ESHID-603931

Los Alamos NATIONAL LABORATORY

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Symbol: EPC-DO: 25-331
LA-UR: 25-31093
Date: November 14, 2025

Mr. George Brozowski
Senior Regional Health Physicist/Radon Policy Advisor
U.S. Environmental Protection Agency, Region 6
1201 Elm Street, Suite 500
Mail Code: 6ARSI
Dallas, TX 75270-2102

Subject: FTWC Radioactive Air Emissions Summary, Volume 1
Stack Emissions & Off-Site Dose Consequence

Dear Mr. Brozowski:

This letter serves to transmit the first volume of the Radioactive Air Emissions Summary addressing the Flanged Tritium Waste Container (FTWC) operation at Los Alamos National Laboratory (LANL). This volume summarizes operations, documents emissions measurements, and reports radiological dose to the Maximally Exposed Individual (MEI) member of the public resulting from FTWC remediation activities.

Over the course of 13 operational days, the project had air emissions of 123 curies of tritium (hydrogen-3). The radiological dose to the hypothetical maximally exposed individual member of the public from these emissions was 0.012 millirem, well below the 10 millirem limit established in 40 CFR 61, Subpart H.

The second volume of this report, to be issued in the first quarter of Calendar Year 2026, will include soil sampling data and ambient air measurement data taken during and after FTWC operations. These media have longer analytical turnaround times and data are not yet available. Volume 2 will also have detailed analyses of the CAP88 plume modeling performed for the project, comparing modeled stack emissions with measured air concentrations at downwind locations.

If you have questions or comments, please contact David Fuehne of my staff. David can be reached by email at davef@lanl.gov or by phone at (505) 699-5619.

Sincerely,

SARAH HOLCOMB
(Affiliate)

Digitally signed by SARAH HOLCOMB (Affiliate)
Date: 2025.11.10 15:54:22 -07'00'

Sarah S. Holcomb
Group Leader
Environmental Compliance Programs

Attachment: TA-54 Flanged Tritium Waste Container Operations, Radioactive Air Emissions Summary, Volume 1: Stack Emissions & Off-Site Dose Consequence; LA-UR: 25-31093

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Attachment 1

TA-54 Flanged Tritium Waste Container Operations
Radioactive Air Emissions Summary
Volume 1: Stack Emissions & Off-Site Dose Consequence
LA-UR: 25-31093

EPC-DO: 25-331

Date: November 14, 2025

LA-UR-25-31093

Approved for public release; distribution is unlimited.

Title:	TA-54 Flanged Tritium Waste Container Operations Radioactive Air Emissions Summary Volume 1: Stack Emissions & Off-Site Dose Consequence
Author(s):	Fuehne, David Patrick
Intended for:	Report
Issued:	2025-11-10

TA-54 Flanged Tritium Waste Container Operations
Radioactive Air Emissions Summary
Volume 1: Stack Emissions & Off-Site Dose Consequence

Executive Summary

In September 2025, pressure mitigation operations began on the four Flanged Tritium Waste Containers (FTWCs) that had been in storage at Los Alamos National Laboratory (LANL), Technical Area (TA-) 54, Area G, Building 1028. Each FTWC was opened at TA-54 and put into a stable configuration, then containers were moved to LANL's Weapons Engineering Tritium Facility (WETF) for further processing in preparation for shipment off-site. Over the course of 13 operational days, the project had air emissions of 123 curies of tritium (hydrogen-3). The radiological dose to the hypothetical maximally exposed individual (MEI) member of the public from these emissions was 0.012 millirem. This is well within the limits established by the Environmental Protection Agency (EPA), which allows 10 millirem per year to any member of the public. Naturally occurring background radiation in Northern New Mexico averages about 300-400 millirem per year to residents.

This report is intended to briefly summarize operations that took place in September and October 2025, provide documentation of the radionuclide air emissions from these operations, and summarize the off-site dose consequence to the public that resulted from these air emissions. Informal notifications addressing these areas were made via email to the EPA and NMED throughout the project, and summaries of these data were also posted on the LANL external web site[1] for FTWC operations.

Introduction

The FTWC pressure mitigation project has been in the planning and preparation phase since before 2018. In addition to the normal operational readiness activities coordinated by the Department of Energy (DOE), this operation was coordinated with Region 6 of the EPA and with the New Mexico Environment Department (NMED). The EPA regulates[2] air emissions of radionuclides from DOE facilities, and LANL's compliance with these rules is managed by the Radioactive Air Emissions Management (RAEM) team within the Environmental Protection & Compliance Division, Compliance Programs Group (EPC-CP). EPA approval was granted in two

[1] FTWC Information Web Site: https://www.lanl.gov/engage/environment/ftwc

[2] National Emissions Standards for Hazardous Air Pollutants – Radionuclides. Title 40 of the Code of Federal Regulations, Part 61, Subpart H. "National Emission Standards for Emissions of Radionuclides Other Than Radon From Department of Energy Facilities." Referred to as the Radionuclide NESHAP or Rad-NESHAP.

separate documents, the 2019 Application for Pre-Construction Approval,[3] and the 2020 Notification of Operational Scope Change.[4] The NMED regulates treatment, storage, and disposal of hazardous waste under the Resource Conservation and Recovery Act (RCRA).[5] RCRA compliance at LANL is managed by the Waste Management Programs Group, EPC-WMP.

Air emissions from the FTWC pressure mitigation operations were continuously monitored in accordance with EPA regulations, and EPA representatives were on-site to observe operations and emissions measurement activities. Emissions measurements were conducted according to the FTWC Emissions Management Plan.[6] Stack emissions were measured using a real-time ionization chamber which measured gross emissions of radioactive tritium (hydrogen-3) and a retrospective sampler. Additional retrospective samplers were installed at select downwind locations as part of the expanded environmental sampling for the project.[7] These retrospective samplers, commonly referred to as "bubblers," can discriminate between the two common forms of tritium emissions, tritiated water vapor (called HTO) and elemental tritium gas (called HT).

This report (Volume 1) will be the first of two reports and will address exhaust stack emissions measurements (made with the ion chamber and stack bubbler) and downwind measurements from the additional "field bubblers." The second report (Volume 2) will focus on the results of soil sampling that was performed in areas around TA-54 and on the routine tritium air sampling using silica gel that is part of LANL's ambient air monitoring network surrounding Area G. Analyses of these media have a longer laboratory turnaround time than the bubbler samples. The second report will also explore modeling data in more detail, comparing actual downwind air concentration measurements with predicted levels using the EPA's prescribed plume model, CAP88.

Notes on Emissions Measurement Data

As mentioned above, interim data on emissions and off-site dose consequence were provided to regulators and to the public web site throughout the operation, sometimes multiple times per

[3] LA-UR-18-26283 rev.2, "Application for Pre-Construction Approval under 40 CFR 61 Subparts A and H for Venting of Flanged Tritium Waste Containers (FTWCs) at TA-54." Transmitted to EPA Region 6 as part of letter EPC-DO-19-137, May 17, 2019. EPA approval received May 22, 2019.

[4] LA-UR-20-22148, "Notification of Operational Scope Change for the FTWC Venting Project at Los Alamos National Laboratory (LANL)." Transmitted to EPA Region 6 as part of letter EPC-DO-20-068, March 05, 2020. EPA approval received August 10, 2020.

[5] Title 40 of the Code of Federal Regulations, Part 264. "Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities."

[6] Procedure EPC-CP-QP-0148, Revision 2, "Emissions Management Plan for the FTWC Venting Project," Immediate Procedure Change (IPC)-1, IPC change date 9/11/2025.

[7] LA-UR-21-30596, "Proposed Environmental Sampling Plan for the FTWC Remediation Project." October 25, 2021.

day. These emissions data were based on the real-time ion chamber readings, and doses were estimated using these real-time emissions data and using bounding dose conversion factors. At the end of each day, the stack bubbler samples were submitted to LANL's Health Physics Analytical Laboratory (HPAL). Dose calculations were then performed using the CAP88 plume model utilizing the HPAL stack bubbler data and the actual meteorological data measured during the time of operations for that day. These end-of-day doses were reported to EPA as part of the daily summary email.

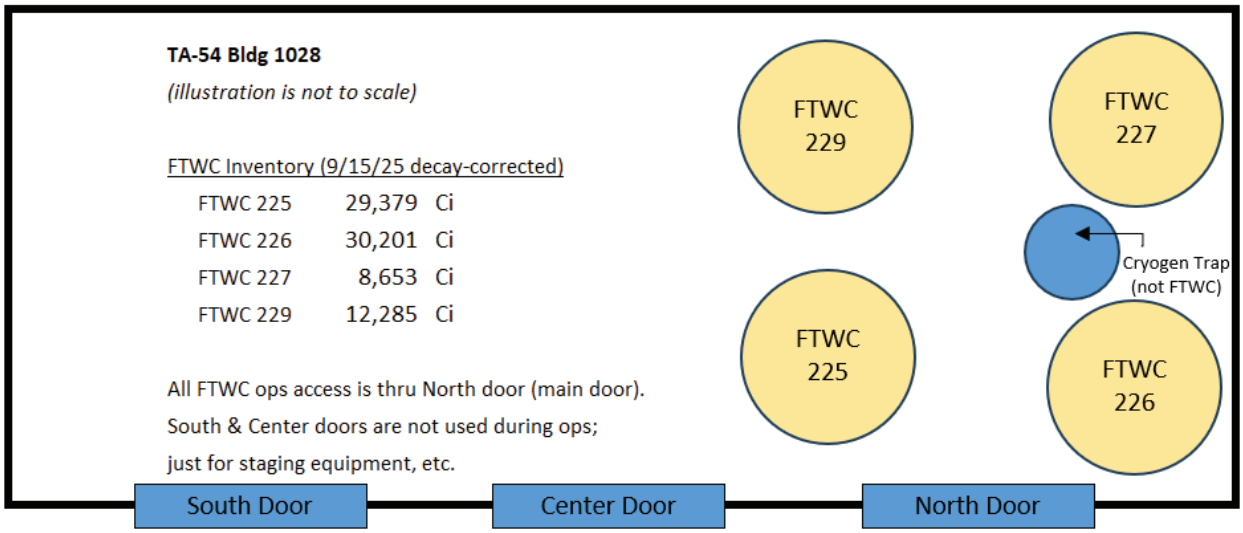
Prior to operations, the plan was to use the stack bubbler as the sampler of record. The bubblers are well understood, used at other LANL facilities, and generate a sample that can be repeatedly analyzed if needed. Throughout the project, the RAEM team compared the ion chamber data and the stack bubbler data for each day. Early on, the stack bubbler data and ion chamber agreed quite well. Later in the project, we noted that emissions calculated by the ion chamber were higher than those calculated using the stack bubbler. We are working with the instrument manufacturer to explore possible reasons for the variation. To ensure that emissions and doses were not under-reported, we decided to use the more conservative (higher) of the two instruments' calculated emissions values whenever the stack bubbler and ion chamber showed significant differences (e.g., more than 1 curie difference).

This decision to use the conservative emissions data was made in early October, in the time interval after venting and evacuation of the FTWCs were completed but prior to their shipment to WETF for final waste processing. As such, there were times when the daily summaries of air emissions and dose numbers that were emailed to EPA representatives are different than the numbers documented in this report. The values presented in this document in Tables 1 and 2 represent the numbers that will be reported to EPA as part of the 2025 annual emissions and dose reporting process.

FTWC Placement Within TA-54 Building 1028

Figure 1 below shows a sketch of the relative layout of the four FTWC drums within TA-54 Building 1028. Building 1028 is a storage container with three access doors. The FTWCs were accessed via the North door, as presented in the figure. Figure 1 also provides the tritium contents of each FTWC decay-corrected to the first day of operations.

Figure 1: Layout within TA-54-1028



FTWC Processing General Steps

A generalized summary of the FTWC processing steps appears below; this is used as a reference in the daily operations notes later in the report.

1. Preparation: open overpack 85-gallon drum lid; mount the venting rig onto the FTWC; leak check the vent rig to ensure it is sealed to FTWC.
2. Open FTWC headspace into vent rig – this allows us to measure any pressure buildup.
3. Open the vent rig to the stack; this will vent the FTWC down to ambient air pressure. This step can result in air emissions from built-up pressure within the FTWC.
4. Remove vent rig and mount the pressure monitoring manifold (PMM) onto the FTWC. During the changeover, the FTWC headspace is briefly open to the ambient air. Any emissions will still be pulled through the monitored exhaust system.
5. Pressurize FTWC with helium to 15 psi (verify leak-tight); this is a stable condition for observation and extended storage within TA-54 Building 1028.
6. Bleed off helium pressure within FTWC/PMM. This step can result in air emissions as the helium pressure is removed. Tritium from the contaminated parts within the FTWC can go airborne and bleed out with the helium.
7. Evacuate FTWC down to ~1/3 atmosphere for long-term observation, storage, and movement. This step can result in air emissions; the vacuum pump is pulling on a contaminated system.
8. Move FTWCs (one at a time) from Area G to the LANL tritium facility. If pressure buildup is observed before moving (at Area G) or after moving (at WETF), we will perform evacuation process #7 again on affected FTWC(s).

FTWC Ventilation and Emissions Monitoring

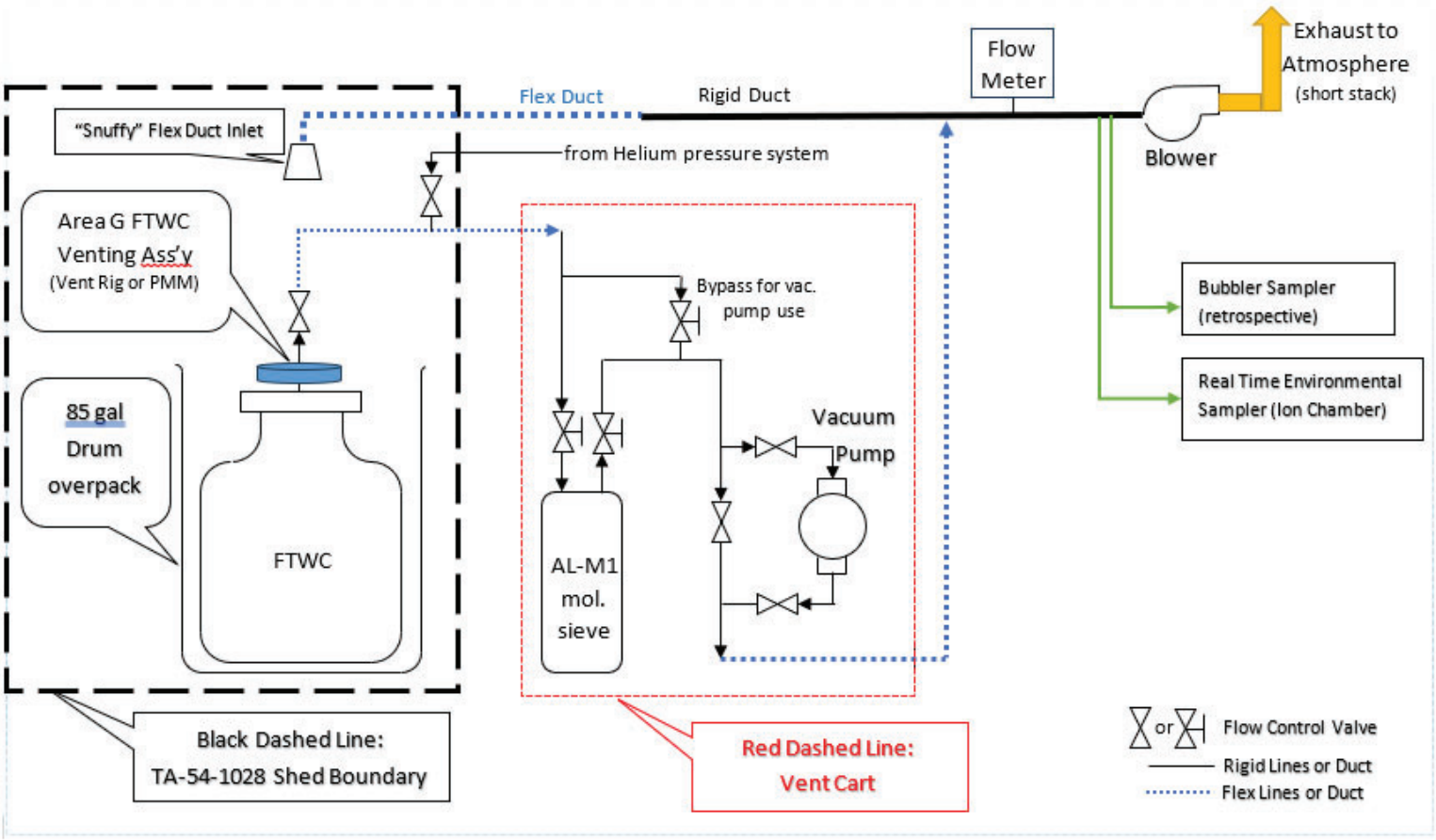
The FTWC ventilation system consists of a flexible exhaust duct within Building 1028, connected to a long rigid duct outside 1028. The rigid duct connects to a blower with a short exhaust stack. The flex duct inlet within 1028 allows repositioning of the duct inlet over the FTWC being processed that day. Also, the flex duct inlet can be lowered directly over the FTWC when the vent rig is removed and before the PMM is installed; this ensures that any tritium escaping the FTWC is pulled into the vent system and emissions are monitored. The flex duct provides general room ventilation within Building 1028, with sufficient flow to pull about one air change per minute within the building. Figure 2 shows a line schematic of the ventilation system.

The vent rig and PMM are connected to a vent cart containing the AL-M1 molecular sieve system which can capture tritium vapor (HTO). The AL-M1 is used in steps 3 and 6, above. The vent cart also has the vacuum pump used in step 7 above. Step 7 will bypass the AL-M1; pulling a vacuum on a potentially contaminated molecular sieve system may cause any tritium adsorbed onto the molecular sieve to be released back into the air stream. The discharge from the vent cart (after either the AL-M1 or the vacuum pump) is then routed to the rigid exhaust duct.

The two monitoring systems (ion chamber and stack bubbler) pull air samples from the duct before the air enters the blower; the monitoring instruments will, therefore, measure airborne tritium coming either through the vent cart or entering the duct through the open flex duct inlet inside Building 1028.

At the end of each workday, the exhaust stack fan is turned off, ventilation ports are capped, and Building 1028 is closed. There is no potential for emissions overnight in these situations.

Figure 2: Ventilation System Schematic



Emissions Monitoring Methods & Instrument Sensitivities

The ion chamber used for the FTWC operations was a Mirion Ionix BM3 tritium monitor, displaying tritium concentrations within the exhaust duct in units of microcuries per cubic meter. EPC-CP staff monitored the instrument and took measurements throughout the project. When the reading was stable, we took less frequent measurements; when the emissions levels were rapidly changing, we took measurements as often as every 30 seconds. We tried to use the bounding (maximum) concentration reading for each interval. Air concentrations were multiplied by the stack flow rate and the applicable time interval (e.g., 5 minutes) to determine the accumulated emissions during that interval. The rolling total emissions (curies) were logged to track emissions for the day. The emissions were recorded using a spreadsheet template with a hard copy paper backup. The Ionix instrument does maintain an electronic log of the readings, but it is not accessible in real time. We compared one day's log with the spreadsheet record and instrument's electronic log, and the emissions were consistent. The background reading of the bubbler was about 9 microcuries per liter, which corresponded to about 0.2 curies over the

course of a typical day's operations. The daily emissions spreadsheet logs using the ion chamber are shown in Appendix A.

The typical bubbler tritium sampler collects tritium from a sample of the exhaust air stream in a series of six vials filled with ethylene glycol. The vials are designated A through F. Tritium in water vapor form (HTO) in the stack sample air stream will absorb into the first three vials (A-B-C). This completely dries out the air stream, and the air stream then passes through a high-temperature catalyst. Within the catalyst, tritium in elemental gas phase (HT) or other possible chemical forms is converted into water phase. The air stream then passes through the final three vials (D-E-F) where the newly formed water vapor is absorbed into the glycol in these vials. After the sample vials are removed from the bubbler at the end of the day, an aliquot of each vial is analyzed using liquid scintillation technology to determine the quantity of tritium in the vials. Vials A-B-C represent the collected tritium vapor (HTO), while vials D-E-F represent tritium in elemental gas phase (HT). The tritium collected in the vials is then multiplied by the ratio of stack flow to the sample flow; this final value represents the total emissions of HTO and HT from the stack for that sample period.

Bubblers are the standard for measuring emissions of airborne tritium from nuclear facilities since the instrument provides a reproducible sample and will discriminate between HTO and HT forms of tritium. The collection efficiency of each individual vial is typically over 90%; the three vials combined give collection efficiency of over 99.9%. Also, liquid scintillation counting is a very high-resolution analysis; the minimum detectable activity is typically better than 0.01 microcuries per liter of analyzed sample, corresponding to an emissions level of less than 0.001 curie per day. When used to measure ambient air (such as the downwind "field bubblers," described later), the bubbler can measure about 500 picocuries per cubic meter over a week; while this is not as low as a typical Airnet station (which measures 20 microcuries or less over the course of a year), the bubbler does measure both HTO and HT, while Airnet stations just measure HTO vapor.

The bubbler used for FTWC operations on the first several days was a Ludlum 336 tritium collector. After day 6, the sample flow rate display started behaving erratically, so we switched to an older Ortec 1700 bubbler for the remaining operations. Both units operate in an identical manner as described above.

The only difference in operation between FTWC stack bubbler sampling and our typical tritium facility bubbler operation was the use of distilled water in Vial C; consultations with subject matter experts (SMEs) at LANL suggested that using distilled water in Vial C would rehydrate the sample air stream and optimize the transmittal of HT gas (after conversion to HTO in the catalyst). The SMEs' concern was that in an extremely dry air stream, the HT-to-HTO converted vapor can plate out on the catalyst and take time to migrate off the catalyst for collection in vials

D-E-F. In normal bubbler operations where samples are run for a week and subsequent samples are immediately installed, this is not an issue. However, for shorter term FTWC operations (less than a day at a time) that can have multiple days between sampling events, it was hypothesized that such possible plate-out in the catalyst might result in underestimating emissions of HT gas. As such, using distilled water in Vial C will rehydrate the sample air stream before the catalyst and optimize rapid movement of the newly converted HT-to-HTO vapor for immediate collection in vials D-E-F. This issue was not a factor for the downwind field bubblers and their longer sample run times; they used ethylene glycol in all six vials. Using glycol in the field bubblers was also necessary due to their extended run time; distilled water would evaporate after more than a few days in the arid environment.

The stack bubbler sample calculations are included with each day's operational forms in Appendix A; Appendix B shows the calculations for the downwind field bubblers.

The stack flow was determined by using a calibrated duct flow meter as shown near the top of Figure 2. This flow meter is a Sierra 620s, sized for the 10 inch duct used in the FTWC operations. The meter reads out in velocity at sea level; the process to convert this information to a volumetric flow rate at altitude is described in detail in a 2019 protocol document.[8] For calculating real-time emissions on the ion chamber, a bounding flow rate (highest) was used for the time period of interest and flow configuration. If the flow changed throughout the day's operation, the flow rate used in the ion chamber calculations was changed accordingly, using a conservative estimate of flow at all times. For the bubbler emissions calculations, only a single value is used in the calculation at the end of the day. We therefore used the single highest flow representing operations for that day; this provides a conservative estimate of emissions for that instrument's calculation. Finally, for CAP88 plume modeling, a lower stack flow rate results in higher off-site doses; therefore, each day's CAP88 plume model used the lowest flow rate measured that day. Collectively, these assumptions ensured that we did not underestimate the calculation of air emissions or public dose. The flow calculations were done in a spreadsheet and hand-checked; these spreadsheet calculations of flow rate appears in each day's documentation packages in Appendix A.

Summary of daily operations

This section briefly describes the activities performed each day, using the steps above as a reference. It also details the air emissions, as measured by the ion chamber in real time and the bubbler at the end of the day. The off-site maximally exposed dose for that day is also noted, as well as the rolling total dose. The spreadsheet logs of each day's emissions limit calculations, flow rate determination, flow rate trending, and real-time emissions logs appear in Appendix A.

[8] LA-UR-19-32748, rev. 1. "Protocol for Determining Actual Flow Rate in FTWC Duct Systems." January 31, 2020.

The bubbler emissions calculations also appear in that appendix. The summary of stack emissions measurements appears in Table 1 following the daily summary narratives. The overall CAP88 dose tracking sheet appears later in this document as Table 2.

