remove water from the well. When using a bailer, care must be taken to avoid excessive agitation of the well water that could result in the loss of volatile constituents. When using a pump, factors such as screened interval and the well yield will determine the most efficient pump placement. In neither case should the evacuation rate be great enough to cause the recharge water to vigorously cascade down the sides of the screen.
7. Measure the temperature, specific conductivity, and pH of the first water to be withdrawn from the well. Record these values in the Field Log Sheet.
8. Repeat the measurements at a regular interval of one well volume or less. Record the values in the Field Log Sheet.
9. Continue purging the well until the measured parameters stabilize within 10%, or until approximately three well casing volumes (three times the well volume calculated in Step 4 above) have been removed. At this point, the well is ready for sampling.
10. Samples should be collected in the following order due to volatility; VOCs collected first, followed by semivolatiles, and inorganics
11. Decontaminate all above-referenced equipment if necessary before proceeding to the next well or at day's end. See SOP-014 for procedures regarding equipment decontamination.

5.2.5 Groundwater Sampling

It is important that wells be sampled as soon as possible after purging. If adequate volume is available, the well should be sampled immediately as long as the well has recovered to 80 percent of the original water column height. If not, sampling should occur as soon as the well has recovered sufficiently to provide adequate volume. Specific instructions for the use of sampling equipment are presented in individual work plans.

Low Stress Groundwater Sampling

Sometimes it is desirable to collect representative samples while exerting minimum stress on the water-bearing formation. Typically this is accomplished by limiting the flow rate during sampling to the range of 200 to 500 ml/min (0.053 to 0.132 gallons/min). Sampling flow rate should not exceed the purge flow rate for which water quality indicator parameters stabilized. However, for certain locations a higher pressure may be required to push the sample water through the filter in order to maintain the same flow rate. Sampling equipment must be the same equipment that was used for purging, and should not be moved between purging and sampling activities.

Standard Sampling Approach

As with purging equipment, there are a number of considerations in the selection of sample collection equipment. Furthermore, it is common to use a different device for sample collection than for purging. An example would be to purge with the use of submersible pump and to collect the sample with the use of a disposable bailer.

As discussed previously, consideration should be given to the order in which sample containers are to be filled for various parameter groups. The order should be determined on the basis of parameter sensitivity to volatilization, pH change, or oxidation, and the priority for analytical data in cases where the water volume in the well is less than what is required for analysis. In general, volatile organic compounds are the most sensitive constituents to volatilization so the sample for these parameters should be containerized immediately. Likewise, pH change occurs rapidly in samples that are in contact with air, so pH measurements and the containerization of pH sensitive parameters, such as anions (e.g., nitrate, sulfate), or metals, (e.g., ferrous iron or Fe2+), should also be implemented expeditiously.

5.2.6 Equipment Instructions

This section provides specific instructions for the installation and use of various devices for both well purging and groundwater sample collection, and includes the following equipment:

A. Small diameter (2-inch) electric submersible pump

B. Electrically powered submersible dedicated pump

C. Peristaltic suction pump

D. Bailer

It is recognized that a combination of the procedures may be employed. An example would be the use of a small diameter electric submersible pump for purging and a bailer for sample collection. The specific methods to be used for purging and sampling a well should be outlined in the project-specific planning documents.

A. Small Diameter (2") Electric Submersible Pump

A small-diameter electric submersible pump (Grundfos Redi-Flo2 or equivalent) can be operated with a wide variety of pumping rates such that it is very versatile for both well purging and sample collection. This type of pump can be used in either a dedicated or non-dedicated mode. Collecting groundwater samples from these pumps is only appropriate if approved project-specific planning documents specifically include this technique for collecting samples.

Required Equipment:

- Small diameter electric submersible pump
- Pump shroud (when used in a six-inch or larger well to minimize turbulence, to keep motor cool)
- Tubing of appropriate type and length
- Check valve (optional)
- Electric pump controller with appropriate power plug
- 230 volt, single phase, electric power source, >10 amps
- Tool kit including basic tools, tubing cutters, extra tubing connector bracket, electrical connectors, wire ties, etc.
- Ground fault interrupter (GFI)
- New disposable gloves of appropriate material
- Graduated measuring container
- Water quality monitoring equipment (preferably a flow through cell).

Installation Instructions:

1. Don a new pair of gloves.
2. Assemble the pump, tubing, optional check valve, and electric power cables.
3. Decontaminate equipment and pump (if not dedicated) as outlined in decontamination SOP (SOP-014).
4. Take and record water level.
5. Lower pump slowly into the well, being careful not to contact any surface other than the interior of the well or the plastic sheeting. When lowering the pump be particularly sensitive to areas that suggest drag or problems in the well where the pump could get stuck. If a problem exists do not continue, but discuss ways to investigate with PM or senior technical personnel.
6. Place the pump intake as discussed previously and monitor the pump discharge and well hydraulics as discussed previously.

Purging Instructions:

1. Refuel the electric generator if used at a location that is remote from the well, being very careful not to spill any fuel on equipment or clothing that will be used at the well site.

2. Place the gasoline-powered compressor if used as far from the well as possible in a down-wind direction to eliminate potential exhaust impact to sampling.
3. Don a new pair of gloves after handling the generator.
4. Connect to electric power.
5. Determine the volume of water to be purged, as described previously.
6. Start the pump.
7. Direct the pump discharge to the graduated measuring container and determine the pumping rate.
8. Collect purge water into appropriate containers.
9. Continue pumping until the necessary volume of water has been purged from the well.
10. If the pump intake has been placed deeply down into the water column for some reason, slowly withdraw the pump upward through the water column while it is still running to purge all water standing above the pump unless the pump will be used for sample collection.
11. Shut off the pump rapidly whenever the pump stops pumping water.
12. Monitor indicator parameters as discussed previously.

