APPENDIX

Documents cited in footnotes 35 through 54 of the CBG Critique of the Navy's Draft Five Year Review for the Hunters Point Naval Shipyard Superfund site that are not otherwise publicly available are attached in this appendix.

EVENT MEMO

FROM:	Elizabeth Adams, Division Director, Superfund and Emergency Management Division, Region 9
CC:	OLEM
SUBJECT:	Dr. Waterhouse visit to Hunters Point Naval Shipyard – Day 2
EVENT DATE:	12/9/2021
LOCATION:	Virtual/In-person 75 Hawthorne Street, San Francisco, CA 94105
ATTIRE:	Business Casual

I. STATEMENT OF PURPOSE

U.S. Environmental Protection Agency Deputy Assistant Administrator Carlton Waterhouse is visiting San Francisco December 8-9, 2021 to engage with the local government, the Navy, and our state Federal Facility Agreement (FFA) partners at the Hunters Point Naval Shipyard to discuss how to address challenges already identified. Dr. Waterhouse will be accompanied by senior officials at the Navy, the California Department of Toxic Substances Control (DTSC), the California Department of Public Health (CDPH), and the CalEPA San Francisco Bay Area Regional Water Quality Control Board (Water Board). The Region and OLEM have involved the Navy in planning the agenda.

Today's agenda begins with a briefing from EPA's Office of Superfund Remediation and Technology Innovation (OSRTI) on radiological cleanups at Superfund sites. This will be followed by a more in-depth discussion on the Navy's radiological retesting efforts for current, onsite buildings. Then, we will travel to the site for the Navy to provide a site tour, targeted on current remediation efforts, radiological retesting work on Parcel G, and the soil stockpile in front of Building 101 (HP Shipyard Artists). After lunch, Dr. Waterhouse has another meeting commitment. At that time, senior management will have a discussion on how to work together more effectively and efficiently. If confirmed, we will then have a discussion with District 10 Supervisor Shaman Walton. Next, we will hear from the Navy about its strontium-90 soil results and path forward for reanalysis. We will end the day with a wrap-up meeting with the FFA partners and CDPH.

II. PARTICIPANTS

Main EPA Participants:

- Dr. Carlton Waterhouse, OLEM Deputy AA
- Greg Gervais, HQ FFRRO Director
- Silvina Fonseca, HQ OLEM Senior Policy and Technical Advisor
- Jonathan Tso, HQ FRRO Physical Scientist
- Elizabeth Adams, R9 SEMD Director
- Angeles Herrera, R9 SEMD Assistant Director
- John Chesnutt, R9 SEMD Section Manager
- Yolanda Sanchez, R9 OPA Communications Lead

Main Navy Participants:

- James Balocki, Principal Deputy Assistant Secretary for Energy, Installations and Environment
- Karnig Ohannessian, Deputy Assistant Secretary of the Navy for Environment
- Laura Duchnak, Base Realignment and Closure (BRAC) Program Director

Main State Participants:

- Nelline Kowbel, DTSC, Chief, Northern California Site Mitigation Division
- Patrice Bowen, Acting Deputy Director for the Office of Environmental Equity
- Anthony Chu, CDPH, Chief, Division of Radiation Safety and Environmental Management
- Phyllis Flack, SF RWQCB, Engineering Geologist, Groundwater Protection & Waste Containment Division

EVENT MEMO

SUBJECT:	**EPA/Navy/State Meeting on EPA's Radiological Cleanups at Superfund Sites**
EVENT DATE:	12/9/2021
TIME:	8:30 AM
KEY CONTACT:	Elizabeth Adams, 415-972-3183

I. STATEMENT OF PURPOSE

This will be an EPA presentation on our radiological cleanups at Superfund sites across the country to the Navy and State representatives.

II. KEY POINTS

- This meeting will focus on Goal 1: Moving forward together on the site.
- Our colleagues from the Office of Superfund Remediation and Technology Innovation (OSRTI) will provide the presentation.

III. BACKGROUND

- The HPNS radiological investigation and cleanup work has many challenges. There are a limited number of radiological Superfund site examples to pull lessons learned.
- The California Department of Public Health (CDPH) has a different regulatory framework than EPA for radiological investigation and cleanup work. CDPH reviews data to decide if the site is significantly different than "background."
- The Navy specifically requested this presentation.

IV. PARTICIPANTS

New EPA Participants:

- Dana Stalcup, OSRTI, Deputy Director
- Brigid Lowery, OSRTI, Director, Assessment and Remediation Division
- Schatzi Fitz-James, OSRTI, Deputy Director, Assessment and Remediation Division
- Stuart Walker, OSRTI, Superfund National Radiation Expert
- David Hockey, FFRRO, Acting Deputy Director
- Mary Cook, FFRRO, Senior Program Manager
- Wayne Praskins, R9, Remedial Project Manager

V. TALKING POINTS

- I understand you would like us to discuss how we approach radiological cleanups and setting cleanup goals at our other Superfund sites.
- There are a limited number of radiological superfund sites to compare the work at Hunters Point Naval Shipyard to. What makes Hunters Point even more challenging is that the buildings should be remediated to accommodate a residential future use.
- We don't have any other site in which we are required to ensure that a radiologically impacted building will be safe for residential use.
- My staff from our Federal Facilities and Superfund Headquarters offices can give you further details.

EVENT MEMO

SUBJECT:	**EPA/Navy/State Meeting on Radiological Retesting of Buildings**
EVENT DATE:	12/9/2021
TIME:	9:30 AM
KEY CONTACT:	John Chesnutt, 415-972-3005

I. STATEMENT OF PURPOSE

This is a meeting between EPA and the Navy to discuss the radiological retesting for current, onsite buildings at HPNS. Our colleagues from the Department of Toxic Substances Control (DTSC) and the California Department of Public Health (CDPH) may engage.

II. KEY POINTS

- Last week, Navy contractors mobilized at the site to prepare the first six of about 26 radiologically impacted buildings planned for retesting.
- EPA does not agree with the Navy that their planned retesting methods are sensitive enough to demonstrate that the buildings are appropriate for future residential use.
- The Navy has stated it plans to proceed with the retesting unless EPA directs the Navy to stop work. As of December 3, Navy contractors continue to make preparations to begin testing. We understand that testing may begin as early as next week.
- Last week, the Navy management noted it looks forward to discussing EPA's proposed path forward to do a "pilot test" of the minimum detection concentrations (MDCs).

III. BACKGROUND

The Navy intends to transfer the property with onsite buildings in place. There are about 26 radiologically impacted buildings that need radiological retesting. The building radiological remediation goals were initially determined based on real-time scanning technology in the 1970's described by an Atomic Energy Agency guidance document. Today's real-time scanning technology can achieve lower levels, as can laboratories. In 2018, EPA asked the Navy to evaluate the protectiveness of the remediation goals. EPA's recent evaluation, using the BPRG calculator, suggests that the Navy's remediation goals are not protective, and the Navy's planned testing is not sensitive enough to demonstrate that the buildings will be safe for residential use.

In 2021, the conversation between EPA and the Navy evolved and is now focused on the appropriate detection levels for the radiological building scans. Collecting the right data will

allow us to compare results to levels determined by using EPA's BPRG method and verify the safety for future residents.

In August 2020, EPA told the Navy we cannot concur with the Navy's conclusions that the current radiological building remediation goals (RGs) remain protective of human health. We provided reasons why we were unable to concur. Over the following 8 months, we worked with the Navy to better understand its risk estimation using the Navy's preferred method- "RESRAD BUILD".

In September 2021, the Navy requested EPA to develop MDCs to be used during retesting, if we were not satisfied with the approach described in the Navy's workplan. In October, we provided the Navy with MDCs developed using the BPRG calculator. These MDCs reflect a number of protective assumptions and are much lower than the Navy's planned MDCs. In November, the Navy declared it would not implement EPA's proposal and announced its plans to proceed with the building retesting using less sensitive testing methods (unless EPA directs the Navy to stop work). In a November 24 letter to the Navy, we recommended the Navy pilot test the sensitivity of the equipment and measurements.

Last week, the Navy noted it looks forward to discussing EPA's proposed path forward to do a "pilot test" of the MDCs.

Navy's concern: EPA is asking that the Navy test for radiological materials at levels that are more stringent than the Nuclear Regulatory Commission (NRC) standards met by NRC licensees. This might create precedence for the Navy's environmental program. It may also impact the costs and timeline of the fieldwork. You may hear the Navy refer to the NRC standards as the "industry standard." For over a year, the Navy has made unsubstantiated claims that lower detection limits are not technically feasible and are below background for building materials.

IV. PARTICIPANTS

New EPA Participants:

- Dana Stalcup, OSRTI, Deputy Director
- Brigid Lowery, OSRTI, Director, Assessment and Remediation Division
- Schatzi Fitz-James, OSRTI, Deputy Director, Assessment and Remediation Division
- Stuart Walker, OSRTI, Superfund National Radiation Expert
- David Hockey, FFRRO, Acting Deputy Director
- Mary Cook, FFRRO, Senior Program Manager
- Wayne Praskins, Remedial Project Manager (for radiological retesting efforts)

VI. TALKING POINTS

Opening Talking Points:

- I understand our teams have been in a multi-year discussion on how to demonstrate that the current, onsite buildings are safe for families to occupy in the future. As you know, most of the radiological remediation goals are from a 1974 Atomic Energy Commission guidance.
- Recently, the Navy asked EPA to determine minimum detection concentrations for the radiological testing at these buildings. We provided that information in October, based on detection limits necessary to verify exposure assumptions both agencies are making in our risk modeling. I understand your management team has rejected our proposal and has chosen to mobilize contractors for this work despite our lack of agreement on the testing approach.
- This back-and-forth between our agencies over the last three years has been closely followed by local leaders, the mayor's office, and key congressional offices, as well as the public. It is time to come to a solution that ensures protection of public health and provides public confidence.

Potential Talking Points During Discussion:

- I strongly encourage the Navy to implement EPA's proposal to pilot test the measurement sensitivity. This will provide us with site-specific data to help us resolve this matter, whether informally or through the Federal Facilities Agreement (FFA) dispute resolution process.
- I also urge the Navy to continue discussion with the Office of Community Investment and Infrastructure (OCII) and the developer, FivePoint on which of these buildings have development potential. Building demolition could help save time and protect public health. We believe they may be content with the Navy choosing to demolish many buildings, and building demolition is consistent with the remedy defined in the Record of Decision.
- We cannot support the Navy's current retesting approach. EPA is considering initiating a formal dispute as outlined in our FFA. Formal dispute resolution provides a clear process with set timelines and facilitates the engagement of higher levels of management. But we think that conducting the pilot testing will give both EPA and the Navy valuable information that may help resolve some of the current disagreements.

EVENT MEMO

SUBJECT:	**HPNS Site Tour**
EVENT DATE:	12/9/2021
TIME:	10:30 AM
LOCATION:	HPNS
ATTIRE:	Business Casual
KEY CONTACT:	John Chesnutt, 415-972-3005

I. STATEMENT OF PURPOSE

The Navy will lead a site tour, specifically focusing on the soil stockpile at Building 101 and UC-2, ongoing remediation work at Parcel E-2, and Parcel E, and ongoing radiological retesting efforts on Parcel G.

II. KEY POINTS

- This meeting will focus on Goal 1: Moving forward together on the site.
- Opportunity for Navy senior management to see buildings, field work and soil pile at building 101.

III. PARTICIPANTS

New Navy Participants:

- Patricia McFadden, Navy Base Closure Caretaker Manager

IV. SEQUENCE OF EVENTS

- The Navy will pick up Navy and EPA participants at the EPA Region 9 building (75 Hawthorne) between 10:00 – 10:15 am.
- The team will drive to the former shipyard to participate in a Navy-lead tour.

EVENT MEMO

SUBJECT:	**EPA/Navy/State Meeting on General Project Management**
EVENT DATE:	12/9/2021
TIME:	1:30 PM
LOCATION:	Virtual/In-person 75 Hawthorne Street, San Francisco, CA 94105
KEY CONTACT:	John Chesnutt, 415-271-1052

I. STATEMENT OF PURPOSE

This meeting will be with senior management at EPA, Navy, and State representatives to explore ways to improve and streamline communications and the project management of HPNS work.

II. KEY POINTS

- This meeting will focus on Goal 1: Moving forward together on the site.
- This meeting is currently scheduled at a time when Dr. Waterhouse is in another meeting. Regional and FFRRO EPA senior management can introduce topics.
- HPNS site work is extremely challenging and stressful, esp. given the nature and complexity of contamination, long-standing community concerns, and redevelopment pressures. While EPA, the State, and the Navy (BRAC Cleanup Team) have had significant success over the years (e.g., the project has executed over $1 billion in investigation and cleanup and almost all RODs are in place – see attachment for more recent successes), EPA and the State are increasingly at odds with the Navy over many project elements, resulting in increased frustration amongst the staff and project delays.
- The tension between the Navy and the regulatory agencies is becoming more visible, frustrating local agencies, the community and developers who expect results from the government, esp. when the tension appears to impact timelines and therefore community development potential.
- EPA believes the tension with the Navy can be improved through senior management intervention to ensure a shared commitment to review project staffing and project management approaches, and to ensure joint team building to better align us all to work together strategically to accomplish our shared goals.

III. BACKGROUND

EPA, California Department of Toxic Substances Control (DTSC), and the San Francisco Regional Water Quality Control Board (SF RWQCB) provide oversight to the Navy on its investigation and cleanup work at the site. Over the years, EPA staff have raised concerns about the quality of overall project leadership and the deliverables provided to the regulatory agencies for review and comment. The Navy is investing a number of staff and contract resources to support project management – it has over 8 project managers assigned, an overarching support contractor, and has spent over $1 billion to date on investigation and cleanup work. Yet, the agencies and the Navy (BRAC Cleanup Team) seem increasingly at odds over project management and other elements.

Examples of project management challenges include:

- **Project staffing/quality of documents:** It's critical at this challenging, high profile project that the appropriately trained and experienced staff are placed in key positions and are not spread too thin. EPA routinely reviews documents or elements of documents submitted by Navy contractors that do not appear to have been adequately reviewed by the Navy and/or do not represent the best that the Navy can do. EPA had previously suggested the Navy transmit a cover letter summary of the document noting their endorsement of the contents of the document before providing it to EPA and the State for review. Another solution could be to reject poor quality documents, rather than starting a failed review process (a suggestion by FFRRO and FFEO). Systematically utilizing template documents developed in concert with regulatory agencies to increase efficiency of producing and reviewing documents. Additionally, in terms of staffing, we have stressed the importance of hiring a skilled, trained professional to lead the Navy's community involvement efforts. That would not only help the CI program, but free the Navy lead RPM up to focus on project management.
- **Unproductive BRAC Cleanup Team (BCT) meetings:** BCT meetings occur monthly and are meant to be the primary forum for project coordination, adjusting schedules, and developing strategies to move issues along. Meetings are attended by up to 30 people from multiple agencies. These meetings have lost the function for which they were intended, discussions have become adversarial, and parties often evade real dialogue and problem solving. Last year, the EPA management team decided to join these monthly meetings and initiated its own monthly management calls with the Navy to help oversee project management. These efforts have somewhat helped. However, the Navy, EPA, and the State need to put more effort into advance planning and agenda-building to make the BCT meetings and the overall project more successful. Some solutions include: the Navy identifying a meeting facilitator who is not a Navy RPM; the Navy providing planning

documents for these meetings with at least a week of notice; and the BCT to revisit the goal and purpose of these meetings.

- **Federal Facility Agreement (FFA) roles and responsibilities:** All parties need to respect each other's roles relative to the FFA. While the Navy is the lead agency for executing the work, EPA and the State play key roles in the review and comment of documents. The regulatory agencies are feeling their concerns are becoming more and more marginalized. Where EPA and the State identify deficiencies, we don't always have to agree, but the Navy needs to work to address our concerns before producing draft final and even final documents. EPA and the State have avoided using the FFA's formal dispute resolution provision, but we are moving towards using it as the Navy is more frequently finalizing documents and pushing to close out sites without adequately resolving agency comments. This has caused issues in various projects, including: Parcel B IR Site 26 with mercury in the groundwater discharging to the Bay; Parcel E-2 Landfill with a built slurry wall that was not installed per the remedy design; Parcel C where an aquifer was not adequately characterized for contamination; and the ongoing base-wide PFAS preliminary investigation effort where after multiple attempts to press the Navy to consider doing adequate investigations of possible PFAS areas, the Navy is only proposing to sample at just 1 of 159 potential PFAS areas.
- **Radiation retesting workplans:** The State has already issued an informal dispute on the Navy's second soil radiological retesting workplan. This informal dispute is due to a number of inconsistencies with the first radiological retesting workplan, additions made between the draft and draft final workplan, and unaddressed comments from the regulatory agencies on both the draft and draft final additions. The first radiological workplan was intended to be a template for the remaining parcel workplans, to allow for efficient forward movement. It would be best if the Navy could ensure consistency between the workplans before sharing with the regulatory agencies.
- **Dust management/air monitoring:** It's concerning to EPA and a challenge to the public to understand the Navy's approach to dust management and air monitoring. The Navy currently has at least four dust/air monitoring projects, which leads to inconsistent action levels across the site, some of them not focused on community members as a receptor. Moreover, EPA had to press the Navy for over a year to obtain adequate meteorological equipment. We all have to do everything necessary to protect this community, especially as Bayview-Hunters Point suffers from the worst air quality in San Francisco.

TALKING POINTS

- The work here is challenging. Each of our agencies are investing significant resources. However, one of the themes I've heard from stakeholders is that people feel that the government is holding up progress on the cleanup, impacting the development potential for this community. People view the Navy, EPA, and the State as not working together to move this project forward.
- I realize we may not always agree on paths forward, but I believe there is always room for improvement, and I am hopeful we can work together to provide a vision to our teams to work collaboratively to move this project forward (recognizing and respecting each other's roles under the FFA) and find ways to appropriately communicate the progress and challenges to the public.
- Some areas for project management improvement, some of which have been highlighted in other discussions the last two days, include:
    - Earlier this year, EPA and Navy senior managers discussed a strategic team-building session between the FFA team to help discuss project management challenges and better align us to work together strategically to accomplish our shared goals. Let's ensure this is scheduled within the next three months. Let's also ensure the Navy resources this critical discussion appropriately for a productive meeting, such as an outside meeting facilitator.
    - Project Staffing: I recognize the resources the Navy as well as the agencies have put towards this project are enormous and represent a serious commitment, but I would like to seek a shared commitment to review project staffing to ensure those resources are used as efficiently and effectively as possible, including whether the appropriately trained/experienced staff are assigned to this significant project.
        - One area we already discussed is whether the Navy could have a dedicated public participation lead (who has the training in strategic communications, plain language, risk communication, cultural competency, and communications). That would also free up the Navy's lead RPM, who currently oversees CI and communications, to focus on overall project management.
        - EPA staffing: we appreciate Navy support for the radiation program and would not be able to keep up without it. However, EPA's own level of FF resources also impacts our ability to keep up on the non-rad side, as the Navy has witnessed this year. I would like to explore whether funding support in this area is also possible.

- BRAC Cleanup Team (BCT) meetings: I'm hearing the regular BCT meetings are attended by as many 30 people and have lost much of their effectiveness relative to their originally intended purpose. The Navy, EPA, and the State need to put more effort into advance planning and agenda-building to make the BCT meetings more successful. It would also be helpful if the Navy could provide a facilitator to help with this and run the meetings. Hopefully the team-building event can discuss this.

- Deliverables quality and the review process: I encourage you to meet with the Navy HPNS Site management to brainstorm approaches to ensure appropriate Navy review of contract deliverables before sending them to the regulatory agencies. When a contractor deliverable is not fully reviewed in advance of sending to the agencies, it puts further stress on the FFA review timelines and process. By example:

    - We expected the radiological retesting workplans would follow the parcel G workplan template to allow for future efficiencies- both for the Navy and the regulatory agencies. It would be best if the Navy could ensure consistency between the workplans before sharing with the regulatory agencies. We are spending significant effort on the subsequent review of Parcel B and C workplans that are not in sync with the Parcel G workplan agreements.

- Dust management/air monitoring: As we have discussed already, I'd like the Navy to consider a truly base-wide air monitoring and dust controls strategy that is focused on the community as potential receptors. The current approach is not as effective or efficient for any of us and does not serve the community well.

Attachment- Recent Successes:

EPA, the State, and the Navy have had some success working together at HPNS:

- **Phased sampling approach for radiological retesting:** A few years ago, EPA and our State partners worked diligently with the Navy to lay out a scientifically driven soil radiological retesting strategy. Working closely with statisticians, we designed an approach to protect public health (to ensure a high confidence the soil retesting will meet the cleanup goals) while allowing the Navy to use a phased approach which saves time and money.

- **Soil Background Study**: The Navy, EPA, and State worked cooperatively to establish scientifically defensible site-specific background values for radiological contaminants that occur naturally or may be present due to non-site activities. Background values help determine the amount of remediation needed. Establishing background values was challenging due to the wide range of fill materials used to create the shipyard and decades of construction and remediation.

- **Dust/air monitoring for radiological retesting:** The Navy and EPA worked through differences to develop a more community-based dust/air monitoring approach for the radiological retesting work at Parcel G. My staff would like to build off this success.

- **Lead-based paint on buildings:** EPA and the SF Water Board worked together with the Navy to bring focus to the issue of lead-based paint chipping off buildings and being released into the San Francisco Bay. Together, we improved the swale maintenance plan and the Navy improved efforts to clean the peeling paint from current, onsite buildings.

- **Risk Management Plan (RMP):** EPA, Navy, and State worked closely with the Office of Community Investment and Infrastructure and its developer to create the RMP, which identifies the requirements to be followed during redevelopment and beyond so the site remedies (e.g., institutional controls, durable cover) remain protective.

EVENT MEMO

SUBJECT:	**Meeting with Supervisor Walton** (*tentative*)
EVENT DATE:	12/9/2021
TIME:	2:30 PM
KEY CONTACT:	Yolanda Sanchez, 415-972-3880

I. STATEMENT OF PURPOSE

This is a meeting with San Francisco District #10 Supervisor Shamann Walton.

II. KEY POINTS

- This meeting will focus on Goal 2: Strategize on regular public communications and renewed community outreach.

III. BACKGROUND

Supervisor Shamann Walton:

- President of the San Francisco Board of Supervisors and represents District 10, which includes the Bayview-Hunters Point neighborhoods.
- Serves on the Board of Directors for the Bay Area Air Quality Management District (BAAQMD).
- Born in San Francisco and lived in public housing at an early age in Bayview and Potrero Hill. He has worked in District 10 neighborhoods for decades. He was also the former Executive Director of Young Community Developers.
- Former president and member of the San Francisco Board of Education, where he helped secure funding for the school district's first African American Achievement and Leadership Initiative and worked at close the achievement gap for Black, Latino, and special needs students.

Supervisor Walton's experience with HPNS:

- Supervisor Walton meets with Navy and EPA staff to obtain updates on the Navy's work at HPNS. He regularly communicates his #1 priority is the safety of the community.

- In 2019, Supervisor Walton and Mayor Breed called for a panel of University of California professors to provide an independent review of the Parcel A health & safety screen by the California Department of Public Health (CDPH) and the Navy's Parcel G radiological retesting work plan. Supervisor Walton took over the facilitation of a contentious January 2020 public meeting where the UC panel presented its conclusions and answered questions from the public.
- In 2020, Supervisor Walton pressed the Navy to pay for soil sampling for radionuclides at Parcel A. Ultimately, he pushed the Office of Community Investment and Infrastructure to perform the elective radiological soil sampling in three blocks it plans to develop.

IV. PARTICIPANTS

New EPA Participants:

- Morgan Capilla, R9 Environmental Justice Team (tentative)

V. TALKING POINTS

- **EPA recognizes the critical importance of redeveloping the former shipyard.** We understand the redevelopment plans will alleviate pressures caused by the ongoing housing crises and provide much needed affordable housing. In addition, it's clear that the city's redevelopment plans will help build wealth and equity in the Bayview Hunters Point community, a community that endures environmental injustices and economic inequities.
- **I also want to acknowledge the frustrations by the halt in redevelopment and the radiological data fraud.** It is indefensible that we are in a situation where we have unreliable radiological data at the site. The Navy must redo years and millions of dollars' worth of contractor work. This situation has rightly frightened and frustrated the community.
- **I do believe we have a shared goal: To redevelop the former shipyard to bring economic benefits to this community in a way that is safe and protective of public health.** Creating beneficial reuse out of formerly contaminated lands is a major priority of President Biden's administration, as well as working to invest our resources in a way that moves toward environmental justice.
- **With that said, there is always room for improvement.** We find opportunities to improve when we learn from locally elected officials. Voices like yours matter. I am pleased we are meeting, as I would like to better understand your perspective, questions, and concerns.

EVENT MEMO

SUBJECT:	**EPA/Navy/State Meeting on Strontium-90**
EVENT DATE:	12/9/2021
TIME:	3:30 PM
LOCATION:	75 Hawthorne Street, San Francisco, CA 94105
ATTIRE:	Business Casual
KEY CONTACT:	John Chesnutt, 415-972-3005

I. STATEMENT OF PURPOSE

The Navy requested that this topic be added to the agenda so we are assuming it will be a Navy-lead meeting with EPA and State representatives to discuss strontium-90 soil results and the Navy's approach to reanalysis at HPNS.

II. KEY POINTS

- This meeting will focus on Goal 1: Moving forward together on the site.
- The Navy requested this meeting be added to the agenda. We expect the Navy to lead this discussion.

III. BACKGROUND

The radiological soil retesting will be completed in two phases. The level of effort in the Phase 2 investigations is dependent on whether any radionuclides are found above the remediation goal in Phase 1. For Phase 1, more than 10% of Navy samples have shown strontium-90 above the remediation goal. (Note: the remediation goal and strontium-90 levels in the samples are much more protective than a 10-6 cancer risk. The remediation goal excludes the garden pathway since there will be a 2-foot cover of clean soil or other durable cover.) The laboratory method used initially in the retesting had a relatively high level of uncertainty. Recently, the Navy updated the laboratory method to decrease uncertainty to increase the precision of the data, which we support.

The Navy also decided to reanalyze previous samples using the improved laboratory method. At this time, EPA is unclear if the planned improvements to the laboratory method justify disregarding the previous results.

The Navy's public communications have not been transparent. When the Navy finally released a public statement about the strontium-90 sampling results, the Navy chose not to present the data. The San Francisco Department of Public Health issued its own statement out of frustration the Navy was holding back information to the public.

Navy's concern: If the Navy must rely on the initial soil sampling results, then it will need to do additional investigations and sampling during Phase 2. This will impact the costs and timeline of the fieldwork. The Navy has, at times, claimed that the strontium-90 results exceeding the remediation goal is consistent with the regional background level for strontium-90. It has also publicly communicated the data uncertainty with the already analyzed results is a major challenge to decision-making.