Day 0 – Sunday, September 14, 2025

This day was the first day for extended site access for the operations team at the FTWC storage area at TA-54. The team conducted the pre-job meeting, inventoried equipment, and planned out specific locations for the ventilation system, generator, and radiological control area boundaries. We performed general inspections of the FTWCs within Building 1028 and discussed operational workflow. No hands-on work was performed on this day; no emissions were generated, and there was no public dose from this day's work.

Day 01 – Monday, September 15, 2025

This was the first day with actual hands-on operations. We set up the ventilation system, established flow in the exhaust duct, and proceeded with drum inspections. We opened the bung access port in the 85-gallon drum overpack for FTWC 226 and sampled the air within the overpack. We then moved to FTWC 225 and repeated those steps. We then opened the overpack lid to directly access the surface of FTWC 225. Preparations were made to mount the vent rig onto FTWC 225.

Workplace air monitoring with hand-held meters detected no airborne tritium. Real-time stack emissions monitoring on the exhaust system measured less than 0.1 curies emitted, consistent with instrument background levels. The bubbler data showed about 0.00018 curies emitted; again, readings were essentially equivalent to the minimum detectable activity on the liquid scintillation system. The bubbler showed only HTO vapor, no detectable levels were measured in vials D-E-F of the bubbler. The off-site dose to the maximally exposed individual (MEI) public receptor location from the emissions (as measured by the bubbler) was 2.2E-8 millirem. The MEI location is a Los Alamos County facility north-northeast (NNE) of Area G.

Day 02 – Tuesday, September 16, 2025

The venting rig was installed onto FTWC 225 (Step 1, above). We opened the FTWC headspace up to the venting rig (Step 2); no measurable pressure was noted on the vent rig gauges. We then proceeded with Steps 3 (opening the vent rig to the stack) and Step 4 (removing the vent rig, switch to PMM). We did measure low levels of stack emissions during Step 4, while the vent rig was removed and the PMM was being installed. The PMM was then mounted onto FTWC 225 and pressurized with helium (Step 5). This is a

stable condition for the FTWC at Area G, and the drum was left in this condition overnight.

Real-time monitoring on the ion chamber indicated 5.5 curies of tritium. The bubbler calculations showed 5.25 curies, all HT gas. No HTO vapor was measured. The CAP88 plume model calculated an off-site dose of 1.6E-4 millirem to the MEI; this was again the LA County facility NNE of Area G. The rolling total dose to this MEI location is 1.6E-4 millirem.

Day 03 – Wednesday, September 17, 2025

This day was focused on bleeding off the helium pressure within FTWC 226 (Step 6). We measured low emissions during this operation. Later in the day, we proceeded to Step 7, evacuating the FTWC down to about a third of an atmosphere to prepare it for later movement out of Area G. Tritium emissions were also measured during this step.

At one point in the operation, radiological control technicians measured concentrations of tritium in the ambient air immediately around Building 1028 and identified a loose fitting on the line between the pump and the exhaust duct. This leak represents a potential unmonitored release from the process. The fitting was tightened and the leak was resolved.

To quantify this potential release, we first determined the total amount of time the vacuum pump was operating before the issue was discovered and fixed; this was a 95-minute time interval (17:00 to 18:35). We then assumed the concentration for this entire time interval was equal to the worst-case concentration measured earlier in the day during the helium pressure venting. Finally, we applied the conservative exhaust flow rate with this maximum air concentration and time interval to calculate a maximum of 12.2 curies of tritium that could have been released during this interval.

This evaluation was discussed with the operations lead for the FTWC project, the on-site representative from the EPA, and the on-site representative from the Defense Nuclear Facility Safety Board. All parties concurred that this method provides a bounding estimate of any potential release. We did measure stack emissions during this time interval as well – this indicates that at least some portion of the vacuum pump exhaust was going through the monitored stack and, therefore, is double counted by adding the 12.2 curies that were calculated to the monitored emissions for that time frame. We administratively declared the 12.2 unmonitored curies to be HTO vapor, since it has a higher dose conversion factor in CAP88 than HT gas. Later, it was noted that the bubbler showed pure HT gas, meaning it's again conservative to assume that this 12.2 curies is

HTO vapor; in reality, the emission was likely pure HT gas. The calculation appears with the Day 03 spreadsheet files in Appendix A.

The ion chamber measured 14.4 curies from this day's operation. The bubbler measured 18.2 curies, all of it HT gas. Adding in the 12.2 curies to the more conservative bubbler value, reported emissions for the day were 30.4 curies. Modeling in CAP88 (with 12.2 curies of HTO, 18.2 curies of HT gas) resulted in the MEI dose of 0.0035 millirem to a residence east of Area G. Due to wind changes from prior days, this day's dose represents the overall MEI dose for the project so far, 0.0035 millirem. The doses from prior days' emissions at this new location east of Area G were much lower than the 1.6E-4 millirem NNE of Area G; thus 0.0035 millirem is the rounded total at the MEI location east of Area G.

Day 04 – Saturday, September 20, 2025

The project took 2 days off for staffing availability issues and to address operational needs at other LANL facilities. Work resumed on Saturday, and Steps 1-5 were performed on FTWC 229. Again, no pressure was measured within the FTWC headspace after the vent rig was mounted and opened up to the FTWC. After the PMM was mounted onto the FTWC, the system was pressurized with helium.

There was very little tritium emissions measured on this day. Trace emissions were measured when swapping between the vent rig and the PMM (Step 4). The real-time ion chamber showed 0.131 curies of tritium for the day. Note that at these low levels, the ion chamber background will dominate reported emissions. Bubbler measurements indicated much lower levels, 2.70E-4 curies of HTO vapor and 3.44E-02 curies of HT gas. The MEI dose from this day's operation was 7.3E-7 millirem, to a residence east-southeast of Area G. The running total MEI dose remains 0.0035 millirem to the residence east of Area G. The spreadsheet summary files are shown in Appendix A.

Day 05 – Sunday, September 21, 2025

Rather than continue with FTWC 229, operations staff determined the best course of action was to proceed with getting all FTWCs through to Step 5 to ensure all containers were in a stable storage condition. Today we focused on FTWC 227, moving through steps 1-5. Once again, the vent rig gauges indicated no pressure buildup within the FTWC. As with prior drums, low emissions were measured during Step 4 when exchanging the vent rig for the PMM.

The ion chamber indicated emissions of 5.345 curies of tritium. The bubbler showed HTO emissions of 6.03E-4 curies and HT gas emissions of 6.21 curies. The winds today were blowing consistently back across the LANL site (generally northeast to southwest),

so the off-site MEI dose was only 6.9E-5 millirem, to a receptor southwest of Area G. The rolling total MEI dose remains 0.0035 millirem to a residence east of Area G.

Day 06 – Tuesday, September 23, 2025

The team took a day to address operational issues at other LANL facilities and resumed FTWC operations on Tuesday 9/23/25. The focus was FTWC 226, again moving through steps 1-5. Once again, the vent rig gauges indicated no pressure buildup within the FTWC. As with prior drums, very low emissions were measured during Step 4 when exchanging the vent rig for the PMM.

The ion chamber indicated emissions of 0.226 curies of tritium. The bubbler showed HTO emissions of 6.18E-3 curies and HT gas emissions of 0.225 curies. The winds were again blowing consistently back across the LANL site, so the off-site MEI dose was only 3.1E-6 millirem, to a receptor southwest of Area G. The rolling total MEI dose remains 0.0035 millirem to a residence east of Area G.

At the end of Tuesday's operations, the display on the bubbler flow indicator failed. The bubbler had sufficient flow, as indicated by observing the rate of bubbles generated in each vial, and the catalyst temperature remained at the proper levels. However, the displayed flow fluctuated rapidly from near-zero to maximum flow rate. Instrument specialists stated it was likely that fluid had splashed and been pulled into the flowmeter, making the displayed reading unstable. It was decided to use a backup instrument for subsequent days' operations. The Ludlum 336 that had been in use for Days 1-6 was replaced with an Ortec 1700 bubbler, starting with Day 7.

Day 07 –Wednesday, September 24, 2025

Today we resumed work on FTWC 226, starting with the helium pressure bleed-down (Step 6). This activity took all of the morning and into the afternoon. Late afternoon, we pulled a vacuum on the container (Step 7) to achieve the "movement ready" condition on FTWC 226. We measured low levels of emissions during the day, mostly when evacuating the FTWC down to negative pressure.

Emissions for the day were about 10 curies according to the ion chamber. The bubbler measurements showed 6.3 curies. Using the more conservative ion chamber values, the MEI dose from today's operation was 0.00051 millirem, to a receptor southwest of Area G. The rolling total MEI dose remains 0.0035 millirem to a residence east of Area G.

Day 08 –Thursday, September 25, 2025

This day focused on FTWC 229, again performing steps 6 (helium pressure bleed-down) and 7 (container evacuation). Similar to Day 7, very low emissions were recorded. The

ion chamber measured 1.50 curies, and the bubbler measured 0.530 curies. Using the more conservative ion chamber data, the MEI dose from today's operation is 0.000083 millirem, to a receptor southwest of Area G. For the fourth consecutive day, winds were consistently blowing back across the Laboratory, minimizing the off-site doses from these operations. The rolling total MEI dose remains 0.0035 millirem to a residence east of Area G.

Day 09 –Monday, September 29, 2025

On Day 09, we processed the final container, FTWC 227. The helium pressure bleed-down (Step 6) took most of the morning; we measured stack tritium concentrations of over 4 millicuries per cubic meter during this period. The afternoon evacuation of the drum showed the highest emissions rate measured during the project, up to 129 millicuries per cubic meter in the stack. The ion chamber measured a total of 69.52 curies, mostly during the drum evacuation. The bubbler data showed much lower, only 28.7 curies total. The differences between the two instruments are more pronounced at the higher emissions rates seen today. We are investigating all possible factors for the discrepancy and working with the instrument vendor on this matter. This issue will be more fully explored in a later report.

Using the higher ion chamber measurements, the MEI dose from today's operations was 0.012 millirem to a receptor southeast of Area G.

Days 10-13 – Sunday, Oct. 5; Friday, Oct. 10; Saturday, Oct. 11; Sunday, Oct. 12, 2025

The final four days of operations were dedicated to moving containers, one at a time and one per day, from Area G out to WETF. Each morning, the pressures were checked on the FTWCs at Area G. No container showed a rise in pressure on any day, indicating that that day's container was safe to move. Using remote handling techniques, the FTWC being moved that day was first moved to the edge of Building 1028, then removed from 1028 and placed on a drum pallet, and then the drum pallet was loaded into an enclosed cargo container. Pressures were checked at each step. With no pressure rise indicated, the cargo container was closed up and the FTWC was moved to WETF. At WETF, the process was reversed, with the FTWC on its pallet it was unloaded from the cargo container and brought to ground level, and then the FTWC was removed from the pallet and loaded onto the WETF loading dock. These movements between the cargo container and the WETF dock were made with remote handling equipment. Once on the WETF dock, the final pressure reading was taken and, when no pressure increase was noted, the FTWC was moved into WETF.

On October 5, we moved FTWC 226. FTWC 225 was moved on October 10, followed by FTWC 229 on October 11. The final move of FTWC 227 was performed on Sunday, October 12. Since FTWC pressures remained within acceptable levels for all these days, the FTWCs all remained sealed and no emissions occurred on these days. No radiological doses resulted from these last four days of operations. The total dose to the public from the FTWC operations was 0.0123 millirem to the MEI in the sector southeast of Area G.

Table 1 shows the stack emissions data for both the ion chamber and the bubbler, summed across the entire project. Bubbler emissions in Table 1 are based on the "quick count" from HPAL; we cross-referenced the quick reports with the full analyses and there was no significant differences between the two reports.

Table 1: Stack Emissions Log Table

FTWC Emissions Log			122.9	Ci total; days 1-6 bubbler, days 7-9 ion chamber data				
Stack Ion Chamber & Bubbler Data				*Emissions of record highlighted in yellow*				
		Source documents →	FTWC Calculations	FTWC equip list	Bubbler Submittal COC forms		Bubbler Calc Spdshts	
Ops Period	Day	Ops Description	Ion Chamber Total (spreadsheet log) (Curies)	Bubbler ID	Bubbler Start	Bubbler End	Bubbler HTO Ci	Bubbler HT Ci
Day 01	Mon 09/15	pre 225 & 226	0.08	Ludlum #52201	9/15/25 14:10	9/15/25 18:11	1.79E-04	0.00E+00
Day 02	Tue 09/16	225 vent	5.50	Ludlum #52201	9/16/25 09:17	9/16/25 17:23	0.00E+00	5.25E+00
Day 03	Wed 09/17	225 evac	14.40	Ludlum #52201	9/17/25 09:08	9/17/25 19:33	*12.2*	1.82E+01
Day 04	Sat 09/20	229 vent	0.13	Ludlum #52201	9/20/25 08:18	9/20/25 14:54	2.70E-04	3.44E-02
Day 05	Sun 09/21	227 vent	5.35	Ludlum #52201	9/21/25 08:30	9/21/25 15:49	6.03E-04	6.21E+00
Day 06	Tue 09/23	226 vent	0.23	Ludlum #52201	9/23/25 08:22	9/23/25 12:52	6.18E-03	2.25E-01
Day 07	Wed 09/24	226 evac	9.72	Ortec #12789	9/24/25 07:27	9/24/25 17:32	9.11E-02	6.19E+00
Day 08	Thu 09/25	229 evac	1.50	Ortec #12789	9/25/25 07:31	9/25/25 15:20	6.89E-02	4.60E-01
Day 09	Mon 09/29	227 evac	69.52	Ortec #12789	9/29/25 07:26	9/29/25 14:53	8.42E-02	2.86E+01
Day 10	Sun 10/05	226 move	0	*Days 10-13*	n/a	n/a	0.00E+00	0.00E+00
Day 11	Fri 10/10	225 move	0	*No emissions;*	n/a	n/a	0.00E+00	0.00E+00
Day 12	Sat 10/11	229 move	0	*moving*	n/a	n/a	0.00E+00	0.00E+00
Day 13	Sun 10/12	227 move	0	*days*	n/a	n/a	0.00E+00	0.00E+00

CAP88 Dose Calculations

The EPA's plume dispersion & dose assessment model, CAP88-PC, was used to calculate doses from each day's operation. We ran calculations using actual emissions, a conservative stack flow, and actual measured meteorological parameters for wind, precipitation, humidity, and temperature. We set up each CAP88 run to evaluate doses at the nearest public receptor in

each of 16 direction sectors (e.g., northeast, east southeast, etc.) and to the three regional Airnet stations located in downwind community locations. The doses at all these locations were loaded into a spreadsheet matrix which identified the maximum dose location for each day's operation. The spreadsheet also tracked the running total maximum dose at any of the locations for the duration of the project. The final dose tracking matrix is shown in Table 2.

As mentioned above, when the ion chamber and bubbler showed a significant difference, we used the higher of the two instrument measurements. When the ion chamber data was used, we applied the relative composition of HTO and HT that was measured in the bubbler to the gross tritium measurements made by the ion chamber.

Note in Table 2, several receptor locations are shown with a zero dose, shown as 0.0E+00. This indicates one of two things; either the CAP88 calculated dose was quite low (e.g., less than 1E-10 millirem or 0.0000000001 mrem), or there was no wind recorded in that direction for the duration of that day's operation. With no wind frequency in a specific sector, CAP88 will not calculate a dose in that direction.

The CAP88 Dose Calculation Matrix appears as Table 2 on the next page. An explanation of the different components of the matrix appears on the page after Table 2.

The summary of CAP88 input parameters used each day appears in Appendix C. The individual wind files, CAP88 input files, and dose summary tables that are used to populate Table 2 are not included with this document due to the size of these files. However, they are available upon request.

Table 2: CAP88 Daily Dose Matrix

Min Day	0.0E+00																	
	Locations below represent the closest receptor in each of the sixteen compass sectors, plus other points of interest (in red)																	
Max Day	1.2E-02				Dose Sum	Dose (mrem) for Real Vent & Met, individual days, summed in the last column per each location												
	Scenario: Area G to...	Distance (m)	Direction	Notes	mrem	09152025	09162025	09172025	09202025	09212025	09232025	09242025	09252025	09292025	10052025	10102025	10112025	10122025
3	Residence on Confianza St	2080	ESE		0.0017	0.0E+00	0.0E+00	1.7E-03	7.3E-07	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
4	Residence on Karen Circle	2308	SE		0.0123	0.0E+00	0.0E+00	3.1E-04	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.2E-02	0.0E+00	0.0E+00	0.0E+00	0.0E+00
5	Residence on Mirador Dr	2523	E		0.0035	0.0E+00	0.0E+00	3.5E-03	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
6	LA County Water - South	4759	NNE		0.0023	2.2E-08	1.6E-04	9.0E-04	0.0E+00	7.5E-06	0.0E+00	2.2E-05	0.0E+00	1.2E-03	0.0E+00	0.0E+00	0.0E+00	0.0E+00
7	Airnet 391 (Bandelier Gate)	4820	SW		0.0024	0.0E+00	9.2E-05	0.0E+00	7.2E-07	6.9E-05	3.1E-06	5.1E-04	8.3E-05	1.6E-03	0.0E+00	0.0E+00	0.0E+00	0.0E+00
8	Airnet 395 (East Gate Tank)	4858	N		0.0013	9.0E-09	5.2E-05	5.2E-04	2.1E-08	4.3E-06	0.0E+00	2.3E-05	0.0E+00	7.5E-04	0.0E+00	0.0E+00	0.0E+00	0.0E+00
9	Peetree Garden Center	5095	NNW		0.0002	0.0E+00	0.0E+00	2.4E-05	2.1E-07	2.8E-05	0.0E+00	1.9E-05	1.6E-06	1.1E-04	0.0E+00	0.0E+00	0.0E+00	0.0E+00
10	Bandelier Visitor's Center	6270	SSW		0.0017	0.0E+00	1.2E-05	0.0E+00	5.8E-07	1.2E-05	0.0E+00	5.8E-05	8.7E-07	1.6E-03	0.0E+00	0.0E+00	0.0E+00	0.0E+00
11	Airnet 317 (DP Road - Monitor)	6458	NW		0.0002	0.0E+00	0.0E+00	4.2E-05	6.1E-08	9.3E-06	0.0E+00	1.1E-05	2.7E-06	9.3E-05	0.0E+00	0.0E+00	0.0E+00	0.0E+00
12	Totavi Gas Station	7622	NE		0.0001	0.0E+00	9.2E-06	4.9E-05	0.0E+00	0.0E+00	0.0E+00	4.7E-05	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
13	Ponderosa Campground	10300	W		0.0002	0.0E+00	9.9E-06	2.6E-05	1.0E-07	6.1E-05	1.9E-06	3.1E-05	6.1E-06	5.9E-05	0.0E+00	0.0E+00	0.0E+00	0.0E+00
14	et 294 (San Ildefonso Transfer Station)	12000	ENE		0.0001	0.0E+00	0.0E+00	5.0E-05	8.7E-09	0.0E+00	0.0E+00	4.5E-06	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
15	Pajarito Ski Area	15050	WNW		0.0001	0.0E+00	0.0E+00	1.8E-05	7.2E-08	9.6E-06	3.9E-07	1.4E-05	1.6E-06	5.2E-05	0.0E+00	0.0E+00	0.0E+00	0.0E+00
16	Regional Airnet 234 (El Rancho)	16660	ENE		0.0000	0.0E+00	0.0E+00	3.0E-05	6.3E-09	0.0E+00	0.0E+00	2.7E-06	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
17	Regional Airnet 116 (Espanola)	24060	NE		0.0000	0.0E+00	1.6E-06	8.6E-06	0.0E+00	0.0E+00	0.0E+00	8.0E-06	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
18	Regional Airnet 226 (Santa Fe West)	24380	ESE		0.0001	0.0E+00	0.0E+00	5.2E-05	1.9E-08	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
19	Business on Paseo Rael, Santa Fe	25685	SSE		0.0000	0.0E+00	1.4E-06	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	2.9E-05	0.0E+00	0.0E+00	0.0E+00	0.0E+00
20	La Bajada Village	30140	S		0.0000	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
21	Ponderosa Post Office	40920	WSW		0.0000	0.0E+00	2.1E-06	0.0E+00	2.0E-08	1.6E-06	3.3E-07	2.3E-06	2.7E-06	1.9E-05	0.0E+00	0.0E+00	0.0E+00	0.0E+00
														No evacuation of drums needed during moving days;				
		FTWC Operations Summary for each day												*no emissions these last 4 days.*				
				FTWC ID# being processed:		225&226 prep	225 vent	225 evac	229 vent	227 vent	226 vent	226 evac	229 evac	227 evac	226 move	225 move	229 move	227move
	Project Totals: HTO:	12.7		(H3 vapor) HTO emitted:		1.79E-04	0	12.2	2.70E-04	6.03E-04	6.18E-03	1.41E-01	1.96E-01	2.04E-01	0	0	0	0
	HT:	110	Ci	(H3-gas) HT emitted:		0	5.25	18.2	3.44E-02	6.21E+00	2.25E-01	9.58E+00	1.31E+00	6.93E+01	0	0	0	0
	Total Tritium:	123	Ci	Total tritium emitted:		1.79E-04	5.25	30.4	3.46E-02	6.21E+00	2.31E-01	9.72E+00	1.50E+00	69.52	0	0	0	0

Explanation of different components of Table 2 are shown on next page.

Explanation of Table 2 Components

Min Day: 0.0E+00

Locations below represent the closest receptor in each of the sixteen compass sectors, plus other points of interest (in red)

Max Day: 1.2E-02

Scenario: Area G to...	Distance (m)	Direction	Notes	Dose Sum mrem	09152025	09162025	09172025	09202025	09212025	09232025	09242025	09252025	09292025	10052025	10102025	10112025	10122025
					Dose (mrem) for Real Vent & Met, individual days, summed in the last column per each location												
Residence on Confianza St	2080	ESE		0.0017	0.0E+00	0.0E+00	1.7E-03	7.3E-07	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Residence on Karen Circle	2308	SE		0.0123	0.0E+00	0.0E+00	3.1E-04	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.2E-02	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Residence on Mirador Dr	2523	E		0.0035	0.0E+00	0.0E+00	3.5E-03	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
LA County Water - South	4759	NNE		0.0023	2.2E-08	1.6E-04	9.0E-04	0.0E+00	7.5E-06	0.0E+00	2.2E-05	0.0E+00	1.2E-03	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Airnet 391 (Bandelier Gate)	4820	SW		0.0024	0.0E+00	9.2E-05	0.0E+00	7.2E-07	6.9E-05	3.1E-06	5.1E-04	8.3E-05	1.6E-03	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Airnet 395 (East Gate Tank)	4858	N		0.0013	9.0E-09	5.2E-05	5.2E-04	2.1E-08	4.3E-06	0.0E+00	2.3E-05	0.0E+00	7.5E-04	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Peetree Garden Center	5095	NNW		0.0002	0.0E+00	0.0E+00	2.4E-05	2.1E-07	2.8E-05	0.0E+00	1.9E-05	1.6E-06	1.1E-04	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Bandelier Visitor's Center	6270	SSW		0.0017	0.0E+00	1.2E-05	0.0E+00	5.8E-07	1.2E-05	0.0E+00	5.8E-05	8.7E-07	1.6E-03	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Airnet 317 (DP Road - Monitor)	6458	NW		0.0002	0.0E+00	0.0E+00	4.2E-05	6.1E-08	9.3E-06	0.0E+00	1.1E-05	2.7E-06	9.3E-05	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Totavi Gas Station	7622	NE		0.0001	0.0E+00	9.2E-06	4.9E-05	0.0E+00	0.0E+00	0.0E+00	4.7E-05	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Ponderosa Campground	10300	W		0.0002	0.0E+00	9.9E-06	2.6E-05	1.0E-07	6.1E-05	1.9E-06	3.1E-05	6.1E-06	5.9E-05	0.0E+00	0.0E+00	0.0E+00	0.0E+00
et 294 (San Ildefonso Transfer Station)	12000	ENE		0.0001	0.0E+00	0.0E+00	5.0E-05	8.7E-09	0.0E+00	0.0E+00	4.5E-06	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Pajarito Ski Area	15050	WNW		0.0001	0.0E+00	0.0E+00	1.8E-05	7.2E-08	9.6E-06	3.9E-07	1.4E-05	1.6E-06	5.2E-05	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Regional Airnet 234 (El Rancho)	16660	ENE		0.0000	0.0E+00	0.0E+00	3.0E-05	6.3E-09	0.0E+00	0.0E+00	2.7E-06	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Regional Airnet 116 (Espanola)	24060	NE		0.0000	0.0E+00	1.6E-06	8.6E-06	0.0E+00	0.0E+00	0.0E+00	8.0E-06	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Regional Airnet 226 (Santa Fe West)	24380	ESE		0.0001	0.0E+00	0.0E+00	5.2E-05	1.9E-08	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Business on Paseo Rael, Santa Fe	25685	SSE		0.0000	0.0E+00	1.4E-06	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	2.9E-05	0.0E+00	0.0E+00	0.0E+00	0.0E+00
La Bajada Village	30140	S		0.0000	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Ponderosa Post Office	40920	WSW		0.0000	0.0E+00	2.1E-06	0.0E+00	2.0E-08	1.6E-06	3.3E-07	2.3E-06	2.7E-06	1.9E-05	0.0E+00	0.0E+00	0.0E+00	0.0E+00

No evacuation of drums needed during moving days; no emissions these last 4 days.