Sampling Instructions:

1. Allow the well to recharge after completion of purging, if necessary.
2. Resume pumping and adjust the pumping rate to the slowest possible rate, if necessary.
3. Collect the samples by pumping directly into each of the required containers.
4. Bottles should be filled as outlined in project-specific planning documents. Care should be taken to ensure that no head space remains in the volatile organic vials. Certain other parameters may also require minimizing headspace (e.g., reduced or ferrous iron).
5. Filtered samples can easily be obtained by installing an in-line, 0.45 µm disposable cartridge filter directly onto the pump discharge.

B. Electrical Powered Submersible Dedicated Pump

The Pumpback Well system consists of 11 dedicated electrical submersible pumps. Since the pumps run frequently it is necessary to monitor parameters for stabilization or to follow purge procedures.

Purging Instructions:

1. Drive to well.
2. Open valve box lid.
3. Don new gloves.
4. Open check valve to begin purging.

5. Purge until discharge tube water is relatively clear.
6. Take parameter reading.

Sampling Instructions:

1. Collect the samples by pumping directly into each of the required containers.
2. Bottles should be filled as outlined in project-specific planning documents. Care should be taken to ensure that no head space remains in the volatile organic vials. Certain other parameters may also require minimizing headspace (e.g., reduced or ferrous iron).

C. Peristaltic Suction Pump

A peristaltic pump can be used to purge shallow, small diameter wells at a low to modest rate. The lift capacity is very limited with these pumps and often exceeded at groundwater depths of greater than 20 to 25 feet (depending upon pump size). This type of pump is normally used with dedicated tubing. Peristaltic pumps can also be used for sample collection for parameters that are not pH or pressure sensitive. Collecting groundwater samples from these pumps is only appropriate if approved project-specific planning documents specifically include this technique for collecting samples.

Required Equipment:

- Peristaltic pump, electric powered 12 VDC.
- 12 VDC power source, such as a sealed motorcycle battery or connection to vehicle battery.
- 3/8" to 1/2" PE, PP, or Teflon® tubing of appropriate length.
- 5/8" OD, 3/8" ID medical grade silicone tubing. Do not attempt to use Tygon® tubing.
- New disposable gloves of appropriate material.
- Graduated measuring container.
- Water quality monitoring equipment (preferably a flow through cell).

Installation Instructions:

1. Don a new pair of gloves.
2. Replace the silicone tubing in the pump head if the pump will be used for sample collection.
3. Lower the tubing into the well, being careful not to contact any surface other than the interior of the well or the plastic sheeting.
4. Place the intake of the tubing as high in the well as possible but deep enough that it will not break suction.

Purging Instructions:

1. Connect the tubing to the pump.
2. Determine the volume of water to be purged, as described above.

3. Start the pump.
4. Collect purge water into container.
5. Direct the pump discharge to the graduated measuring container and determine the pumping rate.
6. Continue pumping until the necessary volume of water has been purged from the well.
7. If the pump intake tubing has been placed deeply down into the water column for some reason, slowly withdraw the tubing upward through the water column while it is still running to purge all water standing above the bottom intake.
8. Dispose of the tubing after use.
9. Monitor indicator parameters as discussed previously.

Sampling Instructions:

1. Allow the well to recharge after completion of purging, if necessary.
2. Resume pumping and adjust to a slow pumping rate, (approximately 100 ml/min) if the pump is equipped with a speed control.
3. Collect the samples by pumping directly into each of the required containers.
4. Bottles should be filled in order or as outlined in project-specific planning documents. Care should be taken to ensure that no head space remains in the volatile organic vials. Certain other parameters may also require minimizing headspace (e.g., reduced or ferrous iron).
5. Filtered samples can easily be obtained by installing an in-line, 0.45 μm disposable cartridge filter directly onto the pump discharge.

D. Sampling Monitoring Wells with a Bailer

Procedures:

1. Bailers used for well evacuation can be constructed from a number of materials, including Teflon, stainless steel, polyvinyl chloride (PVC), and polyethylene. Polyethylene bailers will be the preferred bailer.
2. Prior to commencement of field activities, field personnel shall review the appropriate Site Safety Plan and all applicable SOPs.
3. Review all pertinent sampling information.
    - Well to be sampled.
    - Sampling methodology.
    - Requested analysis.
    - Calculate approximate amount of purge water to be collected.
    - Type of sample containers needed for the sampling event.
4. Obtain coolers, trip blanks, field blank water, ice, filters and preservatives.