IV. PARTICIPANTS

New EPA Participants:

- Wayne Praskins, Remedial Project Manager (for radiological retesting)

V. TALKING POINTS

Opening Talking Points:

- I understand the Navy requested this agenda item to discuss the strontium-90 soil results on Parcel G and its plans to reanalyze the previously analyzed samples.
- We look forward in engaging in this important conversation.

Talking Points During Discussion:

- **Change in lab method:** I understand our teams agreed that improvements to the laboratory methods for strontium-90 produces higher quality data. We support the Navy in making this change. And, we support this change being implemented in future workplans.
- **Reanalysis:** The EPA team is unclear on the Navy's plans to reanalyze the new data alongside the old data. As this time, the Navy has not provided sufficient evidence that the original data are unusable, just concerns about the high uncertainty of the data. In the absence of a *strong* justification for rejecting the initial results, or a defensible rationale for changing the approach, it is unlikely that EPA could support using the new data to supersede existing results.
- **Public Communication:** From our colleagues at the San Francisco Department of Public Health, we heard concerns about the time it took for the Navy to provide the public information. I understand the Navy still has not provided the public with the data on the strontium-90 exceedances, even though the Navy communicated it had found exceedances. I understand wanting to properly

understand and verify data but being able to communicate data to the public in a timely manner can help rebuild trust within the community.

- Can you tell me more about how the Navy has improved its strategy to communicate information moving forward?
- Would the Navy consider bringing back its strategic *Radiological Communications Plan* from 2017? I understand this Plan was to work with regulatory and partners agencies to develop public communication messages. This Plan also included tactics to provide visually appealing information and "plain language" to provide data that could be easily understood by the public.
- EPA has stood ready and continues to stand ready to support and coordinate with the Navy on public communication of its radiological retesting efforts. It appears SFDPH is also ready to work together.

- **Casting doubt on the previously analyzed data:** In public communications, the Navy has already started to communicate doubt on its previously analyzed strontium-90 data. If the Navy chooses to disregard data without a technically defensible reason, this decision will likely fuel the public mistrust. The public perception may likely be that the Navy is choosing data to meet its agenda. We simply need a more transparent approach to this.

EVENT MEMO

SUBJECT:	**HPNS Senior Program Manager Meeting/Wrap-up Meeting**
EVENT DATE:	12/9/2021
TIME:	4:00 PM
KEY CONTACT:	Angeles Herrera, 415-972-3144

I. STATEMENT OF PURPOSE

This will be a wrap-up meeting with senior management from the Federal Facility Agreement (FFA) agencies: The Navy, EPA, the Department of Toxic Substances Control (DTSC), and CalEPA CalEPA San Francisco Bay Regional Water Quality Control Board (SF RWQCB or SF Water Board). We will also be joined by senior management of the California Department of Public Health (CDPH).

II. KEY POINTS

- This meeting will wrap-up conversations had over the past two days. Each FFA agency and CDPH will have a chance to provide observations and next steps.
- Review any action items developed during meeting.
- Greg G. and Karnig O. can expand upon the idea of developing a "HP Senior Program Leadership Group."

III. BACKGROUND

- The Navy is the lead agency for HPNS, responsible to perform environmental investigation and cleanup work, as well as community outreach and involvement. The FFA parties review and comment on Navy work plans and other documents.
- EPA, the California Department of Toxic Substances Control (DTSC) and the San Francisco Bay Area Regional Water Quality Control Board (SF RWQCB) are the regulatory agencies providing oversight of the Navy's environmental investigation and cleanup work, under the FFA. DTSC consults with CDPH on the radiological investigation and cleanup activities.
- Recently, EPA and Navy Headquarters began establishing the "HP Senior Program Leadership Group" to help streamline discussions to move forward on challenges.

IV. PARTICIPANTS

EPA Participants:

- Dr. Carlton Waterhouse, OLEM Deputy AA
- Greg Gervais, FFRRO Director
- Elizabeth Adams, EPA R9 SEMD Director
- Silvina Fonseca, HQ OLEM Senior Policy and Technical Advisor
- Angeles Herrera, R9 SEMD Asst. Director
- John Chesnutt, R9 SEMD Section Manager

Navy Participants:

- James Balocki, Navy Dept. Asst. Secretary
- Karnig Ohannessian, Navy Dept. Asst. Secretary
- Laura Duchnak, Base Realignment and Closure (BRAC) Program Director

State Participants:

- Nelline Kowbel, DTSC, Chief, Northern California Site Mitigation Division
- Patrice Bowen (*tentative*), DTSC, Acting Deputy Director for the Office of Environmental Equity
- Anthony Chu, CDPH, Chief, Division of Radiation Safety and Environmental Management
- Phyllis Flack, SF RWQCB, Engineering Geologist, Groundwater Protection & Waste Containment Division

V. SEQUENCE OF EVENTS

- External guests will join the meeting room in-person or through the Teams virtual meeting
- Elizabeth Adams will kick-off the meeting and give a snapshot of the past two days
- The head of each agency will be invited to provide closing remarks
- Dr. Carlton Waterhouse will provide closing remarks

VI. TALKING POINTS

Elizabeth Adams Closing Talking Points:

- It has been an incredibly busy two days.
- We have come together to discuss challenging topics, like how to address the radiological retesting of onsite buildings or the strontium-90 results in onsite soils; how to work together more effectively and efficiently; and how to stretch to better meet the needs of the community.
- We have had insightful discussions with our colleagues at the San Francisco Department of Public Health, the Bay Area Air Quality Management District, and the Office of Community Investment and Infrastructure.
- The Navy lead us on an interesting tour of the site.
- We heard tough perspectives from folks representing the Public Employees for Environmental Responsibility (PEER), the Committee to Bridge the Gap, the Bayview Hunters Point Advocates, and local university professors.
- I am grateful for your time and your contributions over the past two days.

Dr. Waterhouse Closing Talking Points:

- I am incredibly appreciative for all of you taking time out of your busy schedules to join me over the past two days. The discussions on how we can work together to support the Navy's important cleanup project in the Bayview-Hunters Point community have been insightful.
- I understand all of our agencies are investing significant resources to advance this work. I am hopeful we find new ways to invest and discover new approaches to work together to bring the Navy's cleanup efforts to a close.

NAVFAC
Naval Facilities Engineering Command
Base Realignment and Closure Program Management Office West

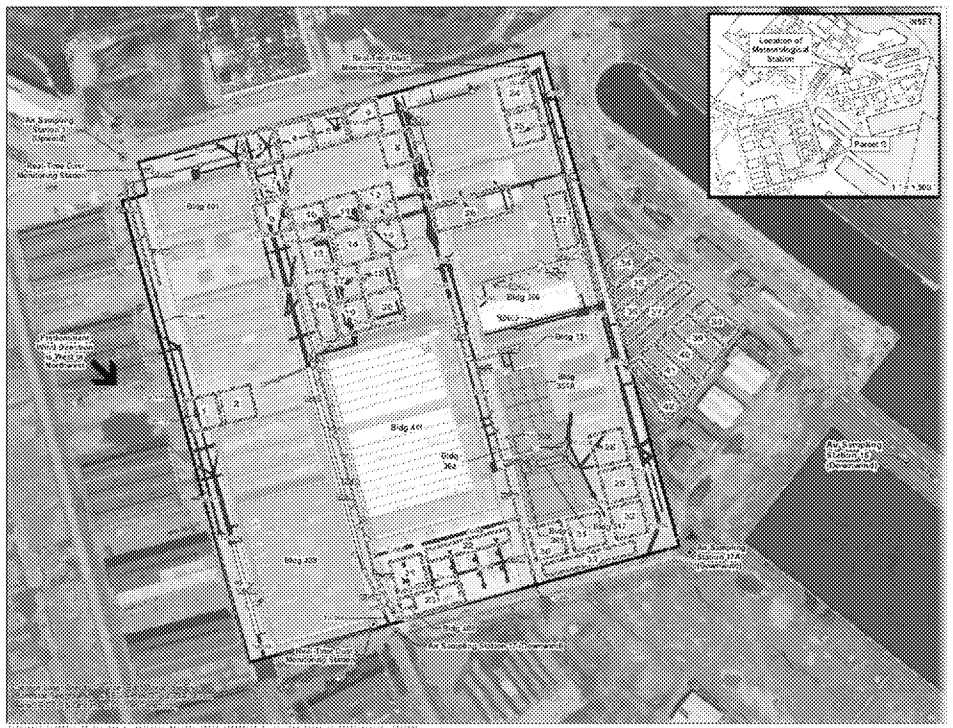
Parcel G & Strontium-90

Hunters Point Naval shipyard
San Francisco, California

4/7/2022

Parcel G Radiological Investigation

What will be tested for ^{90}Sr at Parcel G?



Map of Parcel G Survey Unit and Trench Unit Locations

Radiological Retesting Includes:

- Phase 1 TUs [in yellow]
- Phase 2 TUs [in purple]
- Former Building Site and Crawl Space Area SUs [in blue]

10% of soil samples collected will be analyzed for strontium-90

Initial ^{90}Sr Analysis (EPA Method 905.0)

Why were ^{90}Sr results being re-analyzed?

^{90}Sr analysis was implemented per the Sampling and Analysis Plan for Parcel G. Once preliminary data was available and under review, **the following was observed:**

- Large laboratory total uncertainties in this dataset indicate imprecise measurements and interfere with evaluating very low concentrations
- Higher uncertainties can result in higher false positive rates
- Some Decision Level Concentration (DLC) results were above the recommendation from MARSSIM.
- Additional aliquot analysis for confirmation of ^{90}Sr exceedances were not showing reproducibility of the initial result.
- Samples collected from imported fill, not associated with historical HPNS operations, exceeded the RG, showing that an exceedance is not a de facto indicator of HPNS contamination (could indicate a false positive)

For these reasons the initial data set is unreliable for basing project decisions.

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Initial ^{90}Sr Analysis (EPA Method 905.0)

How can ^{90}Sr analysis be improved?

Based on discussions with the Contractor, the lab, the Navy Technical Team and Regulatory Agencies; **the process for Strontium-90 analysis was improved** under Field Change Request 006 for Parcel G.

These improvements included:

1. Larger aliquot size (2.5 grams, versus 1 gram)
2. Different extraction method (using nitric acid/hydrochloric acid (HNO_3/HCl) digestion and Eichrom Sr resin separation)
3. Full 14-day ingrowth period (stipulated in EPA Method 905.0 for low activity samples)

The goal was to improve the method process to increase precision and accuracy of the results.

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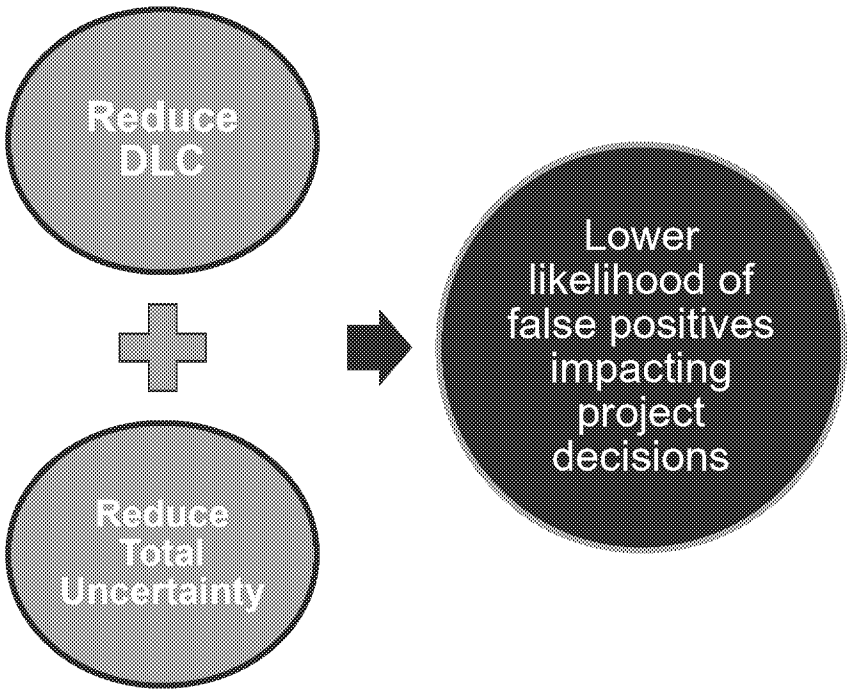
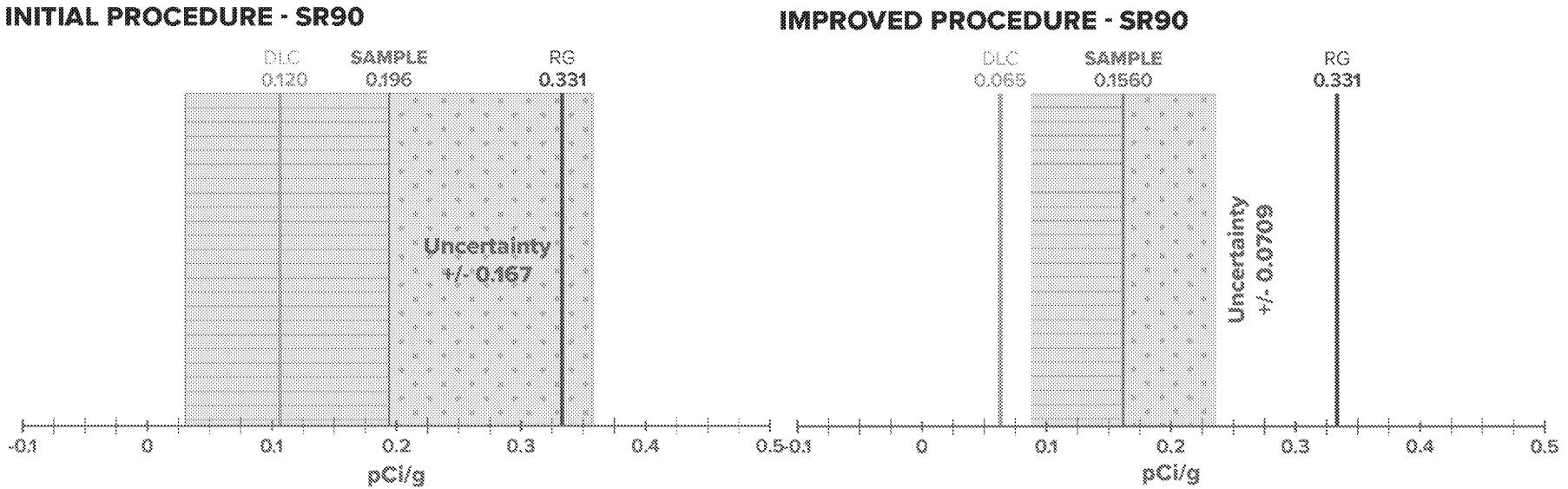
Improved ^{90}Sr Method = Improved Precision and Accuracy

Expectations for improved sample preparation



- Initial results had **high rates of uncertainty and lack of reproducibility,** making them unreliable for decision making.
- The re-analysis of soil samples began in late November 2021 using the improved method process for ^{90}Sr under the Eichrom Method (FCR006)

Eichrom ^{90}Sr Method Improved DLC & Total Uncertainty



LEGEND

RADMACPG_102_1

DLC = Decision level concentration	RG = Remedial goal	Negative uncertainty
	pCi/g = Picocurie per gram	Positive uncertainty

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Eichrom ^{90}Sr Method Interference

- The Navy was notified of several results that exceeded the RG for ^{90}Sr
- Recounts were immediately executed at the lab for results that exceeded the project RG
- Some recount results did not confirm the sample results

- The lab investigated and determined:
  - Low-level Pb-210 interference is causing bias high sample results
  - The lab confirmed the interference by testing a single aliquot for total beta strontium and isotopic ^{90}Sr
    - Results for Total Beta Strontium were below the RG
    - Results for Isotopic ^{90}Sr were consistently higher than the result for Total Beta Strontium, confirming interference under the isotopic ^{90}Sr reanalysis results.

Once an interferent is identified, the data validator can reject the results above the action limit because the interference is not quantifiable for that data point and the sample has to be reanalyzed.

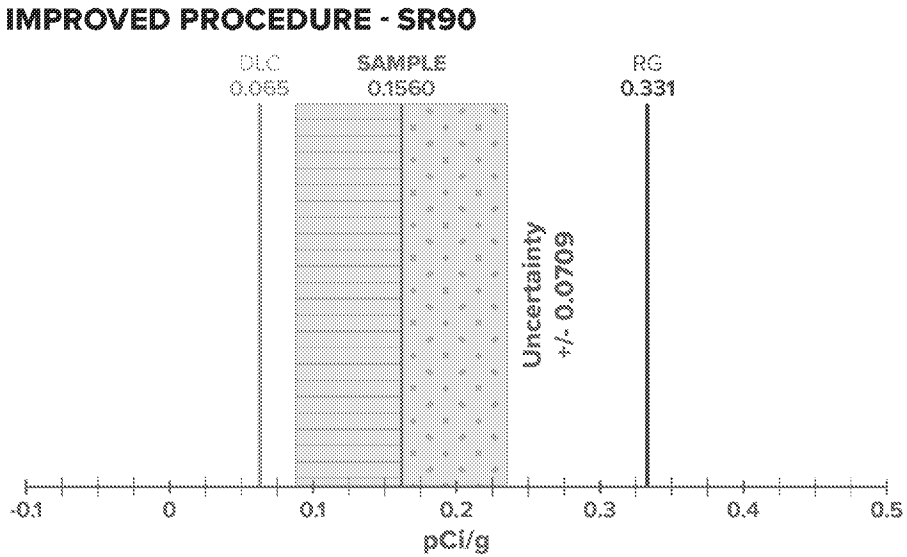
Solution to Eichrom ^{90}Sr Method Interference

- The lab recommended all samples be analyzed for Total Beta Strontium using the Eichrom method
  - Improved DLC and uncertainty are achievable
  - Result is conservative
  - Pb-210 interference is not present
  - Consistent with historical HPNS practices
  - Consistent with other radiological projects

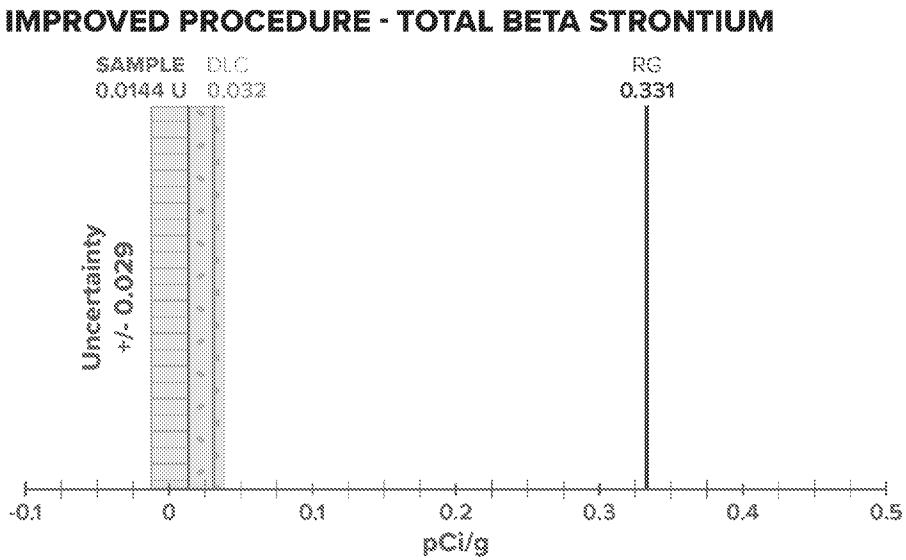
- Isotopic ^{90}Sr can be used to confirm any Total Beta Strontium result that exceeds the project RG
  - The lab has provided a list of improved steps that include additional rinsing of the cartridge through several additional steps to remove the Pb-210 interference

^{90}Sr and Total Beta Strontium Eichrom Comparison

^{90}Sr Eichrom



Total Beta Strontium



LEGEND

DLC = Decision level concentration

RG = Remedial goal

pCi/g = Picocurie per gram

Negative uncertainty

Positive uncertainty

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Breakdown of the Analysis for ^{90}Sr

1. Initial Method EPA 905.0 results had high uncertainty and DLC (imprecise measurements). This data was used to improve the analytical method process.

For the reasons listed on slide 3 the initial data set is unreliable for basing project decisions.

2. ^{90}Sr Eichrom Re-analysis – improved uncertainty and DLC, but resulted in high bias interference due to Pb-210.

Once an interferent is identified, the data validator can reject the results above the action limit because the interference is not quantifiable for that data point and the sample has to be reanalyzed.

3. Total Beta Strontium Eichrom moving forward will improve the uncertainty and DLC, and does not result in Pb-210 interference.

Total Beta Strontium is more conservative, reliable and historically used for radiological projects.

Summary & Schedule

- Improved uncertainty and DLC are achievable under the Total Beta Strontium Eichrom Method.
- Navy will analyze ^{90}Sr samples previously collected using Total Beta Strontium Eichrom method.
- Isotopic ^{90}Sr (Rev. 9) may be used to confirm any Total Beta Strontium result that exceeds the project RG.
- Analysis for Total Beta Strontium under the Eichrom method began March 28, 2022.
- We expect the results for Total Beta Strontium Eichrom Method by end of May 2022.

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Questions?

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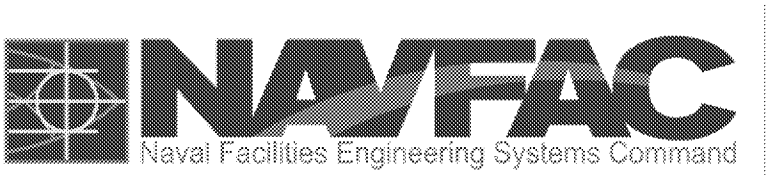

Naval Facilities Engineering Systems Command Southwest
BRAC PMO West
San Diego, California

Draft

Meeting Summary

Base Realignment and Closure Cleanup Team

Hunters Point Naval Shipyard
San Francisco, California

February 3, 2022

Distribution authorized to U.S. Government Agencies only; Premature Dissemination, 03 February 2022, Other requests for this document will be referred to NAVFAC Southwest, 750 Pacific Highway, San Diego, CA 92132-0058

Naval Facilities Engineering Systems Command Southwest
BRAC PMO West
San Diego, California

Draft

Meeting Summary

Base Realignment and Closure Cleanup Team

Hunters Point Naval Shipyard
San Francisco, California

February 3, 2022

DCN: CH2M-0007-4449-0011

Prepared for:

Department of the Navy
Naval Facilities Engineering Systems Command Southwest
BRAC PMO West
33000 Nixie Way, Building 50, Suite 207
San Diego, California 92147

Prepared by:

CH2M HILL, Inc.
San Diego, California

Contract Number: N62470-21-D-0007; Task Order No. N6247321F4449

These notes summarize the Navy Base Realignment and Closure (BRAC) Cleanup Team (BCT) meeting for Hunters Point Naval Shipyard (HPNS) in San Francisco, California. The meeting was held virtually on February 3, 2022.

I. Introductions and Agenda Review

Mr. Derek Robinson (Department of the Navy [Navy]) performed introductions and reviewed the action items from the December 2, 2021, BCT meeting.

II. Navy Business/Action Items (Navy)

The following is a summary of the status of the action items from the December 2, 2021, BCT meeting, provided by Mr. Robinson (Navy):

Item	Description	Status
1	The Navy will set up a call with the BCT regarding the path forward for IR26.	Complete. Meeting held on January 27, 2022.
2	The Navy will resend the BCT Appendix E of the Parcel E-2 Phase II RACSR.	Complete. Sent December 15, 2021.
3	The BCT will email Sean-Ryan McCray their availability for a meeting the week of December 13, 2021.	Complete. Meeting was scheduled and held on December 16, 2021.
4	The Navy will email the BCT an updated Document Tracking Matrix at the beginning of January 2022.	Complete. Sent January 11, 2022.

III. Document Tracking (Navy)

Ms. Brooks Pauly (Navy) noted that Federal Facilities Agreement (FFA) schedule was submitted to the BCT on February 2, 2022, and the Navy is requesting an expedited agency review.

Ms. Pauly noted that the Annual Groundwater Monitoring Report has been submitted as final to the agencies. Additionally, the Draft Remedial Action Work Plan (RAWP) for Parcel C Phase III has been submitted to the agencies for review. The Parcel F documents may be delayed because the meeting with the potentially responsible parties (PRPs) has not yet occurred.

Mr. Paul Stoick (Navy) noted that the radiological heath and safety survey technical memorandum will be delayed until March. There have some been some additional extension requests for the various radiological rework work plans because of extended quality assurance reviews and agency comments on documents.

IV. Fieldwork Updates (Navy)

The Navy presented photographs of fieldwork at Parcels G and E.

Mr. Thomas Macchiarella (Navy) asked the agencies if they would be observing the building scans on Parcel G. Mr. Terry Han (California Department of Public Health [CDPH]) noted that he would be visiting Parcel G on February 3, 2022, along with United States Environmental Protection Agency (USEPA) representative Mr. Wayne Praskins. Mr. Robinson (Navy) also noted that the Tetra Tech observers were also onsite in January.

V. Miscellaneous Topics/Updates (Navy)

Ms. Amy Brownell (City of San Francisco) asked why the Finding of Suitability to Transfer (FOST) dates were not included in the FFA schedule sent to the agencies. Mr. Robinson (Navy) noted that FOSTs are not FFA documents. He noted that the FFA schedule is a snapshot in time and a quick review would be appreciated because extensions will continue to come in while the FFA is in agency review. The FFA schedule captures all the extensions up to a single point in time. As extension requests come in throughout the year, the FFA is updated, and the changes are shown to the agencies via the documentation tracking matrix issued to the BCT each month. Ms. Karen Ueno (USEPA) noted that USEPA may need more time to review the schedule.

Mr. Paul Stoick (Navy) noted that the Navy is re-analyzing strontium-90 samples collected during soil sampling in Parcel G. The Navy has submitted 1,000 samples for re-analysis and have approximately 100 preliminary results back from the laboratory. Four samples had concentrations that ranged from 0.34 to 0.42 picocurie per gram (pCi/g), which were slightly above the remedial goal of 0.331 pCi/g. Those samples were recounted by the laboratory that resulted in three samples below the remedial goal and one sample remaining slightly above. This data has not yet been validated. Mr. Praskins (USEPA) and Mr. Han (CDPH) expressed concerns about not reanalyzing data that were also slightly under the remedial goal and not just the samples over the remedial goal.

VI. Community Outreach (Navy)

Mr. Robinson (Navy) noted that community outreach meetings planned for February were cancelled because of Covid and scheduling issues. The Navy will try to reschedule those meetings with the HPNS artist group and the India Basin Neighborhood. The Navy is planning to present to the Hunters Point Environmental Community Advisory Committee meeting on February 28, 2022.

Ms. Brownell (City of San Francisco) noted that it would be good to have additional conversations in March concerning the virtual community meeting currently scheduled for May 2022.

VII. New Action Items/Future Meetings (Navy)

- The Navy will resend the draft Parcel E radiological rework work plan to the City of San Francisco.