FTWC Operations Summary for each day

	09152025	09162025	09172025	09202025	09212025	09232025	09242025	09252025	09292025	10052025	10102025	10112025	10122025
FTWC ID# being processed:	225&226 prep	225 vent	225 evac	229 vent	227 vent	226 vent	226 evac	229 evac	227 evac	226 move	225 move	229 move	227move
(H3 vapor) HTO emitted:	1.79E-04	0	12.2	2.70E-04	6.03E-04	6.18E-03	1.41E-01	1.96E-01	2.04E-01	0	0	0	0
(H3-gas) HT emitted:	0	5.25	18.2	3.44E-02	6.21E+00	2.25E-01	9.58E+00	1.31E+00	6.93E+01	0	0	0	0
Total tritium emitted:	1.79E-04	5.25	30.4	3.46E-02	6.21E+00	2.31E-01	9.72E+00	1.50E+00	69.52	0	0	0	0

Project Totals:			
	HTO:	12.7	
	HT:	110	Ci
	Total Tritium:	123	Ci

Sum of emissions across all days

Sum of doses across project; highest MEI value is highlighted in blue (0.0123 mrem)

Daily dose calculation:

Top row 09292025 = 9/29/2025

Column of numbers are doses at each possible MEI location; max value highlighted in green (1.2E-02 mrem).

Yellow cells at bottom are brief summary of that day's operations and curie emissions.

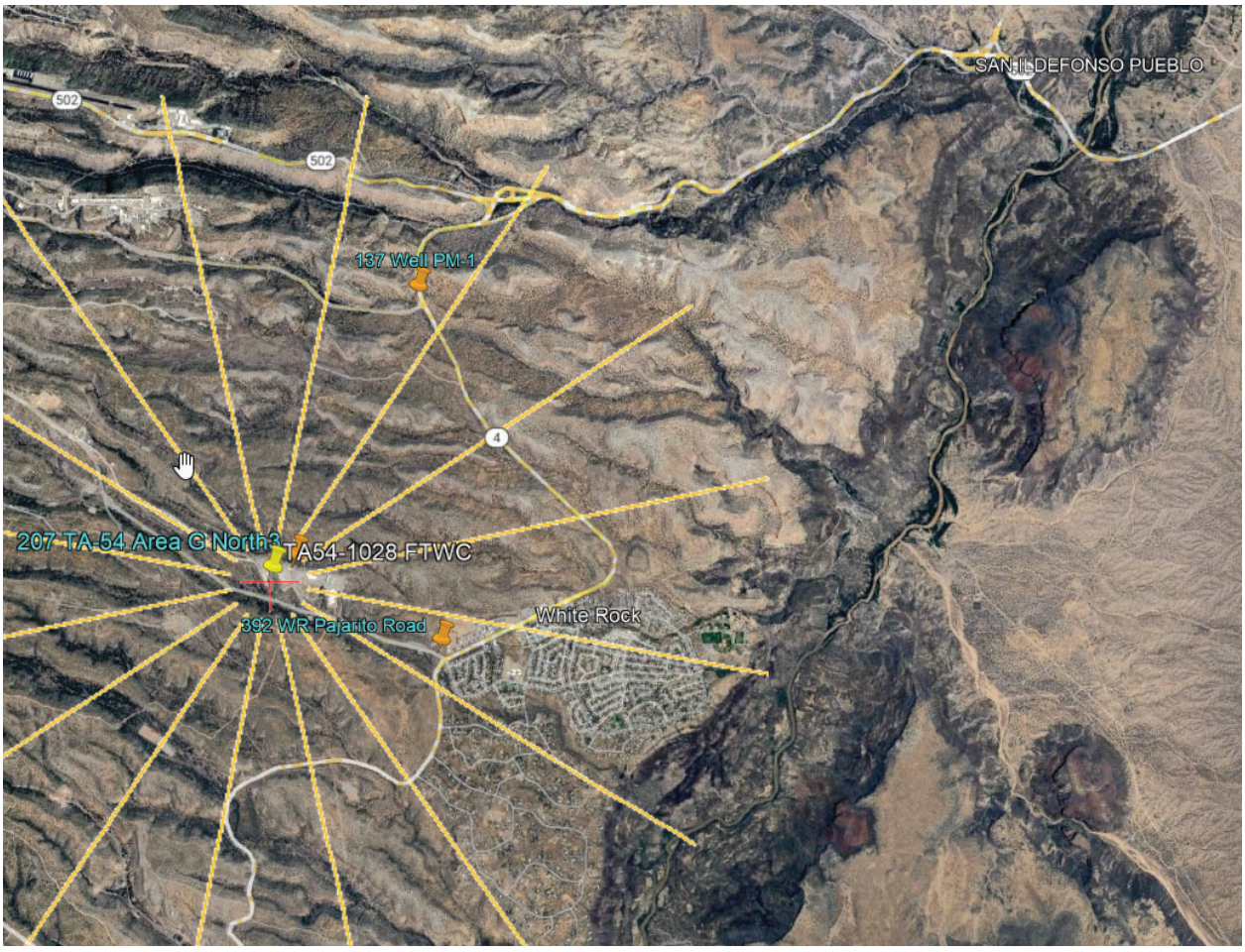
List of evaluated locations and distances; these represent the closest public receptor in each of 16 wind sectors. Also, three regional Airnet stations shown in red type. MEI location is Karen Circle, 2308 meters southeast of TA-54-1028.

Downwind Field Bubbler Measurements

As part of the Environmental Sampling Plan for the FTWC project, several bubblers were installed at downwind locations, collocated with Airnet stations. Bubblers were deployed at three locations, listed below and shown in Figure 3.

- Station 207, about 300 meters ENE of TA-54 Building 1028
- Station 137, about 3500 meters NNE of Building 1028
- Station 392, about 2030 meters ESE of Building 1028.

Figure 3: Field Bubbler Locations



Those three field bubblers ran for pre-operational background and during operations, with each sample covering several days.

- Week 0 – September 12 – 15; pre-operational background;
- Week 1 – September 15-22; first week of operations;
- Week 2 – September 22- October 1; second week of operations;
- Week 3 – October 1-14; third week of operations, “moving week” with no emissions.

On October 1st, the bubbler at Station 137 was relocated to Airnet Station 390, adjacent to the WETF facility. This was in anticipation of possible venting activities at WETF. A log of the Field Bubbler data appears in Table 3. The "dose" columns in Table 3 represent the accumulated dose at that location for the duration of the sampling, based on a time-weighted comparison with dose conversion factors established by the EPA.[9] Note that these concentration and dose values in Table 3 are not corrected for background.

Table 3: Field Bubbler Data Log

Tracking log for Field Bubbler Data											
	Location	Bubbler Model	RP-RIC ID#	On	Off	HTO conc pCi/m3	HTO dose mrem	HT conc pCi/m3	HT dose mrem	Comment	Calc File Name *.xlsx
Pre-Op	207	EL700	7000	5/28/2025	6/18/2025	146	0.06	123	0.05	Area G background	FieldBubblerCalcs_BkdgJune2025-RL
Pre-Op	208	Ortec1700	2222065	6/4/2025	6/18/2025	28	0.01	265	0.07	Area G background	
Week 0	207	Ludlum	55203	9/12/2025	9/15/2025	11663	0.65	192	0.01	PreOp background	FieldBubblerCalcs_Week0-RL
Week 0	137	EL700	7000	9/12/2025	9/15/2025	452	0.03	197	0.01	PreOp background	
Week 0	392	Ortec1700	2222065	9/12/2025	9/15/2025	98	0.01	239	0.01	PreOp background	
Week 1	207	Ludlum	55203	9/15/2025	9/23/2025	12	0.002	0	0	First Week of Ops	FieldBubblerCalcs_Week1-RL
Week 1	137	EL700	7000	9/15/2025	9/22/2025	136	0.02	83	0.01	First Week of Ops	
Week 1	392	Ortec1700	2222065	9/15/2025	9/22/2025	21	0.003	96	0.01	First Week of Ops	
Week 2	207	Ludlum	55203	9/23/2025	10/1/2025	60	0.01	16	0.002	Second week of Ops	FieldBubblerCalcs_Week2-RL
Week 2	137	EL700	7000	9/22/2025	10/1/2025	0	0	1175	0.19	Second week of Ops	
Week 2	392	Ortec1700	2222065	9/22/2025	10/1/2025	191	0.03	0	0	Second week of Ops	
Week 3	207	Ludlum	55203	10/1/2025	10/15/2025	69	0.02	69	0.02	Moving days / no emissions	
Week 3	392	Ortec1700	2222065	10/1/2025	10/14/2025	30	0.01	25	0.01	Moving days / no emissions	
Week 3	390	EL700	7000	10/3/2025	10/14/2025	45	0.01	0	0	390 replaced 137	FieldBubblerCalcs_Week3-RL
Note - Stations 207 and 208 are on LANL property and not in publicly-accessible areas. Not Rad-NESHAP receptor locations											
Station 137 is a publicly-accessible location but does not represent a Rad-NESHAP receptor location; the nearest receptor in that sector is much further downwind.											

Conclusions & Next Steps

The FTWC pressure mitigation project was completed over 13 days in September & October 2025. Air emissions were fairly low; much lower than the bounding levels that were evaluated. All emissions and doses were well within limits established by the Environmental Protection Agency. While the FTWCs did not have the high pressure levels that were of concern during project planning, the operations team executed the FTWC handling procedure as planned to ensure there was no risk of explosion or other hazards to workers, the public, or the environment.

Nuclear safety operations are often faced with this issue of what can appear to be overly-conservative operational assumptions. The philosophy is that if we cannot guarantee a hazard

[9] 40 CFR 61, Appendix E, Table 2. "Concentration Levels for Environmental Compliance."

will not be present, steps must be taken to mitigate that hazard. Especially in this case where no one had ever opened up this type of sealed tritium waste storage container after 18 years of storage, the prudent move was to assume that worst-case scenarios are present and conduct operations accordingly.

This report documented the emissions from the project and dose calculations that were performed each day. Further work will compare the modeled air emissions with downwind soil sampling to evaluate the air dispersion modeling used for this project. We will also compare the day-by-day emissions modeling with modeling runs that combine multiple days together, in a manner more similar to typical CAP88 analyses. Finally, we will compare field bubbler measurements with standard Airnet station measurements to evaluate in-flight behavior of elemental tritium gas emissions. Collectively, Volumes 1 and 2 of this report will present the "summaries of activities, lessons learned, and photographic documentation of the process" as requested in the NMED's Temporary Authorization.[10]

[10] "Approval with Modifications of Temporary Authorization Request, Class 2 Permit Modification for Waste Treatment, Storage, and Repackaging of Four Flanged Tritium Waste Containers, HWB-LANL-19-033." New Mexico Environment Department letter to Theodore Wyka and Steven Coleman, September 4, 2025.

Appendices

A. Spreadsheet forms for each day's operation. This Appendix is subdivided into ten sections, with each section addressing a different day. Each section has several components, shown below. Days 10-13 are collected into a single section, since they only contain the first item below.
    1. Emissions limit calculation, used to identify pause points and overall emissions limits for that day.
    2. Flow rate calculation for the duct; only the first flow rate measurement for the day is included in this form. The flow rate is calculated to ensure sufficient dilution of the FTWC headspace.
    3. Flow rate trending throughout the day. The flow rate calculation from above is repeated as temperature and pressure change throughout the day, or as the exhaust duct is reconfigured throughout the day.
    4. Emissions tracking sheets. These track the ion chamber readings and provide the real-time indication of air emissions from the stack. The package for September 17 also includes the calculation of the potential unmonitored release.
    5. Bubbler emissions calculation forms. These are completed at the end of each day, typically using the "quick count" by the LANL analytical laboratory.
B. Field bubbler concentration & dose calculation forms.
    1. Forms are summarized by week, and a separate worksheet is generated for each downwind field bubbler for each weekly sample. Doses are calculated, relative to the EPA's air concentration dose conversion factor for tritium (per 40CFR61, Appendix E, Table 2; 1.5E-9 curies/m3 = 10 millirem per year; or 150 pCi/m3 over an entire year = 1 mrem).
C. CAP88 input parameter table.
    1. Wind file duration for each day;
    2. Temperature, humidity, and precipitation for each day;
    3. Stack flow rate and curie emissions for each day (HTO vapor & HT gas);
    4. Location of that day's MEI location is noted.

Appendix A.1

Daily Operations Spreadsheets

Day 01

September 15, 2025

- Daily Limit Calculations
- Flow Rate Calculation
- Flow Rate Trending
- Emissions Tracking Log
- Bubbler Emissions Calculation

Daily Emissions Calculation Worksheet

This worksheet calculates emissions hold points and limits based on operations to-date

To QUICKLY insert the current date and time, press Ctrl+; (semi-colon) to add the date,
then press Space, then press Ctrl+Shift-; (semi-colon) to add the time

			Date	Time
Venting Process #	1	Start of operations	9/15/2025	13:17
WCATS ID:	FTWC 226 Lid removal	End of operations	9/15/2025	18:00
Venting Location:	TA 54, Bldg 1028 outside north			

Integrated FTWC Dose (IFD) from previous venting: IFD = 0 mrem *enter 0 if this is first venting operations.*

Calculate Today's Limi & Hold points:

CAP88 Planning Dose Conversation Factor: DCF_p = 3.33E-04 mrem/Ci

Dose Limit:	mrem 6	mrem (IFD) 0		DL mrem 6	
Corresponding Curie Limit:		DL/DCF_p (Ci)	1.802E+04		18,018 curies
Pause For Approval Dose:	mrem 4	mrem (IFD) 0		PFA mrem 4	
Pause for Approval (Ci)		PFA/DFC_p (Ci)	1.201E+04		12,012 curies
Pause for Evaluation Dose:	mrem 2	mrem (IFD) 0		PFED mrem 2	
Pause for Approval (Ci)		$PFED/DFC_p$ (Ci)	6.006E+03		6,006 curies

Concurrance limit for EPC-ES Dose Assessment: (Date/Time/Initial) Day 1 - prior agreement with ES staff

These limits communicated to the FTWC Venting PIC: (Date/Time/Initial) 9/15 13:30; DF to CV

Current Venting Operation Date:

GPS approximation by cell phone app

	Latitude	Longitude
GPS Coordinates of stack:	35.8313	-106.2434

Stack exhaust flow rate: 1766 acfm for SB; 1814 acfm for EPA emissions

Basis for flow rate determination: Sierra 620s

4.3 Documentation of FTWC Flow Rate

Date:	9/15/2025	Location:	54-1028	☑ 2 HP System	☐ 3/4 HP System	TRUE

1. Duct Setup per IWD? ☑ Yes ☐ No

2HP system.
Set up per IWD
-DFuehne 9/15/25

Tested Duct Configuration:
1.Stack
2. Blower
3. Short 12" section
4. Long 5' section w/ rad monitoring
5. Long 5' sectoin w/ Sierra 620
6. short 12" section w/ FTWC inject

---

2. Bounding Condition: minimum velocity achieved on Sierra 620 using worst-case pressure & temp

2 HP System:
2680 sfpm on Sierra 620 = 1476 acfm in duct ☐ Yes ☐ No ☐ N/A

3/4 HP System:
1404 sfpm on Sierra 620 = 753 acfm in duct ☐ Yes ☐ No ☑ N/A

3.

	˚F	˚R		˚F	˚R
T_{act} :	76	535.67	T_{std} :	70	529.67
	mbar			mbar	
P_{act} :	805		P_{std} :	1013.25	

$\frac{T_{act}}{T_{std}} =$ 1.011

$\frac{P_{std}}{P_{act}} =$ 1.269

Pressure Correction: -3.4 mbar for every 100ft difference above reference barometer.

TA-6 weather station:	7424 ft	-6.4 mbar from TA-54
TA-54 weather station:	6548 ft	23.4 mbar from TA-6
TA-54 -1028:	~ 6735 ft	8.5 mbar from TA-6 to TA-49
WETF dock :	~ 7608 ft	-6.3 mbar from TA-6

Type Pressure corrrection here: -6.4

Use Equation 18 to determine flow rate through the duct, based on Sierra 620 reading.

$$\dot{V}_{act} = \left(v_{inst} - 75\ std\frac{ft}{min}\right) * 0.5454\ ft^2 * \left(\frac{T_{act}}{529.67°R}\right) * \left(\frac{1013.25\ mbar}{P_{act}}\right) * 90\%$$

υ_{inst} 2880 std ft/min

$\frac{T_{act}}{T_{std}} =$	1.011
$\frac{P_{std}}{P_{act}} =$	1.269

Safety Basis value (WETF-26)

$\dot{V}_{act}$ = 1766.7 actual ft^3/min for Safety Basis concerns

EPA emissions calcs value

$\dot{V}_{act}$ = 1814.0 actual ft^3/min for stack emissions calculations
(disregards 75 fpm error term; conservative)

Use equation 21 and 22 to determine minimum Seirra 620 reading based on limiting flows in the different duct systems (using 2HP or 3/4Hp blower)

Eq 21

$$v_{inst,2HP} = \left[\frac{1476\ actual\frac{ft^3}{min}}{90\% * 0.5454ft^2} * \frac{529.67°R}{T_{act}} * \frac{P_{act}}{1013.25\ mbar}\right] + 75\ std\frac{ft}{min}$$

2418.4 sfpm — 2 HP fan Threshold

Eq 22

$$v_{inst,3/4HP} = \left[\frac{753\ actual\frac{ft^3}{min}}{90\% * 0.5454ft^2} * \frac{529.67°R}{T_{act}} * \frac{P_{act}}{1013.25\ mbar}\right] + 75\ std\frac{ft}{min}$$

0.0 sfpm — 3/4 HP fan N/A

Sufficient flow in the duct for FTWC venting? ☐ Yes ☐ No ☐ N/A

---

4. EPA full traverse flow measurement performed per procedure 127? ☐ Yes ☐ No ☑ N/A

Actual flow rate measured in duct: _____ acfm

Sufficient flow in the duct for FTWC venting? ☐ Yes ☐ No ☐ N/A

Trending FTWC flow rate

Safety basis flow calculation - uses "-75" sfpm error term to ensure sufficient flow;

EPA compliance calculations do NOT use the "-75" term to ensure conservative emissions calcs.

Constants		
Temp: F to R	459.67	
T-std	529.67	Rankine
P-std	1013.25	mbar
Area	0.5454	ft2
Single-Point Corr Fact	90%	
Sierra Error Bar	-75	std ft/min
Min Flow (Area G, 2 HP)	1476	actual ft3/min
Min Flow (WETF, 3/4 HP)	753	actual ft3/min
flow unit conversion	0.02832	m3 per ft3

Actual flow rate determination

$$\dot{V}_{act} = \left(v_{inst} - 75\ std\frac{ft}{min}\right) * 0.5454\ ft^2 * \left(\frac{T_{act}}{529.67°R}\right) * \left(\frac{1013.25\ mbar}{P_{act}}\right) * 90\%$$

Minimum velocity determination

$$v_{inst,2HP} = \left[\frac{1476\ actual\frac{ft^3}{min}}{90\% * 0.5454 ft^2} * \frac{529.67°R}{T_{act}} * \frac{P_{act}}{1013.25\ mbar}\right] + 75\ std\frac{ft}{min}$$

Date	**Time**	**Temp** deg.F	**Pressure** mbar	**Pressure Adjust** mbar	**Temp Corr Fact**	**Press Corr Fact**	**Sierra Reading** std ft/min	**Safety Basis Flow Rate** act ft3/min	**EPA Calcs Flow Rate** act ft3/min	**EPA Calcs Flow Rate** act m3/min	Area G: **Safety Basis Min Veloc** std ft/min	WETF: **Safety Basis Min Veloc** std ft/min	Comment / Configuration
9/15/2025	14:44	76	805	-6.4	1.011	1.269	2880	1,767	1,814	51.4	2419	1271	prep for 226
9/15/2025	16:03	77	805	-6.4	1.013	1.269	3017	1,856	1,904	53.9	2415	1269	
9/15/2025	16:30	77	805	-6.4	1.013	1.269	2880	1,770	1,817	51.5	2415	1269	
9/15/2025	17:15	77	805	-6.4	1.013	1.269	2880	1,770	1,817	51.5	2415	1269	pause 226 ops
9/15/2025	17:20	77	805	-6.4	1.013	1.269	0	(47)	0	0.0	2415	1269	fan off to reconfigure 225
9/15/2025	17:23	77	805	-6.4	1.013	1.269	3180	1,959	2,007	56.8	2415	1269	worker holding duct
9/15/2025	17:33	77	804	-6.4	1.013	1.270	3180	1,962	2,009	56.9	2412	1267	keep using 56.8 for emiss calc
9/15/2025	17:36	77	804	-6.4	1.013	1.270	3070	1,892	1,940	54.9	2412	1267	duct mounted to ceiling
9/15/2025	17:43	77	804	-6.4	1.013	1.270	2940	1,810	1,858	52.6	2412	1267	
9/15/2025				-6.4									
9/15/2025				-6.4									
9/15/2025				-6.4									
9/15/2025				-6.4									
9/15/2025				-6.4									
9/15/2025				-6.4									
				-6.4									
				-6.4									
				-6.4									
				-6.4									
				-6.4									
				-6.4									
				-6.4									
				-6.4									

Emissions Tracking Worksheet

FTWC Venting Process: 1

Start date & time	
9/15/2025	13:30

This process emissions tracking:

Page 1 of 1

9/15/2025	18:00
End date & time	

Venting Location: TA 54, Bldg 1028 outside north

Stack Flow Rate *(without safety basis error compensation)*

$\dot{V}_{act}$ = 1814.0 actual ft^3/min = 51.4 m^3/min

Emitted Activity (Ci) = Concentration (µCi/m^3) * Δt (min) * Flow (m^3/min) * 1E6 (Ci/µCi)

ctrl+semicolon = inserts date
ctrl+shift+semicolon = inserts time

Total Activity for this sheet (Ci)
0.078

Reading		Concentration	Time Interva	Flow Rate	**Emitted Activity**		Running
Date	Time	(µCi/m3)	Δt (min)	(m^3/min)	(µCi)	(Ci)	Total Ci
9/15/2025	15:00	7.90	n/a	n/a	n/a	n/a	n/a
9/15/2025	15:30	8.30	30.0	51.4	12790	1.28E-02	1.28E-02
9/15/2025	15:57	8.04	27.0	51.4	11151	1.12E-02	2.39E-02
9/15/2025	16:25	8.27	28.0	51.4	11894	1.19E-02	3.58E-02
9/15/2025	16:37	8.42	12.0	51.4	5190	5.19E-03	4.10E-02
9/15/2025	16:45	8.34	8.0	51.4	3427	3.43E-03	4.45E-02
9/15/2025	16:50	8.55	5.0	51.4	2196	2.20E-03	4.66E-02
9/15/2025	16:55	8.55	5.0	51.4	2196	2.20E-03	4.88E-02
9/15/2025	17:05	8.50	10.0	51.4	4366	4.37E-03	5.32E-02
9/15/2025	17:10	8.66	5.0	51.4	2224	2.22E-03	5.54E-02
9/15/2025	17:12	8.73	2.0	51.4	897	8.97E-04	5.63E-02
9/15/2025	17:17	8.75	5.0	51.4	2247	2.25E-03	5.86E-02
9/15/2025	17:23	8.50	6.0	56.8	2897	2.90E-03	6.15E-02
9/15/2025	17:28	8.37	5.0	56.8	2377	2.38E-03	6.39E-02
9/15/2025	17:33	8.58	5.0	56.8	2437	2.44E-03	6.63E-02
9/15/2025	17:38	8.49	5.0	56.8	2411	2.41E-03	6.87E-02
9/15/2025	17:40	8.60	2.0	56.8	977	9.77E-04	6.97E-02
9/15/2025	17:45	8.58	5.0	56.8	2437	2.44E-03	7.21E-02
9/15/2025	17:50	8.50	5.0	56.8	2414	2.41E-03	7.45E-02
9/15/2025	17:55	8.62	5.0	56.8	2448	2.45E-03	7.70E-02
9/15/2025	17:57	8.66	2.0	56.8	984	9.84E-04	7.80E-02
			0.0	56.8	0	0.00E+00	7.80E-02
			0.0	56.8	0	0.00E+00	7.80E-02

Use this sheet for evaluation of a single release.
yellow = required field for proper calc | blue = optional data for complete report

Emissions from: TA - 54 | Bldg - 1028 | ES - FT

Emissions calculation date: 10/29/2025 | HPAL barcode #:

	date	time
Time sample started:	15-Sep-2025	1:00 PM
Time sample ended:	15-Sep-2025	6:00 PM
Length of sample period:	5.0	HRS
Sample period downtime:	0.0	HRS

RADAIR Report Period ID:
Bubbler response (catalyst efficiency for HT): 1.00 | Cal Date: | Expires:

Bubbler flow rate

115	mL/min	at STP
150	**mL/min**	at altitude
5.30E-03	cfm	at altitude
4.50E+04	mL/sample period	at altitude

FTWC flow rate (daily max) 2,009 cfm
1.71E+10 mL/sample period at altitude

Ratio of flow rates: 3.79E+05 = (stack flow)/(sample flow)

FTWC	
1,476	*min*
1,800	*max*

Weight of glycol and water in vials | **Volume of glycol and water in vials**

W_1	29.1	g	V_1	26.2	mL
W_2	32.2	g	V_2	29.0	mL
W_3	26.0	g	V_3	23.4	mL
W_4	34.7	g	V_4	31.2	mL
W_5	32.6	g	V_5	29.3	mL
W_6	32.4	g	V_6	29.1	mL

assumes glycol & water density of 1.113 g/mL

Typical weights
36 g avg
54 g max

Activity concentration in vials | **Activity in vials**

C_1	1.80E-02 µCi/L	quick count	A_1	4.71E-04	µCi
C_2	0.00E+00 µCi/L		A_2	0.00E+00	µCi
C_3	0.00E+00 µCi/L		A_3	0.00E+00	µCi
C_4	0.00E+00 µCi/L		A_4	0.00E+00	µCi
C_5	0.00E+00 µCi/L		A_5	0.00E+00	µCi
C_6	0.00E+00 µCi/L		A_6	0.00E+00	µCi
bkgnd	µCi/L				

*no value indicates less than MDA

OK to analyze single vial.
Enter known values;
calcs are independent
of number of vials

MDA = 0.01 uCi/L

If there were any bubbler performance tests during this period:
HTO Stacked during Cal | HT Stacked during cal:

Ignore if no bubbler tests took place.