5. Locate the line to be used when lowering the bailer into the well. Nylon rope/cord should be used. The rope/cord used for bailing should be new or dedicated to the monitor well to be sampled.
6. Bailers should be checked for cracks and breaks that could cause sample and bailer loss, or operator contamination. Ensure that new clean rope/cord is used and is cut to the appropriate length according to the casing depth of the well.
7. The retrieval line should be securely attached to the bailer. If using nylon rope/cord, ensure that the bailer is secured by tying a knot.
8. The free end of the retrieval line should be secure to avoid losing the bailer in the well.
9. It is important that the bailer is lowered into the screened section of the well to ensure that a sample is collected which is representative of the water flowing through the casing.
10. Disturbance of the ground water sample should be avoided since excessive agitation of the sample results in aeration. This disturbance can be minimized by carefully lowering the bailer into the well (not dropping it), and by using a bailer that can be fitted with a bottom-emptying device.
11. Once presample purging is complete, sampling may begin. Wear a pair of clean, surgical-type disposable gloves during sampling.
12. Steadily remove the bailer while keeping the rope/cord from touching the ground.
13. Fill the appropriate sample bottles. Allow water to flow gently down the side of the bottle with minimal entry turbulence. If a bottom-emptying devise is not available, obtain the sample by gently pouring from the top of the bailer, avoiding excessive agitation.
14. Samples should be obtained in the following order due to volatility; VOCs collected first, followed by semi VOCs, and inorganics.
15. The samples requiring preservation of 4°C should be cooled down with ice cubes. Loose ice may be used when samples need to be rapidly cooled before shipping.
16. If filtering and/or preservation is required, include a notation on the CoC instructing the laboratory to filter and/or preserve samples upon receipt. Alternatively, a vacuum-pump filtration device fitted with a disposable 0.45 μ fiber filter can be used as long as it is not constructed from materials that may interfere with the analyses.
17. Before leaving the sampling location, cross check the samples collected with those requested and note any discrepancies.
18. Prior to sampling another site and to prevent cross contamination of equipment between locations, thoroughly decontaminate all equipment that is not dedicated or disposable.
19. Verify that the CoC is appropriately completed per SOP 802. Indicate any special instructions in the Remarks Section of the CoC. Such instruction may include filtering and preserving the sample upon receipt.

QA records:

- Logbooks
- Chain-of-Custody forms

5.2.7 Field Measurements

The final determination of pH, specific conductance, and temperature should be made immediately upon collection of the samples. It is preferred that these parameters be measured continuously using a water quality meter coupled with a "flow through" cell. Alternately, these measurements would be made in an aliquot contained in a disposable plastic cup.

5.3 Field Records

Accurate field records must be maintained to document groundwater sampling activities. These records include technical field data, sample identification labels, and chain-of-custody information for each sample. These records are described in detail in the following sections, and discussed in the Field Documentation and Sampling Handling SOPs.

Specifically for groundwater sampling, the field sampling records (Field Logs) should include, at a minimum, the following information:

- Sampling location
- Date and time
- Condition of the well
- Static water level (depth to water)
- Calculated well volume
- Purging method
- Actual purged volume
- Sample collection method
- Sample description
- Field meter calibration data
- Water quality measurements
- General comments (weather conditions, etc.)

All data entries should be made using black indelible ink and should be written legibly. Entry errors should be crossed out with a single line, dated, and initialed by the person making the correction.

5.4 Sample Shipment

Shipment of samples to an analytical laboratory is usually required upon completion of sample collection. Proper packaging is necessary in order to protect the sample containers, to maintain the samples at or below a temperature of 4°C, and to comply with all applicable transportation regulations. See the Environmental Sample Handling SOP (SOP-010) for further details.

6.0 QUALITY ASSURANCE/QUALITY CONTROL

In order to assess the accuracy and precision of the field methods and laboratory analytical procedures, quality assurance/quality control (QA/QC) samples are collected during the sampling program according to the project Work Plan and QAPP. QA/QC samples may be labeled with QA/QC identification numbers or fictitious identification numbers if blind submittal is desired, and are sent to the laboratory with the other samples for analyses. The frequency, types, and locations of QA/QC samples are specified in the project QAPP or Work Plan. Examples of QA samples include, but are not limited to, equipment rinsate blanks, field blanks, trip blanks, filter blanks, duplicate samples, and matrix spike/matrix spike duplicate samples.

6.1 Equipment Rinsate Blanks

An equipment rinsate blank is intended to check if decontamination procedures have been effective and to assess potential contamination resulting from containers, preservatives, sample handling and laboratory analysis. Procedures for collection are as follows:

1. Rinse the decontaminated sampling apparatus with deionized water. Allow the rinsate to drain from the sampling apparatus directly into the sample bottle or into a secondary container which is then poured into the sample bottle.
2. Add any preservatives associated with the sample analytical methods to the rinsate sample.
3. Specify (on the COC) the same analytical methods for rinsate samples as is specified for the groundwater samples.
4. Assign the rinsate sample an identification number and label as rinsate samples.
5. Place the rinsate sample in a chilled cooler and ship it to the laboratory with the other samples.

An Equipment Rinsate blank sample will be collected for every 20 samples (or less) each day samples collected using equipment is used.

6.2 Field Blanks

Analyses of field blanks are used to assess the contamination of samples during sample collection. Field blanks are prepared at a sampling location by pouring certified analyte-free water provided by the laboratory into a preserved container. The field blank sample should be analyzed by the same methods as the groundwater sample. An identification number shall be assigned and recorded in the log book which groundwater sample location the field blank was prepared at. A field blank will be collected and analyzed for every 20 investigative samples that are collected.

6.3 Trip Blanks

Trip blanks are volatile organic samples that are prepared in the laboratory using analyte-free water. Trip blanks are analyzed to assess VOC contamination of samples during transport and are used only when VOCs are suspected and being analyzed in the groundwater samples. One trip blank (three 40 ml vials) will be included for each cooler that contains samples for VOC analysis. At no time should the trip blanks be opened by field personnel.

6.4 Filter Blanks

Filter blanks are used to assess potential contamination introduced during the field filtering of samples from the filter media and are applicable only if the sampling event requires filtering of water samples. Filter blanks are collected by passing certified analyte-free reagent water provided by the laboratory through a clean filter similar to that used during the sampling event and from the same filter batch provided by the supplier. The collected filter blank sample shall be analyzed by the same methods as the groundwater samples. A minimum of one filter blank should be collected during each sample event for each batch of filters used.