Next Meeting:

- The next BCT meeting is scheduled to be held virtually on March 10, 2022.

Meeting participants:

Nina Bacey, DTSC	Thomas Macchiarella, Navy
Lynn Bailey, USEPA	Hamid Naimi, Navy
Liz Basinet, Barrett Resources Group	Sharon Ohannessian, Navy
Karla Brasaemle, TechLaw	Derek Robinson, Navy

Amy Brownell, City of San Francisco

Ryan Casey, City of San Francisco

John Chesnutt, USEPA

Maeve Clancy, USEPA

Doug Delong, Navy

Wilson Doctor, Navy

Jamie Egan, Jacobs Engineering Group Inc.

Phyllis Flack, San Francisco Bay Water Quality Control Board

Terry Han, California Department of Public Health

Leslie Howard, Navy

Michael Howley, DTSC

Dennis Rourke, Navy

Brooks Pauly, Navy

Wayne Praskins, USEPA

Christina Rain, Langan Engineering & Environmental Services

Liz Roddy, Navy

Radhika Sreenivasan, E2 Consulting

Paul Stoick, Navy

David Tanouye, San Francisco Bay Water Quality Control Board

Karen Ueno, USEPA

Jeff White, San Francisco Bay Water Quality Control Board

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Hunters Point Naval Shipyard Executive Leadership Meeting: March 2022

Meeting Goals: To revitalize the relationship between the Navy, EPA and the State and to continue solution-oriented discussions to advance the environmental cleanup at the Hunters Point Naval Shipyard

Insert logistics here: meeting location, POC for base access, COVID requirements, dial in number/teams link for remote attendees, etc.

Time	Agenda Item	Expectations
8:00	Navy/EPA/State Introductions and Review of Meeting Goals	Update goals as needed. Ensure note taker(s) for action items capture identified.
8:20	Agenda Review	Principals confirm agreement on the meeting's purpose and overall intended outcome, and determine whether anyone will have any participation constraints
8:30	Soils Rework - Status of Parcel G Field Work - Status of Other Parcels Rework - Sr-90 Data and Communications	Navy- status update on soils rework and Sr-90 EPA – Comments on ongoing work CDPH – AI #18 (look for and review any information on background levels of strontium-90 in the Bay Area) All (Navy, EPA, CDPH, SFDPH)- AI #19 (SR-90 Comms)
9:45	Break	
10:00	Buildings - Status of Resurveys - Impacts to Other Bases (Concord) - Building Demolition	Navy – status update on building resurveys, building demo, impacts to other bases, and AI #5 (radiologically impacted status of five buildings to be reused) CDPH - Update on AI #6 (how a radiologically impacted building restricted for commercial use only would comport with CDPH's regulatory framework, #8 (requirements for disposal of radiologically impacted buildings) EPA - Update on AI #7 (review any CERCLA guidance that apply to land disposal of radiologically impacted buildings), #9 (review the appropriate RODs), #10 (determine the appropriate post-ROD mechanism for demo)
11:30	Lunch	
12:30	Communications and Community Outreach - Recent Community Outreach - Community Survey Results - Community Involvement Plan Status - Navy Communications - Future Team Building	Navy – update on recent community outreach, community outreach survey results, CIP status, plan for future team building, AI#28 (Navy consider options to expand its team with a public participation professional) EPA- report on AI #28 (EPA will provide information on public participation expertise through use of [HYPERLINK "https://www.opm.gov/policy-data-

		oversight/hiring-information/intergovernment-personnel-act/"].) Navy- provide feedback on Intergovernmental Personnel Act (IPA) and Interagency Detail options. All – update on planning and timing for team building activities, and discussion of how leadership can support these efforts.
1:45	Review Remaining Action Items from Dec 2021	All - Report on AIs from December 2021 that were not addressed earlier in the meeting
2:30	Break	
2:45	General Project Management - Agency Review Timelines and Extensions	All - Address schedule delays
3:30	Wrap-Up and Document New Action Items	
4:15	Executives Only Discussion	
4:45	Adjourn	

Annotated Agenda

8:30	Soils Rework - Status of Parcel G Field Work - Status of Other Parcels Rework - Sr-90 Data and Communications	Navy- status update on soils rework and Sr-90 EPA – Comments on ongoing work CDPH – AI #18 (look for and review any information on background levels of strontium-90 in the Bay Area) All (Navy, EPA, CDPH, SFDPH)- AI #19 (SR-90 Comms)

- **Status of Parcel G Field Work**

  Status: Fieldwork has been on hold during the rainy season. Navy expects to start again in mid-April, if Strontium-90 issue is resolved (see below). Of the initial 30% of the trench excavations planned for Phase 1, only 2 trenches left to excavate and scan. As long as the SR-90 or any other radionuclide data does not show an exceedance, after the 2 trenches are addressed the Navy would proceed to Phase 2, which does a minimal amount of sampling in the remaining 70% of trenches (without excavating them).

  Opportunity:

  Talking Points:

- **Status of Other Parcels Rework**

  Status: EPA has approved the Parcel B workplan, and the remaining parcel workplans are not far behind. The Navy anticipates starting on Parcel B before Parcel G is over.

- **Sr-90 Data and Communications**

  Status: The Navy does <u>not</u> have any validated results to share with the regulatory agencies yet. They continue to see some exceedances with the new method, but strongly believe there are interferences with the method, so are working with their lab and QA/QC validator to sort things out. So, the Navy doesn't anticipate a complete validated data set for possibly another month. Additionally, CDPH is working on a document to summarize Strontium-90 background (which might include a brief discussion on environmental fate and transport).

  TPs: We suggest a call should be scheduled with key staff once the Navy has some validated data and an understanding of what decisions it might want to make on that data

10:00	Buildings - Status of Resurveys - Impacts to Other Bases (Concord) - Building Demolition	Navy – status update on building resurveys, building demo, impacts to other bases, and AI #5 (radiologically impacted status of five buildings to be reused) CDPH - Update on AI #6 (how a radiologically impacted building restricted for commercial use only would comport with CDPH's regulatory framework, #8 (requirements for disposal of radiologically impacted buildings) EPA - Update on AI #7 (review any CERCLA guidance that apply to land disposal of radiologically impacted buildings), #9 (review the appropriate RODs), #10 (determine the appropriate post-ROD mechanism for demo)

- **Status of Resurveys**

  Status: As stated in December, the Navy decided to move ahead with resampling, despite not agreeing to incorporate the MDCs EPA calculated for the scans to ensure the data would provide assurance that the levels are in the risk range. And in response to EPA's proposal to conduct a Pilot Study to attempt to achieve our MDCs for the dust samples, the Navy said that they would archive the dust samples in case they needed to attempt to reanalyze to attempt to achieve EPA's MDCs at a later date. EPA also pressed the Navy on what MDCs they were achieving in the fixed/static (non-dust sampling), and the Navy states that they are meeting our MDCs. We have asked for more info and have sent them some additional questions on what they provided.

  Opportunity: If the Navy re-considered attempting to achieve EPA's MDCs on at least the two smaller historic buildings to be retained for commercial use, it's possible a use restriction could be avoided.

- **Impacts to Other Bases (Concord)**

  Status: The Navy called out EPA last week to say that they understood that EPA had agreed that stringent approaches at HP would not set a precedent for other bases. We responded that that does not apply to all decisions across the board, and that we have been saying for years that we expect our BPRG calculator to be used at all bases, but will indeed consider site-specific use factors, to ensure the protectiveness of screening and cleanup levels. Because EPA does not have regional rad expertise outside of HP, we are approaching OLEM for help at Concord to be able to make sense of Concord differences when it comes to BPRG calcs.

  At nearby Alameda Naval Air Station, a near final ROD for a disposal area is proposing to adopt Hunter Point's Radium 226 soil remedial goal. EPA has stated that, despite using that in 3 prior Alameda RODs, this new ROD provides no risk basis for that value, only a footnote that it was used at HP. EPA has requested that the Navy support the proposed remedial goal with soil PRG calculations set at a 10-6 risk level.

TPs: We need the Navy to calculate, using the BPRG, what would be appropriate MDCs for Concord work. It was a tremendous effort at HP and it is really the Navy's responsibility. If they can they make the calculations, we will review the work with HQ support.
At Alameda, we need the Navy to provide a risk basis for their RA-226 Remedial Goal for the Site 32 ROD.

- **Building Demolition**

Status: The Navy has made preliminary statements that it's very possible after building re-sampling that there may not be a CERCLA driver to support the demolition. EPA has not seen any data yet or heard an answer to EPA's request for the Navy to look into a lead-based paint CERCLA risk driver for some of the buildings.

EPA Updates on related Action Items:

#7 (EPA to review any CERCLA guidance that apply to land disposal of radiologically impacted buildings and communicate back to the Navy and CDPH) – Silvina and Stuart to fill in.

#9 (The Navy and EPA to review the appropriate RODs to determine whether building demolition is already included as part of the remedy or determine the appropriate post-ROD mechanism to support potential demolition) -- EPA and Navy attorneys agree that the Parcel G ROD supports demolition of radiologically-impacted buildings.

#10 (The Navy and EPA to determine the appropriate post-ROD mechanism, if any, to add building restrictions to any non-demolished rad impacted buildings): EPA has not confirmed our opinion with the Navy, but we anticipate this requiring a ROD Amendment, because the community, based on our current ROD, had expected all buildings to be cleared for unrestricted use. EPA believes any revised, less stringent clearance levels and restrictions should be subject to public comment.

Opportunity: The Navy has not acknowledged EPA correspondence about whether the lead-based paint impacted buildings could provide the basis for a CERCLA response. We have calculated that 200lbs of lead from the buildings may be migrating to SF Bay each year. The Navy has not responded. They could provide a list of LBP-impacted buildings and each one's potential for chips to migrate to the bay or become airborne.

TPs:

12:30	Communications and Community Outreach - Recent Community Outreach - Community Survey Results - Community Involvement Plan Status - Navy Communications - Future Team Building	Navy – update on recent community outreach, community outreach survey results, CIP status, plan for future team building, AI#28 (Navy consider options to expand its team with a public participation professional) EPA- report on AI #28 (EPA will provide information on public participation expertise through use of [HYPERLINK "https://www.opm.gov/policy-data-oversight/hiring-information/intergovernment-personnel-act/"].) Navy- provide feedback on Intergovernmental Personnel Act (IPA) and Interagency Detail options. All – update on planning and timing for team building activities, and discussion of how leadership can support these efforts.

- **Recent Community Outreach**

  Status: Navy recently presented at Dr Hunnicut's Citizen's Advisory Committee meeting with a site update. EPA was on the panel as well.

- **Community Survey Results**

  Status: The Navy shared it basic survey results with EPA. The community survey had a robust response (about 312 responses), and the Navy gleaned additional information from interviews with 9 people. People prefer information via email (76%) followed by US mail (42%). People preferred quarterly updates (43%) followed by twice a year (20%). The Navy believes these results validate that what they are currently doing is working.

- **Community Involvement Plan Status**

  Status: It looks like the Navy plans to expedite this to the point that EPA is concerned that we will not have adequate time for a thoughtful review and discussion with the Navy and our State partners. It is likely the Navy will provide a draft revised Community Involvement Plan to the regulatory partners in late March, and expect agency comments in 30 days, and then quickly finalize it without response to comments and a draft final document to review.

  TPs: As much as we appreciate the Navy's attention to this and your desire to expedite this CIP revision, this is an important CIP update and we want to have a thoughtful review and discussion with the Navy on the path forward. Let's ensure we have time to look at it closely.

- **Navy Communications**

Status: The Navy has improved, but it still can do better crafting external communications and coordinating those with EPA. Hiring a lead CI/Communications person who could focus on this would relieve the lead RPM of what is an extremely full plate. Despite the December action item, it seems the Navy is not pursuing creating such a position.

TP: EPA believes the Navy creating a new public participation/communications expert position is critical to enhancing communications in an effort to build trust with the community.

- **Future Team Building**

Status: Since proposing a team building session last fall, the Navy has not communicated any progress in planning such an event. Meanwhile, it seems tension amongst the FFA members has not improved, with further disagreement developing over mercury in groundwater and PFAS.

TPs: I realize COVID has presented challenges to such a team building session, but we need to support our staff and the team dynamics and get this effort underway as soon as possible.

Hunters Point Sr-90 Extraction Chromatography Analysis

Suspected Bias Investigation

Investigation Inception

- Site personnel observed Sr-90 results above the action limit for samples not expected to contain Sr-90 activity.
- The data set seemed to have an overall high bias.
- At the request of Aptim, the laboratory investigated potential sources and identified the cause.

High Bias Identified!

- For the process used for Aptim soil samples:
  - Exchange chromatography resin is used to isolate Sr
  - Pb sticks to the resin/cartridge along with the Sr
  - As Pb-210 is present (NORM), the 5-day half-life Bi-210 daughter will begin growing in along with in Y-90
  - When the Y-90 fraction is eluted from the cartridge, Bi-210 will follow along, presenting a **high bias**.
  - This is an issue especially for Sr-90 at **low levels**.

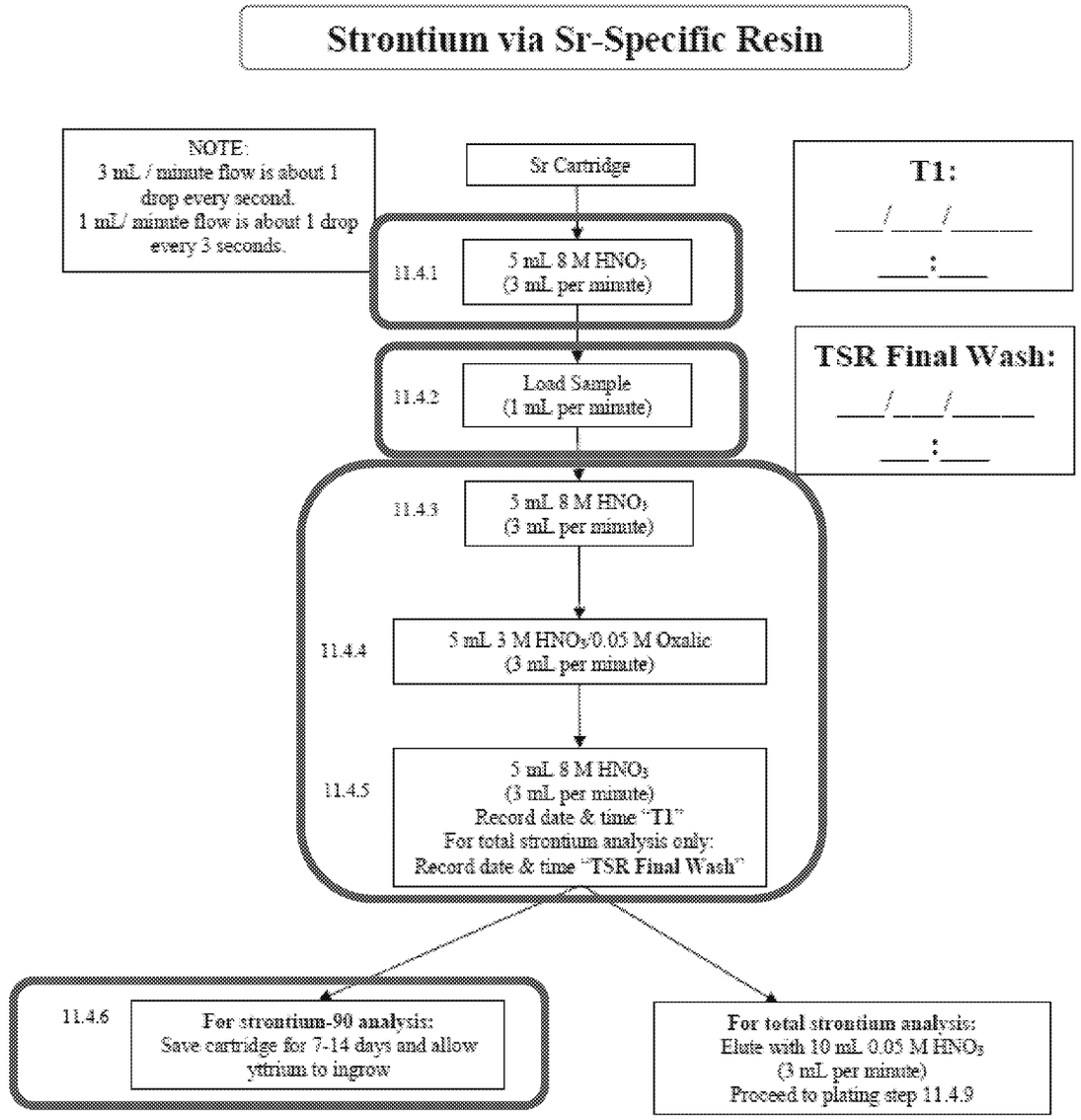
How can we confirm?

Batch	SampleID	ClientID	Analyte	Activity	Flag	UncTotal	DLC	Analyte	Activity	Flag	UncTotal	DLC
552531	160-44722-A-10-A	160-42364-13	Total Beta Strontium	0.0230		0.010	0.019	Sr-90	0.407		0.0857	0.0541
552531	160-44722-A-11-A	160-42364-3	Total Beta Strontium	0.0275		0.011	0.022	Sr-90	0.287		0.0756	0.0556
552531	160-44722-A-12-A	160-42360-1	Total Beta Strontium	0.0081	U	0.012	0.027	Sr-90	0.207		0.067	0.0542
552531	160-44722-A-13-A	160-40443-1	Total Beta Strontium	0.0023	U	0.010	0.024	Sr-90	0.28		0.0719	0.0513
552531	160-44722-A-14-A	160-42314-11	Total Beta Strontium	0.0152	U	0.011	0.023	Sr-90	0.252		0.0706	0.0553
552531	160-44722-A-15-A	160-42314-1	Total Beta Strontium	-0.0135	U	0.009	0.022	Sr-90	0.317		0.0762	0.0383
552531	160-44722-A-16-A	160-43181-3	Total Beta Strontium	-0.0043	U	0.010	0.024	Sr-90	0.278		0.0787	0.0574
552531	160-44722-A-17-A	160-42364-23	Total Beta Strontium	0.0066	U	0.010	0.023	Sr-90	0.365			
552531	160-44722-A-18-A	160-43484-8	Total Beta Strontium	-0.0008	U	0.011	0.025	Sr-90	0.4			
552531	160-44722-A-1-A	160-42764-1	Total Beta Strontium	0.0081	U	0.011	0.024	Sr-90	0.352		0.0833	0.06
552531	160-44722-A-2-A	160-42764-1 DU	Total Beta Strontium	0.0422		0.013	0.025	Sr-90	0.281		0.0736	0.0546
552531	160-44722-A-3-A	160-42715-16	Total Beta Strontium	0.0068	U	0.010	0.022	Sr-90	0.265		0.0732	0.0526
552531	160-44722-A-4-A	160-42525-11	Total Beta Strontium	0.0129	U	0.011	0.024	Sr-90	0.312		0.0743	0.0489
552531	160-44722-A-5-A	160-42525-1	Total Beta Strontium	-0.0049	U	0.014	0.033	Sr-90	0.309		0.0874	0.0668
552531	160-44722-A-6-A	160-40423-26	Total Beta Strontium	-0.0210	U	0.010	0.025	Sr-90	0.337		0.0759	0.0519
552531	160-44722-A-7-A	160-40423-21	Total Beta Strontium	-0.0033	U	0.009	0.022	Sr-90	0.324		0.0751	0.0494
552531	160-44722-A-8-A	160-42460-11	Total Beta Strontium	-0.0143	U	0.012	0.029	Sr-90	0.253		0.0746	0.0601
552531	160-44722-A-9-A	160-42766-1	Total Beta Strontium	0.0025	U	0.013	0.029	Sr-90	0.299		0.0812	0.0612
552531	LCS 160-552531/1-A	LCS 160-552531/1-A	Total Beta Strontium	2.8005		0.146	0.022	Sr-90				
552531	MB 160-552531/20-A	MB 160-552531/20-A	Total Beta Strontium	0.0014	U	0.010	0.024	Sr-90				

What caused the bias?

Initial Cartridge Load:

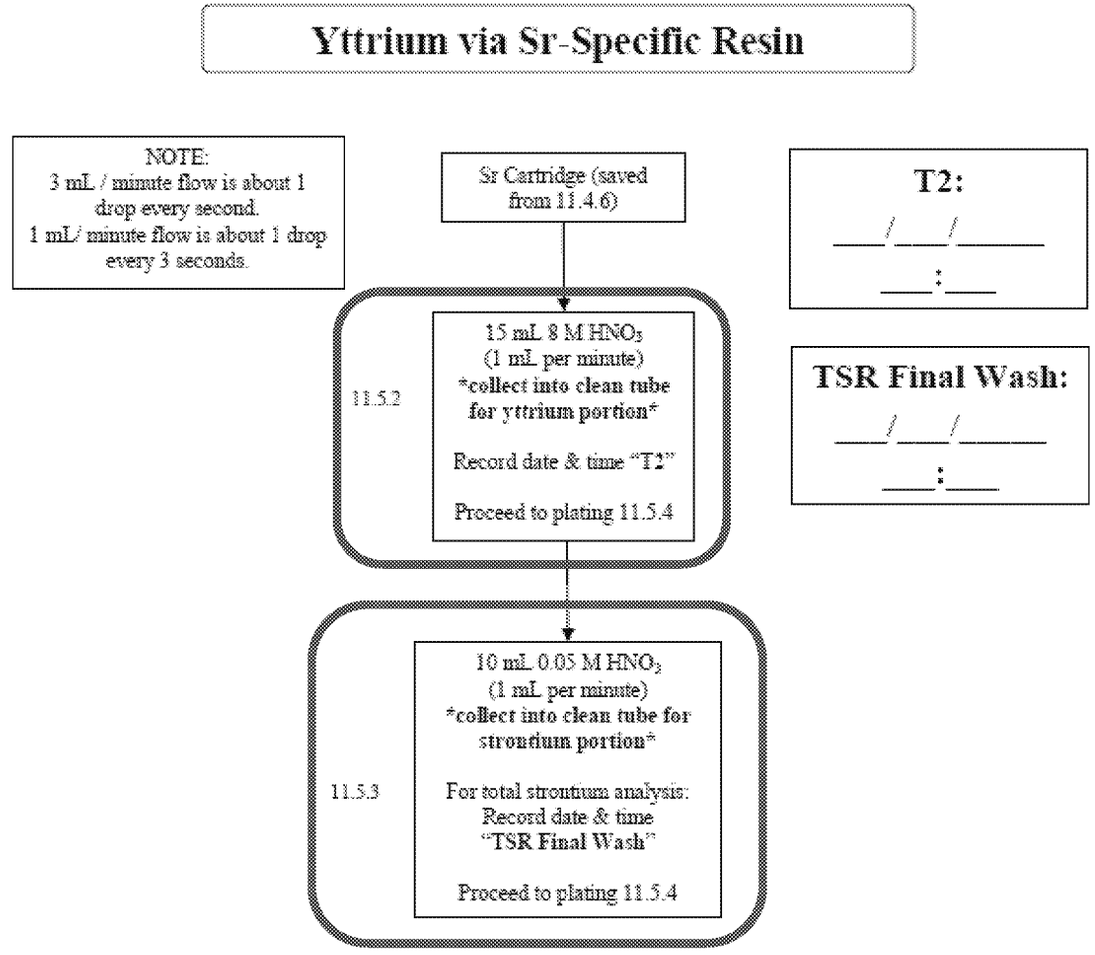
- 11.4.1 – condition cartridge
- 11.4.2 – load sample
- 11.4.3, 11.4.4, 11.4.5, rinse cartridge (removes interferences, Pb remains with the Sr)
- Note: after 11.4.5, Y-90 begins to grow back in



What caused the bias?

Final Cartridge Elution:

- 11.5.2 – elute yttrium
  - Proceed to plating/counting of yttrium fraction
- 11.5.3 – elute strontium
  - Proceed to plating/counting of strontium fraction and/or Sr Chemical Yield

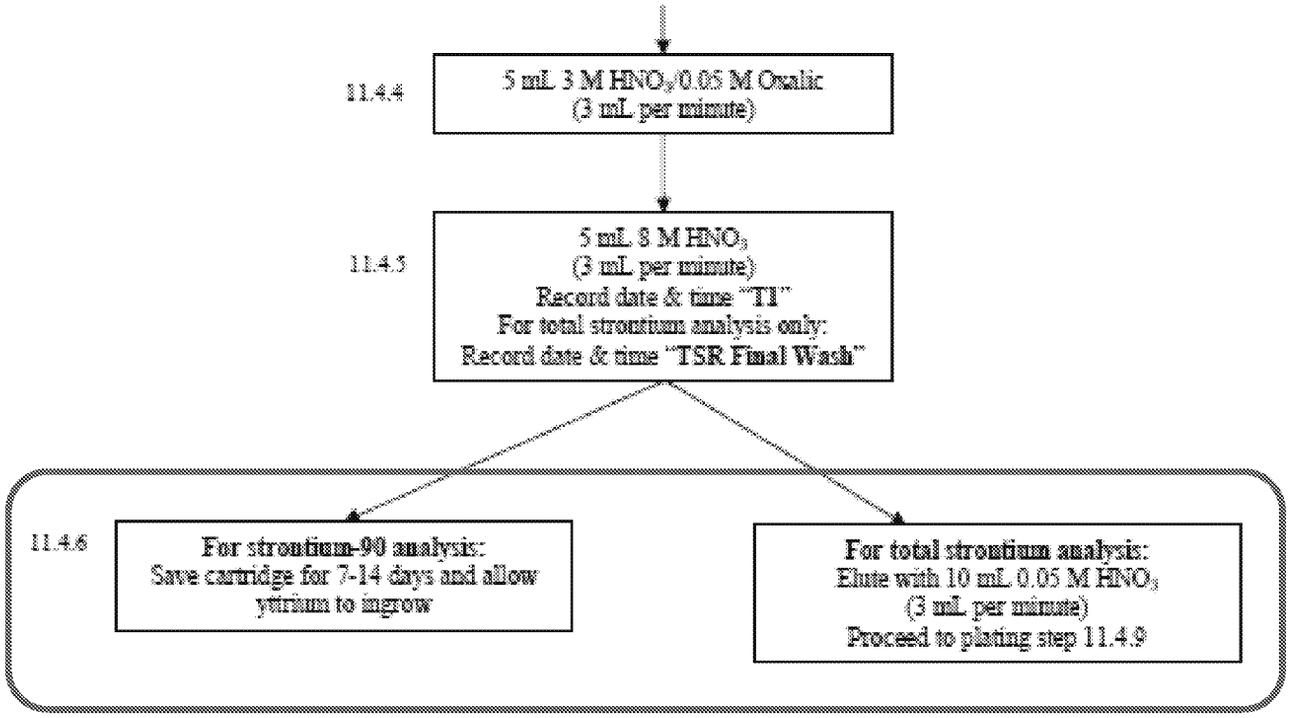


Solution!!