Activity of H-3 emitted from stack for given time period:
HTO 1.79E-04 Ci (includes response factor)
HT 0.00E+00 Ci (includes response factor)
Calculation based on operating times; allows for downtime

Based on flow ratio only:
1.79E-04 total Ci released
1.79E-04 Ci HTO
0.00E+00 Ci HT

Notes: 1.79E-04 total curies emitted

Report by: Dave Fuehne **Signature:** _____ Date 9/15/2025

Review by: Rebecca Lattin **Signature:** _____ Date 9/15/2025

Appendix A.2

Daily Operations Spreadsheets

Day 02

September 16, 2025

- Daily Limit Calculations
- Flow Rate Calculation
- Flow Rate Trending
- Emissions Tracking Log
- Bubbler Emissions Calculation

Daily Emissions Calculation Worksheet

This worksheet calculates emissions hold points and limits based on operations to-date

To QUICKLY insert the current date and time, press Ctrl+; (semi-colon) to add the date,
then press Space, then press Ctrl+Shift-; (semi-colon) to add the time

			Date	Time
Venting Process #	2; Day 2	Start of operations	9/16/2025	10:00
WCATS ID:	225 install vent rig	End of operations	9/16/2025	17:15
Venting Location:	TA 54, Bldg 1028 outside north			

enter 0 if this is first venting operations.

Integrated FTWC Dose (IFD) from previous venting: IFD = 0 mrem

dose less than 1e-5 mrem; round to zero

Calculate Today's Limi & Hold points:

CAP88 Planning Dose Conversation Factor: DCF_p = 3.33E-04 mrem/Ci

	mrem	mrem (IFD)			
Dose Limit:	6	0		DL mrem 6	
Corresponding Curie Limit:		DL/DCF_p (Ci)	1.802E+04		18,018 curies
Pause For Approval Dose:	4	0		PFA mrem 4	
Pause for Approval (Ci)		PFA/DFC_p (Ci)	1.201E+04		12,012 curies
Pause for Evaluation Dose:	2	0		PFED mrem 2	
Pause for Approval (Ci)		PFED/DFC_p (Ci)	6.006E+03		6,006 curies

Concurrance limit for EPC-ES Dose Assessment: (Date/Time/Initial) same as yesterday; no change

These limits communicated to the FTWC Venting PIC: (Date/Time/Initial) 9/16/25 DPF to DH; 10:00

Current Venting Operation Date:

GPS location approx with cell phone app

	Latitude	Longitude
GPS Coordinates of stack:	35.8313	-106.2434

Stack exhaust flow rate: 1586 acfm for SB; Emissions use 1632 acfm EPA

Basis for flow rate determination: flow meter

4.3 Documentation of FTWC Flow Rate

Date:	9/16/2025	Location:	TA54 1028	☑ 2 HP System	☐ 3/4 HP System	TRUE

1. Duct Setup per IWD? ☑ Yes ☐ No

Tested Duct Configuration:
1.Stack
2. Blower
3. Short 12" section
4. Long 5' section w/ rad monitoring
5. Long 5' sectoin w/ Sierra 620
6. short 12" section w/ FTWC inject

---

2. Bounding Condition: minimum velocity achieved on Sierra 620 using worst-case pressure & temp:

2 HP System:
2680 sfpm on Sierra 620 = 1476 acfm in duct ☐ Yes ☐ No ☐ N/A

3/4 HP System:
1404 sfpm on Sierra 620 = 753 acfm in duct ☐ Yes ☐ No ☑ N/A

3.

	˚F	˚R		˚F	˚R
T_{act} :	64	523.67	T_{std} :	70	529.67
	mbar			mbar	
P_{act} :	807.8		P_{std} :	1013.25	

$\frac{T_{act}}{T_{std}} =$ 0.989

$\frac{P_{std}}{P_{act}} =$ 1.264

Pressure Correction: -3.4 mbar for every 100ft difference above reference barometer.

TA-6 weather station:	7424 ft	-6.4 mbar from TA-54
TA-54 weather station:	6548 ft	23.4 mbar from TA-6
TA-54 -1028:	~ 6735 ft	8.5 mbar from TA-6 to TA-49
WETF dock :	~ 7608 ft	-6.3 mbar from TA-6

Type Pressure corrrection here: -6.4

Use Equation 18 to determine flow rate through the duct, based on Sierra 620 reading.

$$\dot{V}_{act} = \left(v_{inst} - 75\ std\ \frac{ft}{min}\right) * 0.5454\ ft^2 * \left(\frac{T_{act}}{529.67°R}\right) * \left(\frac{1013.25\ mbar}{P_{act}}\right) * 90\%$$

υ_{inst} 2660 std ft/min

$\frac{T_{act}}{T_{std}} =$ 0.989

$\frac{P_{std}}{P_{act}} =$ 1.264

Safety Basis value (WETF-26)

$\dot{V}_{act} =$ 1586.1 actual ft^3/min for Safety Basis concerns

EPA emissions calcs value

$\dot{V}_{act} =$ 1632.1 actual ft^3/min for stack emissions calculations (disregards 75 fpm error term; conservative)

Use equation 21 and 22 to determine minimum Seirra 620 reading based on limiting flows in the different duct systems (using 2HP or 3/4Hp blower)

Eq 21

$$v_{inst,2HP} = \left[\frac{1476\ actual\frac{ft^3}{min}}{90\% * 0.5454ft^2} * \frac{529.67°R}{T_{act}} * \frac{P_{act}}{1013.25\ mbar}\right] + 75\ std\frac{ft}{min}$$

2480.5 sfpm — 2 HP fan Threshold

Eq 22

$$v_{inst,3/4HP} = \left[\frac{753\ actual\frac{ft^3}{min}}{90\% * 0.5454ft^2} * \frac{529.67°R}{T_{act}} * \frac{P_{act}}{1013.25\ mbar}\right] + 75\ std\frac{ft}{min}$$

0.0 sfpm — 3/4 HP fan N/A

Sufficient flow in the duct for FTWC venting? ☐ Yes ☐ No ☐ N/A

---

4. EPA full traverse flow measurement performed per procedure 127? ☐ Yes ☐ No ☑ N/A

Actual flow rate measured in duct: _____ acfm

Sufficient flow in the duct for FTWC venting? ☐ Yes ☐ No ☐ N/A

Trending FTWC flow rate

Safety basis flow calculation - uses "-75" sfpm error term to ensure sufficient flow;

EPA compliance calculations do NOT use the "-75" term to ensure conservative emissions calcs.

Constants		
Temp: F to R	459.67	
T-std	529.67	Rankine
P-std	1013.25	mbar
Area	0.5454	ft2
Single-Point Corr Fact	90%	
Sierra Error Bar	-75	std ft/min
Min Flow (Area G, 2 HP)	1476	actual ft3/min
Min Flow (WETF, 3/4 HP)	753	actual ft3/min
flow unit conversion	0.02832	m3 per ft3

Actual flow rate determination

$$\dot{V}_{act} = \left(v_{inst} - 75\ std\frac{ft}{min}\right) * 0.5454\ ft^2 * \left(\frac{T_{act}}{529.67°R}\right) * \left(\frac{1013.25\ mbar}{P_{act}}\right) * 90\%$$

Minimum velocity determination

$$v_{inst,2HP} = \left[\frac{1476\ actual\frac{ft^3}{min}}{90\% * 0.5454 ft^2} * \frac{529.67°R}{T_{act}} * \frac{P_{act}}{1013.25\ mbar}\right] + 75\ std\frac{ft}{min}$$

Date	Time	Temp deg.F	Pressure mbar	Pressure Adjust mbar	Temp Corr Fact	Press Corr Fact	Sierra Reading std ft/min	Safety Basis Flow Rate act ft3/min	EPA Calcs Flow Rate act ft3/min	EPA Calcs Flow Rate act m3/min	Area G: Safety Basis Min Veloc std ft/min	WETF: Safety Basis Min Veloc std ft/min	Comment / Configuration
9/16/2025	10:10	64	807.8	-6.4	0.989	1.264	2660	1,586	1,632	46.2	2481	1303	
9/16/2025	11:05	68	808	-6.4	0.996	1.264	2540	1,524	1,570	44.5	2463	1294	clouding up. Use 46.2 conserv
9/16/2025				-6.4									
9/16/2025	12:55	73	806	-6.4	1.006	1.267	2460	1,492	1,539	43.6	2435	1279	about to do 1st vent 226
9/16/2025	13:28	77	806	-6.4	1.013	1.267	2450	1,497	1,544	43.7	2417	1270	zero psi. break
9/16/2025	15:27	73	805	-6.4	1.006	1.269	2460	1,494	1,541	43.6	2432	1278	
9/16/2025	15:46	73	805	-6.4	1.006	1.269	2540	1,544	1,591	45.0	2432	1278	removing vent rig 15:45
9/16/2025	15:51	73	805	-6.4	1.006	1.269	2460	1,494	1,541	43.6	2432	1278	preparing for PMM mount
9/16/2025	16:03	73	805	-6.4	1.006	1.269	2330	1,412	1,459	41.3	2432	1278	using 43.6 flow - conservativ
9/16/2025	16:28	73	805	-6.4	1.006	1.269	2380	1,444	1,491	42.2	2432	1278	using 43.6 flow - conservativ
9/16/2025	16:29	73	805	-6.4	1.006	1.269	2570	1,563	1,610	45.6	2432	1278	Duct at roof; helium pressuri
9/16/2025				-6.4									
9/16/2025				-6.4									
9/16/2025				-6.4									
9/16/2025				-6.4									
9/16/2025				-6.4									
9/16/2025				-6.4									
9/16/2025				-6.4									
9/16/2025				-6.4									
9/16/2025				-6.4									
9/16/2025				-6.4									
9/16/2025				-6.4									
9/16/2025				-6.4									

Emissions Tracking Worksheet

FTWC Venting Process: 2; Day 2

Start date & time	
9/16/2025	10:00

This process emissions tracking:
Page 1 of

9/16/2025	17:15
End date & time	

Venting Location: TA 54, Bldg 1028 outside north

Stack Flow Rate *(without safety basis error compensation)*

$\dot{V}_{act}$ = 1632.1455 actual ft^3/min = 46.2 m^3/min

Emitted Activity (Ci) = Concentration (µCi/m^3) * Δt (min) * Flow (m^3/min) * 1E6 (Ci/µCi)

ctrl+semicolon = inserts date
ctrl+shift+semicolon = inserts time

Total Activity for this sheet (Ci)
5.500

Reading		Concentration	Time Interval	Flow Rate	**Emitted Activity**		Running
Date	Time	(µCi/m3)	Δt (min)	(m^3/min)	(µCi)	(Ci)	Total Ci
9/16/2025	11:00	7.94	n/a	n/a	n/a	n/a	n/a
9/16/2025	11:10	7.82	10.0	46.2	3614	3.61E-03	3.61E-03
9/16/2025	11:20	7.87	10.0	46.2	3637	3.64E-03	7.25E-03
9/16/2025	11:30	7.99	10.0	46.2	3693	3.69E-03	1.09E-02
9/16/2025	11:40	7.95	10.0	46.2	3674	3.67E-03	1.46E-02
9/16/2025	11:50	8.07	10.0	46.2	3730	3.73E-03	1.83E-02
9/16/2025	12:00	8.17	10.0	46.2	3776	3.78E-03	2.21E-02
9/16/2025	12:10	8.23	10.0	46.2	3804	3.80E-03	2.59E-02
9/16/2025	12:20	8.18	10.0	46.2	3781	3.78E-03	2.97E-02
9/16/2025	12:30	8.40	10.0	46.2	3882	3.88E-03	3.36E-02
9/16/2025	13:04	8.57	34.0	46.2	13467	1.35E-02	4.71E-02
9/16/2025	13:06	8.59	2.0	43.6	749	7.49E-04	4.78E-02
9/16/2025	13:10	8.80	4.0	43.6	1535	1.53E-03	4.93E-02
9/16/2025	13:13	8.40	3.0	43.6	1099	1.10E-03	5.04E-02
9/16/2025	13:18	8.60	5.0	43.6	1875	1.87E-03	5.23E-02
9/16/2025	13:23	8.78	5.0	43.6	1914	1.91E-03	5.42E-02
9/16/2025	13:25	8.74	2.0	43.6	762	7.62E-04	5.50E-02
9/16/2025	13:35	9.00	10.0	43.6	3924	3.92E-03	5.89E-02
9/16/2025	13:45	8.72	10.0	43.6	3802	3.80E-03	6.27E-02
9/16/2025	13:55	8.94	10.0	43.6	3898	3.90E-03	6.66E-02
9/16/2025	14:05	8.98	10.0	43.6	3915	3.92E-03	7.05E-02
9/16/2025	14:15	8.87	10.0	43.6	3867	3.87E-03	7.44E-02
9/16/2025	14:25	9.09	10.0	43.6	3963	3.96E-03	7.84E-02
9/16/2025	14:35	9.47	10.0	43.6	4129	4.13E-03	8.25E-02
9/16/2025	14:45	8.95	10.0	43.6	3902	3.90E-03	8.64E-02
9/16/2025	14:55	8.93	10.0	43.6	3893	3.89E-03	9.03E-02
9/16/2025	15:06	8.95	11.0	43.6	4292	4.29E-03	9.46E-02
9/16/2025	15:15	8.60	9.0	43.6	3375	3.37E-03	9.80E-02
9/16/2025	15:25	8.50	10.0	43.6	3706	3.71E-03	1.02E-01
9/16/2025	15:35	9.73	10.0	43.6	4242	4.24E-03	1.06E-01

9/16/2025	15:38	10.20	3.0	43.6	1334	1.33E-03	1.07E-01
9/16/2025	15:40	9.24	2.0	43.6	806	8.06E-04	1.08E-01
9/16/2025	15:45	20.00	5.0	45.0	4500	4.50E-03	1.13E-01
9/16/2025	15:46	31.00	1.0	45.0	1395	1.40E-03	1.14E-01
9/16/2025	15:48	31.00	2.0	45.0	2790	2.79E-03	1.17E-01
9/16/2025	15:49	45.00	1.0	45.0	2025	2.03E-03	1.19E-01
9/16/2025	15:50	9.10	1.0	45.0	409	4.09E-04	1.19E-01
9/16/2025	15:52	8.44	2.0	43.6	736	7.36E-04	1.20E-01
9/16/2025	15:54	8.60	2.0	43.6	750	7.50E-04	1.21E-01
9/16/2025	15:56	8.44	2.0	43.6	736	7.36E-04	1.21E-01
9/16/2025	15:59	8.43	3.0	43.6	1103	1.10E-03	1.22E-01
9/16/2025	16:01	8.34	2.0	43.6	727	7.27E-04	1.23E-01
9/16/2025	16:04	9.00	3.0	43.6	1177	1.18E-03	1.24E-01
9/16/2025	16:05	3670	1.0	43.6	160012	1.60E-01	2.84E-01
9/16/2025	16:05:30	5330	0.5	43.6	116194	1.16E-01	4.01E-01
9/16/2025	16:06:00	5000	0.5	43.6	109000	1.09E-01	5.10E-01
9/16/2025	16:06:30	24000	0.5	43.6	523200	5.23E-01	1.03E+00
9/16/2025	16:07:00	26300	0.5	43.6	573340	5.73E-01	1.61E+00
9/16/2025	16:07:30	65000	0.5	43.6	1417000	1.42E+00	3.02E+00
9/16/2025	16:08:00	77100	0.5	43.6	1680780	1.68E+00	4.70E+00
9/16/2025	16:08:30	16400	0.5	43.6	357520	3.58E-01	5.06E+00
9/16/2025	16:09:00	4380	0.5	43.6	95484	9.55E-02	5.16E+00
9/16/2025	16:09:30	5230	0.5	43.6	114014	1.14E-01	5.27E+00
9/16/2025	16:10:00	4460	0.5	43.6	97228	9.72E-02	5.37E+00
9/16/2025	16:10:30	2850	0.5	43.6	62130	6.21E-02	5.43E+00
9/16/2025	16:11:00	1100	0.5	43.6	23980	2.40E-02	5.45E+00
9/16/2025	16:11:30	306	0.5	43.6	6671	6.67E-03	5.46E+00
9/16/2025	16:12:00	240	0.5	43.6	5232	5.23E-03	5.47E+00
9/16/2025	16:12:30	168	0.5	43.6	3662	3.66E-03	5.47E+00
9/16/2025	16:13:00	162	0.5	43.6	3532	3.53E-03	5.47E+00
9/16/2025	16:13:30	170	0.5	43.6	3706	3.71E-03	5.48E+00
9/16/2025	16:14:00	12	0.5	43.6	262	2.62E-04	5.48E+00
9/16/2025	16:15:00	9.41	1.0	43.6	410	4.10E-04	5.48E+00
9/16/2025	16:16:00	9.66	1.0	43.6	421	4.21E-04	5.48E+00
9/16/2025	16:17:00	9.35	1.0	43.6	408	4.08E-04	5.48E+00
9/16/2025	16:18:00	9.31	1.0	43.6	406	4.06E-04	5.48E+00
9/16/2025	16:20:00	8.30	2.0	43.6	724	7.24E-04	5.48E+00
9/16/2025	16:22:00	8.07	2.0	43.6	704	7.04E-04	5.48E+00
9/16/2025	16:30:00	8.36	8.0	45.6	3050	3.05E-03	5.48E+00
9/16/2025	16:32:00	7.93	2.0	45.6	723	7.23E-04	5.48E+00
9/16/2025	16:35:00	7.60	3.0	45.6	1040	1.04E-03	5.49E+00
9/16/2025	16:42:00	8.23	7.0	45.6	2627	2.63E-03	5.49E+00
9/16/2025	16:45:00	7.79	3.0	45.6	1066	1.07E-03	5.49E+00
9/16/2025	16:55:00	7.49	10.0	45.6	3415	3.42E-03	5.49E+00
9/16/2025	17:05:00	7.61	10.0	45.6	3470	3.47E-03	5.50E+00
9/16/2025	17:16:00	7.72	11.0	45.6	3872	3.87E-03	5.50E+00
9/16/2025			0.0	45.6	0	0.00E+00	5.50E+00
9/16/2025			0.0	45.6	0	0.00E+00	5.50E+00
9/16/2025			0.0	45.6	0	0.00E+00	5.50E+00

Use this sheet for evaluation of a single release.
yellow = required field for proper calc | blue = optional data for complete report

Emissions from:	**TA - 54**	**Bldg - 1028**	**ES - FT**

Emissions calculation date: 10/30/2025 | HPAL barcode #:

	date	time
Time sample started:	16-Sep-2025	9:17 AM
Time sample ended:	16-Sep-2025	5:23 PM
Length of sample period:	8.1 HRS	
Sample period downtime:	0.0 HRS	

RADAIR Report Period ID:

Bubbler response (catalyst efficiency for HT): 1.00 | Cal Date: | Expires:

Bubbler flow rate	115	mL/min	at STP
	150	**mL/min**	at altitude
	5.30E-03	cfm	at altitude
	7.29E+04	mL/sample period	at altitude
FTWC flow rate (daily max)	1,632	cfm	
	2.25E+10	mL/sample period	at altitude

Ratio of flow rates: 3.08E+05 = (stack flow)/(sample flow)

FTWC	1,476 min
	1,800 max

Weight of glycol and water in vials		**Volume of glycol and water in vials**	
W_1	27.9 g	V_1	25.0 mL
W_2	31.9 g	V_2	28.6 mL
W_3	23.5 g	V_3	21.1 mL
W_4	35.7 g	V_4	32.0 mL
W_5	33.0 g	V_5	29.7 mL
W_6	32.6 g	V_6	29.3 mL

assumes glycol & water density of 1.113 g/mL

Typical weights
36 g avg
54 g max

Activity concentration in vials		**Activity in vials**	
C_1	0.00E+00 µCi/L	A_1	0.00E+00 µCi
C_2	0.00E+00 µCi/L	A_2	0.00E+00 µCi
C_3	0.00E+00 µCi/L	A_3	0.00E+00 µCi
C_4	5.28E+02 µCi/L	A_4	1.69E+01 µCi
C_5	4.52E+00 µCi/L	A_5	1.34E-01 µCi
C_6	0.00E+00 µCi/L	A_6	0.00E+00 µCi
bkgnd	µCi/L		

*no value indicates less than MDA

OK to analyze single vial.
Enter known values;
calcs are independent
of number of vials

MDA = 0.01 uCi/L

If there were any bubbler performance tests during this period:
HTO Stacked during Cal | HT Stacked during cal:

Ignore if no bubbler tests took place.

Activity of H-3 emitted from stack for given time period:
HTO 0.00E+00 Ci (includes response factor)
HT 5.25E+00 Ci (includes response factor)
Calculation based on operating times; allows for downtime

Based on flow ratio only:
5.25E+00 total Ci released
0.00E+00 Ci HTO
5.25E+00 Ci HT

Notes: 5.25E+00 total curies emitted

bubbler quick count data

Report by: Dave Fuehne **Signature:** _____ Date 9/16/2025

Review by: Rebecca Lattin **Signature:** _____ Date 9/16/2025

Appendix A.3

Daily Operations Spreadsheets

Day 03

September 17, 2025

- Daily Limit Calculations
- Flow Rate Calculation
- Flow Rate Trending
- Emissions Tracking Log
- Bubbler Emissions Calculation

Daily Emissions Calculation Worksheet

THIS WAS FIRST SHEET RUN AT START OF OPS - DPF

This worksheet calculates emissions hold points and limits based on operations to-date

To QUICKLY insert the current date and time, press Ctrl+; (semi-colon) to add the date,
then press Space, then press Ctrl+Shift-; (semi-colon) to add the time

			Date	Time
Venting Process #	Day 3	Start of operations	9/17/2025	10:00
WCATS ID:	225 - purge He, evac	End of operations	9/17/2025	19:30
Venting Location:	TA 54, Bldg 1028 outside north			

enter 0 if this is first venting operations.