6.5 Duplicate Samples

Duplicate samples are collected to assess the precision of field and laboratory components of field samples. When collecting a duplicate groundwater sample, the original and duplicate sample containers should be filled simultaneously, or as close to simultaneous as possible, by moving the discharge tubing or bailer back and forth over each container until they are full. Alternatively, the sample could be collected in one larger container, mixed, and split into the original and duplicate samples. This method will give a more representative split but also is more likely to introduce contamination if the larger container is reused and is therefore not preferred.

To maximize the information available in assessing total precision, collect duplicate samples from locations suspected of the highest contaminant concentration. Use field measurements, visual observations, past sampling results, and historical information to select appropriate locations for duplicate analyses.

The duplicate sample is handled and preserved in the same manner as the primary sample and assigned a sample number, stored in a chilled cooler, and shipped to the laboratory with the other samples. Whenever possible, the sample identification numbers for the characteristic sample and its duplicate are independent such that the receiving laboratory is not able to distinguish which samples are duplicates prior to analysis.

One duplicate sample shall be collected per 10 (or less) investigation samples.

6.6 Matrix Spike/Matrix Spike Duplicate Samples

An extra volume of sample media may be collected during the sampling event for performance of matrix spike (MS)/matrix spike duplicate (MSD) analyses by the laboratory to assess laboratory accuracy, precision, and matrix interference. Following shipment of the samples to the laboratory, the laboratory prepares MS and MSD samples by splitting the material into three separate sets of containers and spiking the split samples with appropriate analytes prior to performing the extraction in order to evaluate the total of the spiked compound and whatever quantity of the compound may be present in the sample. Results of the analyses are compared with the results of the primary sample and the known concentrations of the spike compounds. The percent recovery and relative percent difference are calculated and results are used to evaluate the precision and accuracy of the analytical method for various labeled "extra volume samples for MS/MSD." The sample volumes required for these analyses should be coordinated with the laboratory and are described in the project Work Plan.

At least one set of MS/MSD samples will be analyzed per 20 (or less) samples received.

7.0 REFERENCES

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8.0 ATTACHMENTS

Attachment A - Groundwater Sampling Checklist

Attachment B – Groundwater Sampling Form

ATTACHMENTS

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Attachment A. Groundwater Sampling Checklist

Planning

Preparatory Field Activities

☐ Perform well maintenance check.
☐ Prepare clean work area.
☐ Determine the depth to groundwater (±0.02 ft).
☐ Calculate the water volume standing in the well (±2%).

Well Purging

☐ Place purging device at proper depth to ensure complete purging of well (if device is not also used for sample collection).
☐ Purge well, following previously selected strategy.
☐ Handle and dispose of purge water using previously determined method.

Well Sampling

☐ Collect groundwater sample.
☐ Fill containers and made field determinations in order of decreasing sensitivity to volatilization and/or pH change.
☐ Fill all other sample containers.
☐ Record all technical data.
☐ Maintain chain of custody records.
☐ Pack and ship samples to prevent breakage, to maintain sample temperature of 4°C and to comply with Dangerous Goods regulations.

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Attachment B. Groundwater Sampling Form

BROWN AND CALDWELL

GROUNDWATER SAMPLING FIELD DATA

WELL NUMBER: ________________

PROJECT: ______________________ PERSONNEL: ____

JOB NUMBER: ___________________________ TASK: ____

Weather Conditions: ☐ Sun ☐ Partly Cloudy ☐ Cloudy ☐ Rain ☐ Snow ☐ Windy Temperature: ____________ °F

Date/Time: _______________ Other: ____

Casing: Diameter (inches) ______

Type: ☐ Stainless Steel ☐ PVC ☐ Other ___________________________

Intake Screen: ☐ Stainless Steel ☐ PVC ☐ Other _______________________

Elevation at top of Riser __________ ft.

Depth to Static Water Level __________ ft.

Depth to Product Level __________ ft.

Elevation of Static Water Level __________ ft.

Depth to Well Bottom __________ ft.

Feet of Water in Well __________ ft.

Calculated Volume of Water in Well __________ gal. 0.65 gal/ft 4" diameter, 0.167 gal/ft 2" diameter

Measurement Datum: ☐ Top of Inner Casing ☐ Procasing

Other ________________________________

Concrete Pad/ Condition: ____

Number of Well Volumes Purged _______________

Purge Method: ☐ Bladder Pump ☐ Bailer ☐ Sub Pump Other: ____________________________

Materials: Bailer/Pump ☐ Teflon ☐ SS ☐ PVC ☐ PE Other: ____________________________

Cord/Tubing ☐ Teflon ☐ Polypropylene ☐ Nylon Other: ____________________________

Pumping Rate ____________ gal./m

Elapsed Time ____________ Hrs:min

Volume Purged ____________ gal.