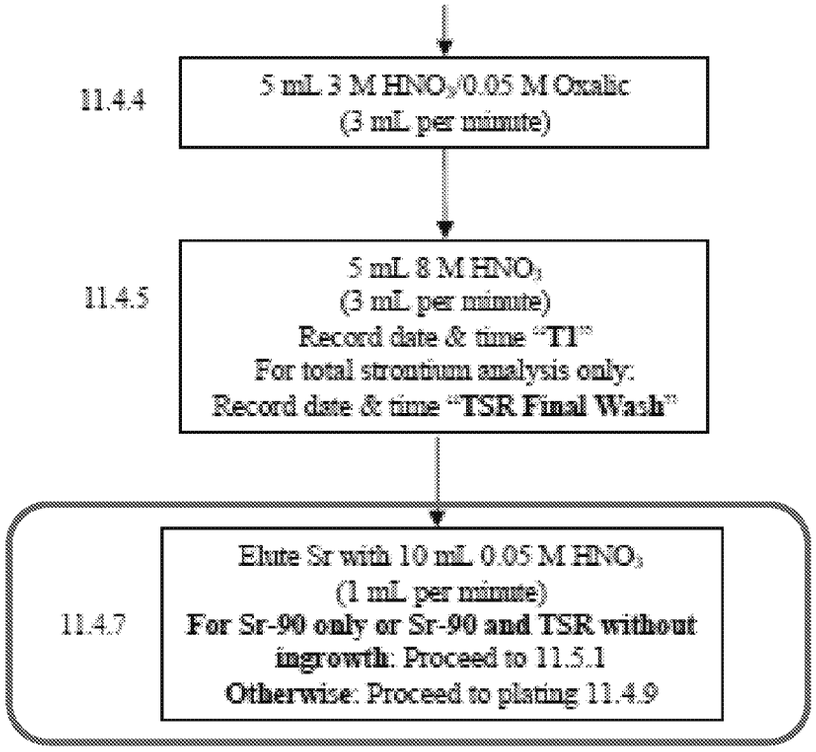
- Immediately after final cartridge rinse:
  - Elute Sr fraction into fresh tube with 0.05M HNO_3
  - Hold on to tube to allow Y-90 to grow back in
  - No Bi-210 of significance present, no Pb-210 either (still on cartridge)
- After 14 day Y-90 ingrowth:
  - Rinse Cartridge with 0.05M HNO_3 (removes any Bi-210 that may have grown back in), then 8M HNO_3 to condition
  - Add conc HNO_3 to Sr fraction in the tube to bring to 8M HNO_3
  - Load Sr fraction
    - Collect the 8M HNO_3 eluant which contains the Y-90, plate and count
    - Elute the Sr fraction with 0.05M HNO_3 for Sr carrier chemical yield

To Avoid the Bias - Flow Chart from Updated SOP

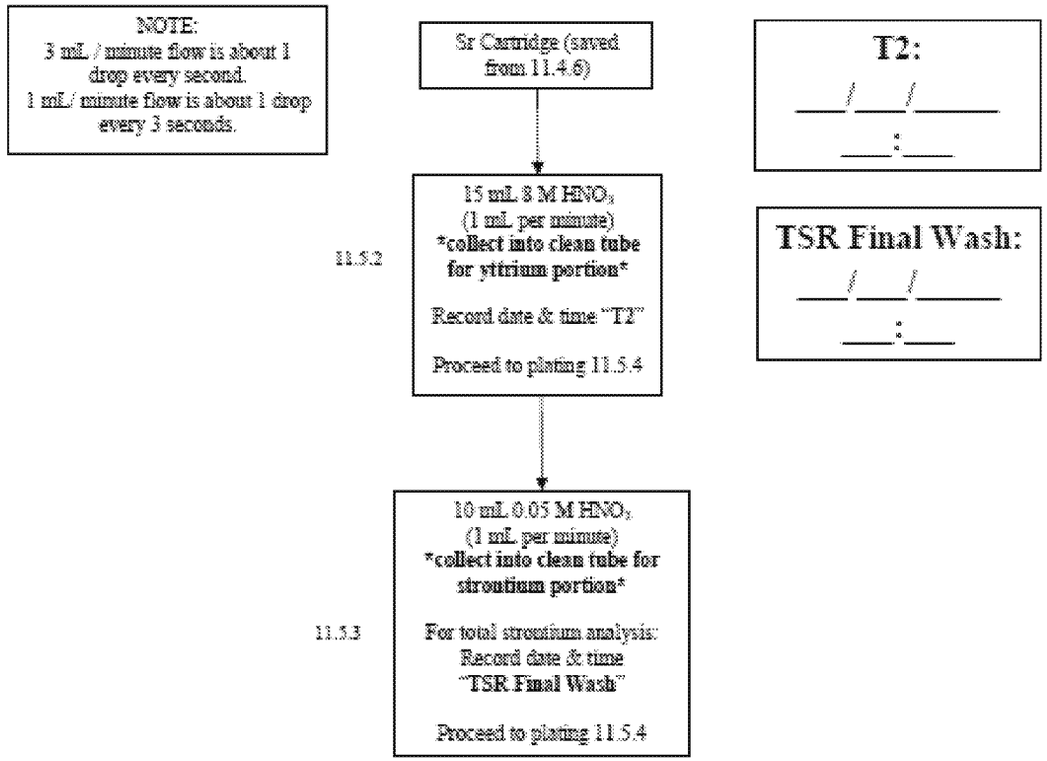
Rev 8



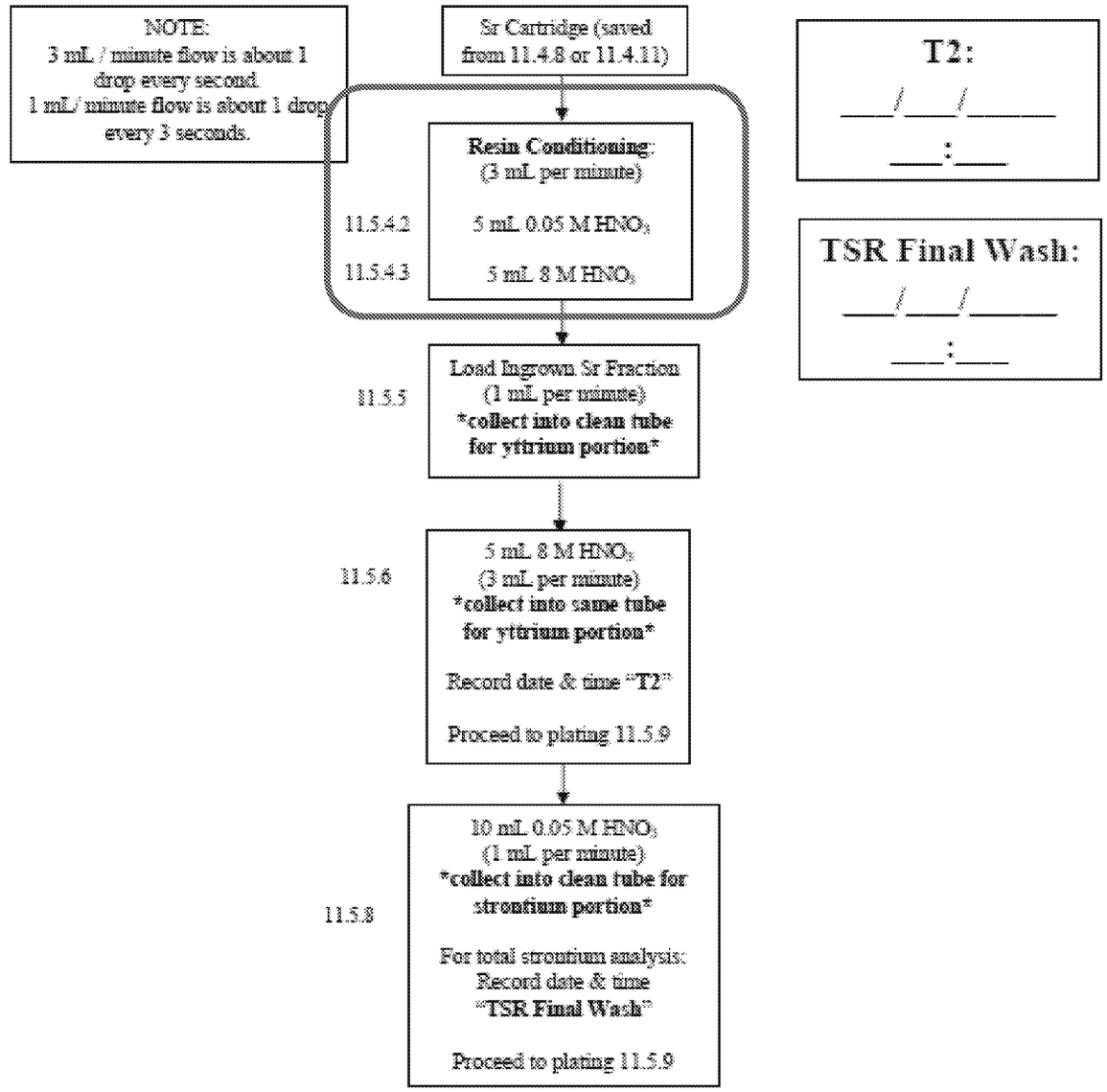
Rev 9



Rev 8


NOTE:
3 mL / minute flow is about 1 drop every second.
1 mL/ minute flow is about 1 drop every 3 seconds.
Sr Cartridge (saved from 11.4.6)
T2:
___/___/_____
___:___
11.5.2
15 mL 8 M HNO3
(1 mL per minute)
collect into clean tube for yttrium portion
Record date & time "T2"
Proceed to plating 11.5.4
TSR Final Wash:
___/___/_____
___:___
11.5.3
10 mL 0.05 M HNO3
(1 mL per minute)
collect into clean tube for strontium portion
For total strontium analysis:
Record date & time
"TSR Final Wash"
Proceed to plating 11.5.4

Rev 9


NOTE:
3 mL / minute flow is about 1 drop every second.
1 mL/ minute flow is about 1 drop every 3 seconds.
Sr Cartridge (saved from 11.4.8 or 11.4.11)
T2:
___/___/_____
___:___
Resin Conditioning:
(3 mL per minute)
11.5.4.2
5 mL 0.05 M HNO3
11.5.4.3
5 mL 8 M HNO3
TSR Final Wash:
___/___/_____
___:___
11.5.5
Load Ingrown Sr Fraction
(1 mL per minute)
collect into clean tube for yttrium portion
11.5.6
5 mL 8 M HNO3
(3 mL per minute)
collect into same tube for yttrium portion
Record date & time "T2"
Proceed to plating 11.5.9
11.5.8
10 mL 0.05 M HNO3
(1 mL per minute)
collect into clean tube for strontium portion
For total strontium analysis:
Record date & time
"TSR Final Wash"
Proceed to plating 11.5.9

Summary

- For the process originally used for Aptim soil samples:
  - Pb-210 (NORM) in the soil presented a **high bias** to the Sr-90 results, which is an issue at **low levels**.
- The laboratory confirmed the high bias by counting the Sr chemical yield fraction for Total Beta Radiostrontium
- The laboratory proposes Total Beta Radiostrontium for future analyses: conservative, lower DLC, lower uncertainty
- Confirmation of Sr-90 for any elevated Sr-Tot result can be performed without bias using the Sr-Tot fraction after Y-90 ingrowth

FIELD CHANGE REQUEST FORM

Contract No.:	CTO No.:	Field Change Request Form No.:
N62473-17-D-0006	N6247318F5065	006
Location: Parcel G, Hunters Point Naval Shipyard		**Date:** August 16, 2021
Document Title: Final Parcel G Removal Site Evaluation Work Plan, Former Hunters Point Naval Shipyard, San Francisco, CA		**NIRIS Document #:**4205

RE: Drawing No.: _____ Title _____

Specification Section _____ Title _____

Other: Work Plan (WP) Appendix B, Sampling and Analysis Plan (SAP), Worksheet (WS) #23

Description (items involved, submit sketch, if applicable)

Add Eurofins TA SOP – ST-RC-0058 Sample Preparation for Strontium-89, Strontium-90 and Total Strontium Using Extraction Chromatography, to SAP WS#23

Reason for Change

Recent Parcel G strontium-90 (Sr-90) exceedances could not be replicated through additional laboratory analysis and initiated further evaluation into the Sr-90 analytical procedure. The current laboratory method used for project samples has a higher-than-expected uncertainty due to the sample preparation procedure. In addition, the current method decision level concentration (DLC), which ranges from 0.09 picocurie per gram (pCi/g) to 0.26 pCi/g, is below but very close to the Sr-90 remediation goal (RG; 0.331 pCi/g). The DLC range and the higher-than-expected uncertainty interfere with evaluating very low concentrations near the RG. The measurement uncertainty resulted in a discussion with the Navy and regulatory agencies to evaluate method improvements to lower uncertainty and the DLC. With input from the laboratory (Eurofins-TA), APTIM proposes adding TA-SOP-RC-0058 to SAP WS#23. This preparation method for Sr-90 uses a larger aliquot (2.5 grams) with HNO3/HCl digestion and Eichrom resin (Sr Resin) separation, with a 14-day ingrowth and gas flow proportional counting (GFPC) detection.

Using this sample preparation procedure for Sr-90 soil samples is expected to lower measurement DLC and uncertainty. Previous samples will be reanalyzed using this sample preparation.

Eurofins-TA is certified with the Department of Defense and Department of Energy for this preparation method for Sr-90 detection.

In addition to the changes in analytical method discussed above in this FCR, to fully comply with the requirements outlined in WP Section 5.3.2 and confirm sample results that indicate a potential area of elevated activity, confirmation of sample results with elevated activity will include the following:

- Sr-90 results will immediately (to the maximum extent practical) be recounted by the laboratory.
- If the recounted sample is below the RG, then the initial result will be considered a false positive.
- If a recount of the sample is not possible, or the recount sample result exceeds the RG, two (2) additional aliquots will be collected from the sample and analyzed for Sr-90.
- If the results of both of the additional aliquots are below the RG, then the original result will be considered a false positive. If either one of the two additional aliquot results is above the RG, then the sample will be considered an exceedance.

FIELD CHANGE REQUEST FORM

Contract No.:	**CTO No.:**	**Field Change Request Form No.:**
N62473-17-D-0006	N6247318F5065	006

As stated above, previous samples will be reanalyzed using the proposed sample preparation. Data from the re-analyzed samples will be included in the Radiological Screening Yard (RSY) pad data package to obtain approval for backfill of the soil, and all results will be discussed in the summary discussion section of the data package. Relevant lab data packages will be attached to the RSY pad data package.

Recommended Disposition (submit sketch, if applicable)

Add Eurofins TA SOP–ST-RC-0058 Sample Preparation for Strontium-89, Strontium-90 and Total Strontium Using Extraction Chromatography, to SAP WS#23 (see attachments).

Additional Details

None

Will this change result in a contract cost or time change? ☒ Yes ☐ No

Estimate of contract cost or time charge (if any) Potential schedule impact of 30 calendar days for reanalysis of existing samples with results above the action limit.

Preparer (signature)	Date	Technical Lead (Signature)	Date
Rae Cendol	9/9/2021	Laura A Shea	9/9/2021

Disposition

☒ Approved

☐ Not approved (give reason): _____

Engineer (signature) (if engineering related)	Date	Project Manager (signature)	Date
N/A ☐ Comments (attached) ☐ No Comments		☐ Comments (attached) ☒ No Comments	9/9/2021
Navy RASO (signature)	**Date**	**QC Manager (signature)**	**Date**
N/A ☐ Comments (attached) ☐ No Comments		☐ Comments (attached) ☒ No Comments	9/9/2021
Navy RPM (signature)	**Date**	**NAVFAC SW QAO (signature)**	**Date**
☐ Comments (attached) ☐ No Comments		☐ Comments (attached) ☐ No Comments	

FIELD CHANGE REQUEST FORM

Attachments:
Addition to WS#23
TA SOP ST-RC-0058
Updated Laboratory Certification

Distribution:
- Project File
- Copy to Site File
- Project Manager

SAP WORKSHEET #23A—ANALYTICAL SOP REFERENCES – RADIOLOGICAL – FCR-006 ADDITIONAL SOP

Lab SOP Number[a]	Title, Revision Date, and/or Number	Definitive or Screening Data	Matrix and Analytical Group	Instrument	Organization Performing Analysis	Modified for Project Work? (Y/N)
ST-RC-0058	SAMPLE PREPARATION FOR STRONTIUM-89, STRONTIUM-90 AND TOTAL STRONTIUM USING EXTRACTION CHROMATOGRAPHY 3/31/2021	Sample Preparation Definitive	Soil Strontium-90	Sample Preparation for GFPC	Eurofins TestAmerica St. Louis	N

Notes:

[a] Laboratory SOP and current DoD Certification FCR-006 Attachment

Title: SAMPLE PREPARATION FOR STRONTIUM-89, STRONTIUM-90 AND TOTAL STRONTIUM USING EXTRACTION CHROMATOGRAPHY

Approvals (Signature/Date):

Chelsea Mazariegos 03/26/2021
Chelsea Mazariegos Date
Department Manager

Michael Ridenhower 03/29/2021
Michael Ridenhower Date
Health & Safety Manager / Coordinator

Kristen Ely 3/26/2021
Kristen Ely Date
Quality Assurance Manager

Sarah C. Bernsen 03/29/2021
Sarah Bernsen Date
Operations Manager

This SOP was previously identified as SOP No. ST-RC-0058 Rev. 6

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Facility Distribution No.: 0 **Distributed To:** See Electronic Distribution Sheet

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1.0 SCOPE AND APPLICATION

1.1 This SOP describes the process for sample preparation of strontium-89, strontium-90 and total strontium using extraction chromatography. This procedure is applicable to water and solid matrices.

1.2 This SOP is based on ASTM Method C1507-07 and Eichrom Method SRW01..

1.3 The reporting limits and QC limits are maintained in the Laboratory Information Management System (LIMS).

2.0 SUMMARY OF METHOD

2.1 Strontium is isolated/separated by extraction chromatography. For waters, the strontium is pre-concentrated with calcium as the phosphate, then brought back up into a liquid matrix. For soils, the strontium is transferred from the soil into a liquid matrix prior to loading on the extraction column/cartridge. Interferences from calcium and other radionuclides are effectively removed by the extraction column. The separated strontium is eluted off the column, evaporated to dryness onto a planchet, and weighed for chemical recovery determination. For reporting total strontium (or strontium-89), the planchet is beta counted soon after planchet preparation, For strontium-90 determination, the strontium nitrate with ingrown yttrium-90 is dissolved from the planchet and loaded back onto the extraction chromatography column. The yttrium-90 passes directly through the column, is evaporated to dryness on a planchet, and beta counted. Strontium-90 and total strontium are counted for beta particle activity by gas flow proportional counting (GFPC). The strontium-89 concentration is determined by difference.

3.0 DEFINITIONS

3.1 See the TestAmerica St. Louis Quality Assurance Manual (ST-QAM) for a glossary of common laboratory terms and data reporting qualifiers.

3.2 There are no specific definitions for this procedure.

4.0 INTERFERENCES

4.1 Samples which contain natural strontium cause inaccurate chemical yield determinations. For samples suspected to contain significant elemental strontium, the concentration should be determined by suitable means, and the yield calculation appropriately corrected.

4.2 The extraction resin effectively removes most beta-emitting isotope interferences (e.g. Ba-140 and K-40) utilizing 8 M nitric acid load and rinse solutions. Certain tetravalent elements, if present, (e.g. uranium, plutonium, neptunium, cerium, and ruthenium) are effectively removed using a 3 M nitric acid – 0.05 M oxalic acid wash.

4.3 The extraction resin has limited capacity based upon the number of sites available to bind the strontium. The carrier should be limited to about 5 mg to avoid overloading the column, resulting in lowered chemical recoveries. Alternatively, cartridges could be stacked to increase the load capacity.

5.0 SAFETY

5.1 Employees must abide by the policies and procedures in the Corporate Environmental Health and Safety Manual (CW-E-M-001), Radiation Safety Manual and this document. This procedure may involve hazardous material, operations and equipment. This SOP does not purport to address all of the safety problems associated with its use. It is the responsibility of the user of the method to follow appropriate safety, waste disposal and health practices under the assumption that all samples and reagents are potentially hazardous. Safety glasses, gloves, lab coats and closed-toe, non-absorbent shoes are a minimum.

5.2 SPECIFIC SAFETY CONCERNS OR REQUIREMENTS

5.2.1 None.

5.3 PRIMARY MATERIALS USED

5.3.1 The following is a list of the materials used in this method, which have a serious or significant hazard rating. NOTE: This list does not include all materials used in the method. The table contains a summary of the primary hazards listed in the SDS for each of the materials listed in the table. A complete list of materials used in the method can be found in the reagents and materials section. Employees must review the information in the SDS for each material before using it for the first time or when there are major changes to the SDS.

Material (1)	Hazards	Exposure Limit (2)	Signs and symptoms of exposure
Nitric Acid	Corrosive Poison Oxidizer	2 ppm (TWA) 4 ppm (STEL)	Inhalation may cause coughing, choking, and irritation of the nose, throat, and respiratory tract. Skin contact can cause redness, pain, and severe skin burns. Concentrated solutions can stain the skin a yellow-brown color. Vapors are irritating to the eyes and contact may cause severe burns.
Oxalic Acid	Corrosive	1 mg/m3 (TWA) 2 mg/m3 (STEL)	Inhalation symptoms include severe irritation and burns of nose, throat, and respiratory tract. Ingestion symptoms include burns, nausea, severe gastroenteritis and vomiting. Skin contact causes severe irritation and burns. Oxalic Acid is an eye irritant.
Hydrochloric Acid	Poison Corrosive	5 ppm (ceiling)	Inhalation symptoms include coughing, choking, inflammation of the nose, throat, and upper respiratory tract. Skin contact can cause redness, pain, severe skin burns, and discoloration. Vapors are irritating to the eyes. Contact may cause severe burns.
Hydrofluoric Acid	Poison Corrosive	3 ppm (TWA)	Inhalation symptoms may include sore throat, coughing, labored breathing and lung congestion/inflammation. Skin contact may cause serious burns which are not immediately apparent or painful. Symptoms of eye contact include redness, pain, and blurred vision.
1 – Always add acid to water to prevent violent reactions.			
2 – Exposure limit refers to the OSHA regulatory exposure limit.			
TWA – Time Weighted Average			
STEL – Short Term Exposure Limit			
Ceiling – At no time should this exposure limit be exceeded.			

6.0 EQUIPMENT AND SUPPLIES

6.1 Analytical Balance (capable of an appropriate precision as required by each measurement within this procedure)

6.2 Centrifuge and centrifuge tubes

6.3 Labware, glass and teflon beakers, various sizes, covers and watch glasses

6.4 Planchets

6.5 Digestion vessels

6.6 Syringes

6.7 Mod block

6.8 Hot plate

6.9 Desiccator

6.10 Strontium-specific extraction chromatography resin – Eichrom Technologies, Inc® Sr resin 2-mL pack cartridge.

7.0 STANDARDS AND REAGENTS

7.1 All standards and reagent preparation, documentation and labeling must follow the requirements of SOP ST-QA-0002, current revision.

7.2 Deionized Water (DI)

7.3 Ammonium hydrogen phosphate (3.2M) (non-critical reagent)
7.3.1 Dissolve 104 g of $(NH_4)_2HPO_4$ in approximately 200 mL of DI water, heat gently to dissolve, and dilute to approximately 250 mL with DI water.

7.4 Ammonium hydroxide (NH_4OH), Reagent.

7.5 Bromocresol Purple indicator solution (non-critical reagent)
7.5.1 Dissolve 0.2 g of Bromocresol Purple (520.24 F.W.) in approximately 250 mL of water, add 1 mL of concentrated Ammonium Hydroxide.

7.6 Calcium nitrate (1.25M) (non-critical reagent)
7.6.1 Dissolve 51 g of $Ca(NO_3)_2$ in approximately 100 mL of DI water and dilute to approximately 250 mL with DI water.

7.7 Hydrochloric acid (12 M HCl) - concentrated, 37.2%.

7.8 Nitric acid (16 N HNO_3) (69 – 71%) - concentrated HNO_3.

7.9 Nitric acid (8 M HNO_3)

7.9.1 Non critical concentration
7.9.2 In a marked 2L bottle, add approximately 1L of DI water. Then SLOWLY and CAREFULLY add approximately 1L of concentrated HNO3
7.9.3 Shake carefully to mix.

7.10 Nitric acid (4 M HNO_3)
7.10.1 Non critical concentration
7.10.2 In a marked 2.5L bottle, add approximately 1875 mL of DI water. Then SLOWLY and CAREFULLY add approximately 625 mL of concentrated HNO3.
7.10.3 Shake carefully to mix.

7.11 Nitric acid (0.05 M HNO_3)
- 7.11.1 Non critical concentration
- 7.11.2 Add approximately 800 mL of DI water to a 1L container. Add approximately 3mL of concentrated HNO3.
- 7.11.3 Dilute to approximately 1L with DI water.
- 7.11.4 Shake carefully to mix.

7.12 Nitric acid (3 M HNO_3)/oxalic acid (0.05 M $C_2H_2O_4$) solution
- 7.12.1 Non critical concentration
- 7.12.2 In a 1L container, disslove 6.3 g of oxalic acid dihydrate in approximately 700 mL of DI water.
- 7.12.3 Add approximately 190 mL of concentrated HNO3 with mixing.
- 7.12.4 Dilute to approximately 1 L with DI water.

7.13 Nitric acid (3 M HNO_3)/boric acid (0.25 M BH_3O_3) solution
- 7.13.1 Non critical concentration
- 7.13.2 In a 1L container, dissolve 15.5 g of boric acid in approximately 700 mL of DI water.
- 7.13.3 Add approximately 190 mL of concentrated HNO3 with mixing.
- 7.13.4 Dilute to approximately 1 L with DI water.

7.14 Hydrofluoric acid, concentrated (29 N HF)

7.14.1

7.15 Strontium carrier (standardized) 5 or 25 mg/mL, NIST traceable
- 7.15.1 If the strontium carrier is not already standardized, standardize the strontium carrier using the following procedure with 6 replications:
  - 7.15.1.1 Add 5 mg (or 0.2 mL of 25 mg/mL SrNO3 solution) to 10 mL of 8M HNO3.
  - 7.15.1.2 Follow 11.4 column separation and plating.
  - 7.15.1.3
  - 7.15.1.4 Record gross and final weights in the Rad Standards Log and allow a manager or QA to assess the data to verify the replications are acceptable. Assign a unique number to the solution.

7.16 Strontium-89, NIST traceable

7.17 Strontium-90, NIST traceable

8.0 SAMPLE COLLECTION, PRESERVATIVES AND STORAGE

8.1 TestAmerica St. Louis supplies sample containers and chemical preservatives in accordance with the method. TestAmerica St. Louis does not perform sample collection. Samplers should reference the methods referenced and other applicable sample collection documents for detailed collection procedures. Sample volumes and preservative information is given in ST-PM-0002.