Integrated FTWC Dose (IFD) from previous venting: IFD = 1.60E-04 mrem

Calculate Today's Limi & Hold points:

CAP88 Planning Dose Conversation Factor: DCF_p = 3.33E-04 mrem/Ci

Dose Limit:	mrem 6	mrem (IFD) 0.00016		DL mrem 5.99984	
Corresponding Curie Limit:		DL/DCF_p (Ci)	1.802E+04		18,018 curies
Pause For Approval Dose:	mrem 4	mrem (IFD) 0.00016		PFA mrem 3.99984	
Pause for Approval (Ci)		PFA/DFC_p (Ci)	1.201E+04		12,012 curies
Pause for Evaluation Dose:	mrem 2	mrem (IFD) 0.00016		PFED mrem 1.99984	
Pause for Approval (Ci)		$PFED/DFC_p$ (Ci)	6.006E+03		6,006 curies

Concurrance limit for EPC-ES Dose Assessment: (Date/Time/Initial) MJCdG 9/17/25 09:27

These limits communicated to the FTWC Venting PIC: (Date/Time/Initial) DPF 9/17/25 09:45

Current Venting Operation Date:

	Latitude	Longitude
GPS Coordinates of stack:	same as Day 1	

Stack exhaust flow rate: 1566 acfm; EPA flow rate

Basis for flow rate determination: Sierra 620s. EPA flow rate - no error bar subtraction

Daily Emissions Calculation Worksheet

THIS SHEET WAS GENERATED WHEN OPS EXTENED PAST SUNDOWN -DPF

This worksheet calculates emissions hold points and limits based on operations to-date

To QUICKLY insert the current date and time, press Ctrl+; (semi-colon) to add the date,
then press Space, then press Ctrl+Shift-; (semi-colon) to add the time

			Date	Time
Venting Process #	3	Start of operations	9/17/2025	10:00
WCATS ID:	225 - purge He, evac	End of operations	9/17/2025	19:30
Venting Location:	TA 54, Bldg 1028 outside north			

Integrated FTWC Dose (IFD) from previous venting: IFD = 1.60E-04 mrem *enter 0 if this is first venting operations.*

Calculate Today's Limi & Hold points:

CAP88 Planning Dose Conversation Factor: DCF_p = 1.40E-03 mrem/Ci 3.64E-02

Dose Limit:	mrem 6	mrem (IFD) 0.00016		DL mrem 5.99984	stop
Corresponding Curie Limit:		DL/DCF_p (Ci)	4.286E+03		4,286 curies
Pause For Approval Dose:	mrem 4	mrem (IFD) 0.00016		PFA mrem 3.99984	
Pause for Approval (Ci)		PFA/DFC_p (Ci)	2.857E+03		2,857 curies
Pause for Evaluation Dose:	mrem 2	mrem (IFD) 0.00016		PFED mrem 1.99984	
Pause for Approval (Ci)		$PFED/DFC_p$ (Ci)	1.428E+03		1,428 curies

Concurrance limit for EPC-ES Dose Assessment: (Date/Time/Initial) MJCdG 9/17/25 09:27

These limits communicated to the FTWC Venting PIC: (Date/Time/Initial) 9/17/25 19:00 DPF to DRH

Current Venting Operation Date:

	Latitude	Longitude
GPS Coordinates of stack:	same as Day 1	

Stack exhaust flow rate: 1566 acfm; EPA flow rate

Basis for flow rate determination: Sierra 620s. EPA flow rate - no error bar subtraction

4.3 Documentation of FTWC Flow Rate

Date:	9/17/2025	Location:	TA54-1028

☑ 2 HP System ☐ 3/4 HP System

1. Duct Setup per IWD? ☑ Yes ☐ No

Tested Duct Configuration:
1.Stack
2. Blower
3. Short 12" section
4. Long 5' section w/ rad monitoring
5. Long 5' sectoin w/ Sierra 620
6. short 12" section w/ FTWC inject

---

2. Bounding Condition: minimum velocity achieved on Sierra 620 using worst-case pressure & temp:

2 HP System:
2680 sfpm on Sierra 620 = 1476 acfm in duct ☐ Yes ☐ No ☐ N/A

3/4 HP System:
1404 sfpm on Sierra 620 = 753 acfm in duct ☐ Yes ☐ No ☑ N/A

3.

	˚F	˚R		˚F	˚R
T_{act} :	62	521.67	T_{std} :	70	529.67
	mbar			mbar	
P_{act} :	807		P_{std} :	1013.25	

$\frac{T_{act}}{T_{std}}$ = 0.985

$\frac{P_{std}}{P_{act}}$ = 1.266

Pressure Correction: -3.4 mbar for every 100ft difference above reference barometer.

TA-6 weather station:	7424 ft	-6.4 mbar from TA-54
`	6548 ft	23.4 mbar from TA-6
TA-54 -1028:	~ 6735 ft	8.5 mbar from TA-6 to TA-49
WETF dock :	~ 7608 ft	-6.3 mbar from TA-6

Type Pressure corrrection here: -6.4

Use Equation 18 to determine flow rate through the duct, based on Sierra 620 reading.

$$\dot{V}_{act} = \left(v_{inst} - 75\ std\ \frac{ft}{min}\right) * 0.5454\ ft^2 * \left(\frac{T_{act}}{529.67°R}\right) * \left(\frac{1013.25\ mbar}{P_{act}}\right) * 90\%$$

υ_{inst} 2560 std ft/min

$\frac{T_{act}}{T_{std}}$ =	0.985
$\frac{P_{std}}{P_{act}}$ =	1.266

Safety Basis value (WETF-26)

$\dot{V}_{act}$ = 1520.5 actual ft^3/min for Safety Basis concerns

EPA emissions calcs value

$\dot{V}_{act}$ = 1566.4 actual ft^3/min for stack emissions calculations (disregards 75 fpm error term; conservative)

Use equation 21 and 22 to determine minimum Seirra 620 reading based on limiting flows in the different duct systems (using 2HP or 3/4Hp blower)

Eq 21

$$v_{inst,2HP} = \left[\frac{1476\ actual\frac{ft^3}{min}}{90\% * 0.5454ft^2} * \frac{529.67°R}{T_{act}} * \frac{P_{act}}{1013.25\ mbar}\right] + 75\ std\frac{ft}{min}$$

0.0 sfpm — 2 HP fan N/A

Eq 22

$$v_{inst,3/4HP} = \left[\frac{753\ actual\frac{ft^3}{min}}{90\% * 0.5454ft^2} * \frac{529.67°R}{T_{act}} * \frac{P_{act}}{1013.25\ mbar}\right] + 75\ std\frac{ft}{min}$$

1305.7 sfpm — 3/4 HP fan Threshold

Sufficient flow in the duct for FTWC venting? ☐ Yes ☐ No ☐ N/A

yes

4. EPA full traverse flow measurement performed per procedure 127? ☐ Yes ☐ No ☑ N/A

Actual flow rate measured in duct: _____ acfm

Sufficient flow in the duct for FTWC venting? ☐ Yes ☐ No ☐ N/A

Trending FTWC flow rate

Safety basis flow calculation - uses "-75" sfpm error term to ensure sufficient flow;

EPA compliance calculations do NOT use the "-75" term to ensure conservative emissions calcs.

Constants		
Temp: F to R	459.67	
T-std	529.67	Rankine
P-std	1013.25	mbar
Area	0.5454	ft2
Single-Point Corr Fact	90%	
Sierra Error Bar	-75	std ft/min
Min Flow (Area G, 2 HP)	1476	actual ft3/min
Min Flow (WETF, 3/4 HP)	753	actual ft3/min
flow unit conversion	0.02832	m3 per ft3

Actual flow rate determination

$$\dot{V}_{act} = \left(v_{inst} - 75\ std\frac{ft}{min}\right) * 0.5454\ ft^2 * \left(\frac{T_{act}}{529.67°R}\right) * \left(\frac{1013.25\ mbar}{P_{act}}\right) * 90\%$$

Minimum velocity determination

$$v_{inst,2HP} = \left[\frac{1476\ actual\frac{ft^3}{min}}{90\% * 0.5454 ft^2} * \frac{529.67°R}{T_{act}} * \frac{P_{act}}{1013.25\ mbar}\right] + 75\ std\frac{ft}{min}$$

Date	Time	Temp deg.F	Pressure mbar	Pressure Adjust mbar	Temp Corr Fact	Press Corr Fact	Sierra Reading std ft/min	Safety Basis Flow Rate act ft3/min	EPA Calcs Flow Rate act ft3/min	EPA Calcs Flow Rate act m3/min	Area G: Safety Basis Min Veloc std ft/min	WETF: Safety Basis Min Veloc std ft/min	Comment / Configuration
9/17/2025	10:17	62	807	-6.4	0.985	1.266	2560	1,520	1,566	44.4	2488	1306	FTWC 229 lid removal
9/17/2025	10:47	65	807	-6.4	0.991	1.266	2500	1,492	1,538	43.6	2474	1299	back to 225. mount PMM
9/17/2025	10:55	66	807	-6.4	0.992	1.266	2500	1,495	1,541	43.6	2469	1297	1st He purge
9/17/2025	11:12	67	806	-6.4	0.994	1.267	2500	1,500	1,546	43.8	2462	1293	still He purge
9/17/2025	12:14	70	806	-6.4	1.000	1.267	2500	1,508	1,555	44.0	2448	1286	still He purge
9/17/2025	14:10	76	804	-6.4	1.011	1.270	2450	1,498	1,545	43.8	2416	1270	final He purge
9/17/2025	14:56	79	803	-6.4	1.017	1.272	2460	1,514	1,562	44.2	2400	1261	
9/17/2025	15:44	79	803	-6.4	1.017	1.272	2430	1,495	1,543	43.7	2400	1261	close PMM closed v1
9/17/2025	17:38	80	802	-6.4	1.019	1.274	2460	1,519	1,567	44.4	2393	1258	
9/17/2025	19:30	73	802	-6.4	1.006	1.274	2450	1,493	1,540	43.6	2423	1273	background on Ionix. Pulled bubbler. All valves shut.
9/17/2025				-6.4									keeping vent on for personnel access; tracking emissions
9/17/2025				-6.4									
9/17/2025				-6.4									
9/17/2025				-6.4									
9/17/2025				-6.4									
9/17/2025				-6.4									
9/17/2025				-6.4									
9/17/2025				-6.4									
9/17/2025				-6.4									
9/17/2025				-6.4									
9/17/2025				-6.4									
9/17/2025				-6.4									

Stack flow for emissions calcs - use 10:17 measurement (highest/bounding). 1566 actual ft3/min

Stack flow for CAP88 is minimum flow rate for day = 1538 ft3/min = 14.33 m/sec

Emissions Tracking Worksheet

FTWC Venting Process: Day 3

Start date & time	
9/17/2025	10:00

This process emissions tracking:
Page 1 of 2

9/17/2025	19:30
End date & time	

Venting Location: TA 54, Bldg 1028 outside north

Stack Flow Rate *(without safety basis error compensation)*

$\dot{V}_{act}$ = 1566.35112 actual ft^3/min = 44.4 m^3/min

Emitted Activity (Ci) = Concentration ($\mu Ci/m^3$) * Δt (min) * Flow (m^3/min) * 1E6 ($Ci/\mu Ci$)

ctrl+semicolon = inserts date
ctrl+shift+semicolon = inserts time

Total Activity for this sheet (Ci)
13.695

Reading		Concentration	Time Interval	Flow Rate	**Emitted Activity**		Running
Date	Time	(µCi/m3)	Δt (min)	(m^3/min)	(µCi)	(Ci)	Total Ci
9/17/2025	10:00:00	7.69	n/a	n/a	n/a	n/a	n/a
9/17/2025	10:18:00	7.71	18.0	44.4	6155	6.16E-03	6.16E-03
9/17/2025	10:31:00	7.37	13.0	44.4	4250	4.25E-03	1.04E-02
9/17/2025	10:35:00	20.00	4.0	44.4	3548	3.55E-03	1.40E-02
9/17/2025	10:36:00	17.20	1.0	44.4	763	7.63E-04	1.47E-02
9/17/2025	10:37:00	15.00	1.0	44.4	665	6.65E-04	1.54E-02
9/17/2025	10:38:00	12.80	1.0	44.4	568	5.68E-04	1.59E-02
9/17/2025	10:39:00	10.70	1.0	44.4	475	4.75E-04	1.64E-02
9/17/2025	10:43:00	8.40	4.0	44.4	1490	1.49E-03	1.79E-02
9/17/2025	10:45:00	7.90	2.0	44.4	701	7.01E-04	1.86E-02
9/17/2025	10:52:00	7.12	7.0	44.4	2211	2.21E-03	2.08E-02
9/17/2025	10:57:00	7.21	5.0	44.4	1599	1.60E-03	2.24E-02
9/17/2025	11:00:00	7.19	3.0	44.4	957	9.57E-04	2.34E-02
9/17/2025	11:02:00	9.60	2.0	44.4	852	8.52E-04	2.42E-02
9/17/2025	11:02:30	53.30	0.5	44.4	1182	1.18E-03	2.54E-02
9/17/2025	11:03:00	183.00	0.5	44.4	4058	4.06E-03	2.95E-02
9/17/2025	11:03:30	399.00	0.5	44.4	8849	8.85E-03	3.83E-02
9/17/2025	11:04:00	672.00	0.5	44.4	14903	1.49E-02	5.32E-02
9/17/2025	11:04:30	940.00	0.5	44.4	20847	2.08E-02	7.41E-02
9/17/2025	11:05:00	1120.00	0.5	44.4	24838	2.48E-02	9.89E-02
9/17/2025	11:05:30	1380.00	0.5	44.4	30605	3.06E-02	1.30E-01
9/17/2025	11:06:00	1570.00	0.5	44.4	34818	3.48E-02	1.64E-01
9/17/2025	11:06:30	1740.00	0.5	44.4	38588	3.86E-02	2.03E-01
9/17/2025	11:07:00	2000.00	0.5	44.4	44354	4.44E-02	2.47E-01
9/17/2025	11:07:30	2090.00	0.5	44.4	46350	4.64E-02	2.94E-01
9/17/2025	11:08:00	2200.00	0.5	44.4	48790	4.88E-02	3.42E-01
9/17/2025	11:08:30	2300.00	0.5	44.4	51008	5.10E-02	3.93E-01
9/17/2025	11:09:00	2420.00	0.5	44.4	53669	5.37E-02	4.47E-01
9/17/2025	11:10:00	2530.00	1.0	44.4	112217	1.12E-01	5.59E-01

Reading		Concentration	Time Interval	Flow Rate	**Emitted Activity**		Running
Date	Time	(µCi/m3)	Δt (min)	(m^3/min)	(µCi)	(Ci)	Total Ci
9/17/2025	11:11:00	2650.00	1.0	44.4	117539	1.18E-01	6.77E-01
9/17/2025	11:12:00	2730.00	1.0	44.4	121087	1.21E-01	7.98E-01
9/17/2025	11:13:00	2780.00	1.0	44.4	123305	1.23E-01	9.21E-01
9/17/2025	11:15:00	2860.00	2.0	44.4	253707	2.54E-01	1.17E+00
9/17/2025	11:17:00	2880.00	2.0	44.4	255481	2.55E-01	1.43E+00
9/17/2025	11:19:00	2890.00	2.0	44.4	256368	2.56E-01	1.69E+00
9/17/2025	11:22:00	2870.00	3.0	44.4	381891	3.82E-01	2.07E+00
9/17/2025	11:25:00	2830.00	3.0	44.4	376569	3.77E-01	2.45E+00
9/17/2025	11:28:00	2770.00	3.0	44.4	368585	3.69E-01	2.81E+00
9/17/2025	11:31:00	2720.00	3.0	44.4	361932	3.62E-01	3.18E+00
9/17/2025	11:34:00	2610.00	3.0	44.4	347295	3.47E-01	3.52E+00
9/17/2025	11:37:00	2550.00	3.0	44.4	339311	3.39E-01	3.86E+00
9/17/2025	11:40:00	2480.00	3.0	44.4	329996	3.30E-01	4.19E+00
9/17/2025	11:45:00	2370.00	5.0	44.4	525599	5.26E-01	4.72E+00
9/17/2025	11:50:00	2280.00	5.0	44.4	505640	5.06E-01	5.22E+00
9/17/2025	11:55:00	2180.00	5.0	44.4	483463	4.83E-01	5.71E+00
9/17/2025	12:00:00	2090.00	5.0	44.4	463503	4.64E-01	6.17E+00
9/17/2025	12:10:00	1920.00	10.0	44.4	851604	8.52E-01	7.02E+00
9/17/2025	12:17:00	890.00	7.0	44.4	276328	2.76E-01	7.30E+00
9/17/2025	12:24:00	60.00	7.0	44.4	18629	1.86E-02	7.32E+00
9/17/2025	12:32:00	14.60	8.0	44.4	5181	5.18E-03	7.32E+00
9/17/2025	13:00:00	11.60	28.0	44.4	14406	1.44E-02	7.34E+00
9/17/2025	13:32:00	8.60	32.0	44.4	12206	1.22E-02	7.35E+00
9/17/2025	13:35:00	8.80	3.0	44.4	1171	1.17E-03	7.35E+00
9/17/2025	13:36:00	9.12	1.0	44.4	405	4.05E-04	7.35E+00
9/17/2025	13:37:00	666.00	1.0	44.4	29540	2.95E-02	7.38E+00
9/17/2025	13:38:00	827.00	1.0	44.4	36681	3.67E-02	7.42E+00
9/17/2025	13:39:00	1040.00	1.0	44.4	46129	4.61E-02	7.46E+00
9/17/2025	13:40:00	1350.00	1.0	44.4	59878	5.99E-02	7.52E+00
9/17/2025	13:41:00	1490.00	1.0	44.4	66088	6.61E-02	7.59E+00
9/17/2025	13:42:00	1560.00	1.0	44.4	69193	6.92E-02	7.66E+00
9/17/2025	13:43:00	1610.00	1.0	44.4	71411	7.14E-02	7.73E+00
9/17/2025	13:44:00	1630.00	1.0	44.4	72298	7.23E-02	7.80E+00
9/17/2025	13:45:00	1640.00	1.0	44.4	72741	7.27E-02	7.87E+00
9/17/2025	13:46:00	1650.00	1.0	44.4	73185	7.32E-02	7.95E+00
9/17/2025	13:47:00	1650.00	1.0	44.4	73185	7.32E-02	8.02E+00
9/17/2025	13:48:00	1650.00	1.0	44.4	73185	7.32E-02	8.09E+00
9/17/2025	13:49:00	1650.00	1.0	44.4	73185	7.32E-02	8.17E+00
9/17/2025	13:50:00	1640.00	1.0	44.4	72741	7.27E-02	8.24E+00
9/17/2025	13:55:00	1580.00	5.0	44.4	350399	3.50E-01	8.59E+00
9/17/2025	14:00:00	1560.00	5.0	44.4	345964	3.46E-01	8.94E+00
9/17/2025	14:05:00	1480.00	5.0	44.4	328222	3.28E-01	9.26E+00
9/17/2025	14:10:00	1410.00	5.0	44.4	312698	3.13E-01	9.58E+00
9/17/2025	14:20:00	1310.00	10.0	44.4	581042	5.81E-01	1.02E+01
9/17/2025	14:40:00	1100.00	20.0	44.4	975796	9.76E-01	1.11E+01
9/17/2025	14:50:00	1104.00	10.0	44.4	489672	4.90E-01	1.16E+01

Reading		Concentration	Time Interval	Flow Rate	**Emitted Activity**		Running
Date	Time	(µCi/m3)	Δt (min)	(m^3/min)	(µCi)	(Ci)	Total Ci
9/17/2025	15:00:00	943.00	10.0	44.4	418262	4.18E-01	1.20E+01
9/17/2025	15:10:00	806.00	10.0	44.4	357496	3.57E-01	1.24E+01
9/17/2025	15:20:00	833.00	10.0	44.4	369472	3.69E-01	1.28E+01
9/17/2025	15:30:00	773.00	10.0	44.4	342859	3.43E-01	1.31E+01
9/17/2025	15:40:00	730.00	10.0	44.4	323787	3.24E-01	1.34E+01
9/17/2025	15:45:00	650.00	5.0	44.4	144152	1.44E-01	1.36E+01
9/17/2025	15:48:00	330.00	3.0	44.4	43911	4.39E-02	1.36E+01
9/17/2025	15:50:00	177.00	2.0	44.4	15701	1.57E-02	1.36E+01
9/17/2025	15:52:00	99.00	2.0	44.4	8782	8.78E-03	1.36E+01
9/17/2025	15:56:00	31.00	4.0	44.4	5500	5.50E-03	1.37E+01
9/17/2025	16:06:00	15.90	10.0	44.4	7052	7.05E-03	1.37E+01
9/17/2025	16:30:00	14.30	24.0	44.4	15222	1.52E-02	1.37E+01
9/17/2025	16:45:00	13.20	15.0	44.4	8782	8.78E-03	1.37E+01
9/17/2025	16:46:00	51.00	1.0	44.4	2262	2.26E-03	1.37E+01
9/17/2025	16:47:00	101.00	1.0	44.4	4480	4.48E-03	1.37E+01
9/17/2025	16:48:00	91.00	1.0	44.4	4036	4.04E-03	1.37E+01
9/17/2025	next sheet		xxx	move to next sheet			

Emissions Tracking Worksheet

FTWC Venting Process: Day 3

Start date & time	
9/17/2025	10:00

This process emissions tracking:
Page 2 of 2

9/17/2025	19:30
End date & time	

Venting Location: TA 54, Bldg 1028 outside north

Stack Flow Rate *(without safety basis error compensation)*

$\dot{V}_{act}$ = 1566.35112 actual ft^3/min = 44.4 m^3/min

Emitted Activity (Ci) = Concentration (µCi/m^3) * Δt (min) * Flow (m^3/min) * 1E6 (Ci/µCi)

ctrl+semicolon = inserts date
ctrl+shift+semicolon = inserts time

Total Activity for this sheet (Ci)	0.700
Total activity - all sheets	14.396

Reading		Concentration	Time Interval	Flow Rate	**Emitted Activity**		Running
Date	Time	(µCi/m3)	Δt (min)	(m^3/min)	(µCi)	(Ci)	Total Ci
9/17/2025	16:48:00	91.00	n/a	n/a	n/a	n/a	n/a
9/17/2025	16:49:00	87.00	1.0	44.4	3859	3.86E-03	1.37E+01
9/17/2025	16:50:00	51.50	1.0	44.4	2284	2.28E-03	1.37E+01
9/17/2025	16:51:00	38.00	1.0	44.4	1685	1.69E-03	1.37E+01
9/17/2025	16:53:00	24.70	2.0	44.4	2191	2.19E-03	1.37E+01
9/17/2025	16:55:00	17.20	2.0	44.4	1526	1.53E-03	1.37E+01
9/17/2025	16:57:00	12.30	2.0	44.4	1091	1.09E-03	1.37E+01
9/17/2025	16:59:00	10.70	2.0	44.4	949	9.49E-04	1.37E+01
9/17/2025	17:01:00	10.30	2.0	44.4	914	9.14E-04	1.37E+01
9/17/2025	17:02:00	10.40	1.0	44.4	461	4.61E-04	1.37E+01
9/17/2025	17:02:30	130.00	0.5	44.4	2883	2.88E-03	1.37E+01
9/17/2025	17:03:00	188.00	0.5	44.4	4169	4.17E-03	1.37E+01
9/17/2025	17:03:30	181.00	0.5	44.4	4014	4.01E-03	1.37E+01
9/17/2025	17:04:00	152.00	0.5	44.4	3371	3.37E-03	1.37E+01
9/17/2025	17:05:00	125.00	1.0	44.4	5544	5.54E-03	1.37E+01
9/17/2025	17:06:00	91.00	1.0	44.4	4036	4.04E-03	1.37E+01
9/17/2025	17:07:00	66.00	1.0	44.4	2927	2.93E-03	1.37E+01
9/17/2025	17:09:00	37.00	2.0	44.4	3282	3.28E-03	1.37E+01
9/17/2025	17:10:00	28.20	1.0	44.4	1251	1.25E-03	1.37E+01
9/17/2025	17:10:30	26.10	0.5	44.4	579	5.79E-04	1.37E+01
9/17/2025	17:11:00	25.10	0.5	44.4	557	5.57E-04	1.37E+01
9/17/2025	17:11:30	92.80	0.5	44.4	2058	2.06E-03	1.37E+01
9/17/2025	17:12:00	311.00	0.5	44.4	6897	6.90E-03	1.38E+01
9/17/2025	17:12:30	640.00	0.5	44.4	14193	1.42E-02	1.38E+01
9/17/2025	17:13:00	848.00	0.5	44.4	18806	1.88E-02	1.38E+01
9/17/2025	17:13:30	862.00	0.5	44.4	19117	1.91E-02	1.38E+01
9/17/2025	17:14:00	805.00	0.5	44.4	17853	1.79E-02	1.38E+01
9/17/2025	17:14:30	759.00	0.5	44.4	16832	1.68E-02	1.38E+01
9/17/2025	17:15:00	739.00	0.5	44.4	16389	1.64E-02	1.39E+01