Well Purged Dry? ☐ Yes ☐ No

Purging Equipment

☐ Dedicated ☐ Disposable

☐ Field Cleaned

Time Series Data

Instruments: YSI 650 MDS/600XL Hanna 93703-11

Time	______	______	______	______	______	______
Volume (gal)	______	______	______	______	______	______
Temp (C)	______	______	______	______	______	______
pH (SU)	______	______	______	______	______	______
COND (µmhos/cm)	______	______	______	______	______	______
DO (mg/L)	______	______	______	______	______	______
ORP (mV)	______	______	______	______	______	______
Turbidity (NTU)	______	______	______	______	______	______

Materials: ☐ Bladder Pump ☐ Bailer ☐ Sub Pump

Other: ________________________

Date: ___________ Time: ___________

(Date and time should correspond with time on sample bottle)

Sampling Method:

Bailer/Pump ☐ Teflon ☐ SS ☐ PVC ☐ PE Other:________________________

Cord/Tubing ☐ Teflon ☐ Polypropylene ☐ Nylon Other:________________________

Sampling Equipment: ☐ Dedicated ☐ Disposable ☐ Field Cleaned

Metals Field Filtered? ☐ Yes ☐ No

Filtering Method: __________________

Filter Size: ______________ micron

Duplicate Collected? ☐ Yes ☐ No

Duplicate Name/Time: ________________________

Number of Bottles Filled: ___________

Comments ____

____

____

THIS SAMPLE WAS COLLECTED AND HANDLED IN ACCORDANCE WITH APPLICABLE
REGULATORY AND CORPORATE PROTOCOLS

________________________________ ______________

SIGNATURE DATE

SOP-024

Monitoring Well Water Level Measurement

Ordot Dump Post-Closure Facility

Standard Operating Procedure

Revision 2

Revision Date: September 20, 2021

SOP-024

MONITORING WELL
WATER LEVEL MEASUREMENT

TABLE OF CONTENTS

1.0 OBJECTIVES

The objective of this standard operating procedure (SOP) is to provide the methods to be used for the consistent measurement of groundwater elevations in Site monitoring wells.

2.0 SCOPE AND APPLICABILITY

This procedure is intended for the field acquisition and documentation of monitor well water level data, measured as the depth-to-water from a surveyed reference point elevation. Groundwater levels may be monitored continuously using electronic data loggers and pressure-sensitive transducers, or obtained manually, with a water level indicator or steel surveyor tape, at a prescribed frequency (e.g., weekly, monthly, or quarterly).

During a field investigation, groundwater levels may be obtained in association with monitor well development, purging and sampling, or aquifer testing. Successive measurements of groundwater levels over time in association with a long-term monitoring program may be used to assess seasonal and/or diurnal fluctuations, as well as the effects of any pumping wells on groundwater flow direction and gradient.

3.0 RESPONSIBILITES

The *Project Manager* is responsible for ensuring that groundwater measurements are implemented in accordance with this SOP and any other site-specific or project specific planning documents.

The *Field Personnel* are responsible for understanding and implementing this SOP during all field activities, as well as obtaining the appropriate field logbooks, forms and records necessary to complete the field activities.

The *Site Safety Officer (SSO)*, typically the supervising field manager, is responsible for overseeing the health and safety of employees and for stopping work if necessary to fix unsafe conditions observed in the field.

4.0 DEFINITIONS

Hydrograph: A plot of monitor well water level elevation versus time.

Potentiometric surface: The level to which water will rise in a cased well under atmospheric pressure conditions.

Reference Point: Survey marker at the top of the well casing, or other selected point, at which a water level is to be measured from.

5.0 REQUIRED MATERIALS

Planning for a groundwater level monitoring event entails assessing, selecting, and testing the types of equipment and supplies necessary to perform the scope of work. Listed below are the basic types of equipment and supplies used for the measurement of water levels.

5.1 Manual Measurement

The following materials are necessary for performing manual groundwater measurements.

- Water-level indicator (two-wire electrical sounder or conductivity meter), equipped with a sufficient length of cable to reach the deepest anticipated water level; the cable should be graduated into 0.01-foot intervals.
- Extra batteries for the water level indicator.
- Decontamination supplies (e.g., Alconox or other nonphosphate detergent, deionized or distilled water, brush, plastic bucket, clean spray bottles, paper towels, clean plastic sheeting) used for decontamination of the water level indicator, interface probe and cable, or steel tape.
- Keys for locked protective casings.
- Tools (e.g., wrenches), as needed, to enter well vault boxes.
- Health and safety monitoring equipment.

5.2 Continuous Measurement

The following materials are needed for conducting continuous measurements of groundwater levels.

- Electronic data logger (with the appropriate number of channels, a function of the number of wells to be monitored simultaneously).
- Water level indicator, (as described above).
- Pressure-sensitive transducers, including one barometric pressure transducer, that are compatible with both water quality and anticipated pressure-sensitivity range in a given well if total pressure measurements are made. (Note that some data loggers, e.g. Hermit 3000, have an internal barometric gauge). Alternatively, vented pressure-sensitive transducers can be used. Typically, vented transducers eliminate the need for a barometric pressure transducer; however, depending on study objectives, vented transducers may or may not be applicable. Also, transducer cables graduated into 0.01-foot intervals, if available.
- Decontamination supplies (as described above).
- Keys for locked protective casings.
- Tools, as needed, to enter well vault boxes.
- Health and safety monitoring equipment.

6.0 PROCEDURES

Groundwater level measurements in monitor wells shall be obtained manually using a two-conductor, battery-powered water level indicator (e.g., electrical sounder or conductivity meter) or steel surveyor tape. Continuous water level measurements, made in association with aquifer testing activities, may be obtained using an electronic data logger and pressure transducers (e.g., an In Situ Inc. Hermit, coupled with pressure transducer(s), Troll, or equivalent device).

6.1 Preparation for Monitoring Well Water Levels

In preparation for a monitoring event, the geologist/environmental engineer shall review the site-specific planning documents to obtain the following information:

- the identification number(s) of the well or wells to be monitored
- the locations of the wells as shown on a site map
- records listing the most recent water level measurements for the well(s) (if available)
- well access requirements (e.g., permission of owner, locked gates, locked wells, road conditions)
- reference point information (e.g., elevation of casing, location of reference point)
- the types of equipment needed to perform the scheduled monitoring activity
- calibration requirements for the equipment (if applicable)
- health and safety considerations, as appropriate.