8.2 Samples may be collected in glass or plastic containers.

9.0 QUALITY CONTROL

9.1 **Batch**
- 9.1.1 A sample batch is a maximum of 20 environmental samples, which are prepared together using the same process and same lot(s) of reagents. Where no preparation method exists (e.g. water sample volatile organics, water sample anion analysis) the batch is comprised

of a maximum of 20 environmental samples which are analyzed together with the same process, lots of reagents and personnel.

9.1.2 Instrument conditions must be the same for all standards, samples and QC samples.

9.1.3 For this analysis, batch QC consists of a method blank, a Laboratory Control Sample (LCS), and Sample Duplicate (DU). In the event that there is insufficient sample to analyze a sample duplicate, an LCS Duplicate (LCSD) is prepared and analyzed.

9.1.4 Matrix Spike (MS) and Matrix Spike Duplicate (MSD) may be performed upon client request, and are noted in the Client Requirement Sheets and Log-in.

9.2 **Method Blank**

9.2.1 A method blank is a blank matrix processed simultaneously with, and under the same conditions as, samples through all steps of the procedure.

9.2.2 A method blank must be prepared with every sample batch.

9.2.3 For **soil** analyses, the method blank is comprised of calcium nitrate.

9.2.4 For water analyses, the method blank is comprised of DI water acidified with nitric acid.

9.3 **Laboratory Control Sample**

9.3.1 An LCS is a blank matrix spiked with a known amount of analyte(s), processed simultaneously with, and under the same conditions as, samples through all steps of the analytical procedure.

9.3.2 An LCS must be prepared with every sample batch.

9.3.3 For **soil** analyses, the LCS is comprised of calcium nitrate fortified with strontium-90.

9.3.4 For water analyses, the LCS is comprised of DI water acidified with nitric acid and fortifide with strontium-90.

9.4 **Matrix Spike/Matrix Spike Duplicate**

9.4.1 A Matrix Spike (MS) is an aliquot of a field sample to which a known amount of target analyte(s) is added, and is processed simultaneously with, and under the same conditions as, samples through all steps of the analytical procedure.

9.4.2 MS/MSD samples do not count towards the 20 environmental samples in a sample batch.

9.4.3 MS/MSD samples, when requested, must be performed with every sample batch and every LIMS batch.

9.5 **Sample Duplicate**

9.5.1 A Sample Duplicate is an additional aliquot of a field sample taken through the entire analytical process to demonstrate precision.

9.5.2 If there is insufficient sample to perform a Sample Duplicate, a duplicate LCS is analyzed. A NCM is written to document the insufficient volume and utilizing of an LCSD for demonstration of precision.

9.6 **Procedural Variations/ Nonconformance and Corrective Action**

9.6.1 Any variation shall be completely documented using a Nonconformance Memo and approved by the Supervisor and QA Manager. See SOP ST-QA-0036 for details regarding the NCM process.

10.0 CALIBRATION AND STANDARDIZATION

10.1 Balance and automatic pipetter calibrations must be checked daily when used. Refer to SOP ST-QA-0005, "Calibration and Verification Procedure for Laboratory Support Equipment."

10.2 See analytical SOP ST-RD-0403, "Low Background Gas Flow Proportional Counting (GFPC) System", for instrument calibration requirements.

11.0 PROCEDURE

11.1 Water Samples

11.1.1 Initiate sample preparation worksheet.

11.1.2 Ensure that the sample container is capped tightly and shake it thoroughly.

11.1.3 Transfer sample aliquot to a beaker; generally 1L is used.

11.1.3.1 Upon visual inspection, if the aqueous sample is suspected to have a high density (> 1.2 g/mL, e.g. a brine or waste) or a low density (< 0.98 g/mL, e.g. mixed solvent), the sample density will be measured and the volume determined arithmetically (sample mass divided by the density equals the volume).

11.1.3.2 Create the MB and LCS using DI water and acidify to a pH <2 with nitric acid

11.1.4 Add 5 mg strontium equivalent of standardized strontium carrier (either 0.2 mL of 25 mg/mL carrier or 1 mL of 5 mg/mL carrier) to samples and QC. Add about 5x the client's requested limit of Sr-90 spike to the LCS and MS/MSD, if applicable.

11.1.5 Add 2 mL of 1.25M $Ca(NO_3)_2$ to each sample and QC.

11.1.6 Add 5mL of 3.2M $(HN_4)_2HPO_4$ solution per liter of sample.

11.1.7 Add enough bromocresol purple indicator, while stirring, to see the color of the indicator (should be yellow at this point). If the samples are purple instead of yellow, check the pH and add more concentrated nitric acid to ensure the sampels are acidic.

11.1.8 Place samples on a hot plate and begin heating to near boiling. After the sample has reached near boiling (should see steam from the sample), turn the heat down to about medium.

11.1.9 While stirring add enough NH_4OH to reach the purple indicator end point and form $Ca_3(PO_4)_2$ precipitate. Allow the sample to heat for another 20-30 minutes.

11.1.10 Remove from the hot plate, and allow the sample to cool and the precipitate to settle.

11.1.11 Decant the excess supernate to a base waste container.

11.1.12 Transfer the precipitate to a labeled centrifuge tube and centrifuge the preicipitate for approximately 5 minutes at 2000 rpm.

11.1.13 Decant the supernate and discard to base waste.

11.1.14 Wash the precipitate with 10 mL of DI water. Vortex or shake to ensure the precipitate is thoroughly washed.

11.1.15 Centrifuge for approximately 5 minutes at 2000 rpm.

11.1.16 Decant the supernate and discard to base waste.

11.1.17 Dissolve the precipitate in 10 mL of 8M nitric acid.

11.1.18 Proceed to column loading (11.3).

11.2 Soil Samples (aliquot of less than 2.5 g or non-soil solids such as resin beads)

11.2.1 For soil samples, prepare sample as per SOP ST-RC-0003, "Drying and Grinding of Soil and Solid Samples."

11.2.2 Weigh approximately 1 g of sample into a labeled beaker. Larger aliquots (up to 10 g) may be utilized, but acid volumes need to be adjusted accordingly. See your supervisor or technical director for instructions.

11.2.3 Add sufficient calcium nitrate to cover the bottom of the method blank and LCS beakers.

11.2.4 Add a small amount of DI water to all soil samples.

11.2.5 Add 5 mg strontium equivalent of standardized strontium carrier (either 0.2 mL of 25 mg/mL carrier or 1 mL of 5 mg/mL carrier) to samples and QC. Add about 5x the client's requested limit of Sr-90 spike (usually 1 mL) to the LCS and MS/MSD, if applicable.

11.2.6 Gently dry the beakers on a hotplate.

11.2.7 Place in muffle oven at 600° and allow to muffle for 4 hours. Allow to cool.

11.2.8 Add 10 mL concentrated hydrochloric acid to the beakers and cover with a watchglass. Heat at a low temperature (approximately 200 degrees) for 20-30 minutes to reflux solids off the bottom of the beaker.

11.2.9 Using a cut transfer pipette, scrape the sides and bottom of the inside of the beaker and rinse the solids with concentrated nitric acid (about 5 mL) into a teflon beaker or digestion tube, completely removing the sample.

11.2.10 Add 10 mL concentrated hydrofluoric acid to the teflon beakers or digestion tubes. Cook until samples are completely dry.

11.2.11 Add 5 mL concentrated nitric acid, 5 mL concentrated hydrochloric acid, and 10 mL concentrated hydrofluoric acid to the teflon beakers or digestion tubes, and cook until completely dry once more.

11.2.12 Add 10 mL 8M HNO3 to samples and cover with a watchglass, heating for about 15-20 minutes to dissolve the solids.

11.2.13 Transfer samples to 50 mL centrifuge tubes. Proceed to column separation section 11.4.

11.3 Soil Samples (aliquot of 2.5 g of soil or larger)

11.3.1 For soil samples, prepare sample as per SOP ST-RC-0003, "Drying and Grinding of Soil and Solid Samples."

11.3.2 Weigh up to 2.5 g of sample into a labeled beaker. Larger aliquots (up to 10 g) may be utilized, but acid volumes need to be adjusted accordingly. See your supervisor or technical director for instructions.

11.3.3 Add sufficient calcium nitrate to cover the bottom of the method blank and LCSbeakers.

11.3.4 Add a small amount of DI water to all soil samples.

11.3.5 Add 5 mg strontium equivalent of standardized strontium carrier (either 0.2 mL of 25 mg/mL carrier or 1 mL of 5 mg/mL carrier) to samples and QC. Add about 5x the client's requested limit of Sr-90 spike to the LCS and MS/MSD, if applicable.

11.3.6 Gently dry the beakers on a hotplate.

11.3.7 Place in muffle oven at 600° and allow to muffle for 4 hours. Allow to cool.

11.3.8 Add 10 mL of concentrated hydrochloric acid to all crucibles and cover with a plastic watch glass. Reflux on a hotplate for 20-30 minutes at approximately 200-300 degrees.

11.3.9 Use a cut transfer pipet and scrape the inside of the beaker to remove all solids. Transfer to digestion tube using approximately 5 mL of concentrated nitric acid.

11.3.10 Add an additional 25 mL of concentrated nitric acid to each digestion tube.

11.3.11

11.3.12 Digest in mod block at > 110° for 1-2 hours

11.3.13 Allow the solution to cool.

11.3.14 Transfer the solution/solids to a labeled centrifuge tube with minimal DI water and centrifuge. Carefully transfer the supernatant to a labeled beaker.

11.3.15 Add 10 mL of concentrated nitric acid to the solids remaining in the centrifuge tube and vortex to loosen the solids. Transfer the solids/solution to the original digestion tube. Rinse the tube with 10 mL concentrated nitric acid to ensure all the soil transfers and add to the digestion tube. Add 10 mL more nitric acid and 10 mL concentrated hydrochloric acid to the digestion tube.

11.3.16 Digest in mod block at > 110° for 1-2 hours.

11.3.17 Allow the solution to cool.

11.3.18 Transfer the solution/solids to a labeled centrifuge tube with minimal DI water and centrifuge. Carefully transfer/combine the supernatant with the supernatant from the first digestion.

11.3.19 For samples which are not expected to contain refractory strontium, proceed to step 11.1.15. The following steps are to be used for samples expected to contain refractory strontium or for which the client requires total dissolution. The client should notify the lab if the sample(s) received may contain refractory strontium.

11.3.19.1 Add 10 mL of concentrated nitric acid to the solids remaning in the centrifuge tube and vortex to loosen the solids. Transfer the solids/solution to a labeled teflon beaker.

11.3.19.2 Add 30 mL of concentrated hydrofluoric acid.

11.3.19.3 Cover the beaker and digest for several hours at low heat.

11.3.19.4 Remove the cover and evaporate to dryness.
11.3.19.5 If necessary to dissolve remaining residue, add 10 mL of concentrated nitric acid and 30 mL of concentrated hydrofluoric acid and repeat the digestion/evaporation steps above.
11.3.19.6 Add 15 mL 3 M nitric acid/0.25 M boric acid and evaporate to dryness.
11.3.19.7 Add 10 mL 8 M nitric acid, cover, and heat just to boiling for 5 minutes.
11.3.19.8 Cool, and then transfer the solids/solution to a centrifuge tube with minimal DI water and centrifuge. Carefully transfer/combine the supernatant with the supernatant from the initial digestions.
11.3.20 Carefully evaporate the combined supernatant to dryness.
11.3.21 Add 15 mL of 4 M nitric acid to the beaker and reflux for 10-15 minutes. Do not allow the volume to drop below 5 mL.
11.3.22 Transfer the solution to a labeled mod block tube.
11.3.23 Rinse the beaker with 5 mL of 4 M nitric acid. Transfer to the labeled mod block tube.
11.3.24 Carefully reduce the volume to 10 mL. If the volume drops below 10 mL, but greater than 5 mL, bring up to 10 mL with DI water. If the volume drops below 5 mL, consult your supervisor or technical director for instruction.
11.3.25 Proceed to column loading (11.4)

11.4 Initial Column Loading/Eluting
11.4.1 Prepare a labeled 2 mL extraction cartridge with a reservior (e.g. syringe barrel) and waste container and condition with 5 mL of 8 M nitric acid on a vacuum box setup.
11.4.2 Transfer the 10 mL sample to the reservior and allow to load at 1 mL per minute (approximately 1 drop every 3 seconds).
11.4.3 Rinse the cartridge with 5 mL of 8 M nitric acid at approximately 3 mL per minute (approximately 1 drop every second).
11.4.4 Rinse the cartridge with 5 mL of 3 M nitric acid/0.05 M oxalic acid solution at approximately 3 mL per minute.
11.4.5 Rinse the cartridge with 5 mL of 8 M nitric acid at approximately 3 mL per minute.
11.4.5.1 **Note: Record in LIMS, the date/time of this step as the final strontium rinse, indicating the beginning of the yttrium-90 ingrowth ("T1").**
11.4.6 Remove the acid waste container (discard to acid waste) and replace with a labeled collection tube.
11.4.7 Elute the strontium from the column with 10 mL of 0.05 M nitric acid at 1 mL per minute.
11.4.8 Evaporate the strontium eluant onto a cleaned/pre-weighed planchet (tare weight should be recorded in LIMS) by adding small portions (3-5 mL) to the plancheton a hot plate and allowing each portion to evaporate to near dryness between additions.
11.4.9 Evaporate completely to dryness, cool in a dessicator, and re-weigh. Record the final gross weight in LIMS.The expected strontium mass added (based on the amount added as a standardized carrier) is used to calculate strontium carrier recovery gravimetrically.
11.4.10 For total strontium or strontium-89 analysis, submit the prepared planchet(s) to the count room for analysis. Store in a dessicator until count is performed.
11.4.11 Save the labeled extraction cartridge and planchet if strontium-90 analysis is to be performed.

11.5 Yttrium-90 preparation
11.5.1 For strontium-90 analysis, hold the planchet and allow the yttrium-90 to ingrow for 7-14 days.
11.5.2 Condition the extraction cartridge from the initial strontium separation.
11.5.2.1 Prepare the labeled extraction cartridge saved from the initial strontium separation (or a new cartridge) with a reservoir (e.g. syringe barrel) and acid waste container on a vacuum box.
11.5.2.2 For a *new cartridge*, proceed to 11.4.2.4.

11.5.2.3 For a *reused cartridge*, rinse with 5 mL of 0.05 M nitric acid at 3 mL per minute. Note: the 0.05 M nitric acid removes Bi-210 that might be present due to Pb-210 from the sample tightly bound to the resin.

11.5.2.4 Condition the cartridge with 5 mL of 8 M nitric acid at 3 mL per minute.

11.5.2.5 Remove the acid waste container (discard acid waste) and replace with a labeled collection tube.

11.5.3 Dissolve the strontium nitrate residue from the planchet with up to 3 portions of 5 mL of warm 8 M nitric acid and store in a tube to be loaded onto the cartridge.

11.5.4 Load the 8 M nitric acid solution containing the dissolved residue onto the prepared cartridge at 1mL per minute a collect the rinse that falls through the resin for plating.

11.5.5 Rinse each cartridge with an additional 5 mL of 8 M nitric acid. Collect this rinse with the rinse from step 11.4.4.

11.5.6 Record in LIMS, the time of the last rinse as the stop time for the yttrium-90 ingrowth ("**T2**").

11.5.7 Evaporate the yttrium eluant (combined from steps 11.4.3 and 11.4.4) onto a cleaned/pre-weighed planchet (tare weight should be recorded in LIMS) by adding small portions (3-5 mL) to the planchet on a hot plate and allowing each portion to evaporate to near dryness between additions.

11.5.8 Evaporate completely to dryness, cool in a dessicator, and reweigh. Record the final gross weight in LIMS, to be used in the efficiency determination. The yttrium yield is assumed to be 100%.

11.5.9 Submit the prepared planchet(s) to the count room for analysis. Store in a dessicator until count is performed.

12.0 DATA ANALYSIS AND CALCULATIONS

12.1 There are no calculations pertaining to this sample preparation procedure.

12.2 Commonly used calculations (e.g. precent recovery and realtive precent difference "RPD") and standard instrument software calculations are given in the TestAmerica St. Louis QAM (ST-QAM). Specific analysis calculations are given in the applicable analysis SOP.

13.0 DATA ASSESSMENT AND ACCEPTANCE CRITERIA; CORRECTIVE ACTIONS FOR OUT OF CONTROL DATA

13.1 Data assessment does not pertain to this sample preparation procedure.

13.2 Samples requiring re-preparation are submitted to the preparation lab with a NCM detailing the issue. The NCM process is described in SOP: ST-QA-0036. Specific information is given in the applicable analysis SOP.

14.0 METHOD PERFORMANCE AND DEMONSTRATION OF CAPABILITY

14.1. The requested limits (RL), minimum detectable amount (MDA) and QC limits are maintained in the Laboratory Information Management System (LIMS).

14.2. Demonstration of Capability

14.2.1. Initial and continuing demonstrations of capability requirements are established in ST-QAM.

14.3. Training Qualification

14.3.1. The manager/supervisor has the responsibility to ensure that this procedure is performed by an analyst who has been properly trained in its use and has the required experience.

14.3.2. The analyst must have successfully completed the initial demonstration capability requirements prior to working independently. See requirements in ST-QAM.

14.4. Annually, the analyst must successfully demonstrate proficiency to continue to perform this analysis. See requirements in ST-QAM

15.0 VALIDATION

15.1 This method is based upon a published ASTM procedure which presents performance results for over 30 measurements made over 8 years using 16 different samples in duplicate from the Department of Energy – Environmental Measurements Laboratory – Quality Assurance Program. The laboratory has also validated this method using a MARLAP Level C type protocol for total strontium.

16.0 WASTE MANAGEMENT AND POLLUTION PREVENTION

16.1 All waste will be disposed of in accordance with Federal, State and Local regulations. Where reasonably feasible, technological changes have been implemented to minimize the potential for pollution of the environment. Employees will abide by this method and the policies in the Corporate Safety Manual for "Waste Management and Pollution Prevention."

16.2 Waste Streams Produced by the Method

16.2.1 The following waste streams are produced when this method is carried out.

16.2.1.1 Acidic sample waste generated. All acidic waste will be accumulated in the appropriate waste accumulation container, labeled as Drum Type "A" or "B".

16.2.1.2 Sample waste with a Basic pH is generated. All base waste will be accumulated in the appropriate waste accumulation container, labeled as Drum Type "A" or "B".

16.2.1.3 Contaminated disposable glass or plastic materials utilized in the analysis are disposed of in the sanitary trash. If the labware was used for the analysis of radioactive samples and contains radioactivity at a level of 100 cpm over background as determined by a GM meter, the labware will be collected in waste barrels designated for solid rad waste for disposal by the EH&S Coordinator.

17.0 REFERENCES

17.1 ASTM Method C1507-07, "Standard Test Method for Radiochemical Determination of Strontium-90 in Soil". Current edition approved June 1, 2007.

17.2 Eichrom Technologies, Inc., Analytical Procedure SRW01 ("Strontium-89/90 in Water"), February 2003.

17.3 TestAmerica Quality Assurance Manual (ST-QAM), current revision

17.4 TestAmerica Corporate Environmental Health and Safety Manual (CW-E-M-001) and St. Louis Facility Addendum (SOP ST-HS-0002), current revisions.

17.5 Associated SOPs (Current Revisions)

17.5.1 ST-RC-0002, Planchet Preparation for Radiochemistry and Radiological Screening Analysis

17.5.2 ST-RC-0003, Drying and Grinding of Soil and solid Samples

17.5.3 ST-RC-0004, Preparation of Soil, Sludge, Filter, Biota and Oil & Grease Samples for Radiochemical Analysis

17.5.4 ST-RC-5006, Decontamination of Laboratory Glassware. Labware and Equipment
17.5.5 ST-RD-0403, Low Background Gas Flow Proportional Counting (GFPC) System
17.5.6 ST-QA-0002, Standards and Reagent Preparation
17.5.7 ST-QA-0005, Calibration and Verification Procedure for Laboratory Support Equipment
17.5.8 ST-QA-0036, Non-conformance Memorandum (NCM) and Corrective Action Processes
17.5.9 ST-PM-0002, Sample Receipt and Chain of Custody

18.0 CLARIFICATIONS, MODIFICATIONS TO THE REFERENCE METHOD

18.1 Modifictions to method C1507-07:
18.1.1 The reference method is geared for 10 g sample aliquot. This SOP is scaled for smaller aliquot volumes as needed.
18.1.2 Total dissolution with HF is only performed for samples expected to contain refractory strontium or when required by the client.
18.1.3 A 3 M nitric acid/0.05 M oxalic acid rinse is used in the initial strontium portion of the procedure based upon extraction resin manufacturer (Eichrom Technologies, Inc) recommendation to remove possible interferences.
18.1.4 Based upon recommendation by Eichrom, boric acid is utilized following the HF digestion step to help destroy residual HF, which can interfere with the ensuing process.
18.2 Modifications to method SRW01:
18.2.1 The final load solution of 15 mL nitric acid/aluminum nitrate was changed to just 10 mL of 8M nitric acid to be consistent with the soil load solution.

19.0 CHANGES TO PREVIOUS REVISION

19.1 New procedure (no previous revision).
19.2 Rev. 1:
19.2.1 In section 11.2.8 updated the amounts needed to perform an ICP metals analysis for chemical yields.
19.3 Rev 2: (07/31/2014)
19.3.1 Grammatical errors fixed throughout SOP
19.3.2 Removed references to Quantims, replaced with LIMS
19.3.3 Updated text in Section 14
19.4 Annual Review – No Changes (04/04/2016)
19.5 Revision 3: (02/27/2017):
19.5.1 Updated section 5.0 – replaced MSDS with SDS
19.5.2 Updated section 7.0
19.5.2.1 DI water source
19.5.2.2 Clarified how to make reagents
19.5.3 Updated section 9
19.5.3.1 Updated abbreviation for sample duplicate to match LIMS
19.5.3.2 Removed duplicate paragraph from section 9.6
19.5.4 Updated section 11.0 – replaced Rad Capture with LIMS
19.6 Revision 4: (12/12/2017 Technical Review S. Bernsen/QA Review: M. Ward):
19.6.1 Updated section 7.4- added ICP Rinse/Diluent as a reagent.
19.6.2 Updated section 11.1.1- fixed the SOP from ST-RC-003 to ST-RC-0003.
19.6.3 Updated section 11.1.4- added 50 mL digestion tube
19.6.4 Updated section 11.2.2- added approximately 1 drop every 3 seconds.
19.6.5 Updated section 11.2.3- added approximately 1 drop every 1-2 seconds
19.6.6 Grammatical Errors Fixed
19.7 Revision 5: (11/9/2018 Technical Review: S. Bernsen, T. Romanko)

19.7.1 Updated signature page
19.7.2 Updated Title, Section 1 and Section 2 to add water to the matrices
19.7.3 Updated section 9.0- added calcium nitrate to method blank and LCS
19.7.4 Updated section 11.0
19.7.5 Added procedure for spiking and tracing samples prior to muffling
19.7.6 Updated digestion procedure to accommodate spiking and tracing prior to muffling
19.7.7 Added section 11.2 for water samples.
19.7.8 Clarified step 11.3.5 in the Yttrium 90 preparation.
19.7.9 Updated section18.

19.8 Added Eurofins logo and updated copyright information (4/16/2019)

19.9 Revision 6 (01/31/2020) Technical Review C. Mazariegos/ QA Review K. Ely
19.9.1 Removed references to quarts crucibles and ICP in section 6.0
19.9.2 Removed instructions for non-standardized Sr carriers in section 7.0
19.9.3 Generalized creation of MB and LCS samples and simplified requirements for spike amount in section 11.0
19.9.4 Removed instructions for Sr yield determination by ICP and added information on gravimentric carrier recovery determination in section 11.3
19.9.5 Corrected step references on Strontium Flow Chart
19.9.6 Added Yttrium Flow Chart (attachment 2)
19.9.7 Corrected spelling and grammar throughout
19.9.8 Section 9 – removed language pertaining to old LIMS system
19.9.9 Updated SOP names throughout.

19.10 Revision 7 (3/31/2021) Tech Review C. Mazariegos; QA Review M Ward/K. Ely
19.10.1 Added additional instructions (now standard prep) for alternative digestion of soils less than 2.5 g or solid samples that dissolve easily such as resin.
19.10.2 Corrected some spelling errors.
19.10.3 Adjusted step numbers to correlate to cahnges.