9/17/2025	17:15:30	758.00	0.5	44.4	16810	1.68E-02	1.39E+01
9/17/2025	17:16:00	790.00	0.5	44.4	17520	1.75E-02	1.39E+01
9/17/2025	17:17:00	818.00	1.0	44.4	36282	3.63E-02	1.39E+01
9/17/2025	17:18:00	722.00	1.0	44.4	32024	3.20E-02	1.40E+01
9/17/2025	17:20:00	520.00	2.0	44.4	46129	4.61E-02	1.40E+01
9/17/2025	17:22:00	381.00	2.0	44.4	33798	3.38E-02	1.40E+01
9/17/2025	17:23:00	342.00	1.0	44.4	15169	1.52E-02	1.41E+01
9/17/2025	17:24:00	338.00	1.0	44.4	14992	1.50E-02	1.41E+01
9/17/2025	17:26:00	303.00	2.0	44.4	26879	2.69E-02	1.41E+01
9/17/2025	17:28:00	229.00	2.0	44.4	20314	2.03E-02	1.41E+01
9/17/2025	17:30:00	183.00	2.0	44.4	16234	1.62E-02	1.41E+01
9/17/2025	17:32:00	133.00	2.0	44.4	11798	1.18E-02	1.41E+01
9/17/2025	17:34:00	115.00	2.0	44.4	10202	1.02E-02	1.42E+01
9/17/2025	17:36:00	99.70	2.0	44.4	8844	8.84E-03	1.42E+01
9/17/2025	17:37:00	77.30	1.0	44.4	3429	3.43E-03	1.42E+01
9/17/2025	17:38:00	60.70	1.0	44.4	2692	2.69E-03	1.42E+01
9/17/2025	17:40:00	57.70	2.0	44.4	5118	5.12E-03	1.42E+01
9/17/2025	17:42:00	48.70	2.0	44.4	4320	4.32E-03	1.42E+01
9/17/2025	17:45:00	41.50	3.0	44.4	5522	5.52E-03	1.42E+01
9/17/2025	17:50:00	27.20	5.0	44.4	6032	6.03E-03	1.42E+01
9/17/2025	17:55:00	22.60	5.0	44.4	5012	5.01E-03	1.42E+01
9/17/2025	17:56:00	30.10	1.0	44.4	1335	1.34E-03	1.42E+01
9/17/2025	18:02:00	23.10	6.0	44.4	6148	6.15E-03	1.42E+01
9/17/2025	18:11:00	15.50	9.0	44.4	6187	6.19E-03	1.42E+01
9/17/2025	18:15:00	14.40	4.0	44.4	2555	2.55E-03	1.42E+01
9/17/2025	18:22:00	13.50	7.0	44.4	4191	4.19E-03	1.42E+01
9/17/2025	18:27:00	12.60	5.0	44.4	2794	2.79E-03	1.42E+01
9/17/2025	18:30:00	13.40	3.0	44.4	1783	1.78E-03	1.42E+01
9/17/2025	18:35:00	36.10	5.0	44.4	8006	8.01E-03	1.42E+01
9/17/2025	18:36:00	44.10	1.0	44.4	1956	1.96E-03	1.42E+01
9/17/2025	18:36:30	55.00	0.5	44.4	1220	1.22E-03	1.42E+01
9/17/2025	18:39:00	77.00	2.5	44.4	8538	8.54E-03	1.42E+01
9/17/2025	18:40:00	89.20	1.0	44.4	3956	3.96E-03	1.42E+01
9/17/2025	18:48:00	98.60	8.0	44.4	34987	3.50E-02	1.43E+01
9/17/2025	18:52:00	94.40	4.0	44.4	16748	1.67E-02	1.43E+01
9/17/2025	18:56:00	91.80	4.0	44.4	16287	1.63E-02	1.43E+01
9/17/2025	19:06:00	82.20	10.0	44.4	36459	3.65E-02	1.43E+01
9/17/2025	19:12:00	77.00	6.0	44.4	20492	2.05E-02	1.44E+01
9/17/2025	19:14:00	60.00	2.0	44.4	5323	5.32E-03	1.44E+01
9/17/2025	19:15:00	43.40	1.0	44.4	1925	1.92E-03	1.44E+01
9/17/2025	19:18:00	19.00	3.0	44.4	2528	2.53E-03	1.44E+01
9/17/2025	19:21:00	11.60	3.0	44.4	1544	1.54E-03	1.44E+01
9/17/2025	19:30:00	7.70	9.0	44.4	3074	3.07E-03	1.44E+01
9/17/2025	19:40:00	6.80	10.0	44.4	3016	3.02E-03	1.44E+01
9/17/2025	19:50:00	6.74	10.0	44.4	2989	2.99E-03	1.44E+01
9/17/2025	20:05:00	6.52	15.0	44.4	4338	4.34E-03	1.44E+01
9/17/2025	20:15:00	6.50	10.0	44.4	2883	2.88E-03	1.44E+01
9/17/2025			0.0	44.4	0	0.00E+00	1.44E+01
9/17/2025			0.0	44.4	0	0.00E+00	1.44E+01

9/17/2025		0.0	44.4	0	0.00E+00	1.44E+01
9/17/2025		0.0	44.4	0	0.00E+00	1.44E+01
9/17/2025		0.0	44.4	0	0.00E+00	1.44E+01
9/17/2025		0.0	44.4	0	0.00E+00	1.44E+01
9/17/2025		0.0	44.4	0	0.00E+00	1.44E+01
9/17/2025		0.0	44.4	0	0.00E+00	1.44E+01
9/17/2025		0.0	44.4	0	0.00E+00	1.44E+01
9/17/2025		0.0	44.4	0	0.00E+00	1.44E+01
9/17/2025		0.0	44.4	0	0.00E+00	1.44E+01
9/17/2025		0.0	44.4	0	0.00E+00	1.44E+01
9/17/2025		0.0	44.4	0	0.00E+00	1.44E+01
9/17/2025		0.0	44.4	0	0.00E+00	1.44E+01
9/17/2025		0.0	44.4	0	0.00E+00	1.44E+01
9/17/2025		0.0	44.4	0	0.00E+00	1.44E+01

Possible Unmonitored Release
9/17/2025

When FTWC ventilation system switched from helium pressure bleed-down over to active evacuation of FTWC 225, RCTs measured elevated tritium air concentrations around the FTWC work site.

It turns out the vacuum pump discharge line was not fully connected to the pump; a portion of the pump exhuast was not being returned to the stack exhaust simply being discharged to the ambient air. This represents a potential unmonitored release.

Bounding analysis:	Start of vacuum pump operations	17:00	
	Issue discovered & fixed	18:35	
	total duration =	95	minutes
	Worst-case concentration noted prior to equipment malfunction earlier this day =	2890	microCi/m3
	Stack flow rate at the time of release =	44.4	m3/min
	Bounding quantity of tritium release =	12.2	curies

release = concentration * flow * duration / 1E6 microCi per Ci

Administratively considering this release to be HTO vapor; conservative estimate for dose calculation (HTO dose factor is slightly higher than HT gas).

Using the worst-case concentration from earlier in the day and flow rate is a conservative estimate; the worst-case value is usually a very short-lived peak, and applying that value to the entire duration of the event will over-report emissions for this time period.

While the concentration coming out of the vacuum pump may not match the concentration measured within the duct earlier in the day, applying the very high flow rate in the duct to the assumed concentration will balance things out and result in a conservative estimate of potential releases for this time period.

We discussed this issue and the emissions estimate methodology with operations staff, with on-site EPA representative, and with the on-site DNFSB representative. All parties concurred that this method would be a bounding estimate of releases.

Local RCT instrument measurements agreed with this estimate; the maximum area readings were about 100-200 picocuries per cubic meter, well within the assumed concentration.

All site personnel had tritium bioassay measurements done; there were no measureable uptakes. Operations were paused to address the equipment issue before any subsequent drum evacuation operations took place.

Dave Fuehne, RAEM team leader, 10/30/2025

Use this sheet for evaluation of a single release.
yellow = required field for proper calc | blue = optional data for complete report

Emissions from:	**TA - 54**	**Bldg - 1028**	**ES - FT**

Emissions calculation date: 11/12/2025 | HPAL barcode #:

	date	time
Time sample started:	17-Sep-2025	9:08 AM
Time sample ended:	17-Sep-2025	7:33 PM
Length of sample period:	10.4	HRS
Sample period downtime:	0.0	HRS

RADAIR Report Period ID:
Bubbler response (catalyst efficiency for HT): 1.00 | Cal Date: | Expires:

Bubbler flow rate	115	mL/min	at STP
	150	**mL/min**	at altitude
	5.30E-03	cfm	at altitude
	9.38E+04	mL/sample period	at altitude
FTWC flow rate (daily max)	1,566	cfm	
	2.77E+10	mL/sample period	at altitude

Ratio of flow rates: 2.96E+05 = (stack flow)/(sample flow)

FTWC	*1,476 min*
	1,800 max

Weight of glycol and water in vials			**Volume of glycol and water in vials**		
W_1	31.4	g	V_1	28.2	mL
W_2	32.4	g	V_2	29.1	mL
W_3	22.8	g	V_3	20.4	mL
W_4	36.6	g	V_4	32.9	mL
W_5	33.3	g	V_5	29.9	mL
W_6	32.4	g	V_6	29.1	mL

assumes glycol & water density of 1.113 g/mL

Typical weights
36 g avg
54 g max

Activity concentration in vials			**Activity in vials**		
C_1	0.00E+00	µCi/L	A_1	0.00E+00	µCi
C_2	0.00E+00	µCi/L	A_2	0.00E+00	µCi
C_3	0.00E+00	µCi/L	A_3	0.00E+00	µCi
C_4	1.74E+03	µCi/L	A_4	5.72E+01	µCi
C_5	1.44E+02	µCi/L	A_5	4.30E+00	µCi
C_6	2.06E+00	µCi/L	A_6	5.99E-02	µCi
bkgnd		µCi/L			

*no value indicates less than MDA

OK to analyze single vial.
Enter known values;
calcs are independent of number of vials

MDA = 0.01 uCi/L

If there were any bubbler performance tests during this period:
HTO Stacked during Cal | HT Stacked during cal:
Ignore if no bubbler tests took place.

Activity of H-3 emitted from stack for given time period:
HTO 0.00E+00 Ci (includes response factor)
HT 1.82E+01 Ci (includes response factor)
Calculation based on operating times; allows for downtime

Based on flow ratio only:
1.82E+01 total Ci released
0.00E+00 Ci HTO
1.82E+01 Ci HT

Notes: 1.82E+01 total curies emitted

12.2 Ci HTO for worst case for missed 95 minutes
activity above based on HPAL quick count

Report by: Rebecca Lattin **Signature:** _____ Date 9/17/2025

Review by: Dave Fuehne **Signature:** _____ Date 9/17/2025

Appendix A.4

Daily Operations Spreadsheets

Day 04

September 20, 2025

- Daily Limit Calculations
- Flow Rate Calculation
- Flow Rate Trending
- Emissions Tracking Log
- Bubbler Emissions Calculation

Daily Emissions Calculation Worksheet

This worksheet calculates emissions hold points and limits based on operations to-date

To QUICKLY insert the current date and time, press Ctrl+; (semi-colon) to add the date,
then press Space, then press Ctrl+Shift-; (semi-colon) to add the time

			Date	Time
Venting Process #	4	Start of operations	9/20/2025	9:15
WCATS ID:	226lid-227lid-229 vent	End of operations	9/20/2025	15:19
Venting Location:	TA 54, Bldg 1028 outside north			

Integrated FTWC Dose (IFD) from previous venting: IFD = 0.0035 mrem *enter 0 if this is first venting operations.*

Calculate Today's Limi & Hold points:

CAP88 Planning Dose Conversation Factor: DCF_p = 3.33E-04 mrem/Ci

Dose Limit:	mrem 6	mrem (IFD) 0.0035		DL mrem 5.9965	
Corresponding Curie Limit:		DL/DCF_p (Ci)	1.801E+04		18,008 curies
Pause For Approval Dose:	mrem 4	mrem (IFD) 0.0035		PFA mrem 3.9965	
Pause for Approval (Ci)		PFA/DFC_p (Ci)	1.200E+04		12,002 curies
Pause for Evaluation Dose:	mrem 2	mrem (IFD) 0.0035		PFED mrem 1.9965	
Pause for Approval (Ci)		$PFED/DFC_p$ (Ci)	5.995E+03		5,995 curies

Concurrance limit for EPC-ES Dose Assessment: (Date/Time/Initial) emailed MJCdG/JG 10:30

These limits communicated to the FTWC Venting PIC: (Date/Time/Initial) RRL yes

Current Venting Operation Date:

	Latitude	Longitude
GPS Coordinates of stack:	same as Day 01	

Stack exhaust flow rate: 1608 acfm at time of venting (SB)

Basis for flow rate determination: Sierra 620s. Safety Basis flow rate 1608; EPA flow = 1681 acfm

4.3 Documentation of FTWC Flow Rate

Date:		Location:		☑ 2 HP System	☐ 3/4 HP System	TRUE

1. Duct Setup per IWD? ☑ Yes ☐ No

Tested Duct Configuration:
1.Stack
2. Blower
3. Short 12" section
4. Long 5' section w/ rad monitoring
5. Long 5' sectoin w/ Sierra 620
6. short 12" section w/ FTWC inject

---

2. Bounding Condition: minimum velocity achieved on Sierra 620 using worst-case pressure & temp:

2 HP System:
2680 sfpm on Sierra 620 = 1476 acfm in duct ☐ Yes ☐ No ☐ N/A

3/4 HP System:
1404 sfpm on Sierra 620 = 753 acfm in duct ☐ Yes ☐ No ☑ N/A

3.

	˚F	˚R		˚F	˚R
T_{act} :	66	525.67	T_{std} :	70	529.67
	mbar			mbar	
P_{act} :	806		P_{std} :	1013.25	

$\frac{T_{act}}{T_{std}}$ = 0.992

$\frac{P_{std}}{P_{act}}$ = 1.267

Pressure Correction: -3.4 mbar for every 100ft difference above reference barometer.

TA-6 weather station:	7424 ft	**-6.4 mbar from TA-54**
TA-54 weather station:	6548 ft	23.4 mbar from TA-6
TA-54 -1028:	~ 6735 ft	8.5 mbar from TA-6 to TA-49
WETF dock :	~ 7608 ft	-6.3 mbar from TA-6

Type Pressure corrrection here: -6.4

Use Equation 18 to determine flow rate through the duct, based on Sierra 620 reading.

$$\dot{V}_{act} = \left(v_{inst} - 75\ std\ \frac{ft}{min}\right) * 0.5454\ ft^2 * \left(\frac{T_{act}}{529.67°R}\right) * \left(\frac{1013.25\ mbar}{P_{act}}\right) * 90\%$$

υ_{inst} 2680 std ft/min

$\frac{T_{act}}{T_{std}}$ = 0.992

$\frac{P_{std}}{P_{act}}$ = 1.267

Safety Basis value (WETF-26)

$\dot{V}_{act}$ = 1608.1 actual ft^3/min for Safety Basis concerns

EPA emissions calcs value

$\dot{V}_{act}$ = 1654.4 actual ft^3/min for stack emissions calculations (disregards 75 fpm error term; conservative)

Use equation 21 and 22 to determine minimum Seirra 620 reading based on limiting flows in the different duct systems (using 2HP or 3/4Hp blower)

Eq 21

$$v_{inst,2HP} = \left[\frac{1476\ actual\frac{ft^3}{min}}{90\% * 0.5454ft^2} * \frac{529.67°R}{T_{act}} * \frac{P_{act}}{1013.25\ mbar}\right] + 75\ std\frac{ft}{min}$$

2466.0 sfpm — 2 HP fan Threshold

Eq 22

$$v_{inst,3/4HP} = \left[\frac{753\ actual\frac{ft^3}{min}}{90\% * 0.5454ft^2} * \frac{529.67°R}{T_{act}} * \frac{P_{act}}{1013.25\ mbar}\right] + 75\ std\frac{ft}{min}$$

0.0 sfpm — 3/4 HP fan N/A

Sufficient flow in the duct for FTWC venting? ☐ Yes ☐ No ☐ N/A

---

4. EPA full traverse flow measurement performed per procedure 127? ☐ Yes ☐ No ☑ N/A

Actual flow rate measured in duct: _____ acfm

Sufficient flow in the duct for FTWC venting? ☐ Yes ☐ No ☐ N/A

Trending FTWC flow rate

Safety basis flow calculation - uses "-75" sfpm error term to ensure sufficient flow;

EPA compliance calculations do NOT use the "-75" term to ensure conservative emissions calcs.

Actual flow rate determination

$$\dot{V}_{act} = \left(v_{inst} - 75\ std\frac{ft}{min}\right) * 0.5454\ ft^2 * \left(\frac{T_{act}}{529.67°R}\right) * \left(\frac{1013.25\ mbar}{P_{act}}\right) * 90\%$$

Minimum velocity determination

$$v_{inst,2HP} = \left[\frac{1476\ actual\frac{ft^3}{min}}{90\% * 0.5454 ft^2} * \frac{529.67°R}{T_{act}} * \frac{P_{act}}{1013.25\ mbar}\right] + 75\ std\frac{ft}{min}$$

0.3048 m/ft

Constants		
Temp: F to R	459.67	
T-std	529.67	Rankine
P-std	1013.25	mbar
Area	0.5454	ft2
Single-Point Corr Fact	90%	
Sierra Error Bar	-75	std ft/min
Min Flow (Area G, 2 HP)	1476	actual ft3/min
Min Flow (WETF, 3/4 HP)	753	actual ft3/min
flow unit conversion	0.02832	m3 per ft3

Date	Time	Temp deg.F	Pressure mbar	Pressure Adjust mbar	Temp Corr Fact	Press Corr Fact	Sierra Reading std ft/min	Safety Basis Flow Rate act ft3/min	EPA Calcs Flow Rate act ft3/min	EPA Calcs Flow Rate act m3/min	Area G: Safety Basis Min Veloc std ft/min	WETF: Safety Basis Min Veloc std ft/min	Comment / Configuration	CAP88: EPA flow velocity m/s
9/20/2025	09:15	53	806	-6.4	0.968	1.267	2128	1,236	1,281	36.3	2527	1326	lid 226 & 227 removal	11.9
9/20/2025	09:36	61	806	-6.4	0.983	1.267	2220	1,312	1,357	38.4	2489	1307	both lids have been removed	12.6
9/20/2025	09:45	61	806	-6.4	0.983	1.267	2600	1,544	1,590	45.0	2489	1307	reconfigure for 229 venting	14.8
9/20/2025	10:06	63	806	-6.4	0.987	1.267	2630	1,568	1,614	45.7	2480	1302	prep for venting 229	15.0
9/20/2025	11:08	66	806	-6.4	0.992	1.267	2690	1,614	1,661	47.0	2466	1295	vent rig leak tested	15.5
9/20/2025	11:11	66	806	-6.4	0.992	1.267	3280	1,979	2,025	57.3	2466	1295	short flex; vent cart checks	18.9
9/20/2025	11:30	66	806	-6.4	0.992	1.267	3200	1,929	1,975	55.9	2466	1295	end cart checks	18.4
9/20/2025	11:33	66	806	-6.4	0.992	1.267	2680	1,608	1,654	46.8	2466	1295	back to 229 for venting	15.4
9/20/2025	11:50	66	806	-6.4	0.992	1.267	2590	1,553	1,599	45.3	2466	1295		14.9
9/20/2025	12:17	70	806	-6.4	1.000	1.267	2575	1,555	1,602	45.4	2448	1286	zero psi on 229; open/shut va	14.9
9/20/2025	13:31	74	805	-6.4	1.008	1.269	2540	1,547	1,594	45.1	2428	1276	end 1-hr post 'vent' check.	14.8
9/20/2025	14:20	75	804	-6.4	1.009	1.270	2570	1,571	1,618	45.8	2420	1272		15.1
9/20/2025				-6.4										
9/20/2025				-6.4										
9/20/2025				-6.4										
9/20/2025				-6.4										
9/20/2025				-6.4										
9/20/2025				-6.4										
9/20/2025				-6.4										
9/20/2025				-6.4										
				-6.4										
				-6.4										
				-6.4										

Stack flow for emissions calcs - use 11:33 measurement. Note rounded flow value used on hard copy was 1607 acfm (SB) and 1653 acfm (EPA calcs)
Stack flow for CAP88 is minimum flow rate for day = 1281 acfm = 11.9 m/sec

Emissions Tracking Worksheet

FTWC Venting Process: 4

Start date & time	
9/20/2025	9:15

This process emissions tracking:
Page 1 of

9/20/2025	0:00
End date & time	

Venting Location: TA 54, Bldg 1028 outside north

Stack Flow Rate *(without safety basis error compensation)*

$\dot{V}_{act}$ = 1281.16664 actual ft^3/min = 36.3 m^3/min

Emitted Activity (Ci) = Concentration (µCi/m^3) * Δt (min) * Flow (m^3/min) * 1E6 (Ci/µCi)

ctrl+semicolon = inserts date
ctrl+shift+semicolon = inserts time

Total Activity for this sheet (Ci)
0.131

Reading		Concentration	Time Interval	Flow Rate	**Emitted Activity**		Running	
Date	Time	(µCi/m3)	Δt (min)	(m^3/min)	(µCi)	(Ci)	Total Ci	
9/20/2025	09:20:00	9.12	n/a	n/a	n/a	n/a	n/a	
9/20/2025	09:22:00	9.22	2.0	36.3	669	6.69E-04	6.69E-04	
9/20/2025	09:27:00	9.25	5.0	36.3	1678	1.68E-03	2.35E-03	
9/20/2025	09:32:00	9.19	5.0	36.3	1667	1.67E-03	4.01E-03	
9/20/2025	09:38:00	9.00	6.0	36.3	1959	1.96E-03	5.97E-03	
9/20/2025	09:42:00	8.45	4.0	36.3	1226	1.23E-03	7.20E-03	
9/20/2025	09:49:00	8.24	7.0	36.3	2094	2.09E-03	9.29E-03	
9/20/2025	09:56:00	7.77	7.0	36.3	1974	1.97E-03	1.13E-02	
9/20/2025	10:03:00	7.69	7.0	36.3	1954	1.95E-03	1.32E-02	
9/20/2025	10:12:00	7.54	9.0	45.7	3101	3.10E-03	1.63E-02	
9/20/2025	10:22:00	7.27	10.0	45.7	3322	3.32E-03	1.96E-02	
9/20/2025	10:36:00	7.12	14.0	45.7	4555	4.56E-03	2.42E-02	
9/20/2025	10:51:00	7.73	15.0	45.7	5299	5.30E-03	2.95E-02	
9/20/2025	11:10:00	7.19	19.0	45.7	6243	6.24E-03	3.57E-02	
9/20/2025	11:15:00	7.58	5.0	57.3	2172	2.17E-03	3.79E-02	
9/20/2025	11:25:00	7.23	10.0	57.3	4143	4.14E-03	4.21E-02	
9/20/2025	11:38:00	7.25	13.0	46.8	4411	4.41E-03	4.65E-02	
9/20/2025	11:48:00	7.64	10.0	46.8	3576	3.58E-03	5.00E-02	
9/20/2025	11:55:00	7.66	7.0	46.8	2509	2.51E-03	5.26E-02	
9/20/2025	12:01:00	7.97	6.0	46.8	2238	2.24E-03	5.48E-02	
9/20/2025	12:10:00	7.42	9.0	46.8	3125	3.13E-03	5.79E-02	entry to open
9/20/2025	12:14:00	7.77	4.0	46.8	1455	1.45E-03	5.94E-02	zero psi on 229!
9/20/2025	12:19:00	7.93	5.0	46.8	1856	1.86E-03	6.12E-02	
9/20/2025	12:22:00	7.86	3.0	46.8	1104	1.10E-03	6.23E-02	end vent. Break for lunch
9/20/2025	12:37:00	8.03	15.0	46.8	5637	5.64E-03	6.80E-02	
9/20/2025	12:57:00	7.93	20.0	46.8	7422	7.42E-03	7.54E-02	
9/20/2025	13:13:00	8.65	16.0	46.8	6477	6.48E-03	8.19E-02	
9/20/2025	13:28:00	8.22	15.0	46.8	5770	5.77E-03	8.76E-02	
9/20/2025	13:43:00	8.22	15.0	46.8	5770	5.77E-03	9.34E-02	
9/20/2025	13:48:00	8.40	5.0	46.8	1966	1.97E-03	9.54E-02	sample bottle attached onto 229
9/20/2025	13:50:00	10.00	2.0	46.8	936	9.36E-04	9.63E-02	remove vent rig from 229
9/20/2025	13:50:30	29.30	0.5	46.8	686	6.86E-04	9.70E-02	vent rig off; 229 still
9/20/2025	13:51:00	17.80	0.5	46.8	417	4.17E-04	9.74E-02	
9/20/2025	13:51:30	12.00	0.5	46.8	281	2.81E-04	9.77E-02	
9/20/2025	13:52:00	8.16	0.5	46.8	191	1.91E-04	9.79E-02	
9/20/2025	13:53:00	7.99	1.0	46.8	374	3.74E-04	9.83E-02	
9/20/2025	13:59:00	8.42	6.0	46.8	2364	2.36E-03	1.01E-01	prep for opening to the air