A well monitoring form or similar form shall be used to record groundwater level measurements and supporting information. In addition, fluid level measurements should be recorded in a bound field notebook.

6.2 Review of Existing Data

The geologist/environmental engineer may elect to prepare a hydrograph with the groundwater level data available for each well (or update an existing hydrograph) prior to going to the field. A hydrograph provides a visual record of groundwater level fluctuations over time. A hydrograph can be useful to identify any water level measurements that appear anomalous due to changes in conditions (e.g., a groundwater level rise due to a rainfall event or events, or a drop in water level due to initiation of pumping at a nearby well).

If groundwater levels are obtained at a regular frequency (e.g., monthly or quarterly), the geologist/environmental engineer may plot groundwater elevation contour maps based on the data obtained during each monitoring event at a given site. Changes in the interpretation of the potentiometric surface configuration may be readily observed when the contour maps are compared, and may be indicative of a change(s) in conditions in the hydrogeologic regime.

6.3 Well Inspection

Prior to obtaining a water level in a given well, its condition shall be inspected. Any signs of vandalism, unauthorized entry, or settlement and/or ponding around the well surface completion shall be noted.

6.4 Manual Water-Level Measurement

Prior to measuring depth to water, the well cover shall be removed and left off for at least three minutes prior to conducting measurements. Indications of air movement in or out of the well should be noted.

The probe of the electric water level indicator shall be lowered into the riser casing until water is encountered, as indicated by the instrument signal. The water level is then measured with respect to the "top-of-casing" reference point and entered on the field log. Two additional water level measurements shall be made to verify the initial reading obtained. It is good practice to visually inspect the measuring tape/probe to insure that it is not missing sections and the numbers are accurate. A periodic measurement of electric water level indicators using a measuring tape also is good practice.

The water level measurement shall be compared to the most recent water level obtained for the well (if any). If the measurements differ by more than 0.5-foot, the depth to water shall be measured a second time for verification purposes. A remark shall be made on the field log if a probable cause for the discrepancy is known (e.g., tidal fluctuation, rainfall event, or start-up of a nearby pumping well).

As indicated in Section 8, field measurements of water levels for a given well shall be recorded on the field form including the following information:

- the type of measurement device used
- date and time of the measurement
- any pertinent remarks concerning the well condition, instrument malfunction, variation of the sounded depth versus the installed depth of the well, etc.

A weighted steel tape can be used to sound the total depth of the well. Any discrepancy between the total well depth as compared to the constructed well depth shall be noted as a remark on the form; such a discrepancy may indicate the presence of a possible obstruction or break in the casing or sedimentation at the bottom of the monitor well. Use of an interface probe or electronic water level meter to sound the total depth of a monitor well should be avoided because of the difficulty in decontaminating the instrument cable.

6.5 Continuous Water Level Measurement

Continuous water level data may be required for certain field investigation activities such as aquifer testing. Electronic data loggers and transducers are typically used for continuous water level measurement.

6.5.1 Equipment Installation

An electronic data logger may be installed in one well with one transducer cable or may be connected to additional transducer cables that simultaneously monitor up to 15 additional nearby wells (the maximum transducer cable length currently available from one manufacturer [*In situ*, Inc.] is 4,500 feet). Standard transducer cables are made of polyurethane and are available for rental or purchase; however, Teflon cables are also available for purchase and rental.

If the data logger is not equipped with an internal barometer or vented pressure transducers are not being used, one of the transducers used should be a barometric pressure transducer. If a barometric pressure transducer is not available, a barograph may be used to gage changes in barometric pressure during the monitoring event that might impact water level measurements.

The electronic data logger and transducer cables shall be installed by the geologist/environmental engineer in accordance with the manufacturer's instructions. The data logger may be placed near a well or mounted on a post (if mounted on a post, the data logger shall be housed in a protective cabinet). A transducer cable shall be lowered into each well to be monitored and secured with plastic tie strips to the riser casing or protective well casing. The cable shall be positioned such that it does not interfere with closing and locking of the wells protective casing; also, the cable shall be positioned such that it is not pinched. If transducer cables are extended over areas that are heavily trafficked or mowed, they should be buried in a 6-inch-deep trench or strung through small-diameter, polyvinyl chloride (PVC) casing for protection. If cables are buried, their respective locations shall be flagged with survey laths and colored surveyor tape.

6.5.2 Equipment Calibration

Pressure transducers are available which require no field calibration (e.g., In-Situ Inc. PXD-260). If fluctuations in water level are anticipated over a range of less than 23 feet, a transducer rated at 10 pounds per square inch (psi) is appropriate. If a greater range of water level fluctuation is anticipated, the manufacturer's representative should be consulted as to the transducer psi rating required. Periodic manual measurement of water levels shall be performed as a check on the water level data recorded by a data logger.

7.0 QUALITY ASSURANCE/QUALITY CONTROL

To promote consistency of data, water level measurements in a given well should be obtained with the same measuring device as used during previous monitoring events.

As a Quality Assurance/Quality Control (QA/QC) check on the accuracy of water level indicator measurements, the water level in a well may be obtained using a steel tape and carpenter’s chalk. Measuring water levels with a steel tape graduated to 0.01-foot is considered the most accurate method for obtaining water levels. Verification of data obtained with an electronic data logger shall be obtained by periodic (e.g., hourly or daily) manual water level measurement.

8.0 RECORDS

The geologist/environmental engineer shall submit copies of water and/or water/product levels forms to the Project Manager or designate immediately following the monitoring event for checking and revision purposes. The Project Manager or designate shall review and transmit the completed forms for incorporation into the project file.