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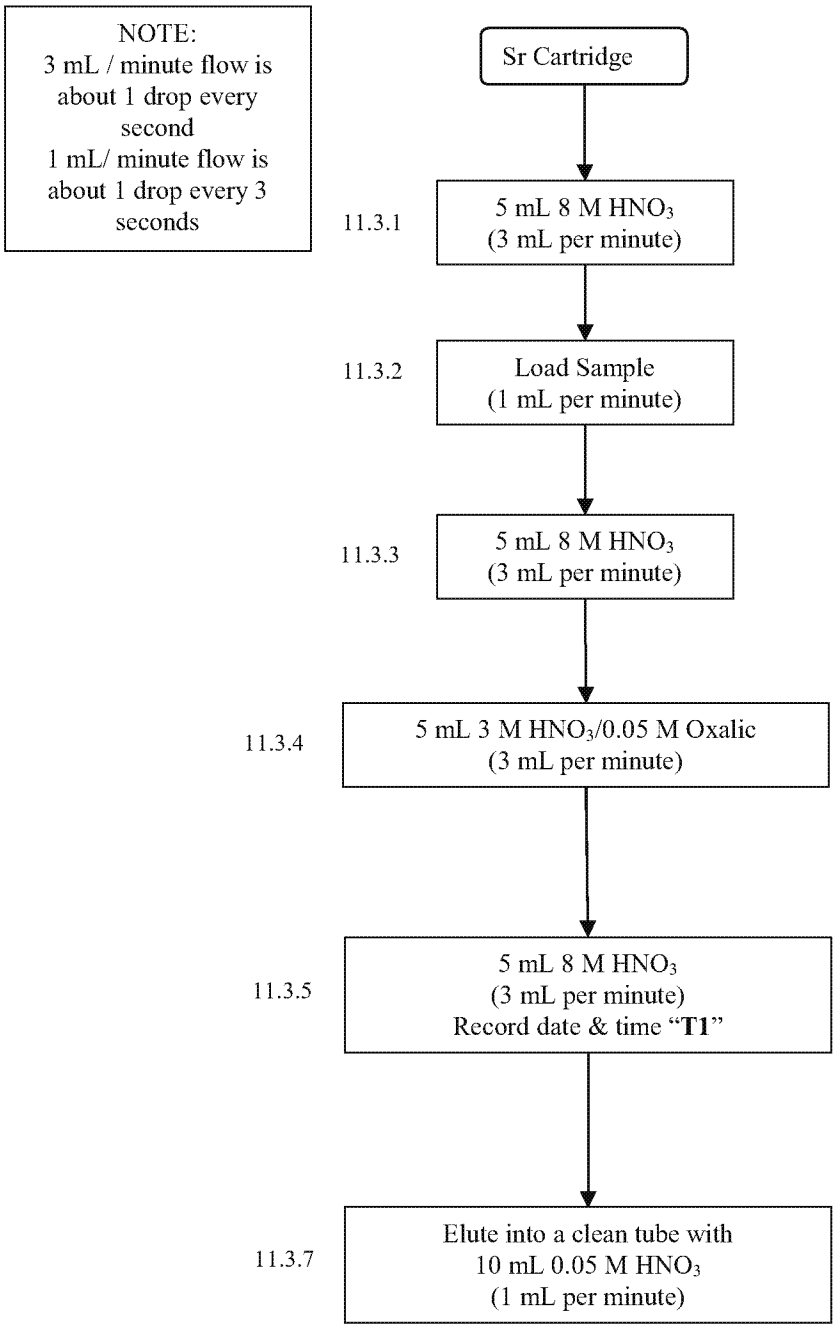
Attachment 1

Strontium via Sr-Specific Resin



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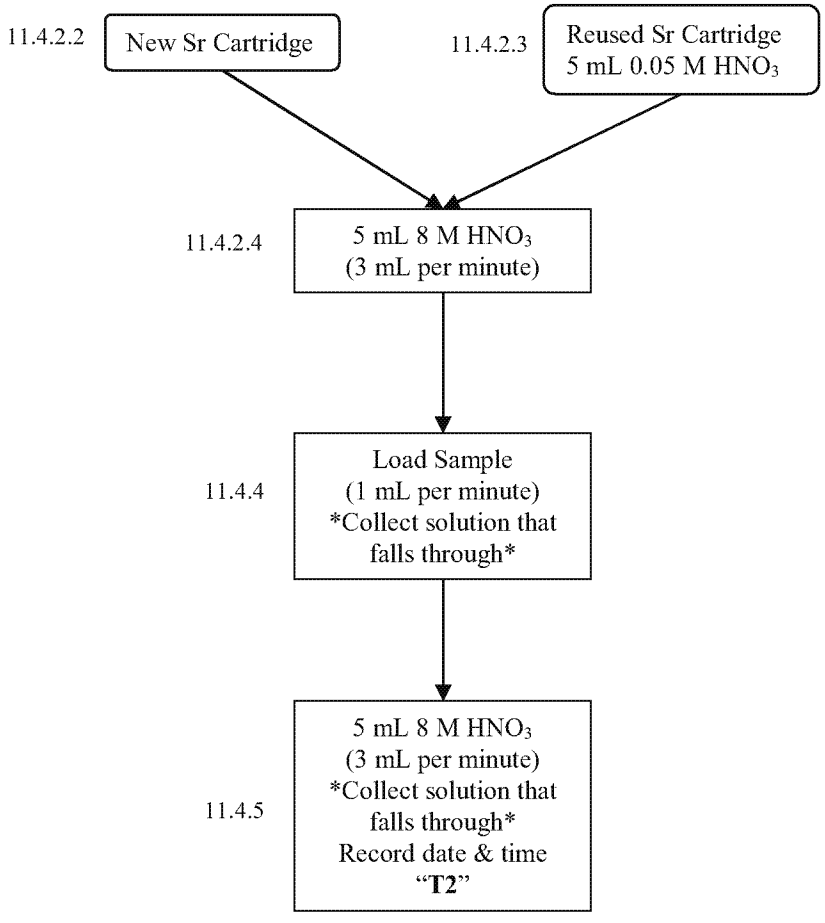
Attachment 2

Yttrium via Sr-Specific Resin



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CERTIFICATE OF ACCREDITATION

The ANSI National Accreditation Board

Hereby attests that

Eurofins TestAmerica, St. Louis Facility
13715 Rider Trail North
Earth City, Missouri 63045

Fulfills the requirements of

ISO/IEC 17025:2017

and the

U.S. Department of Defense (DoD) Quality Systems Manual for Environmental Laboratories (DoD QSM V5.3)

In the field of

TESTING

This certificate is valid only when accompanied by a current scope of accreditation document.
The current scope of accreditation can be verified at www.anab.org.

R. Douglas Leonard Jr., VP, PILR SBU

Expiry Date: 06 April 2022
Certificate Number: L2305

This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2017. This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system (refer to joint ISO-ILAC-IAF Communiqué dated April 2017).

SCOPE OF ACCREDITATION TO ISO/IEC 17025:2017 and U.S. DEPARTMENT OF DEFENSE (DoD) QUALITY SYSTEMS MANUAL FOR ENVIRONMENTAL LABORATORIES (DoD QSM V5.3)

Eurofins TestAmerica, St. Louis Facility
13715 Rider Trail North
Earth City, Missouri 63045
Kristen Ely
314-298-8566

TESTING

Valid to: **April 6, 2022** Certificate Number: **L2305**

Environmental

Non-Potable Water		
Technology	**Method**	**Analyte**
ICP-AES	EPA 6010B/6010C/6010D	Aluminum
ICP-AES	EPA 6010B/6010C/6010D	Antimony
ICP-AES	EPA 6010B/6010C/6010D	Arsenic
ICP-AES	EPA 6010B/6010C/6010D	Barium
ICP-AES	EPA 6010B/6010C/6010D	Beryllium
ICP-AES	EPA 6010B/6010C/6010D	Bismuth
ICP-AES	EPA 6010B/6010C/6010D	Boron
ICP-AES	EPA 6010B/6010C/6010D	Cadmium
ICP-AES	EPA 6010B/6010C/6010D	Calcium
ICP-AES	EPA 6010B/6010C/6010D	Chromium
ICP-AES	EPA 6010B/6010C/6010D	Cobalt
ICP-AES	EPA 6010B/6010C/6010D	Copper
ICP-AES	EPA 6010B/6010C/6010D	Iron
ICP-AES	EPA 6010B/6010C/6010D	Lead
ICP-AES	EPA 6010B/6010C/6010D	Lithium
ICP-AES	EPA 6010B/6010C/6010D	Magnesium
ICP-AES	EPA 6010B/6010C/6010D	Manganese

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Non-Potable Water		
Technology	**Method**	**Analyte**
ICP-AES	EPA 6010B/6010C/6010D	Molybdenum
ICP-AES	EPA 6010B/6010C/6010D	Nickel
ICP-AES	EPA 6010B/6010C/6010D	Phosphorus
ICP-AES	EPA 6010B/6010C/6010D	Potassium
ICP-AES	EPA 6010B/6010C/6010D	Selenium
ICP-AES	EPA 6010B/6010C/6010D	Silicon
ICP-AES	EPA 6010B/6010C/6010D	Silver
ICP-AES	EPA 6010B/6010C/6010D	Sodium
ICP-AES	EPA 6010B/6010C/6010D	Strontium
ICP-AES	EPA 6010B/6010C/6010D	Sulfur
ICP-AES	EPA 6010B/6010C/6010D	Thallium
ICP-AES	EPA 6010B/6010C/6010D	Thorium
ICP-AES	EPA 6010B/6010C/6010D	Tin
ICP-AES	EPA 6010B/6010C/6010D	Titanium
ICP-AES	EPA 6010B/6010C/6010D	Vanadium
ICP-AES	EPA 6010B/6010C/6010D	Zinc
GC/MS	EPA 8260B/8260C/8260D	Acetone
GC/MS	EPA 8260B/8260C/8260D	Acetonitrile
GC/MS	EPA 8260B/8260C/8260D	Acrolein
GC/MS	EPA 8260B/8260C/8260D	Acrylonitrile
GC/MS	EPA 8260B/8260C/8260D	Benzene
GC/MS	EPA 8260B/8260C/8260D	Benzyl chloride
GC/MS	EPA 8260B/8260C/8260D	Bromobenzene
GC/MS	EPA 8260B/8260C/8260D	Bromochloromethane
GC/MS	EPA 8260B/8260C/8260D	Bromodichloromethane
GC/MS	EPA 8260B/8260C/8260D	Bromoform
GC/MS	EPA 8260B/8260C/8260D	Bromomethane
GC/MS	EPA 8260B/8260C/8260D	n-Butanol
GC/MS	EPA 8260B/8260C/8260D	2-Butanone
GC/MS	EPA 8260B/8260C/8260D	n-Butylbenzene
GC/MS	EPA 8260B/8260C/8260D	sec-Butylbenzene

Non-Potable Water		
Technology	**Method**	**Analyte**
GC/MS	EPA 8260B/8260C/8260D	tert-Butylbenzene
GC/MS	EPA 8260B/8260C/8260D	Carbon disulfide
GC/MS	EPA 8260B/8260C/8260D	Carbon tetrachloride
GC/MS	EPA 8260B/8260C/8260D	Chlorobenzene
GC/MS	EPA 8260B/8260C/8260D	2-Chloro-1,3-butadiene
GC/MS	EPA 8260B/8260C/8260D	Chlorodibromomethane
GC/MS	EPA 8260B/8260C/8260D	Chloroethane
GC/MS	EPA 8260B/8260C/8260D	2-Chloroethyl vinyl ether
GC/MS	EPA 8260B/8260C/8260D	Chloroform
GC/MS	EPA 8260B/8260C/8260D	Chloromethane
GC/MS	EPA 8260B/8260C/8260D	Allyl chloride
GC/MS	EPA 8260B/8260C/8260D	2-Chlorotoluene
GC/MS	EPA 8260B/8260C/8260D	4-Chlorotoluene
GC/MS	EPA 8260B/8260C/8260D	Cyclohexane
GC/MS	EPA 8260B/8260C/8260D	Cyclohexanone
GC/MS	EPA 8260B/8260C/8260D	1,2-Dibromo-3-chloropropane
GC/MS	EPA 8260B/8260C/8260D	1,2-Dibromoethane
GC/MS	EPA 8260B/8260C/8260D	Dibromomethane
GC/MS	EPA 8260B/8260C/8260D	1,2-Dichlorobenzene
GC/MS	EPA 8260B/8260C/8260D	1,3-Dichlorobenzene
GC/MS	EPA 8260B/8260C/8260D	1,4-Dichlorobenzene
GC/MS	EPA 8260B/8260C/8260D	trans-1,4-Dichloro-2-butene
GC/MS	EPA 8260B/8260C/8260D	Dichlorodifluoromethane
GC/MS	EPA 8260B/8260C/8260D	1,1-Dichloroethane
GC/MS	EPA 8260B/8260C/8260D	1,2-Dichloroethane
GC/MS	EPA 8260B/8260C/8260D	cis-1,2-Dichloroethene
GC/MS	EPA 8260B/8260C/8260D	trans-1,2-Dichloroethene
GC/MS	EPA 8260B/8260C/8260D	1,1-Dichloroethene
GC/MS	EPA 8260B/8260C/8260D	1,2-Dichloroethene (total)
GC/MS	EPA 8260B/8260C/8260D	1,2-Dichloropropane
GC/MS	EPA 8260B/8260C/8260D	1,3-Dichloropropane
GC/MS	EPA 8260B/8260C/8260D	2,2-Dichloropropane

Non-Potable Water		
Technology	**Method**	**Analyte**
GC/MS	EPA 8260B/8260C/8260D	cis-1,3-Dichloropropene
GC/MS	EPA 8260B/8260C/8260D	trans-1,3-Dichloropropene
GC/MS	EPA 8260B/8260C/8260D	1,1-Dichloropropene
GC/MS	EPA 8260B/8260C/8260D	1,2-Dichloro-1,1,2,2-tetrafluoroethane
GC/MS	EPA 8260B/8260C/8260D	Dimethyl disulfide
GC/MS	EPA 8260B/8260C/8260D	1,4-Dioxane
GC/MS	EPA 8260B/8260C/8260D	Ethyl acetate
GC/MS	EPA 8260B/8260C/8260D	Ethylbenzene
GC/MS	EPA 8260B/8260C/8260D	Ethyl ether
GC/MS	EPA 8260B/8260C/8260D	Ethyl methacrylate
GC/MS	EPA 8260B/8260C/8260D	Hexachlorobutadiene
GC/MS	EPA 8260B/8260C/8260D	n-Hexane
GC/MS	EPA 8260B/8260C/8260D	2-Hexanone
GC/MS	EPA 8260B/8260C/8260D	Iodomethane
GC/MS	EPA 8260B/8260C/8260D	Isobutanol
GC/MS	EPA 8260B/8260C/8260D	Isopropylbenzene
GC/MS	EPA 8260B/8260C/8260D	p-Isopropyltoluene
GC/MS	EPA 8260B/8260C/8260D	Methacrylonitrile
GC/MS	EPA 8260B/8260C/8260D	Methyl acetate
GC/MS	EPA 8260B/8260C/8260D	Methylcyclohexane
GC/MS	EPA 8260B/8260C/8260D	Methylene chloride
GC/MS	EPA 8260B/8260C/8260D	Methyl methacrylate
GC/MS	EPA 8260B/8260C/8260D	4-Methyl-2-pentanone
GC/MS	EPA 8260B/8260C/8260D	MTBE
GC/MS	EPA 8260B/8260C/8260D	Naphthalene
GC/MS	EPA 8260B/8260C/8260D	2-Nitropropane
GC/MS	EPA 8260B/8260C/8260D	Nonanal
GC/MS	EPA 8260B/8260C/8260D	Pentachloroethane
GC/MS	EPA 8260B/8260C/8260D	Propionitrile
GC/MS	EPA 8260B/8260C/8260D	n-Propylbenzene
GC/MS	EPA 8260B/8260C/8260D	Styrene
GC/MS	EPA 8260B/8260C/8260D	1,1,1,2-Tetrachloroethane

Non-Potable Water		
Technology	**Method**	**Analyte**
GC/MS	EPA 8260B/8260C/8260D	1,1,2,2-Tetrachloroethane
GC/MS	EPA 8260B/8260C/8260D	Tetrachloroethene
GC/MS	EPA 8260B/8260C/8260D	Tetrahydrofuran
GC/MS	EPA 8260B/8260C/8260D	Toluene
GC/MS	EPA 8260B/8260C/8260D	1,3,5-Trichlorobenzene
GC/MS	EPA 8260B/8260C/8260D	1,2,3-Trichlorobenzene
GC/MS	EPA 8260B/8260C/8260D	1,2,4-Trichlorobenzene
GC/MS	EPA 8260B/8260C/8260D	1,1,1-Trichloroethane
GC/MS	EPA 8260B/8260C/8260D	1,1,2-Trichloroethane
GC/MS	EPA 8260B/8260C/8260D	Trichloroethene
GC/MS	EPA 8260B/8260C/8260D	Trichlorofluoromethane
GC/MS	EPA 8260B/8260C/8260D	1,2,3-Trichloropropane
GC/MS	EPA 8260B/8260C/8260D	1,1,2-Trichloro-1,2,2-trifluoroethane
GC/MS	EPA 8260B/8260C/8260D	1,2,4-Trimethylbenzene
GC/MS	EPA 8260B/8260C/8260D	1,3,5-Trimethylbenzene
GC/MS	EPA 8260B/8260C/8260D	Vinyl acetate
GC/MS	EPA 8260B/8260C/8260D	Vinyl chloride
GC/MS	EPA 8260B/8260C/8260D	m-Xylene & p-Xylene
GC/MS	EPA 8260B/8260C/8260D	o-Xylene
GC/MS	EPA 8260B/8260C/8260D	Xylenes (total)
GC/MS	EPA 8260B/8260C/8260D SIM	1,4-Dioxane
ICP-MS	EPA 6020/6020A/6020B	Aluminum
ICP-MS	EPA 6020/6020A/6020B	Antimony
ICP-MS	EPA 6020/6020A/6020B	Arsenic
ICP-MS	EPA 6020/6020A/6020B	Barium
ICP-MS	EPA 6020/6020A/6020B	Beryllium
ICP-MS	EPA 6020/6020A/6020B	Bismuth
ICP-MS	EPA 6020/6020A/6020B	Boron
ICP-MS	EPA 6020/6020A/6020B	Cadmium
ICP-MS	EPA 6020/6020A/6020B	Calcium
ICP-MS	EPA 6020/6020A/6020B	Cerium

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Non-Potable Water		
Technology	**Method**	**Analyte**
ICP-MS	EPA 6020/6020A/6020B	Cesium
ICP-MS	EPA 6020/6020A/6020B	Chromium
ICP-MS	EPA 6020/6020A/6020B	Cobalt
ICP-MS	EPA 6020/6020A/6020B	Copper
ICP-MS	EPA 6020/6020A/6020B	Gold
ICP-MS	EPA 6020/6020A/6020B	Hafnium
ICP-MS	EPA 6020/6020A/6020B	Iron
ICP-MS	EPA 6020/6020A/6020B	Lanthanum
ICP-MS	EPA 6020/6020A/6020B	Lead
ICP-MS	EPA 6020/6020A/6020B	Lithium
ICP-MS	EPA 6020/6020A/6020B	Magnesium
ICP-MS	EPA 6020/6020A/6020B	Manganese
ICP-MS	EPA 6020/6020A/6020B	Molybdenum
ICP-MS	EPA 6020/6020A/6020B	Neodymium
ICP-MS	EPA 6020/6020A/6020B	Nickel
ICP-MS	EPA 6020/6020A/6020B	Niobium
ICP-MS	EPA 6020/6020A/6020B	Palladium
ICP-MS	EPA 6020/6020A/6020B	Phosphorus
ICP-MS	EPA 6020/6020A/6020B	Platinum
ICP-MS	EPA 6020/6020A/6020B	Potassium
ICP-MS	EPA 6020/6020A/6020B	Praseodymium
ICP-MS	EPA 6020/6020A/6020B	Rhenium
ICP-MS	EPA 6020/6020A/6020B	Rhodium
ICP-MS	EPA 6020/6020A/6020B	Ruthenium
ICP-MS	EPA 6020/6020A/6020B	Samarium
ICP-MS	EPA 6020/6020A/6020B	Selenium
ICP-MS	EPA 6020/6020A/6020B	Silver
ICP-MS	EPA 6020/6020A/6020B	Sodium
ICP-MS	EPA 6020/6020A/6020B	Strontium
ICP-MS	EPA 6020/6020A/6020B	Tantalum
ICP-MS	EPA 6020/6020A/6020B	Tellurium

Non-Potable Water		
Technology	**Method**	**Analyte**
ICP-MS	EPA 6020/6020A/6020B	Thallium
ICP-MS	EPA 6020/6020A/6020B	Thorium
ICP-MS	EPA 6020/6020A/6020B	Tin
ICP-MS	EPA 6020/6020A/6020B	Titanium
ICP-MS	EPA 6020/6020A/6020B	Tungsten
ICP-MS	EPA 6020/6020A/6020B	Uranium
ICP-MS	EPA 6020/6020A/6020B	Uranium 233
ICP-MS	EPA 6020/6020A/6020B	Uranium 234
ICP-MS	EPA 6020/6020A/6020B	Uranium 235
ICP-MS	EPA 6020/6020A/6020B	Uranium 236
ICP-MS	EPA 6020/6020A/6020B	Uranium 238
ICP-MS	EPA 6020/6020A/6020B	Vanadium
ICP-MS	EPA 6020/6020A/6020B	Yttrium
ICP-MS	EPA 6020/6020A/6020B	Zinc
ICP-MS	EPA 6020/6020A/6020B	Zirconium
ICP-MS	EPA 6020/6020A/6020B	Total Hardness
ICP-MS	EPA 6020/6020A/6020B	Dysprosium
ICP-MS	EPA 6020/6020A/6020B	Erbium
ICP-MS	EPA 6020/6020A/6020B	Europium
ICP-MS	EPA 6020/6020A/6020B	Gadolinium
ICP-MS	EPA 6020/6020A/6020B	Gallium
ICP-MS	EPA 6020/6020A/6020B	Holmium
ICP-MS	EPA 6020/6020A/6020B	Lutetium
ICP-MS	EPA 6020/6020A/6020B	Rubidium
ICP-MS	EPA 6020/6020A/6020B	Terbium
ICP-MS	EPA 6020/6020A/6020B	Thulium
ICP-MS	EPA 6020/6020A/6020B	Ytterbium
ICP-MS	EPA 200.8	Aluminum
ICP-MS	EPA 200.8	Antimony
ICP-MS	EPA 200.8	Arsenic
ICP-MS	EPA 200.8	Barium

Non-Potable Water		
Technology	**Method**	**Analyte**
ICP-MS	EPA 200.8	Beryllium
ICP-MS	EPA 200.8	Boron
ICP-MS	EPA 200.8	Cadmium
ICP-MS	EPA 200.8	Calcium
ICP-MS	EPA 200.8	Cerium
ICP-MS	EPA 200.8	Cesium
ICP-MS	EPA 200.8	Chromium
ICP-MS	EPA 200.8	Cobalt
ICP-MS	EPA 200.8	Copper
ICP-MS	EPA 200.8	Gold
ICP-MS	EPA 200.8	Iron
ICP-MS	EPA 200.8	Lead
ICP-MS	EPA 200.8	Lithium
ICP-MS	EPA 200.8	Magnesium
ICP-MS	EPA 200.8	Manganese
ICP-MS	EPA 200.8	Molybdenum
ICP-MS	EPA 200.8	Nickel
ICP-MS	EPA 200.8	Phosphorus
ICP-MS	EPA 200.8	Platinum
ICP-MS	EPA 200.8	Potassium
ICP-MS	EPA 200.8	Rhodium
ICP-MS	EPA 200.8	Selenium
ICP-MS	EPA 200.8	Silver
ICP-MS	EPA 200.8	Sodium
ICP-MS	EPA 200.8	Strontium
ICP-MS	EPA 200.8	Tantalum
ICP-MS	EPA 200.8	Thallium
ICP-MS	EPA 200.8	Thorium
ICP-MS	EPA 200.8	Tin
ICP-MS	EPA 200.8	Titanium
ICP-MS	EPA 200.8	Tungsten

Non-Potable Water		
Technology	**Method**	**Analyte**
ICP-MS	EPA 200.8	Uranium
ICP-MS	EPA 200.8	Vanadium
ICP-MS	EPA 200.8	Zinc
ICP-MS	EPA 200.8	Zirconium
ICP-AES	EPA 200.7	Aluminum
ICP-AES	EPA 200.7	Antimony
ICP-AES	EPA 200.7	Arsenic
ICP-AES	EPA 200.7	Barium
ICP-AES	EPA 200.7	Beryllium
ICP-AES	EPA 200.7	Bismuth
ICP-AES	EPA 200.7	Boron
ICP-AES	EPA 200.7	Cadmium
ICP-AES	EPA 200.7	Calcium
ICP-AES	EPA 200.7	Chromium
ICP-AES	EPA 200.7	Cobalt
ICP-AES	EPA 200.7	Copper
ICP-AES	EPA 200.7	Iron
ICP-AES	EPA 200.7	Lead
ICP-AES	EPA 200.7	Lithium
ICP-AES	EPA 200.7	Magnesium
ICP-AES	EPA 200.7	Manganese
ICP-AES	EPA 200.7	Molybdenum
ICP-AES	EPA 200.7	Nickel
ICP-AES	EPA 200.7	Phosphorus
ICP-AES	EPA 200.7	Potassium
ICP-AES	EPA 200.7	Selenium
ICP-AES	EPA 200.7	Silicon
ICP-AES	EPA 200.7	Silver
ICP-AES	EPA 200.7	Sodium
ICP-AES	EPA 200.7	Strontium
ICP-AES	EPA 200.7	Sulfur

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Non-Potable Water		
Technology	**Method**	**Analyte**
ICP-AES	EPA 200.7	Thallium
ICP-AES	EPA 200.7	Thorium
ICP-AES	EPA 200.7	Tin
ICP-AES	EPA 200.7	Titanium
ICP-AES	EPA 200.7	Vanadium
ICP-AES	EPA 200.7	Zinc
CVAA	EPA 245.1/7470A	Mercury
Ion Chromatography	EPA 300.0/9056/9056A	Bromide
Ion Chromatography	EPA 300.0/9056/9056A	Chloride
Ion Chromatography	EPA 300.0/9056/9056A	Fluoride
Ion Chromatography	EPA 300.0/9056/9056A	Nitrate
Ion Chromatography	EPA 300.0/9056/9056A	Nitrite
Ion Chromatography	EPA 300.0/9056/9056A	Sulfate
Ion Chromatography	EPA 300.0/9056/9056A	Ortho-phosphate
Ion Chromatography	EPA 300.0/9056/9056A	Iodide
Probe	EPA 9040C EPA 150.1 SM 4500-H+ B -2011	pH
Colormetric	EPA 7196A	Hex Chromium
Gas Flow Proportional Counter	EPA 900.0 EPA 9310 SM 7110C	gross alpha/beta
Gas Flow Proportional Counter	ST-RC-0036 ST-RD-0403	Chlorine-36
Gas Flow Proportional Counter	EPA 903.0 EPA 9315	Radium-226
Gas Flow Proportional Counter	EPA 903.0 EPA 9315	total radium
Gas Flow Proportional Counter	EPA 904.0 EPA 9320	Radium-228
Gas Flow Proportional Counter	EPA 905.0 DOE HASL 300 Sr-02 DOE HASL 300 Sr-03	Strontium-90
Liquid Scintillation Counter	SM 7500-Rn B	Radon-222

Non-Potable Water		
Technology	**Method**	**Analyte**
Liquid Scintillation Counter	ST-RC-0079	Selenium-79
Liquid Scintillation Counter	EPA 906.0	Tritium
Liquid Scintillation Counter	Eichrom Technologies TCW01/TCS01 HASL 300 Tc-02-RC	Tecnetium-99
Liquid Scintillation Counter	EERF C-01-C14	Carbon-14
Gamma Spectroscopy	EPA 901.1 / DOE HASL 300 Ga-01-R	Gamma Emitters:
Gamma Spectroscopy	EPA 901.1 / DOE HASL 300 Ga-01-R	Actinium 227 (assumes equilibrium w/ Th-227)
Gamma Spectroscopy	EPA 901.1 / DOE HASL 300 Ga-01-R	Actinium 228
Gamma Spectroscopy	EPA 901.1 / DOE HASL 300 Ga-01-R	Americium 241
Gamma Spectroscopy	EPA 901.1 / DOE HASL 300 Ga-01-R	Antimony 124
Gamma Spectroscopy	EPA 901.1 / DOE HASL 300 Ga-01-R	Antimony 125
Gamma Spectroscopy	EPA 901.1 / DOE HASL 300 Ga-01-R	Barium/Lanthanum-140
Gamma Spectroscopy	EPA 901.1 / DOE HASL 300 Ga-01-R	Barium 133
Gamma Spectroscopy	EPA 901.1 / DOE HASL 300 Ga-01-R	Barium 140
Gamma Spectroscopy	EPA 901.1 / DOE HASL 300 Ga-01-R	Beryllium 7
Gamma Spectroscopy	EPA 901.1 / DOE HASL 300 Ga-01-R	Bismuth 211 eq Th-227
Gamma Spectroscopy	EPA 901.1 / DOE HASL 300 Ga-01-R	Bismuth 207
Gamma Spectroscopy	EPA 901.1 / DOE HASL 300 Ga-01-R	Bismuth-210M
Gamma Spectroscopy	EPA 901.1 / DOE HASL 300 Ga-01-R	Bismuth 212
Gamma Spectroscopy	EPA 901.1 / DOE HASL 300 Ga-01-R	Bismuth 214
Gamma Spectroscopy	EPA 901.1 / DOE HASL 300 Ga-01-R	Cerium 141