9/20/2025	14:02:00	8.53	3.0	46.8	1198	1.20E-03	1.02E-01	
9/20/2025	14:03:30	8.56	1.5	46.8	601	6.01E-04	1.02E-01	pull plug FTWC 229
9/20/2025	14:05:00	10.70	1.5	46.8	751	7.51E-04	1.03E-01	FTWC 229 open to air
9/20/2025	14:05:30	12.10	0.5	46.8	283	2.83E-04	1.03E-01	
9/20/2025	14:06:00	9.15	0.5	46.8	214	2.14E-04	1.04E-01	
9/20/2025	14:07:00	8.33	1.0	46.8	390	3.90E-04	1.04E-01	
9/20/2025	14:08:00	8.29	1.0	46.8	388	3.88E-04	1.04E-01	PMM is on FTWC 229
9/20/2025	14:09:00	8.48	1.0	46.8	397	3.97E-04	1.05E-01	
9/20/2025	14:14:00	8.34	5.0	46.8	1952	1.95E-03	1.07E-01	
9/20/2025	14:22:00	8.09	8.0	46.8	3029	3.03E-03	1.10E-01	begin pressurization 229 with Helium
9/20/2025	14:33:00	8.33	11.0	46.8	4288	4.29E-03	1.14E-01	
9/20/2025	14:40:00	8.20	7.0	46.8	2686	2.69E-03	1.17E-01	finished leak check; done with ops for the day
9/20/2025	15:19:00	8.04	39.0	46.8	14675	1.47E-02	1.31E-01	vent system shut down.
9/20/2025			0.0	46.8	0	0.00E+00	1.31E-01	
9/20/2025			0.0	46.8	0	0.00E+00	1.31E-01	
9/20/2025			0.0	46.8	0	0.00E+00	1.31E-01	
9/20/2025			0.0	46.8	0	0.00E+00	1.31E-01	
9/20/2025			0.0	46.8	0	0.00E+00	1.31E-01	
9/20/2025			0.0	46.8	0	0.00E+00	1.31E-01	
9/20/2025			0.0	46.8	0	0.00E+00	1.31E-01	

Use this sheet for evaluation of a single release.
yellow = required field for proper calc | blue = optional data for complete report

Emissions from:	**TA - 54**	**Bldg - 1028**	**ES - FT**

Emissions calculation date: 10/30/2025 | HPAL barcode #:

	date	time
Time sample started:	20-Sep-2025	8:18 AM
Time sample ended:	20-Sep-2025	2:54 PM
Length of sample period:	6.6	HRS
Sample period downtime:	0.0	HRS

RADAIR Report Period ID:
Bubbler response (catalyst efficiency for HT): 1.00 | Cal Date: | Expires:

Bubbler flow rate	115	mL/min	at STP
	150	**mL/min**	at altitude
	5.30E-03	cfm	at altitude
	5.94E+04	mL/sample period	at altitude
FTWC flow rate (daily max)	1,654	cfm	
	1.86E+10	mL/sample period	at altitude

Ratio of flow rates: 3.12E+05 = (stack flow)/(sample flow)

FTWC	1,476 min
	1,800 max

Weight of glycol and water in vials			**Volume of glycol and water in vials**		
W_1	32.1	g	V_1	28.8	mL
W_2	31.2	g	V_2	28.0	mL
W_3	24.9	g	V_3	22.4	mL
W_4	35.1	g	V_4	31.5	mL
W_5	32.8	g	V_5	29.5	mL
W_6	32.3	g	V_6	29.0	mL

assumes glycol & water density of 1.113 g/mL

Typical weights
36 g avg
54 g max

Activity concentration in vials			**Activity in vials**		
C_1	3.00E-02	µCi/L	A_1	8.64E-04	µCi
C_2	0.00E+00	µCi/L	A_2	0.00E+00	µCi
C_3	0.00E+00	µCi/L	A_3	0.00E+00	µCi
C_4	1.08E+00	µCi/L	A_4	3.40E-02	µCi
C_5	2.48E+00	µCi/L	A_5	7.31E-02	µCi
C_6	1.00E-01	µCi/L	A_6	2.90E-03	µCi
bkgnd		µCi/L			

*no value indicates less than MDA

OK to analyze single vial. Enter known values; calcs are independent of number of vials

MDA = 0.01 uCi/L

If there were any bubbler performance tests during this period:
HTO Stacked during Cal | HT Stacked during cal:
Ignore if no bubbler tests took place.

Activity of H-3 emitted from stack for given time period:
HTO 2.70E-04 Ci (includes response factor)
HT 3.44E-02 Ci (includes response factor)
Calculation based on operating times; allows for downtime

Based on flow ratio only:
3.46E-02 total Ci released
2.70E-04 Ci HTO
3.44E-02 Ci HT

Notes: 3.46E-02 total curies emitted

Report by: Dave Fuehne **Signature:** _____ Date 9/20/2025

Review by: Rebecca Lattin **Signature:** _____ Date 9/20/2025

Appendix A.5

Daily Operations Spreadsheets

Day 05

September 21, 2025

- Daily Limit Calculations
- Flow Rate Calculation
- Flow Rate Trending
- Emissions Tracking Log
- Bubbler Emissions Calculation

Daily Emissions Calculation Worksheet

This worksheet calculates emissions hold points and limits based on operations to-date

To QUICKLY insert the current date and time, press Ctrl+; (semi-colon) to add the date,
then press Space, then press Ctrl+Shift-; (semi-colon) to add the time

			Date	Time
Venting Process #	Day 5	Start of operations	9/21/2025	9:00
WCATS ID:	Vent 227	End of operations	9/21/2025	15:38
Venting Location:	TA 54, Bldg 1028 outside north			

Integrated FTWC Dose (IFD) from previous venting: IFD = 0.0035 mrem *enter 0 if this is first venting operations.*

Calculate Today's Limi & Hold points:

CAP88 Planning Dose Conversation Factor: DCF_p = 3.33E-04 mrem/Ci

	mrem	mrem (IFD)			
Dose Limit:	6	0.0035		DL mrem 5.9965	
Corresponding Curie Limit:		DL/DCF_p (Ci)	1.801E+04		18,008 curies
Pause For Approval Dose:	4	0.0035		PFA mrem 3.9965	
Pause for Approval (Ci)		PFA/DFC_p (Ci)	1.200E+04		12,002 curies
Pause for Evaluation Dose:	2	0.0035		PFED mrem 1.9965	
Pause for Approval (Ci)		$PFED/DFC_p$ (Ci)	5.995E+03		5,995 curies

Concurrance limit for EPC-ES Dose Assessment: (Date/Time/Initial) MJCdG ok 9:11 9/21/2025

These limits communicated to the FTWC Venting PIC: (Date/Time/Initial) 9/21/2025 7:10 AM DPF/DRH

Current Venting Operation Date:

	Latitude	Longitude
GPS Coordinates of stack:	same as Day 1	

Stack exhaust flow rate: 1648 acfm EPA reading; safety basis 1603

Basis for flow rate determination: Sierra 620s

4.3 Documentation of FTWC Flow Rate

Date:	Day 5	Location:	54-1028.	☑ 2 HP System	☐ 3/4 HP System	TRUE

venting 227 today

1. Duct Setup per IWD? ☑ Yes ☐ No

Tested Duct Configuration:
1.Stack
2. Blower
3. Short 12" section
4. Long 5' section w/ rad monitoring
5. Long 5' sectoin w/ Sierra 620
6. short 12" section w/ FTWC inject

---

2. Bounding Condition: minimum velocity achieved on Sierra 620 using worst-case pressure & temp:

2 HP System:
2680 sfpm on Sierra 620 = 1476 acfm in duct ☐ Yes ☐ No ☐ N/A

3/4 HP System:
1404 sfpm on Sierra 620 = 753 acfm in duct ☐ Yes ☐ No ☑ N/A

3.

	˚F	˚R		˚F	˚R
T_{act} :	55	514.67	T_{std} :	70	529.67
	mbar			mbar	
P_{act} :	804		P_{std} :	1013.25	

$\frac{T_{act}}{T_{std}} =$ 0.972

$\frac{P_{std}}{P_{act}} =$ 1.270

Pressure Correction: -3.4 mbar for every 100ft difference above reference barometer.

TA-6 weather station:	7424 ft	**-6.4 mbar from TA-54**
TA-54 weather station:	6548 ft	23.4 mbar from TA-6
TA-54 -1028:	~ 6735 ft	8.5 mbar from TA-6 to TA-49
WETF dock :	~ 7608 ft	-6.3 mbar from TA-6

Type Pressure corrrection here: -6.4

Use Equation 18 to determine flow rate through the duct, based on Sierra 620 reading.

$$\dot{V}_{act} = \left(v_{inst} - 75\ std\ \frac{ft}{min}\right) * 0.5454\ ft^2 * \left(\frac{T_{act}}{529.67°R}\right) * \left(\frac{1013.25\ mbar}{P_{act}}\right) * 90\%$$

υ_{inst} 2720 std ft/min

$\frac{T_{act}}{T_{std}} =$	0.972
$\frac{P_{std}}{P_{act}} =$	1.270

Safety Basis value (WETF-26)

$\dot{V}_{act}$ = 1602.6 actual ft^3/min for Safety Basis concerns

EPA emissions calcs value

$\dot{V}_{act}$ = 1648.1 actual ft^3/min for stack emissions calculations (disregards 75 fpm error term; conservative)

Use equation 21 and 22 to determine minimum Seirra 620 reading based on limiting flows in the different duct systems (using 2HP or 3/4Hp blower)

Eq 21

$$v_{inst,2HP} = \left[\frac{1476\ actual\frac{ft^3}{min}}{90\% * 0.5454ft^2} * \frac{529.67°R}{T_{act}} * \frac{P_{act}}{1013.25\ mbar}\right] + 75\ std\frac{ft}{min}$$

2511.0 sfpm — 2 HP fan Threshold

Eq 22

$$v_{inst,3/4HP} = \left[\frac{753\ actual\frac{ft^3}{min}}{90\% * 0.5454ft^2} * \frac{529.67°R}{T_{act}} * \frac{P_{act}}{1013.25\ mbar}\right] + 75\ std\frac{ft}{min}$$

0.0 sfpm — 3/4 HP fan N/A

Sufficient flow in the duct for FTWC venting? ☐ Yes ☐ No ☐ N/A

---

4. EPA full traverse flow measurement performed per procedure 127? ☐ Yes ☐ No ☑ N/A

Actual flow rate measured in duct: _____ acfm

Sufficient flow in the duct for FTWC venting? ☐ Yes ☐ No ☐ N/A

Trending FTWC flow rate

Safety basis flow calculation - uses "-75" sfpm error term to ensure sufficient flow;

EPA compliance calculations do NOT use the "-75" term to ensure conservative emissions calcs.

Actual flow rate determination

$$\dot{V}_{act} = \left(v_{inst} - 75\ std\frac{ft}{min}\right) * 0.5454\ ft^2 * \left(\frac{T_{act}}{529.67°R}\right) * \left(\frac{1013.25\ mbar}{P_{act}}\right) * 90\%$$

Minimum velocity determination

$$v_{inst,2HP} = \left[\frac{1476\ actual\frac{ft^3}{min}}{90\% * 0.5454 ft^2} * \frac{529.67°R}{T_{act}} * \frac{P_{act}}{1013.25\ mbar}\right] + 75\ std\frac{ft}{min}$$

0.3048 m/ft

Constants		
Temp: F to R	459.67	
T-std	529.67	Rankine
P-std	1013.25	mbar
Area	0.5454	ft2
Single-Point Corr Fact	90%	
Sierra Error Bar	-75	std ft/min
Min Flow (Area G, 2 HP)	1476	actual ft3/min
Min Flow (WETF, 3/4 HP)	753	actual ft3/min
flow unit conversion	0.02832	m3 per ft3

Date	Time	Temp deg.F	Pressure mbar	Pressure Adjust mbar	Temp Corr Fact	Press Corr Fact	Sierra Reading std ft/min	Safety Basis Flow Rate act ft3/min	EPA Calcs Flow Rate act ft3/min	EPA Calcs Flow Rate act m3/min	Area G: Safety Basis Min Veloc std ft/min	WETF: Safety Basis Min Veloc std ft/min	Comment / Configuration	CAP88: EPA flow velocity m/s
9/21/2025	08:30	55	804	-6.4	0.972	1.270	2720	1,603	1,648	46.7	2511	1318	set up. Prep to vent 227	15.4
9/21/2025	09:14	60	804	-6.4	0.981	1.270	2690	1,600	1,646	46.6	2488	1306	leak testing vent rig	15.3
9/21/2025	09:30	61	804	-6.4	0.983	1.270	2515	1,496	1,542	43.7	2483	1304		14.4
9/21/2025	09:34	61	804	-6.4	0.983	1.270	2630	1,566	1,612	45.7	2483	1304		15.0
9/21/2025	09:37	61	804	-6.4	0.983	1.270	2850	1,701	1,747	49.5	2483	1304		16.3
9/21/2025	09:38	61	804	-6.4	0.983	1.270	2900	1,732	1,778	50.3	2483	1304	opened vent cart; residual	16.6
9/21/2025	11:17	67	804	-6.4	0.994	1.270	2860	1,727	1,773	50.2	2456	1290	replacing vent cart w/WETF	16.5
9/21/2025	11:26	67	804	-6.4	0.994	1.270	2860	1,727	1,773	50.2	2456	1290	temp reconfigure to swap car	16.5
9/21/2025	11:47	67	804	-6.4	0.994	1.270	3000	1,814	1,860	52.7	2456	1290	cart swap / temp config	17.3
9/21/2025	11:57	67	804	-6.4	0.994	1.270	0	(47)	0	0.0	2456	1290	end cart swap; back to ops	0.0
9/21/2025	12:09	71	804	-6.4	1.002	1.270	2820	1,715	1,762	49.9	2438	1281	resume ops / start pump	16.4
9/21/2025	12:37	71	804	-6.4	1.002	1.270	4400	2,702	2,749	77.8	2438	1281	temp reconfigure. Fix cart 2	25.6
9/21/2025	12:46	71	804	-6.4	1.002	1.270	0	(47)	0	0.0	2438	1281	end temp config	0.0
9/21/2025	12:49	71	804	-6.4	1.002	1.270	2770	1,684	1,731	49.0	2438	1281	back to normal ops config	16.1
9/21/2025	13:03	75	803	-6.4	1.009	1.272	2700	1,654	1,702	48.2	2417	1270	**ZERO PSI IN #227**	15.8
9/21/2025	14:49	76	803	-6.4	1.011	1.272	2670	1,639	1,686	47.7	2413	1268	1-hr wait; about to pull plug	15.7
9/21/2025	14:49	78	802	-6.4	1.015	1.274	2600	1,602	1,650	46.7	2401	1262	swap vent rig for PMM 227	15.4
9/21/2025	15:16	78	802	-6.4	1.015	1.274	2700	1,666	1,713	48.5	2401	1262	pressurize the FTWC 227	16.0
9/21/2025	15:38			-6.4									cease ops. Pull bubbler	
9/21/2025	16:10			-6.4									shut down ventilation/Ionix	
9/21/2025				-6.4										
9/21/2025				-6.4										
9/21/2025				-6.4										

Bubbler Emissions flow: 1732 acfm (usually max flow during ops) not include short term snuffy ops

CAP88 flow: 1542 acfm minimum flow for day 14.4

Emissions Tracking Worksheet

FTWC Venting Process: Day 5

Start date & time	
9/21/2025	9:00

This process emissions tracking:
Page 1 of 1

9/21/2025	15:38
End date & time	

Venting Location: TA 54, Bldg 1028 outside north

Stack Flow Rate *(without safety basis error compensation)*

$\dot{V}_{act}$ = 1648.09216 actual ft^3/min = 46.7 m^3/min

Emitted Activity (Ci) = Concentration (µCi/m^3) * Δt (min) * Flow (m^3/min) * 1E6 (Ci/µCi)

ctrl+semicolon = inserts date
ctrl+shift+semicolon = inserts time

Total Activity for this sheet (Ci)
5.345

Reading		Concentration	Time Interval	Flow Rate	**Emitted Activity**		Running
Date	Time	(µCi/m3)	Δt (min)	(m^3/min)	(µCi)	(Ci)	Total Ci
9/21/2025	09:00:00	9.60	n/a	n/a	n/a	n/a	n/a
9/21/2025	09:15:00	9.79	15.0	46.7	6853	6.85E-03	6.85E-03
9/21/2025	09:22:00	10.40	7.0	46.7	3398	3.40E-03	1.03E-02
9/21/2025	09:30:00	9.80	8.0	46.7	3659	3.66E-03	1.39E-02
9/21/2025	09:37:00	8.85	7.0	50.3	3116	3.12E-03	1.70E-02
9/21/2025	09:38:00	26.80	1.0	50.3	1348	1.35E-03	1.84E-02
9/21/2025	09:38:30	17.60	0.5	50.3	443	4.43E-04	1.88E-02
9/21/2025	09:39:00	12.30	0.5	50.3	309	3.09E-04	1.91E-02
9/21/2025	09:39:30	10.00	0.5	50.3	252	2.52E-04	1.94E-02
9/21/2025	09:41:00	8.80	1.5	50.3	664	6.64E-04	2.00E-02
9/21/2025	09:45:00	8.52	4.0	50.3	1714	1.71E-03	2.18E-02
9/21/2025	09:50:00	8.27	5.0	50.3	2080	2.08E-03	2.38E-02
9/21/2025	09:55:00	9.77	5.0	50.3	2457	2.46E-03	2.63E-02
9/21/2025	09:55:30	13.60	0.5	50.3	342	3.42E-04	2.66E-02
9/21/2025	09:56:00	12.60	0.5	50.3	317	3.17E-04	2.70E-02
9/21/2025	09:56:30	9.80	0.5	50.3	246	2.46E-04	2.72E-02
9/21/2025	09:57:00	8.60	0.5	50.3	216	2.16E-04	2.74E-02
9/21/2025	10:00:00	8.56	3.0	50.3	1292	1.29E-03	2.87E-02
9/21/2025	10:10:00	8.20	10.0	50.3	4125	4.12E-03	3.28E-02
9/21/2025	10:25:00	7.73	15.0	50.3	5832	5.83E-03	3.87E-02
9/21/2025	10:36:00	8.00	11.0	50.3	4426	4.43E-03	4.31E-02
9/21/2025	11:00:00	7.56	24.0	50.3	9126	9.13E-03	5.22E-02
9/21/2025	11:15:00	8.04	15.0	50.3	6066	6.07E-03	5.83E-02
9/21/2025	11:25:00	7.60	10.0	50.3	3823	3.82E-03	6.21E-02
9/21/2025	11:47:00	7.93	22.0	0.0	0	0.00E+00	6.21E-02
9/21/2025	11:48:00	7.96	1.0	52.7	419	4.19E-04	6.25E-02
9/21/2025	11:51:00	8.76	3.0	52.7	1385	1.38E-03	6.39E-02
9/21/2025	11:52:00	11.40	1.0	52.7	601	6.01E-04	6.45E-02
9/21/2025	11:53:00	14.40	1.0	52.7	759	7.59E-04	6.53E-02
9/21/2025	11:54:00	15.70	1.0	52.7	827	8.27E-04	6.61E-02

Reading		Concentration	Time Interval	Flow Rate	**Emitted Activity**		Running
Date	Time	(µCi/m3)	Δt (min)	(m^3/min)	(µCi)	(Ci)	Total Ci
9/21/2025	11:55:00	9.00	1.0	52.7	474	4.74E-04	6.66E-02
9/21/2025	11:56:00	8.14	1.0	52.7	429	4.29E-04	6.70E-02
9/21/2025	12:12:00	7.99	16.0	49.9	6379	6.38E-03	7.34E-02
9/21/2025	12:14:00	14.00	2.0	49.9	1397	1.40E-03	7.48E-02
9/21/2025	12:15:00	7.87	1.0	49.9	393	3.93E-04	7.52E-02
9/21/2025	12:16:00	7.97	1.0	49.9	398	3.98E-04	7.56E-02
9/21/2025	12:18:00	8.15	2.0	49.9	813	8.13E-04	7.64E-02
9/21/2025	12:30:00	7.95	12.0	49.9	4760	4.76E-03	8.11E-02
9/21/2025	12:37:00	8.16	7.0	77.8	4444	4.44E-03	8.56E-02
9/21/2025	12:38:00	10.80	1.0	77.8	840	8.40E-04	8.64E-02
9/21/2025	12:39:00	11.10	1.0	77.8	864	8.64E-04	8.73E-02
9/21/2025	12:44:00	8.25	5.0	77.8	3209	3.21E-03	9.05E-02
9/21/2025	12:50:00	8.16	6.0	49.0	2399	2.40E-03	9.29E-02
9/21/2025	12:58:00	8.32	8.0	49.0	3261	3.26E-03	9.62E-02
9/21/2025	13:00:00	8.41	2.0	49.0	824	8.24E-04	9.70E-02
9/21/2025	13:03:00	8.22	3.0	49.0	1208	1.21E-03	9.82E-02
9/21/2025	13:08:00	8.38	5.0	49.0	2053	2.05E-03	1.00E-01
9/21/2025	13:13:00	8.03	5.0	49.0	1967	1.97E-03	1.02E-01
9/21/2025	13:20:00	8.22	7.0	49.0	2819	2.82E-03	1.05E-01
9/21/2025	13:30:00	8.47	10.0	49.0	4150	4.15E-03	1.09E-01
9/21/2025	13:40:00	8.49	10.0	49.0	4160	4.16E-03	1.13E-01
9/21/2025	13:50:00	8.65	10.0	49.0	4239	4.24E-03	1.18E-01
9/21/2025	14:02:00	8.50	12.0	49.0	4998	5.00E-03	1.23E-01
9/21/2025	14:33:00	8.35	31.0	49.0	12684	1.27E-02	1.35E-01
9/21/2025	14:48:00	9.22	15.0	49.0	6777	6.78E-03	1.42E-01
9/21/2025	14:53:00	8.59	5.0	49.0	2105	2.10E-03	1.44E-01
9/21/2025	14:55:00	8.95	2.0	49.0	877	8.77E-04	1.45E-01
9/21/2025	14:56:30	55.80	1.5	49.0	4101	4.10E-03	1.49E-01
9/21/2025	14:57:00	1050.00	0.5	49.0	25725	2.57E-02	1.75E-01
9/21/2025	14:57:30	1490.00	0.5	49.0	36505	3.65E-02	2.11E-01
9/21/2025	14:58:00	15600.00	0.5	49.0	382200	3.82E-01	5.94E-01
9/21/2025	14:58:30	10400.00	0.5	49.0	254800	2.55E-01	8.48E-01
9/21/2025	14:59:00	500.00	0.5	49.0	12250	1.23E-02	8.61E-01
9/21/2025	14:59:30	35.00	0.5	49.0	858	8.58E-04	8.61E-01
9/21/2025	15:00:00	11.20	0.5	49.0	274	2.74E-04	8.62E-01
9/21/2025	15:00:30	111.00	0.5	49.0	2720	2.72E-03	8.64E-01
9/21/2025	15:01:00	1100.00	0.5	49.0	26950	2.70E-02	8.91E-01
9/21/2025	15:01:30	2240.00	0.5	49.0	54880	5.49E-02	9.46E-01
9/21/2025	15:02:00	38700.00	0.5	49.0	948150	9.48E-01	1.89E+00
9/21/2025	15:02:30	39400.00	0.5	49.0	965300	9.65E-01	2.86E+00
9/21/2025	15:03:00	3000.00	0.5	49.0	73500	7.35E-02	2.93E+00
9/21/2025	15:03:30	14800.00	0.5	49.0	362600	3.63E-01	3.30E+00
9/21/2025	15:04:00	38600.00	0.5	49.0	945700	9.46E-01	4.24E+00
9/21/2025	15:04:30	15000.00	0.5	49.0	367500	3.68E-01	4.61E+00
9/21/2025	15:05:00	7290.00	0.5	49.0	178605	1.79E-01	4.79E+00
9/21/2025	15:05:30	4920.00	0.5	49.0	120540	1.21E-01	4.91E+00
9/21/2025	15:06:00	5220.00	0.5	49.0	127890	1.28E-01	5.04E+00