9.0 REFERENCES

ASTM D 4750-87. 1988. Standard Test Method for Determining Subsurface Liquid Levels in a Borehole or Monitoring Well (Observation Well).

United States Environmental Protection Agency. 1986. RCRA Groundwater Monitoring Technical Enforcement Document, OSWER-9950.1.

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10.0 ATTACHMENTS

None

SOP-026
Pre-sample Purging and Sampling of Low Yielding Monitoring Wells

Ordot Dump Post-Closure Facility
Standard Operating Procedure

Revision 2
Revision Date: September 20, 2021

SOP-026
PRE-SAMPLE PURGING AND SAMPLING OF LOW YIELDING MONITORING WELLS

TABLE OF CONTENTS

1.0 OBJECTIVE

To provide well purging (evacuation) and sampling techniques that will obtain representative samples from wells that yield less than three well-casing volumes of water.

This procedure is applicable to sampling groundwater monitoring wells that are completed in low-yielding aquifers, which produce less than three well casing volumes prior to sampling.

2.0 DEFINITIONS

Low-Yielding Monitoring Well: A groundwater monitoring well completed in an aquifer having low hydraulic conductivity, and thus having a limited capacity to transmit water. If the well is purged at a constant flow rate, either the screened interval or the pump intake will be exposed to the air prior to the removal of three well-casing volumes.

3.0 PROCEDURES

To remove stagnant water from the well casing prior to sampling, standard well sampling protocol is to purge three times the volume of water standing in the well casing (well-casing volumes) from the well prior to sampling. Preferably, this should be done without lowering the water level in the well below the screened interval, to prevent water from cascading down the screen, possibly volatilizing constituents of interest. However, the sustainable flow rate of some wells is so low that it is impossible to avoid drawing the water level into the screened interval. This SOP describes procedures to minimize problems inherent in sampling low yielding wells, and it provides consistency in sampling such wells.

1. Prior to beginning field activities, all applicable SOPs and Site Safety Plans should be reviewed by field personnel. Current copies of all relevant documents shall be retained in the sampling vehicle at all times.
2. Review all pertinent sampling information.
    - Well to be sampled
    - Requested analysis
    - Estimated amount of purge water to be collected, and where and how it will be treated
3. Well specification information:
    - Type and size of pump
    - Casing depth and diameter
    - Screened interval
    - Discharge rate
4. Obtain appropriate data collection forms
5. Obtain the number and type of sample containers needed for the sampling event. The type of analysis for which a sample is being collected determines the type of bottle, preservative, holding time, and filtering requirement.

6. Check supplies (i.e., disposable 0.45 µ fiber filters, trip blanks, field blanks, plastic bags, etc.).
7. Purging Techniques:
    - Initial field measurements should be taken from the first available water as soon as purging begins. Field parameter measurements consist of temperature, pH, turbidity, dissolved oxygen, and specific conductance. Once the initial field parameters have been measured a discharge rate should be calculated. Regardless of the type of purging device used, the intent is to cause the least disturbance possible to the aquifer during the purging process.
    - Take a second set of field parameter measurements (temperature, pH, dissolved oxygen, and specific conductance) halfway through the removal of the first well volume.
    - After removing 90% of the first well-casing volume, take a third set of field parameters just prior to sample collection. A fourth set (three additional measurements) of field parameter measurements need to be obtained at 2- to 3-minute intervals immediately following the third set of measurements and prior to sample collection for wells sampled under the Resource Conversation and Recovery Act (RCRA) guidelines.
    - Purging a well to dryness should be avoided, if at all possible. Samples should be collected after removing one well-casing volume. If purging a well to dryness cannot be avoided then follow procedures below.
8. Dry Out Criteria. If purging a well to dryness cannot be avoided then follow procedures below.
    - The preferred method of sampling wells that fit the “dry out” criteria is to purge a minimal amount of water prior to sampling using low-volume purge techniques.
    - Exposing the screened interval is to be avoided.
    - The discharge rate should be reduced to permit the recording of as many parameter measurements as possible, prior to sampling.
    - If a well is purged to dryness, determine the amount of water purged from the well after discharge has ceased.
    - Once the well has been purged measuring the water level and calculating the volume of water remaining in the well casing should monitor dry well recovery.
    - When a well goes dry prior to sample collection, field parameters should be measured before collecting the sample.
9. Sampling procedures should be followed as closely as possible. Ideally, all samples for the analysis of volatile compounds should be obtained within 2 hours of purging the well dry. It is acceptable to obtain these samples within 2 hours, allowing additional well recovery for any remaining samples for nonvolatile analysis. If sampling is split between recovery periods, field measurements should be obtained after each recovery period.

10. If insufficient water is available to obtain the samples for volatile analysis, the well should be monitored approximately every 2 hours until sufficient water is available for sampling. If sufficient water is still not available for sampling at the end of the work day, samples should be obtained immediately the next morning, providing water is available. If there is still insufficient water available for sampling, the 2-hour monitoring schedule should be resumed until enough water is available for sampling.
11. All purging rates, number of times purged, field measurements, and well recovery monitoring should be recorded in the field log.

4.0 QUALITY ASSURANCE RECORDS

- Logbooks
- Chain-of-Custody forms

5.0 REFERENCES

Barcelona, M. J., J. P. Gibb, J. A. Helfrich, and E. E. Garske (1985), Practical Guide to Ground Water Sampling, U.S. EPA, Washington, D.C. (EPA-600/2-85/104).