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Non-Potable Water		
Technology	**Method**	**Analyte**
Gamma Spectroscopy	EPA 901.1 / DOE HASL 300 Ga-01-R	Cerium 139
Gamma Spectroscopy	EPA 901.1 / DOE HASL 300 Ga-01-R	Cerium 144
Gamma Spectroscopy	EPA 901.1 / DOE HASL 300 Ga-01-R	Cesium 134
Gamma Spectroscopy	EPA 901.1 / DOE HASL 300 Ga-01-R	Cesium 137
Gamma Spectroscopy	EPA 901.1 / DOE HASL 300 Ga-01-R	Cobalt 56
Gamma Spectroscopy	EPA 901.1 / DOE HASL 300 Ga-01-R	Cobalt 57
Gamma Spectroscopy	EPA 901.1 / DOE HASL 300 Ga-01-R	Cobalt 58
Gamma Spectroscopy	EPA 901.1 / DOE HASL 300 Ga-01-R	Cobalt 60
Gamma Spectroscopy	EPA 901.1 / DOE HASL 300 Ga-01-R	Europium 152
Gamma Spectroscopy	EPA 901.1 / DOE HASL 300 Ga-01-R	Europium 154
Gamma Spectroscopy	EPA 901.1 / DOE HASL 300 Ga-01-R	Europium 155
Gamma Spectroscopy	EPA 901.1 / DOE HASL 300 Ga-01-R	Hafnium 181
Gamma Spectroscopy	EPA 901.1 / DOE HASL 300 Ga-01-R	Iodine 131
Gamma Spectroscopy	EPA 901.1 / DOE HASL 300 Ga-01-R	Iridium 192
Gamma Spectroscopy	EPA 901.1 / DOE HASL 300 Ga-01-R	Iron 59
Gamma Spectroscopy	EPA 901.1 / DOE HASL 300 Ga-01-R	Lanthanum 140
Gamma Spectroscopy	EPA 901.1 / DOE HASL 300 Ga-01-R	Lead 210
Gamma Spectroscopy	EPA 901.1 / DOE HASL 300 Ga-01-R	Lead 211
Gamma Spectroscopy	EPA 901.1 / DOE HASL 300 Ga-01-R	Lead 212

Non-Potable Water		
Technology	**Method**	**Analyte**
Gamma Spectroscopy	EPA 901.1 / DOE HASL 300 Ga-01-R	Lead 214
Gamma Spectroscopy	EPA 901.1 / DOE HASL 300 Ga-01-R	Manganese 54
Gamma Spectroscopy	EPA 901.1 / DOE HASL 300 Ga-01-R	Mercury 203
Gamma Spectroscopy	EPA 901.1 / DOE HASL 300 Ga-01-R	Neptunium 237
Gamma Spectroscopy	EPA 901.1 / DOE HASL 300 Ga-01-R	Neptunium 239
Gamma Spectroscopy	EPA 901.1 / DOE HASL 300 Ga-01-R	Niobium 94
Gamma Spectroscopy	EPA 901.1 / DOE HASL 300 Ga-01-R	Niobium 95
Gamma Spectroscopy	EPA 901.1 / DOE HASL 300 Ga-01-R	Potassium 40
Gamma Spectroscopy	EPA 901.1 / DOE HASL 300 Ga-01-R	Promethium 144
Gamma Spectroscopy	EPA 901.1 / DOE HASL 300 Ga-01-R	Promethium 146
Gamma Spectroscopy	EPA 901.1 / DOE HASL 300 Ga-01-R	Promethium 147
Gamma Spectroscopy	EPA 901.1 / DOE HASL 300 Ga-01-R	Protactinium 234M
Gamma Spectroscopy	EPA 901.1 / DOE HASL 300 Ga-01-R	Protactinium 231
Gamma Spectroscopy	EPA 901.1 / DOE HASL 300 Ga-01-R	Protactinium 234
Gamma Spectroscopy	EPA 901.1 / DOE HASL 300 Ga-01-R	Radium (226)
Gamma Spectroscopy	EPA 901.1 / DOE HASL 300 Ga-01-R	Radium 228
Gamma Spectroscopy	EPA 901.1 / DOE HASL 300 Ga-01-R	Radium 223 (assumes equilibrium w/ Th-227)
Gamma Spectroscopy	EPA 901.1 / DOE HASL 300 Ga-01-R	Radium 224
Gamma Spectroscopy	EPA 901.1 / DOE HASL 300 Ga-01-R	Ruthenium 106
Gamma Spectroscopy	EPA 901.1 / DOE HASL 300 Ga-01-R	Scandium 46

Non-Potable Water		
Technology	**Method**	**Analyte**
Gamma Spectroscopy	EPA 901.1 / DOE HASL 300 Ga-01-R	Sodium 22
Gamma Spectroscopy	EPA 901.1 / DOE HASL 300 Ga-01-R	Sodium 24
Gamma Spectroscopy	EPA 901.1 / DOE HASL 300 Ga-01-R	Strontium 85
Gamma Spectroscopy	EPA 901.1 / DOE HASL 300 Ga-01-R	Thallium 208
Gamma Spectroscopy	EPA 901.1 / DOE HASL 300 Ga-01-R	Thorium 227
Gamma Spectroscopy	EPA 901.1 / DOE HASL 300 Ga-01-R	Thorium 228
Gamma Spectroscopy	EPA 901.1 / DOE HASL 300 Ga-01-R	Thorium 230
Gamma Spectroscopy	EPA 901.1 / DOE HASL 300 Ga-01-R	Thorium 231
Gamma Spectroscopy	EPA 901.1 / DOE HASL 300 Ga-01-R	Thorium 232
Gamma Spectroscopy	EPA 901.1 / DOE HASL 300 Ga-01-R	Thorium 234
Gamma Spectroscopy	EPA 901.1 / DOE HASL 300 Ga-01-R	Tin 113
Gamma Spectroscopy	EPA 901.1 / DOE HASL 300 Ga-01-R	Uranium 235
Gamma Spectroscopy	EPA 901.1 / DOE HASL 300 Ga-01-R	Uranium 238
Gamma Spectroscopy	EPA 901.1 / DOE HASL 300 Ga-01-R	Vanadium-48
Gamma Spectroscopy	EPA 901.1 / DOE HASL 300 Ga-01-R	Yttrium 88
Gamma Spectroscopy	EPA 901.1 / DOE HASL 300 Ga-01-R	Zinc 65
Gamma Spectroscopy	EPA 901.1 / DOE HASL 300 Ga-01-R	Zirconium 95
Alpha Spectroscopy	DOE HASL 300 A-01-R	Alpha spec analysis:
Alpha Spectroscopy	DOE HASL 300 A-01-R DOE HASL 300 U-02-RC	Isotopic Uranium
Alpha Spectroscopy	DOE HASL 300 A-01-R	Isotopic Thorium
Alpha Spectroscopy	DOE HASL 300 A-01-R	Isotopic Americium

Non-Potable Water		
Technology	**Method**	**Analyte**
Alpha Spectroscopy	DOE HASL 300 A-01-R	Isotopic Plutonium
Alpha Spectroscopy	DOE HASL 300 A-01-R	Isotopic Neptunium
Alpha Spectroscopy	DOE HASL 300 A-01-R	Isotopic Curium
Alpha Spectroscopy	ST-RC-0301	Radium-226
Liquid Scintillation Counter	Eichrom Technologies OTW01, OTS01	Lead-210
Alpha Spectroscopy	ST-RC-0210	Polonium-210
Liquid Scintillation Counter	Eichrom Technologies FEW01	Iron-55
Liquid Scintillation Counter	DOE RP-300	Nickel 59/63
Liquid Scintillation Counter	SM 7500-IB	Iodine-129
Extraction Chromatography	ST-RC-0058	Strontium-90
Preparation	**Method**	**Type**
Volatile Prep	EPA 5000	Sample Preparation for Volatile Organic Compounds
Acid Digestion (Aqueous samples)	EPA 3010A EPA 3005A	Acid Digestion for Metals (Aqueous samples)
Purge & Trap	EPA 5030C	Purge & Trap for Aqueous Volatile
TCLP Extraction	EPA 1311	TCLP Extraction
SPLP Extraction	EPA 1312	SPLP Extraction
CWET Extraction	CA Title 22	CWET Extraction

Drinking Water		
Technology	**Method**	**Analyte**
ICP-MS	EPA 200.8	Uranium
Alpha Spectroscopy	DOE HASL 300 U-02-RC	Isotopic Uranium
Gas Flow Proportional Counter	EPA 900.0 EPA 9310	Gross alpha/beta
Gas Flow Proportional Counter	SM 7110C	Gross alpha

Drinking Water		
Technology	**Method**	**Analyte**
Gas Flow Proportional Counter	ST-RC-0036 ST-RD-0403	Chlorine-36
Gas Flow Proportional Counter	EPA 903.0 EPA 9315	Radium-226
Gas Flow Proportional Counter	EPA 904.0 EPA 9320	Radium-228
Gas Flow Proportional Counter	EPA 905.0 DOE HASL 300 Sr-02	Strontium-90
Liquid Scintillation Counter	SM 7500-Rn B	Radon-222
Liquid Scintillation Counter	ST-RC-0079	Selenium-79
Liquid Scintillation Counter	EPA 906.0	Tritium
Gamma Spectroscopy	EPA 901.1 / DOE HASL 300 Ga-01-R	Gamma Emitters:
Gamma Spectroscopy	EPA 901.1 / DOE HASL 300 Ga-01-R	Actinium 227 (assumes equilibrium w/ Th-227)
Gamma Spectroscopy	EPA 901.1 / DOE HASL 300 Ga-01-R	Actinium 228
Gamma Spectroscopy	EPA 901.1 / DOE HASL 300 Ga-01-R	Americium 241
Gamma Spectroscopy	EPA 901.1 / DOE HASL 300 Ga-01-R	Antimony 124
Gamma Spectroscopy	EPA 901.1 / DOE HASL 300 Ga-01-R	Antimony 125
Gamma Spectroscopy	EPA 901.1 / DOE HASL 300 Ga-01-R	Barium/Lanthanum-140
Gamma Spectroscopy	EPA 901.1 / DOE HASL 300 Ga-01-R	Barium 133
Gamma Spectroscopy	EPA 901.1 / DOE HASL 300 Ga-01-R	Barium 140
Gamma Spectroscopy	EPA 901.1 / DOE HASL 300 Ga-01-R	Beryllium 7
Gamma Spectroscopy	EPA 901.1 / DOE HASL 300 Ga-01-R	Bismuth 211 eq Th-227
Gamma Spectroscopy	EPA 901.1 / DOE HASL 300 Ga-01-R	Bismuth 207

Drinking Water		
Technology	**Method**	**Analyte**
Gamma Spectroscopy	EPA 901.1 / DOE HASL 300 Ga-01-R	Bismuth-210M
Gamma Spectroscopy	EPA 901.1 / DOE HASL 300 Ga-01-R	Bismuth 212
Gamma Spectroscopy	EPA 901.1 / DOE HASL 300 Ga-01-R	Bismuth 214
Gamma Spectroscopy	EPA 901.1 / DOE HASL 300 Ga-01-R	Cerium 141
Gamma Spectroscopy	EPA 901.1 / DOE HASL 300 Ga-01-R	Cerium 139
Gamma Spectroscopy	EPA 901.1 / DOE HASL 300 Ga-01-R	Cerium 144
Gamma Spectroscopy	EPA 901.1 / DOE HASL 300 Ga-01-R	Cesium 134
Gamma Spectroscopy	EPA 901.1 / DOE HASL 300 Ga-01-R	Cesium 137
Gamma Spectroscopy	EPA 901.1 / DOE HASL 300 Ga-01-R	Cobalt 56
Gamma Spectroscopy	EPA 901.1 / DOE HASL 300 Ga-01-R	Cobalt 57
Gamma Spectroscopy	EPA 901.1 / DOE HASL 300 Ga-01-R	Cobalt 58
Gamma Spectroscopy	EPA 901.1 / DOE HASL 300 Ga-01-R	Cobalt 60
Gamma Spectroscopy	EPA 901.1 / DOE HASL 300 Ga-01-R	Europium 152
Gamma Spectroscopy	EPA 901.1 / DOE HASL 300 Ga-01-R	Europium 154
Gamma Spectroscopy	EPA 901.1 / DOE HASL 300 Ga-01-R	Europium 155
Gamma Spectroscopy	EPA 901.1 / DOE HASL 300 Ga-01-R	Hafnium 181
Gamma Spectroscopy	EPA 901.1 / DOE HASL 300 Ga-01-R	Iodine 131

Drinking Water		
Technology	**Method**	**Analyte**
Gamma Spectroscopy	EPA 901.1 / DOE HASL 300 Ga-01-R	Iridium 192
Gamma Spectroscopy	EPA 901.1 / DOE HASL 300 Ga-01-R	Iron 59
Gamma Spectroscopy	EPA 901.1 / DOE HASL 300 Ga-01-R	Lanthanum 140
Gamma Spectroscopy	EPA 901.1 / DOE HASL 300 Ga-01-R	Lead 210
Gamma Spectroscopy	EPA 901.1 / DOE HASL 300 Ga-01-R	Lead 211
Gamma Spectroscopy	EPA 901.1 / DOE HASL 300 Ga-01-R	Lead 212
Gamma Spectroscopy	EPA 901.1 / DOE HASL 300 Ga-01-R	Lead 214
Gamma Spectroscopy	EPA 901.1 / DOE HASL 300 Ga-01-R	Manganese 54
Gamma Spectroscopy	EPA 901.1 / DOE HASL 300 Ga-01-R	Mercury 203
Gamma Spectroscopy	EPA 901.1 / DOE HASL 300 Ga-01-R	Neptunium 237
Gamma Spectroscopy	EPA 901.1 / DOE HASL 300 Ga-01-R	Neptunium 239
Gamma Spectroscopy	EPA 901.1 / DOE HASL 300 Ga-01-R	Niobium 94
Gamma Spectroscopy	EPA 901.1 / DOE HASL 300 Ga-01-R	Niobium 95
Gamma Spectroscopy	EPA 901.1 / DOE HASL 300 Ga-01-R	Potassium 40
Gamma Spectroscopy	EPA 901.1 / DOE HASL 300 Ga-01-R	Promethium 144
Gamma Spectroscopy	EPA 901.1 / DOE HASL 300 Ga-01-R	Promethium 146
Gamma Spectroscopy	EPA 901.1 / DOE HASL 300 Ga-01-R	Promethium 147

Drinking Water		
Technology	**Method**	**Analyte**
Gamma Spectroscopy	EPA 901.1 / DOE HASL 300 Ga-01-R	Protactinium 234M
Gamma Spectroscopy	EPA 901.1 / DOE HASL 300 Ga-01-R	Protactinium 231
Gamma Spectroscopy	EPA 901.1 / DOE HASL 300 Ga-01-R	Protactinium 234
Gamma Spectroscopy	EPA 901.1 / DOE HASL 300 Ga-01-R	Radium (226)
Gamma Spectroscopy	EPA 901.1 / DOE HASL 300 Ga-01-R	Radium 228
Gamma Spectroscopy	EPA 901.1 / DOE HASL 300 Ga-01-R	Radium 223 (assumes equilibrium w/ Th-227)
Gamma Spectroscopy	EPA 901.1 / DOE HASL 300 Ga-01-R	Radium 224
Gamma Spectroscopy	EPA 901.1 / DOE HASL 300 Ga-01-R	Ruthenium 106
Gamma Spectroscopy	EPA 901.1 / DOE HASL 300 Ga-01-R	Scandium 46
Gamma Spectroscopy	EPA 901.1 / DOE HASL 300 Ga-01-R	Sodium 22
Gamma Spectroscopy	EPA 901.1 / DOE HASL 300 Ga-01-R	Sodium 24
Gamma Spectroscopy	EPA 901.1 / DOE HASL 300 Ga-01-R	Strontium 85
Gamma Spectroscopy	EPA 901.1 / DOE HASL 300 Ga-01-R	Thallium 208
Gamma Spectroscopy	EPA 901.1 / DOE HASL 300 Ga-01-R	Thorium 227
Gamma Spectroscopy	EPA 901.1 / DOE HASL 300 Ga-01-R	Thorium 228
Gamma Spectroscopy	EPA 901.1 / DOE HASL 300 Ga-01-R	Thorium 230
Gamma Spectroscopy	EPA 901.1 / DOE HASL 300 Ga-01-R	Thorium 231

Drinking Water		
Technology	**Method**	**Analyte**
Gamma Spectroscopy	EPA 901.1 / DOE HASL 300 Ga-01-R	Thorium 232
Gamma Spectroscopy	EPA 901.1 / DOE HASL 300 Ga-01-R	Thorium 234
Gamma Spectroscopy	EPA 901.1 / DOE HASL 300 Ga-01-R	Tin 113
Gamma Spectroscopy	EPA 901.1 / DOE HASL 300 Ga-01-R	Uranium 235
Gamma Spectroscopy	EPA 901.1 / DOE HASL 300 Ga-01-R	Uranium 238
Gamma Spectroscopy	EPA 901.1 / DOE HASL 300 Ga-01-R	Vanadium-48
Gamma Spectroscopy	EPA 901.1 / DOE HASL 300 Ga-01-R	Yttrium 88
Gamma Spectroscopy	EPA 901.1 / DOE HASL 300 Ga-01-R	Zinc 65
Gamma Spectroscopy	EPA 901.1 / DOE HASL 300 Ga-01-R	Zirconium 95

Solid and Chemical Materials		
Technology	**Method**	**Analyte**
ICP-AES	EPA 6010B/6010C/6010D	Aluminum
ICP-AES	EPA 6010B/6010C/6010D	Antimony
ICP-AES	EPA 6010B/6010C/6010D	Arsenic
ICP-AES	EPA 6010B/6010C/6010D	Barium
ICP-AES	EPA 6010B/6010C/6010D	Beryllium
ICP-AES	EPA 6010B/6010C/6010D	Bismuth
ICP-AES	EPA 6010B/6010C/6010D	Boron
ICP-AES	EPA 6010B/6010C/6010D	Cadmium
ICP-AES	EPA 6010B/6010C/6010D	Calcium
ICP-AES	EPA 6010B/6010C/6010D	Chromium

Solid and Chemical Materials		
Technology	**Method**	**Analyte**
ICP-AES	EPA 6010B/6010C/6010D	Cobalt
ICP-AES	EPA 6010B/6010C/6010D	Copper
ICP-AES	EPA 6010B/6010C/6010D	Iron
ICP-AES	EPA 6010B/6010C/6010D	Lead
ICP-AES	EPA 6010B/6010C/6010D	Lithium
ICP-AES	EPA 6010B/6010C/6010D	Magnesium
ICP-AES	EPA 6010B/6010C/6010D	Manganese
ICP-AES	EPA 6010B/6010C/6010D	Molybdenum
ICP-AES	EPA 6010B/6010C/6010D	Nickel
ICP-AES	EPA 6010B/6010C/6010D	Phosphorus
ICP-AES	EPA 6010B/6010C/6010D	Potassium
ICP-AES	EPA 6010B/6010C/6010D	Selenium
ICP-AES	EPA 6010B/6010C/6010D	Silicon
ICP-AES	EPA 6010B/6010C/6010D	Silver
ICP-AES	EPA 6010B/6010C/6010D	Sodium
ICP-AES	EPA 6010B/6010C/6010D	Strontium
ICP-AES	EPA 6010B/6010C/6010D	Sulfur
ICP-AES	EPA 6010B/6010C/6010D	Thallium
ICP-AES	EPA 6010B/6010C/6010D	Thorium
ICP-AES	EPA 6010B/6010C/6010D	Tin
ICP-AES	EPA 6010B/6010C/6010D	Titanium
ICP-AES	EPA 6010B/6010C/6010D	Vanadium
ICP-AES	EPA 6010B/6010C/6010D	Zinc
ICP-MS	EPA 6020/6020A/6020B	Aluminum
ICP-MS	EPA 6020/6020A/6020B	Antimony
ICP-MS	EPA 6020/6020A/6020B	Arsenic
ICP-MS	EPA 6020/6020A/6020B	Barium
ICP-MS	EPA 6020/6020A/6020B	Beryllium
ICP-MS	EPA 6020/6020A/6020B	Bismuth
ICP-MS	EPA 6020/6020A/6020B	Boron
ICP-MS	EPA 6020/6020A/6020B	Cadmium

Solid and Chemical Materials		
Technology	**Method**	**Analyte**
ICP-MS	EPA 6020/6020A/6020B	Calcium
ICP-MS	EPA 6020/6020A/6020B	Cerium
ICP-MS	EPA 6020/6020A/6020B	Cesium
ICP-MS	EPA 6020/6020A/6020B	Chromium
ICP-MS	EPA 6020/6020A/6020B	Cobalt
ICP-MS	EPA 6020/6020A/6020B	Copper
ICP-MS	EPA 6020/6020A/6020B	Gold
ICP-MS	EPA 6020/6020A/6020B	Hafnium
ICP-MS	EPA 6020/6020A/6020B	Iron
ICP-MS	EPA 6020/6020A/6020B	Lanthanum
ICP-MS	EPA 6020/6020A/6020B	Lead
ICP-MS	EPA 6020/6020A/6020B	Lithium
ICP-MS	EPA 6020/6020A/6020B	Magnesium
ICP-MS	EPA 6020/6020A/6020B	Manganese
ICP-MS	EPA 6020/6020A/6020B	Molybdenum
ICP-MS	EPA 6020/6020A/6020B	Neodymium
ICP-MS	EPA 6020/6020A/6020B	Nickel
ICP-MS	EPA 6020/6020A/6020B	Niobium
ICP-MS	EPA 6020/6020A/6020B	Palladium
ICP-MS	EPA 6020/6020A/6020B	Phosphorus
ICP-MS	EPA 6020/6020A/6020B	Platinum
ICP-MS	EPA 6020/6020A/6020B	Potassium
ICP-MS	EPA 6020/6020A/6020B	Praseodymium
ICP-MS	EPA 6020/6020A/6020B	Rhenium
ICP-MS	EPA 6020/6020A/6020B	Rhodium
ICP-MS	EPA 6020/6020A/6020B	Ruthenium
ICP-MS	EPA 6020/6020A/6020B	Samarium
ICP-MS	EPA 6020/6020A/6020B	Selenium
ICP-MS	EPA 6020/6020A/6020B	Silver
ICP-MS	EPA 6020/6020A/6020B	Sodium
ICP-MS	EPA 6020/6020A/6020B	Strontium

Solid and Chemical Materials		
Technology	**Method**	**Analyte**
ICP-MS	EPA 6020/6020A/6020B	Tantalum
ICP-MS	EPA 6020/6020A/6020B	Tellurium
ICP-MS	EPA 6020/6020A/6020B	Thallium
ICP-MS	EPA 6020/6020A/6020B	Thorium
ICP-MS	EPA 6020/6020A/6020B	Tin
ICP-MS	EPA 6020/6020A/6020B	Titanium
ICP-MS	EPA 6020/6020A/6020B	Tungsten
ICP-MS	EPA 6020/6020A/6020B	Uranium
ICP-MS	EPA 6020/6020A/6020B	Uranium 233
ICP-MS	EPA 6020/6020A/6020B	Uranium 234
ICP-MS	EPA 6020/6020A/6020B	Uranium 235
ICP-MS	EPA 6020/6020A/6020B	Uranium 236
ICP-MS	EPA 6020/6020A/6020B	Uranium 238
ICP-MS	EPA 6020/6020A/6020B	Vanadium
ICP-MS	EPA 6020/6020A/6020B	Yttrium
ICP-MS	EPA 6020/6020A/6020B	Zinc
ICP-MS	EPA 6020/6020A/6020B	Zirconium
CVAA	EPA 7471A/7471B	Mercury
Ion Chromatrography	EPA 300.0/9056A	Bromide
Ion Chromatrography	EPA 300.0/9056A	Chloride
Ion Chromatrography	EPA 300.0/9056A	Fluoride
Ion Chromatrography	EPA 300.0/9056A	Nitrate
Ion Chromatrography	EPA 300.0/9056A	Nitrite
Ion Chromatrography	EPA 300.0/9056A	Sulfate
Ion Chromatrography	EPA 300.0/9056A	Ortho-phosph
Ion Chromatrography	EPA 300.0/9056A	Iodide
Probe	EPA 9045D	pH
Gas Flow Proportional Counter	EPA 900.0 EPA 9310	gross alpha/beta
Gas Flow Proportional Counter	EPA 903.0 EPA 9315	Radium-226
Gas Flow Proportional Counter	EPA 903.0 EPA 9315	total radium

Solid and Chemical Materials		
Technology	**Method**	**Analyte**
Gas Flow Proportional Counter	EPA 904.0 EPA 9320	Radium-228
Gas Flow Proportional Counter	EPA 905.0 DOE HASL 300 Sr-02 DOE HASL 300 Sr-03	Strontium-90
Liquid Scintillation Counter	ST-RC-0079	Selenium-79
Liquid Scintillation Counter	EPA 906.0	Tritium
Liquid Scintillation Counter	Eichrom Technologies TCW01/TCS01 HASL 300 Tc-02-RC	Tecnetium-99
Liquid Scintillation Counter	EERF C-01-C14	Carbon-14
Gamma Spectroscopy	EPA 901.1 / DOE HASL 300 Ga-01-R	Gamma Emitters:
Gamma Spectroscopy	EPA 901.1 / DOE HASL 300 Ga-01-R	Actinium 227 (assumes equilibrium w/ Th-227)
Gamma Spectroscopy	EPA 901.1 / DOE HASL 300 Ga-01-R	Actinium 228
Gamma Spectroscopy	EPA 901.1 / DOE HASL 300 Ga-01-R	Americium 241
Gamma Spectroscopy	EPA 901.1 / DOE HASL 300 Ga-01-R	Antimony 124
Gamma Spectroscopy	EPA 901.1 / DOE HASL 300 Ga-01-R	Antimony 125
Gamma Spectroscopy	EPA 901.1 / DOE HASL 300 Ga-01-R	Barium/Lanthanum-140
Gamma Spectroscopy	EPA 901.1 / DOE HASL 300 Ga-01-R	Barium 133
Gamma Spectroscopy	EPA 901.1 / DOE HASL 300 Ga-01-R	Barium 140
Gamma Spectroscopy	EPA 901.1 / DOE HASL 300 Ga-01-R	Beryllium 7
Gamma Spectroscopy	EPA 901.1 / DOE HASL 300 Ga-01-R	Bismuth 211 eq Th-227
Gamma Spectroscopy	EPA 901.1 / DOE HASL 300 Ga-01-R	Bismuth 207
Gamma Spectroscopy	EPA 901.1 / DOE HASL 300 Ga-01-R	Bismuth-210M
Gamma Spectroscopy	EPA 901.1 / DOE HASL 300 Ga-01-R	Bismuth 212