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SOP-030
Sampling Monitoring Wells with a Bailer

Ordot Dump Post-Closure Facility
Standard Operating Procedure

Revision 2
Revision Date: September 20, 2021

SOP-030

SAMPLING MONITORING WELLS WITH A BAILER

TABLE OF CONTENTS

1.0 PURPOSE

To obtain a representative sample of the ground water from monitor wells using a bailer. This procedure applies to all field personnel using a bailer to purge and/or collect groundwater samples from a monitoring well.

2.0 PROCEDURES

1. Bailers used for well evacuation can be constructed from a number of materials, including Teflon, stainless steel, polyvinyl chloride (PVC), and polyethylene. Polyethylene bailers will be the preferred bailer.
2. Prior to commencement of field activities, field personnel shall review the appropriate Site Safety Plan and all applicable SOPs.
3. Review all pertinent sampling information.
    - Well to be sampled
    - Sampling methodology
    - Requested analysis
    - Estimated amount of purge water to be collected
    - Type of sample containers needed for the sampling event.
4. Obtain coolers, trip blanks, field blank water, ice, filters and preservatives.
5. Locate the line to be used when lowering the bailer into the well. Nylon rope/cord should be used. The rope/cord used for bailing should be new or dedicated to the monitor well to be sampled.
6. Bailers should be checked for cracks and breaks that could cause sample and bailer loss, or operator contamination. Ensure that new clean rope/cord is used and is cut to the appropriate length according to the casing depth of the well.
7. The retrieval line should be securely attached to the bailer. If using nylon rope/cord, ensure that the bailer is secured by tying a knot.
8. The free end of the retrieval line should be secure to avoid losing the bailer in the well.
9. It is important that the bailer is lowered into the screened section of the well to ensure that a sample is collected which is representative of the water flowing through the casing.
10. Disturbance of the ground water sample should be avoided since excessive agitation of the sample results in aeration. This disturbance can be minimized by carefully lowering the bailer into the well (not dropping it), and by using a bailer that can be fitted with a bottom-emptying device.
11. Once pre-sample purging is complete, sampling may begin. Wear a pair of clean, surgical-type disposable gloves during sampling.
12. Steadily remove the bailer while keeping the rope/cord from touching the ground.

13. Fill the appropriate sample bottles. Allow water to flow gently down the side of the bottle with minimal entry turbulence. If a bottom-emptying devise is not available, obtain the sample by gently pouring from the top of the bailer, avoiding excessive agitation.
14. Samples should be obtained in order of volatility; VOCs collected first, followed by semi VOCs, and inorganics.
15. The samples requiring preservation of 4°C should be cooled down with ice cubes. Loose ice may be used when samples need to be rapidly cooled before shipping.
16. If filtering and/or preservation is required, include a notation on the CoC instructing the laboratory to filter and/or preserve samples upon receipt. Alternatively, a vacuum-pump filtration device fitted with a disposable 0.45 μ fiber filter can be used as long as it is not constructed from materials that may interfere with the analyses.
17. Before leaving the sampling location, cross check the samples collected with those requested and note any discrepancies.
18. Prior to sampling another site and to prevent cross contamination of equipment between locations, thoroughly decontaminate all equipment that is not dedicated or disposable.
19. Verify that the CoC is appropriately completed. Indicate any special instructions in the Remarks Section of the CoC. Such instruction may include filtering and preserving the sample upon receipt.

3.0 QUALITY ASSURANCE RECORDS

- Logbooks
- Chain-of-Custody forms

4.0 REFERENCES

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SOP-031
Chain-of-Custody

Ordot Dump Post-Closure Facility
Standard Operating Procedure

Revision 2
Revision Date: September 20, 2021

SOP-031
CHAIN-OF-CUSTODY

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1.0 PURPOSE

This SOP is designed to provide guidelines for proper chain-of-custody procedures. The intent of the defined chain-of-custody procedures is for the sample to arrive at the analytical laboratory with the chain-of-custody intact.

2.0 NECESSARY EQUIPMENT/SUPPLIES

- Chain-of Custody Form (Attachment A)
- Waterproof Pen

3.0 PROCEDURES

The field procedures are as follows:

1. Sample labels will be affixed to the sample containers prior to sample collection.
2. Sample bottles will be labeled with the sample description (number), sample location, date and time of sampling, preservatives used, and relevant comments.
3. Samples are considered under custody if they are in the sampler's or custodian's possession, in their view in a sealed container to prevent tampering, or in a designated secure area.

Transfers of custody and shipment procedures are as follows:

1. A properly completed chain-of-custody form accompanies samples (e.g., See Attachment A). The chain-of-custody form will contain the following information:
    - Project Name and Address
    - Contact Name & Phone No.
    - Sampler's Signature
    - Invoice - Name & Address
    - Report – Name & Address
    - Sample Date & Time
    - Sample ID
    - No. of Containers
    - Sample Media
    - Analysis Requested
    - Comments & Special Instructions
    - Relinquished Signature, Date & Time
    - Received By Signature
2. When transferring the possession of samples, the individuals relinquishing and receiving will sign, date, and note the time on the record.

3. Samples will be properly packaged for shipment and dispatched to the appropriate laboratory. Shipping containers will be secured with tape and custody seals for shipment. The custody seal will be covered with clear tape to prevent tearing during shipment.
4. The chain-of-custody record identifying the contents will accompany shipments. The original record will accompany the shipment and the duplicate copies) will be retained by the sampler.
5. Whenever samples are split with a source or government agency, a separate sample receipt is prepared for those samples and marked to indicate with whom the samples are being split. The person relinquishing the samples to the facility or agency should request the representative’s signature.