Solid and Chemical Materials		
Technology	**Method**	**Analyte**
Gamma Spectroscopy	EPA 901.1 / DOE HASL 300 Ga-01-R	Bismuth 214
Gamma Spectroscopy	EPA 901.1 / DOE HASL 300 Ga-01-R	Cerium 141
Gamma Spectroscopy	EPA 901.1 / DOE HASL 300 Ga-01-R	Cerium 139
Gamma Spectroscopy	EPA 901.1 / DOE HASL 300 Ga-01-R	Cerium 144
Gamma Spectroscopy	EPA 901.1 / DOE HASL 300 Ga-01-R	Cesium 134
Gamma Spectroscopy	EPA 901.1 / DOE HASL 300 Ga-01-R	Cesium 137
Gamma Spectroscopy	EPA 901.1 / DOE HASL 300 Ga-01-R	Cobalt 56
Gamma Spectroscopy	EPA 901.1 / DOE HASL 300 Ga-01-R	Cobalt 57
Gamma Spectroscopy	EPA 901.1 / DOE HASL 300 Ga-01-R	Cobalt 58
Gamma Spectroscopy	EPA 901.1 / DOE HASL 300 Ga-01-R	Cobalt 60
Gamma Spectroscopy	EPA 901.1 / DOE HASL 300 Ga-01-R	Europium 152
Gamma Spectroscopy	EPA 901.1 / DOE HASL 300 Ga-01-R	Europium 154
Gamma Spectroscopy	EPA 901.1 / DOE HASL 300 Ga-01-R	Europium 155
Gamma Spectroscopy	EPA 901.1 / DOE HASL 300 Ga-01-R	Hafnium 181
Gamma Spectroscopy	EPA 901.1 / DOE HASL 300 Ga-01-R	Iodine 131
Gamma Spectroscopy	EPA 901.1 / DOE HASL 300 Ga-01-R	Iridium 192
Gamma Spectroscopy	EPA 901.1 / DOE HASL 300 Ga-01-R	Iron 59
Gamma Spectroscopy	EPA 901.1 / DOE HASL 300 Ga-01-R	Lanthanum 140
Gamma Spectroscopy	EPA 901.1 / DOE HASL 300 Ga-01-R	Lead 210
Gamma Spectroscopy	EPA 901.1 / DOE HASL 300 Ga-01-R	Lead 211

Solid and Chemical Materials		
Technology	**Method**	**Analyte**
Gamma Spectroscopy	EPA 901.1 / DOE HASL 300 Ga-01-R	Lead 212
Gamma Spectroscopy	EPA 901.1 / DOE HASL 300 Ga-01-R	Lead 214
Gamma Spectroscopy	EPA 901.1 / DOE HASL 300 Ga-01-R	Manganese 54
Gamma Spectroscopy	EPA 901.1 / DOE HASL 300 Ga-01-R	Mercury 203
Gamma Spectroscopy	EPA 901.1 / DOE HASL 300 Ga-01-R	Neptunium 237
Gamma Spectroscopy	EPA 901.1 / DOE HASL 300 Ga-01-R	Neptunium 239
Gamma Spectroscopy	EPA 901.1 / DOE HASL 300 Ga-01-R	Niobium 94
Gamma Spectroscopy	EPA 901.1 / DOE HASL 300 Ga-01-R	Niobium 95
Gamma Spectroscopy	EPA 901.1 / DOE HASL 300 Ga-01-R	Potassium 40
Gamma Spectroscopy	EPA 901.1 / DOE HASL 300 Ga-01-R	Promethium 144
Gamma Spectroscopy	EPA 901.1 / DOE HASL 300 Ga-01-R	Promethium 146
Gamma Spectroscopy	EPA 901.1 / DOE HASL 300 Ga-01-R	Promethium 147
Gamma Spectroscopy	EPA 901.1 / DOE HASL 300 Ga-01-R	Protactinium 234M
Gamma Spectroscopy	EPA 901.1 / DOE HASL 300 Ga-01-R	Protactinium 231
Gamma Spectroscopy	EPA 901.1 / DOE HASL 300 Ga-01-R	Protactinium 234
Gamma Spectroscopy	EPA 901.1 / DOE HASL 300 Ga-01-R	Radium (226)
Gamma Spectroscopy	EPA 901.1 / DOE HASL 300 Ga-01-R	Radium 228
Gamma Spectroscopy	EPA 901.1 / DOE HASL 300 Ga-01-R	Radium 223 (assumes equilibrium w/ Th-227)
Gamma Spectroscopy	EPA 901.1 / DOE HASL 300 Ga-01-R	Radium 224
Gamma Spectroscopy	EPA 901.1 / DOE HASL 300 Ga-01-R	Ruthenium 106

Solid and Chemical Materials		
Technology	**Method**	**Analyte**
Gamma Spectroscopy	EPA 901.1 / DOE HASL 300 Ga-01-R	Scandium 46
Gamma Spectroscopy	EPA 901.1 / DOE HASL 300 Ga-01-R	Sodium 22
Gamma Spectroscopy	EPA 901.1 / DOE HASL 300 Ga-01-R	Sodium 24
Gamma Spectroscopy	EPA 901.1 / DOE HASL 300 Ga-01-R	Strontium 85
Gamma Spectroscopy	EPA 901.1 / DOE HASL 300 Ga-01-R	Thallium 208
Gamma Spectroscopy	EPA 901.1 / DOE HASL 300 Ga-01-R	Thorium 227
Gamma Spectroscopy	EPA 901.1 / DOE HASL 300 Ga-01-R	Thorium 228
Gamma Spectroscopy	EPA 901.1 / DOE HASL 300 Ga-01-R	Thorium 230
Gamma Spectroscopy	EPA 901.1 / DOE HASL 300 Ga-01-R	Thorium 231
Gamma Spectroscopy	EPA 901.1 / DOE HASL 300 Ga-01-R	Thorium 232
Gamma Spectroscopy	EPA 901.1 / DOE HASL 300 Ga-01-R	Thorium 234
Gamma Spectroscopy	EPA 901.1 / DOE HASL 300 Ga-01-R	Tin 113
Gamma Spectroscopy	EPA 901.1 / DOE HASL 300 Ga-01-R	Uranium 235
Gamma Spectroscopy	EPA 901.1 / DOE HASL 300 Ga-01-R	Uranium 238
Gamma Spectroscopy	EPA 901.1 / DOE HASL 300 Ga-01-R	Vanadium-48
Gamma Spectroscopy	EPA 901.1 / DOE HASL 300 Ga-01-R	Yttrium 88
Gamma Spectroscopy	EPA 901.1 / DOE HASL 300 Ga-01-R	Zinc 65
Gamma Spectroscopy	EPA 901.1 / DOE HASL 300 Ga-01-R	Zirconium 95
Alpha Spectroscopy	DOE HASL 300 A-01-R	Alpha spec analysis:
Alpha Spectroscopy	DOE HASL 300 A-01-R DOE HASL 300 U-02-RC	Isotopic Uranium

Solid and Chemical Materials		
Technology	**Method**	**Analyte**
Alpha Spectroscopy	DOE HASL 300 A-01-R	Isotopic Thorium
Alpha Spectroscopy	DOE HASL 300 A-01-R	Isotopic Americium
Alpha Spectroscopy	DOE HASL 300 A-01-R	Isotopic Plutonium
Alpha Spectroscopy	DOE HASL 300 A-01-R	Isotopic Neptunium
Alpha Spectroscopy	DOE HASL 300 A-01-R	Isotopic Curium
Alpha Spectroscopy	ST-RC-0301	Radium-226
Liquid Scintillation Counter	Eichrom Technologies OTW01, OTS01	Lead-210
Alpha Spectroscopy	Laboratory SOP ST-RC-0210	Polonium-210
Liquid Scintillation Counter	Eichrom Technologies FEW01	Iron-55
Liquid Scintillation Counter	DOE RP-300	Nickel 59/63
Liquid Scintillation Counter	SM 7500-IB	Iodine-129
Preparation	**Method**	**Type**
Volatile Prep	EPA 5000	Sample Preparation for Volatile Organic Compounds
Acid Digestion (Aqueous samples)	EPA 3010A	Acid Digestion for Metals (Aqueous samples)
Acid Digestion (solids)	EPA 3050B	Acid Digestion for Metals of Sedimtent/Soils
Purge & Trap	EPA 5030C	Purge & Trap for Aqueous Volatile Samples
Closed System Purge & Trap and Extraction for Volatiles	EPA 5035A	Closed System Purge & Trap and Extraction for Volatiles
TCLP Extraction	EPA 1311	TCLP Extraction
SPLP Extraction	EPA 1312	SPLP Extraction
CWET Extraction	CA Title 22	CWET Extraction
Extraction Chromatography	Eichrom Technologies FEW01	Iron-55
Extraction Chromatography	ST-RC-0058	Strontium-90

Note:

1. This scope is formatted as part of a single document including Certificate of Accreditation No. L2305.

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Environmental Protection Agency's (EPA's) Review of *Draft Technical Memorandum: Strontium Analysis, Parcel G, Former Hunters Point Naval Shipyard, San Francisco, CA*, dated December 2022 (Strontium TM), Supplemental Documents, and Laboratory Corrective Actions

Total Propagated Uncertainty – Section 2.4.2

The last sentence of page 2-4 states, "Due to the low radiological RGs (remedial goals) at HPNS, the suggested TPU (total propagated uncertainty) ranges are not always achievable due to practical laboratory limitations." The report states that the reason for this is, "Uncertainty, like DLC (decision level concentration) …" However, the contributing factors to the uncertainties are unclear, and there is no discussion of how the laboratory addressed the uncertainty. Potential uncertainties may include count time and/or low recovery. Increasing the count time may minimize the uncertainty. Please update the text of Section 2.4.2 to explain the contributing factors to the uncertainties the laboratory identified. Please also describe actions the laboratory took to minimize the uncertainty and whether longer count times could lower the TPU sufficiently to meet project decision requirements.

Additional Aliquots – Section 3.1.2

The first sentence of Section 3.1.2 seems to indicate that the basis for analyzing four additional aliquots from a subset of samples was that the Sr-90 results exceeded the RG. The report indicates that at least one of the samples that was re-analyzed met QC criteria. Typically, this type of reanalysis is recommended if there was some objective indication that a problem had occurred during the measurement process, and sometimes would require the reanalysis of an entire sample batch. For example, reanalysis might be triggered by: QC failures like an LCS or duplicate result that exceeded established controls, instrumentation problems which occurred during the counting of the sample, very low-level tracer recovery which may indicate a matrix interference problem for that sample, poor spectra, or concerns about sample homogeneity. Please update this section to document the objective criteria that were the basis for the reanalysis.

EPA Method 905 and Associated Data – Sections 3.1, 3.1.1 and 3.1.2

Section 3.1.2 ends with "The quadruplicate results indicate EPA Method 905 is not reliable or reproducible at very low decision levels. The high uncertainty in the isotopic Sr-90 analysis indicated a potential for bias and error at the decision level." As noted in Section 3.1, EPA Method 905 was developed and validated for the analysis of drinking water samples. It is also noted in the same section that the laboratory modified the method for soil analysis. EPA presumes that the modified method 905 was validated using spiked material with activity both above and below the RG prior to the 788 Sr-90 analyses and 234 total beta strontium analyses being performed on soil samples from HPNS.

- Were any issues of high uncertainty or lack of reproducible results encountered during the method validation study that was conducted before the HPNS soil was analyzed?
- Was the modified method 905 used to analyze for Sr-90 on soil samples from other sites and were similar problems encountered?

Eichrom Method and Associated Data – Sections 3.2 and 3.2.1

Section 3.2.1 states "The 950 Sr-90 results analyzed using the Eichrom method are not valid due to the interference." This section provides a plausible rationale for Pb-210/Bi-210 being the interferent; however, a cursory review of the laboratory radiological data packages provided for Parcel G didn't seem to support a correlation between Pb-210 and elevated Sr-90 results. Therefore, EPA requests

additional information to establish that the bias from Pb-210/Bi-210 is the principal component of what the Navy interprets as bias to Sr-90 results.

EPA agrees that the total strontium method is more straightforward and less complex than the Sr-90 method, and appears to meet site decision needs; however, EPA believes that a high level of transparency regarding common method performance quality control will better enable stakeholder acceptance of the multiple laboratory method changes and method challenges. Therefore, EPA recommends that some additional performance information be provided:

- The Navy should review the corresponding gamma spectroscopy measurements for evidence of decay chain analytes that would yield Pb-210. If the review supports the Navy's hypothesis, please update the text of the Strontium TM with the supporting information.
- If the Navy's contract laboratory analyzed any proficiency test (PT) soil samples spiked with strontium, like the PT samples sent out through the Department of Energy (DOE) Mixed Analyte Performance Evaluation Program (MAPEP), EPA would like to review the results of those analyses. It would be beneficial to review the PT soil sample results from all four analytical methods used in this report. Since the Navy wishes to demonstrate the reliability of the total strontium Eichrom method, those PT results would be particularly beneficial.
- If current PT results are not available for each method, the laboratory should analyze single blind samples of soil spiked with an activity concentration of Sr-90 unknown to the laboratory as a check on the performance of the method(s).

Table 1: Project Timeline for Strontium Analysis

The timeline does not seem to include EPA's engagement with the Navy on the strontium issues. Please update Table 1 to document EPA's engagement.

Tables 2, 4, 5, and 6: Results Presented by Method

The data summarized in Tables 2, 4, 5, and 6 reportedly underwent third party data validation. During data validation, the validator reviews the QC tests associated with each sample batch and flags data with data qualifiers. For instance, results that are estimated are flagged with a "J" and results that should be rejected are flagged with an "R". The data qualifiers are based on objective criteria and tests. Although the Navy provided validated data for this report, the summary tables do not present any data flagged for rejection. Please update the text of the report to state whether the third-party data validation subcontractor qualified any data for rejection based on objective criteria and tests.

Please explain any possible sources and mechanisms of interferences for method blank samples.

5. **Section 3.2.1 "Strontium-90 Results", Page 3-6:**
"The Eichrom method Sr-90 exceedances did not correlate with results from previous Sr-90 or total beta strontium analyses using EPA Method 905."
In Table 2 soil samples from 7 locations both yield elevated results by EPA and Eichrom methods. Please explain this observation.

6. **Section 3.2.1 "Strontium-90 Results", Page 3-6:**
"Eight samples from TU 77 (consisting of clean import fill from the previous SS/SD removal action project) reported Sr-90 results above the RG."
This import fill of TU 77 was performed by Tetra Tech EC, Inc. and there is an independent third-party evaluation of previous falsification on some of Tetra Tech's work.
25% of elevated Sr-90 results (per Method 905) were from TU77 soil samples. Please explain if this high percentage of 25% contradicts Tetra Tech's claim on the cleanness of backfill soil for TU 77.

7. **Section 3.2.1 "Strontium-90 Results", Page 3-6:**
"The laboratory identified the Y-90 ingrowth step as the source for Pb-210/Bi-210 growing back into the Sr-90 fraction of the analysis."
Please explain whether this identification is based on proof of the presence of Pb/Bi by analytical chemical laboratory analysis results.

8. **Section 3.2.1 "Strontium-90 Results", Page 3-6:**
"Although lower DLCs and TPUs were achieved using the Eichrom method for Sr-90, a high bias due to the presence of Pb-210/Bi-210 was observed. The 950 Sr-90 results analyzed using the Eichrom method are not valid due to the interference."
The interference of Pb-210/Bi-210 with strontium is a well-known problem during chemical separations. Many experimental steps have been proposed in the literature (i.e., EPA 402-R-14-011) to eliminate the possibility of interference. Please explain the reasoning for not being able to resolve the Pb-210/Bi-210 interference problem.

9. **Section 3.2.1 "Strontium-90 Results", Page 3-7:**
"The results for these 49 samples are included in Table 2. The SOP Revision 9 Sr-90 results range from -0.0677 to 0.2210 pCi/g, below the Sr-90 RG. These results

Message

From: Han, Terry@CDPH [Terry.Han@cdph.ca.gov]
Sent: 5/18/2022 4:53:10 PM
To: juanita.bacey@dtsc.ca.gov; Praskins, Wayne [Praskins.Wayne@epa.gov]
CC: Ufuktepe, Yuksel@CDPH [Yuksel.Ufuktepe@cdph.ca.gov]; Eidelberg, Joseph [Eidelberg.Joseph@epa.gov]
Subject: RE: Draft Request

Hi Nina,

Yes, your summary is correct on our request to the Navy. The duplicates of the Sr-90 fortified samples are meant to evaluate the reproducibility of the Total Beta Strontium Method and the Isotopic Sr-90 Method (Eichrom Rev9). Since the Sr-90 fortified Lab Control Samples (LCS) is created in a chemical-based medium, the 30 Parcel G samples are meant to show the Total Beta Strontium Method and the Isotopic Sr-90 Method (Eichrom Rev9) would work well with the soil medium. At the same time, all these samples (LCS, duplicates, and Parcel G soil samples) are meant to verify the Total Beta Strontium can be used as a method for Sr-90 analysis. The number of duplicates and Parcel G soil samples can be discussed. You are correct that those numbers are meant to provide data for statistical analysis.

The Navy and the contractor may already have some of these data we are looking for, especially from the Parcel G samples, and we are okay if the Navy can provide those existing data for our review. All these sample requests are meant to verify the Total Beta Strontium Method and the Isotopic Sr-90 Method (Eichrom Rev9) would work consistently and reliably, and the analysis results would be meaningful and informative.

I will update you once I have more information.

Thank you very much!

Terry

From: Bacey, Juanita@DTSC <Juanita.Bacey@dtsc.ca.gov>
Sent: Tuesday, May 17, 2022 5:46 PM
To: Praskins, Wayne <Praskins.Wayne@epa.gov>; Han, Terry@CDPH <Terry.Han@cdph.ca.gov>
Cc: Ufuktepe, Yuksel@CDPH <Yuksel.Ufuktepe@cdph.ca.gov>; Eidelberg, Joseph <Eidelberg.Joseph@epa.gov>
Subject: RE: Draft Request

EXTERNAL EMAIL. Links/attachments may not be safe. To report suspicious emails, click "Report Phish" button.

Hi Terry,
So just to clarify what you are asking for, you'd like the Navy to spike samples and analyze them, along with 30 Parcel G samples, using the two lab methods, Total Beta Strontium Method and the Isotopic Sr-90 Method (Eichrom Rev 9). 30 samples seems excessive, but I'm sure it's for statistical purposes. Is there any flexibility on that number? Perhaps less would be more amiable to the Navy. That said, I think my mgmt. would be fine with this if this is the path CDPH feels is necessary to "improve confidence" in the method. I think we will need the EPA support on this or the Navy may ignore the request. While at the same time, we'll need to be clear to the Navy that this is to "improve confidence" in the method, and in know way has any bearing on the original samples that were analyzed and the decision yet to be made on those results.
Terry, I think you said that you'll still need to run it past your management before we move forward on this, so let us know how it goes.

Nina

From: Praskins, Wayne <Praskins.Wayne@epa.gov>
Sent: Tuesday, May 17, 2022 3:19 PM
To: Han, Terry@CDPH <Terry.Han@cdph.ca.gov>; Bacey, Juanita@DTSC <Juanita.Bacey@dtsc.ca.gov>
Cc: Ufuktepe, Yuksel@CDPH <Yuksel.Ufuktepe@cdph.ca.gov>; Eidelberg, Joseph <Eidelberg.Joseph@epa.gov>
Subject: RE: Draft Request

EXTERNAL:

Terry –

I shared your proposal with Joe Eidelberg, a chemist in our QA Office. We also received input on the Navy's proposed changes to the Sr90 analytical method from Shane Knockemus, the radiochemistry group leader at EPA's NAREL lab. We suggest two additional comments/questions. The first would address the potential overloading of the separation column. The second is intended to give us additional information beyond what we are requesting in the event the lab has already completed a testing/validation study.

Proposed comments/questions:

1. Section 4.1 of the SOP ST-RC-0058, Rev 7, March 31, 2021, states if "significant elemental strontium" is present in the samples an adjustment should be made to the yield calculation using a measurement of the total strontium. In the planned reanalysis of the samples, what is the trigger concentration for the actions that are required if elemental strontium is "significant"?

2. Please provide any formal testing study (validation study) of the reproducibility and accuracy of the sample preparation method including the increased sample size of 2.5 grams and steps for removal of lead-210. If available, provide any documentation showing elution profile reproducibility for samples that represent the site matrix.

Wayne Praskins | Superfund Project Manager
U.S. Environmental Protection Agency Region 9
75 Hawthorne St. (SFD-7-3)
San Francisco, CA 94105
415-972-3181

From: Han, Terry@CDPH <Terry.Han@cdph.ca.gov>
Sent: Monday, May 16, 2022 2:47 PM
To: Praskins, Wayne <Praskins.Wayne@epa.gov>; juanita.bacey@dtsc.ca.gov
Cc: Ufuktepe, Yuksel@CDPH <Yuksel.Ufuktepe@cdph.ca.gov>
Subject: Draft Request

Hi Wayne and Nina,

The following languages describes the additional data we are considering asking the Navy to provide regarding the Sr-90 soil analysis method. Please note that this is still an early draft version. Feel free to provide any question or input!

Thanks,

Terry

"To improve the confidence in the Navy's latest proposed change on the Sr 90 soil analysis method for HPNS Parcel G Rework, CDPH requests the Navy and its subcontractor to create an array of Laboratory Control Samples (LCS) fortified with known Sr90 activity at approximately 0.150, 0.331, 0.500, 0.750, and 1.000 pCi/g, and 5 duplicates for each concentration level. CDPH requests the Navy and its contractor to analyze these LCSs, the duplicates, and 30 soil samples from Parcel G Phase 1 excavation using the Total Beta Strontium Method first then followed by the Isotopic Sr-90 Method (Eichrom Rev 9), and provide the analysis results with detailed lab report including, but not limited to, the analysis concentration, counting time, uncertainty, DLC, and MDC for Regulators' review.

The analysis results of the Total Beta Strontium Method and the Isotopic Sr-90 Method (Eichrom Rev 9) on these LCSs, duplicates, and Parcel G soil samples will be used to evaluate the following items:

1) the validity of the Navy's proposal to use Total Beta Strontium as the primary screening,
2) the validity of using the Isotopic Sr-90 Method (Eichrom Rev 9) analysis result as the confirmation, when necessary,
3) the consistency and the reproducibility of analysis results within each method,
4) the consistency of analysis results from both methods with each other,
5) the reproducibility of the Total Beta Strontium Method,
6) the reproducibility of the Isotopic Sr-90 (Eichrom Rev9) Method. "

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12/22/2022

Rose Condit
Aptim Federal Services LLC
4005 Port Chicago Hwy, Suite 200
Concord, CA 94520

RE: Project HPNS-Parcel E 500712/501158, Corrective Action Response

Dear Ms. Condit,

It is the policy of Eurofins to conduct its business with honesty and integrity, to produce accurate and useable environmental analytical test results and related services, and to provide the best possible service to our clients.

Eurofins St. Louis had previously analyzed data for a validation study, with the objective to validate that Total Beta Strontium by Extraction Chromatography (SrE) provides accurate results. This study was reviewed by EPA's National Analytical Radiation Environmental Laboratory (NAREL). NAREL and EPA identified bias in the study, resulting in further review of the process by the laboratory. After investigation, it was discovered by the laboratory that the carrier used for the validation study had been sub optimally standardized, resulting in a low bias to sample results. At the time, it was believed that only the results from the validation study were affected. On December 15, 2022 the laboratory discovered that HPNS samples had also been affected.

A spreadsheet has been provided with affected samples, "Client Data SrE – Aptim"

- Column K shows the reported result
- Column P shows the corrected result (estimated – fully corrected results to be reissued in revised reports)
- Column S shows if the corrected result is less than the action level of 0.331 pCi/g
- Highlighted rows 24, 25 and 26 show the samples that went from below the action level to above the action level. All other results stayed either above or below.

The carrier in question was standardized (i.e. the true value determined) on June 30, 2022 according to the SOP (ST-RC-0058 rev 9) which instructed the carrier to go through the typical column and plating procedure. While samples do go through this process, column and plating should not be a part of the standardization process. The goal of the standardization is to find the concentration of the carrier under ideal conditions.

The SOP was updated on 12/15/2022 with the correct procedure, and analysts trained. A new carrier was standardized with the updated procedure and is now in use.

The lab is unsure why the carrier standardization procedure was originally changed to include columns/plating. To help ensure all SOP changes have been approved by the Technical Director, all technical SOP's will now have the Technical Director added to the cover page. After review of the SOP, the Technical Director will sign the cover page. In addition, when SOP's are

being reviewed prior to being signed, the original Word document with tracking enabled will be made available. This will facilitate determining what changes were made to the SOP.

All affected data is in the process of being revised and updated reports will be sent.

Eurofins St. Louis prides itself on supplying its clients with reliable quality data. We deeply apologize for the error resulting in biased data and the difficulties this has caused. If you have any questions regarding this matter, please feel free to contact me or Terry Romanko.

Regards,

Kristen Ely
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Rhonda Ridenhower Rhonda.Ridenhower@ET.EurofinsUS.com

Pacific PEER
Public Employees for Environmental Responsibility

December 19, 2023

Regional Freedom of Information Officer
U.S. EPA, Region 9
75 Hawthorne Street (OPPA-2)
San Francisco, CA 94105

RE: FOIA REQUEST

Dear FOIA Officer:

In an email dated October 26, 2023, U.S. Environmental Protection Agency (EPA) Region 9 Assistant Regional Counsel Xiao Zhang wrote to me concerning a pending Freedom of Information Act request (FOIA No. EPA-R9-2023-000317) from Public Employees for Environmental Responsibility (PEER), the following:

> "As described below, the Navy has moved away from keeping the remaining buildings at the site except for five buildings that are on the National Historic Register. After December 2021, EPA and the Navy suspended discussions regarding reconciling differences between the building remedial goal risk calculations based on RESRAD BUILD vs. EPA's BPRG calculator. The goal now is to demolish 77 non-radiologically impacted and 25 potentially radiologically impacted buildings at HPNS (~2.6M sq ft), and the Navy has been primarily working with the State of California to determine the nature of the building surveys and how the data will support decisions regarding the disposal of building demolition debris."

Pursuant to the Freedom of Information Act, 5 U.S.C. 552, as amended, PEER requests information concerning this message and related subjects. Specifically, we request the following:

1. Documents that discuss the Navy plans to demolish the indicated 102 buildings, including the basis for the decision to demolish rather than remediate them;

2. Records concerning and/or discussing the plans and alternatives for the disposal of the resulting debris, including but not limited to the debris from the "25 potentially radiologically impacted buildings," including where the debris will be sent, whether recycling will be permitted, what standards will be employed in determining whether the material must go to a licensed low-level radioactive waste (LLRW) disposal facility, and what measurements will be required;

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