Reading		Concentration	Time Interval	Flow Rate	**Emitted Activity**		Running
Date	Time	(µCi/m3)	Δt (min)	(m^3/min)	(µCi)	(Ci)	Total Ci
9/21/2025	15:06:30	8320.00	0.5	49.0	203840	2.04E-01	5.24E+00
9/21/2025	15:07:00	3160.00	0.5	49.0	77420	7.74E-02	5.32E+00
9/21/2025	15:07:30	71.90	0.5	49.0	1762	1.76E-03	5.32E+00
9/21/2025	15:08:00	14.80	0.5	49.0	363	3.63E-04	5.32E+00
9/21/2025	15:08:30	11.50	0.5	49.0	282	2.82E-04	5.32E+00
9/21/2025	15:09:00	10.60	0.5	49.0	260	2.60E-04	5.32E+00
9/21/2025	15:09:30	10.40	0.5	49.0	255	2.55E-04	5.32E+00
9/21/2025	15:10:00	10.10	0.5	49.0	247	2.47E-04	5.32E+00
9/21/2025	15:10	10.10	0.0	49.0	0	0.00E+00	5.32E+00
9/21/2025	15:11	9.64	1.0	49.0	472	4.72E-04	5.32E+00
9/21/2025	15:12	9.61	1.0	49.0	471	4.71E-04	5.32E+00
9/21/2025	15:14	9.53	2.0	49.0	934	9.34E-04	5.32E+00
9/21/2025	15:19	9.09	5.0	49.0	2227	2.23E-03	5.32E+00
9/21/2025	15:24	8.76	5.0	49.0	2146	2.15E-03	5.33E+00
9/21/2025	15:30	8.69	6.0	49.0	2555	2.55E-03	5.33E+00
9/21/2025	15:38	8.72	8.0	49.0	3418	3.42E-03	5.33E+00
9/21/2025	16:10	8.14	32.0	49.0	12764	1.28E-02	5.35E+00

Use this sheet for evaluation of a single release.
yellow = required field for proper calc | blue = optional data for complete report

Emissions from:	**TA - 54**	**Bldg - 1028**	**ES - FT**

Emissions calculation date: 10/30/2025 | HPAL barcode #:

	date	time
Time sample started:	21-Sep-2025	8:30 AM
Time sample ended:	21-Sep-2025	3:49 PM
Length of sample period:	7.3	HRS
Sample period downtime:	0.0	HRS

RADAIR Report Period ID:
Bubbler response (catalyst efficiency for HT): 1.00 | Cal Date: | Expires:

Bubbler flow rate	115	mL/min	at STP
	150	**mL/min**	at altitude
	5.30E-03	cfm	at altitude
	6.59E+04	mL/sample period	at altitude
FTWC flow rate (daily max)	1,732	cfm	
	2.15E+10	mL/sample period	at altitude
Ratio of flow rates:	3.27E+05	= (stack flow)/(sample flow)	

FTWC	*1,476 min*
	1,800 max

Weight of glycol and water in vials

	Full Wt	Vial Wt	Glycol Wt
W_1 (g)	117.50	81.70	35.8
W_2 (g)	107.63	76.60	31.0
W_3 (g)	107.81	82.20	25.6
W_4 (g)	119.61	82.70	36.9
W_5 (g)	117.01	82.80	34.2
W_6 (g)	115.77	82.20	33.6

Volume of glycol and water in vials

V_1	32.2	mL
V_2	27.9	mL
V_3	23.0	mL
V_4	33.2	mL
V_5	30.7	mL
V_6	30.2	mL

assumes glycol & water density of 1.113 g/mL

Typical weights
36 g avg
54 g max

Activity concentration in vials

C_1	4.00E-02	µCi/L
C_2	2.00E-02	µCi/L
C_3	0.00E+00	µCi/L
C_4	5.68E+02	µCi/L
C_5	5.18E+00	µCi/L
C_6	0.00E+00	µCi/L
bkgnd		µCi/L

*no value indicates less than MDA

Activity in vials

A_1	1.29E-03	µCi
A_2	5.58E-04	µCi
A_3	0.00E+00	µCi
A_4	1.88E+01	µCi
A_5	1.59E-01	µCi
A_6	0.00E+00	µCi

OK to analyze single vial.
Enter known values;
calcs are independent
of number of vials

MDA = 0.01 uCi/L

If there were any bubbler performance tests during this period:
HTO Stacked during Cal | HT Stacked during cal:
Ignore if no bubbler tests took place.

Activity of H-3 emitted from stack for given time period:

HTO	**6.03E-04 Ci**	**(includes response factor)**
HT	**6.21E+00 Ci**	**(includes response factor)**

Calculation based on operating times; allows for downtime

Based on flow ratio only:
6.21E+00 total Ci released
6.03E-04 Ci HTO
6.21E+00 Ci HT

Notes: 6.21E+00 total curies emitted

based on bubbler quick count

Report by: Rebecca Lattin **Signature:** _____ Date 9/21/2025

Review by: Dave Fuehne **Signature:** _____ Date 9/21/2025

Appendix A.6

Daily Operations Spreadsheets

Day 06

September 23, 2025

- Daily Limit Calculations
- Flow Rate Calculation
- Flow Rate Trending
- Emissions Tracking Log
- Bubbler Emissions Calculation

6

Daily Emissions Calculation Worksheet

This worksheet calculates emissions hold points and limits based on operations to-date

To QUICKLY insert the current date and time, press Ctrl+; (semi-colon) to add the date,
then press Space, then press Ctrl+Shift-; (semi-colon) to add the time

			Date	Time
Venting Process #	6	Start of operations	9/23/2025	9:18
WCATS ID:	vent #226	End of operations	9/23/2025	12:36
Venting Location:	TA 54, Bldg 1028 outside north			

Integrated FTWC Dose (IFD) from previous venting: IFD = 0.0035 mrem *enter 0 if this is first venting operations.*

Calculate Today's Limi & Hold points:

CAP88 Planning Dose Conversation Factor: DCF_p = 3.33E-04 mrem/Ci

Dose Limit:	mrem 6	mrem (IFD) 0.0035		DL mrem 5.9965	
Corresponding Curie Limit:		DL/DCF_p (Ci)	1.801E+04		18,008 curies
Pause For Approval Dose:	mrem 4	mrem (IFD) 0.0035		PFA mrem 3.9965	
Pause for Approval (Ci)		PFA/DFC_p (Ci)	1.200E+04		12,002 curies
Pause for Evaluation Dose:	mrem 2	mrem (IFD) 0.0035		PFED mrem 1.9965	
Pause for Approval (Ci)		$PFED/DFC_p$ (Ci)	5.995E+03		5,995 curies

Concurrance limit for EPC-ES Dose Assessment: (Date/Time/Initial) same as yesterday - n/a

These limits communicated to the FTWC Venting PIC: (Date/Time/Initial) DPF told DRH 9/23/2025 09:16

Current Venting Operation Date:

	Latitude	Longitude
GPS Coordinates of stack:	Same as Day 1	

Stack exhaust flow rate: 1730 acfm

Basis for flow rate determination: Sierra 620s

4.3 Documentation of FTWC Flow Rate

Date:	23-Sep	Location:	54-1028; Day 6	☑ 2 HP System	☐ 3/4 HP System	TRUE

1. Duct Setup per IWD? ☑ Yes ☐ No

Tested Duct Configuration:
1.Stack
2. Blower
3. Short 12" section
4. Long 5' section w/ rad monitoring
5. Long 5' sectoin w/ Sierra 620
6. short 12" section w/ FTWC inject

---

2. Bounding Condition: minimum velocity achieved on Sierra 620 using worst-case pressure & temp:

2 HP System:
2680 sfpm on Sierra 620 = 1476 acfm in duct ☐ Yes ☐ No ☐ N/A

3/4 HP System:
1404 sfpm on Sierra 620 = 753 acfm in duct ☐ Yes ☐ No ☑ N/A

3.

	˚F	˚R		˚F	˚R
T_{act} :	54	513.67	T_{std} :	70	529.67
	mbar			mbar	
P_{act} :	804		P_{std} :	1013.25	

$\frac{T_{act}}{T_{std}} =$ 0.970

$\frac{P_{std}}{P_{act}} =$ 1.270

Pressure Correction: -3.4 mbar for every 100ft difference above reference barometer.

TA-6 weather station:	7424 ft	**-6.4 mbar from TA-54**
TA-54 weather station:	6548 ft	23.4 mbar from TA-6
TA-54 -1028:	~ 6735 ft	8.5 mbar from TA-6 to TA-49
WETF dock :	~ 7608 ft	-6.3 mbar from TA-6

Type Pressure corrrection here: -6.4

Use Equation 18 to determine flow rate through the duct, based on Sierra 620 reading.

$$\dot{V}_{act} = \left(v_{inst} - 75\ std\ \frac{ft}{min}\right) * 0.5454\ ft^2 * \left(\frac{T_{act}}{529.67°R}\right) * \left(\frac{1013.25\ mbar}{P_{act}}\right) * 90\%$$

FTWC 226 is next to door; so we went straight from rigid duct on ground up into 1028 with 12' flex

v_{inst} 2860 std ft/min

Safety Basis value (WETF-26)

$\dot{V}_{act}$ = 1684.2 actual ft^3/min for Safety Basis concerns

$\frac{T_{act}}{T_{std}} =$	0.970
$\frac{P_{std}}{P_{act}} =$	1.270

EPA emissions calcs value

$\dot{V}_{act}$ = 1729.6 actual ft^3/min for stack emissions calculations (disregards 75 fpm error term; conservative)

Use equation 21 and 22 to determine minimum Seirra 620 reading based on limiting flows in the different duct systems (using 2HP or 3/4Hp blower)

Eq 21

$$v_{inst,2HP} = \left[\frac{1476\ actual\frac{ft^3}{min}}{90\% * 0.5454ft^2} * \frac{529.67°R}{T_{act}} * \frac{P_{act}}{1013.25\ mbar}\right] + 75\ std\frac{ft}{min}$$

2515.7 sfpm — 2 HP fan Threshold

Eq 22

$$v_{inst,3/4HP} = \left[\frac{753\ actual\frac{ft^3}{min}}{90\% * 0.5454ft^2} * \frac{529.67°R}{T_{act}} * \frac{P_{act}}{1013.25\ mbar}\right] + 75\ std\frac{ft}{min}$$

0.0 sfpm — 3/4 HP fan N/A

Sufficient flow in the duct for FTWC venting? ☐ Yes ☐ No ☐ N/A

---

4. EPA full traverse flow measurement performed per procedure 127? ☐ Yes ☐ No ☑ N/A

Actual flow rate measured in duct: _____ acfm

Sufficient flow in the duct for FTWC venting? ☐ Yes ☐ No ☐ N/A

Trending FTWC flow rate

Safety basis flow calculation - uses "-75" sfpm error term to ensure sufficient flow;

EPA compliance calculations do NOT use the "-75" term to ensure conservative emissions calcs.

Constants		
Temp: F to R	459.67	
T-std	529.67	Rankine
P-std	1013.25	mbar
Area	0.5454	ft2
Single-Point Corr Fact	90%	
Sierra Error Bar	-75	std ft/min
Min Flow (Area G, 2 HP)	1476	actual ft3/min
Min Flow (WETF, 3/4 HP)	753	actual ft3/min
flow unit conversion	0.02832	m3 per ft3

Actual flow rate determination

$$\dot{V}_{act} = \left(v_{inst} - 75\,std\,\frac{ft}{min}\right) * 0.5454\,ft^2 * \left(\frac{T_{act}}{529.67°R}\right) * \left(\frac{1013.25\,mbar}{P_{act}}\right) * 90\%$$

Minimum velocity determination

$$v_{inst,2HP} = \left[\frac{1476\,actual\,\frac{ft^3}{min}}{90\% * 0.5454 ft^2} * \frac{529.67°R}{T_{act}} * \frac{P_{act}}{1013.25\,mbar}\right] + 75\,std\,\frac{ft}{min}$$

0.3048 m/ft

Date	Time	Temp deg.F	Pressure mbar	Pressure Adjust mbar	Temp Corr Fact	Press Corr Fact	Sierra Reading std ft/min	Safety Basis Flow Rate act ft3/min	EPA Calcs Flow Rate act ft3/min	EPA Calcs Flow Rate act m3/min	Area G: Safety Basis Min Veloc std ft/min	WETF: Safety Basis Min Veloc std ft/min	Comment / Configuration	CAP88: EPA flow velocity m/s
9/23/2025	09:20	54	804	-6.4	0.970	1.270	2860	1,684	1,730	49.0	2516	1321	startup - one short flex	16.1
9/23/2025	09:57	54	804	-6.4	0.970	1.270	2750	1,618	1,663	47.1	2516	1321		15.5
9/23/2025	10:07	57	805	-6.4	0.975	1.269	2820	1,668	1,713	48.5	2505	1315	zero psi on FTWC 226	16.0
9/23/2025	11:04	62	805	-6.4	0.985	1.269	2750	1,641	1,687	47.8	2482	1303	taking air sample	15.7
9/23/2025	11:25	62	805	-6.4	0.985	1.269	3030	1,813	1,859	52.6	2482	1303	messing w/ snuffy	17.3
9/23/2025	11:26	62	805	-6.4	0.985	1.269	3110	1,862	1,908	54.0	2482	1303	remove vent rig	17.8
9/23/2025	11:31	62	805	-6.4	0.985	1.269	2760	1,647	1,693	47.9	2482	1303	about to open FTWC plug	15.8
9/23/2025	11:46	65	805	-6.4	0.991	1.269	2970	1,786	1,832	51.9	2468	1296	pressurizing FTWC 226	17.1
9/23/2025	12:30	66	805	-6.4	0.992	1.269	3054	1,841	1,888	53.5	2463	1294		17.6
9/23/2025	12:36			-6.4			0						fan off. End ops	
9/23/2025				-6.4										
9/23/2025				-6.4										
9/23/2025				-6.4										
9/23/2025				-6.4										
9/23/2025				-6.4										
9/23/2025				-6.4										
9/23/2025				-6.4										
9/23/2025				-6.4										
9/23/2025				-6.4										
9/23/2025				-6.4										
9/23/2025				-6.4										
9/23/2025				-6.4										
9/23/2025				-6.4										

Bubbler Emissions Calcs (usually max flow during ops)	1862 acfm	
CAP88 flow: minimum flow for day	1663 acfm =	15.5 m/sec

Emissions Tracking Worksheet

FTWC Venting Process: 6 process FTWC 226

Start date & time	
9/23/2025	9:18

This process emissions tracking:

Page 1 of 1

9/23/2025	12:36
End date & time	

Venting Location: TA 54, Bldg 1028 outside north

Stack Flow Rate *(without safety basis error compensation)*

$\dot{V}_{act}$ = 1729.55338 actual ft^3/min = 49.0 m^3/min

Emitted Activity (Ci) = Concentration (µCi/m^3) * Δt (min) * Flow (m^3/min) * 1E6 (Ci/µCi)

ctrl+semicolon = inserts date
ctrl+shift+semicolon = inserts time

Total Activity for this sheet (Ci)
0.226

Reading		Concentration	Time Interval	Flow Rate	**Emitted Activity**		Running
Date	Time	(µCi/m3)	Δt (min)	(m^3/min)	(µCi)	(Ci)	Total Ci
9/23/2025	09:10:00	10.40	n/a	n/a	n/a	n/a	n/a
9/23/2025	09:30:00	12.10	20.0	49.0	11858	1.19E-02	1.19E-02
9/23/2025	09:50:00	11.10	20.0	49.0	10878	1.09E-02	2.27E-02
9/23/2025	09:53:00	602.00	3.0	49.0	88494	8.85E-02	1.11E-01
9/23/2025	09:55:00	392.00	2.0	49.0	38416	3.84E-02	1.50E-01
9/23/2025	09:56:00	9.03	1.0	49.0	442	4.42E-04	1.50E-01
9/23/2025	10:06:00	8.90	10.0	49.0	4361	4.36E-03	1.54E-01
9/23/2025	10:07:00	8.81	1.0	49.0	432	4.32E-04	1.55E-01
9/23/2025	10:16:00	8.74	9.0	49.0	3854	3.85E-03	1.59E-01
9/23/2025	10:30:00	8.31	14.0	49.0	5701	5.70E-03	1.64E-01
9/23/2025	11:00:00	8.20	30.0	49.0	12054	1.21E-02	1.76E-01
9/23/2025	11:20:00	7.67	20.0	49.0	7517	7.52E-03	1.84E-01
9/23/2025	11:28:00	22.90	8.0	54.0	9893	9.89E-03	1.94E-01
9/23/2025	11:29:00	14.70	1.0	54.0	794	7.94E-04	1.95E-01
9/23/2025	11:30:00	7.62	1.0	54.0	411	4.11E-04	1.95E-01
9/23/2025	11:33:00	7.73	3.0	54.0	1252	1.25E-03	1.96E-01
9/23/2025	11:35:00	7.60	2.0	54.0	821	8.21E-04	1.97E-01
9/23/2025	11:37:00	8.19	2.0	54.0	885	8.85E-04	1.98E-01
9/23/2025	11:37:30	84.90	0.5	54.0	2292	2.29E-03	2.00E-01
9/23/2025	11:38:00	91.80	0.5	54.0	2479	2.48E-03	2.03E-01
9/23/2025	11:38:30	10.90	0.5	54.0	294	2.94E-04	2.03E-01
9/23/2025	11:40:00	7.75	1.5	54.0	628	6.28E-04	2.04E-01
9/23/2025	11:50:00	7.15	10.0	54.0	3861	3.86E-03	2.08E-01
9/23/2025	12:00:00	7.53	10.0	54.0	4066	4.07E-03	2.12E-01
9/23/2025	12:30:00	7.55	30.0	54.0	12231	1.22E-02	2.24E-01
9/23/2025	12:36:00	7.44	6.0	54.0	2411	2.41E-03	2.26E-01
9/23/2025			0.0	54.0	0	0.00E+00	2.26E-01
9/23/2025			0.0	54.0	0	0.00E+00	2.26E-01
9/23/2025			0.0	54.0	0	0.00E+00	2.26E-01
9/23/2025			0.0	54.0	0	0.00E+00	2.26E-01

Use this sheet for evaluation of a single release.
yellow = required field for proper calc | blue = optional data for complete report

Emissions from:	**TA - 54**	**Bldg - 1028**	**ES - FT**

Emissions calculation date: 10/30/2025 | HPAL barcode #:

	date	time
Time sample started:	23-Sep-2025	8:22 AM
Time sample ended:	23-Sep-2025	12:52 PM
Length of sample period:	4.5	HRS
Sample period downtime:	0.0	HRS

RADAIR Report Period ID:

Bubbler response (catalyst efficiency for HT): 1.00 | Cal Date: | Expires:

Bubbler flow rate	115	mL/min	at STP
	150	**mL/min**	at altitude
	5.30E-03	cfm	at altitude
	4.05E+04	mL/sample period	at altitude
FTWC flow rate (daily max)	1,862	cfm	
	1.42E+10	mL/sample period	at altitude

Ratio of flow rates: 3.52E+05 = (stack flow)/(sample flow)

FTWC	1,476 min
	1,800 max

Weight of glycol and water in vials			**Volume of glycol and water in vials**		
W_1	37.3	g	V_1	33.5	mL
W_2	31.7	g	V_2	28.5	mL
W_3	25.2	g	V_3	22.7	mL
W_4	34.8	g	V_4	31.2	mL
W_5	32.5	g	V_5	29.2	mL
W_6	32.4	g	V_6	29.1	mL

assumes glycol & water density of 1.113 g/mL

Typical weights
36 g avg
54 g max

Activity concentration in vials			**Activity in vials**		
C_1	4.50E-01	µCi/L	A_1	1.51E-02	µCi
C_2	0.00E+00	µCi/L	A_2	0.00E+00	µCi
C_3	1.10E-01	µCi/L	A_3	2.49E-03	µCi
C_4	1.93E+01	µCi/L	A_4	6.03E-01	µCi
C_5	1.26E+00	µCi/L	A_5	3.68E-02	µCi
C_6	3.00E-02	µCi/L	A_6	8.74E-04	µCi
bkgnd		µCi/L			

*no value indicates less than MDA

OK to analyze single vial.
Enter known values;
calcs are independent
of number of vials

MDA = 0.01 uCi/L

If there were any bubbler performance tests during this period:
HTO Stacked during Cal | HT Stacked during cal:

Ignore if no bubbler tests took place.

Activity of H-3 emitted from stack for given time period:
HTO 6.18E-03 Ci (includes response factor)
HT 2.25E-01 Ci (includes response factor)
Calculation based on operating times; allows for downtime

Based on flow ratio only:
2.31E-01 total Ci released
6.18E-03 Ci HTO
2.25E-01 Ci HT

Notes: 2.31E-01 total curies emitted

based on bubbler quick count

Report by: Dave Fuehne **Signature:** _____ Date 9/23/2025

Review by: Rebecca Lattin **Signature:** _____ Date 9/23/2025

Appendix A.7

Daily Operations Spreadsheets

Day 07

September 24, 2025

- Daily Limit Calculations
- Flow Rate Calculation
- Flow Rate Trending
- Emissions Tracking Log
- Bubbler Emissions Calculation

Daily Emissions Calculation Worksheet

This worksheet calculates emissions hold points and limits based on operations to-date

To QUICKLY insert the current date and time, press Ctrl+; (semi-colon) to add the date,
then press Space, then press Ctrl+Shift-; (semi-colon) to add the time

			Date	Time
Venting Process #	Day 7	Start of operations	9/24/2025	7:30
WCATS ID:	226-purge He, evac	End of operations	9/24/2025	17:23
Venting Location:	TA 54, Bldg 1028 outside north			

enter 0 if this is first venting operations.

Integrated FTWC Dose (IFD) from previous venting: IFD = 0.0035 mrem

Calculate Today's Limi & Hold points:

CAP88 Planning Dose Conversation Factor: DCF_p = 3.33E-04 mrem/Ci

Dose Limit:	mrem 6	mrem (IFD) 0.0035		DL mrem 5.9965	
Corresponding Curie Limit:		DL/DCF_p (Ci)	1.801E+04		18,008 curies
Pause For Approval Dose:	mrem 4	mrem (IFD) 0.0035		PFA mrem 3.9965	
Pause for Approval (Ci)		PFA/DFC_p (Ci)	1.200E+04		12,002 curies
Pause for Evaluation Dose:	mrem 2	mrem (IFD) 0.0035		PFED mrem 1.9965	
Pause for Approval (Ci)		$PFED/DFC_p$ (Ci)	5.995E+03		5,995 curies

Concurrance limit for EPC-ES Dose Assessment: (Date/Time/Initial) confirmed via text MJCdG

These limits communicated to the FTWC Venting PIC: (Date/Time/Initial) DF or DH 9/24/2025 07:30

Current Venting Operation Date:

	Latitude	Longitude
GPS Coordinates of stack:	same as Day 1	

Stack exhaust flow rate: *see flow trend sheet* acfm

Basis for flow rate determination: Sierra 620s

Daily Emissions Calculation Worksheet

This worksheet calculates emissions hold points and limits based on operations to-date

To QUICKLY insert the current date and time, press Ctrl+; (semi-colon) to add the date,
then press Space, then press Ctrl+Shift-; (semi-colon) to add the time

We ran this calc again with nighttime dose factors in case ops extended past sunset. They did not. - DF 9/24/2025

			Date	Time
Venting Process #	Day 7	Start of operations	9/24/2025	7:30
WCATS ID:	226-purge He, evac	End of operations	9/24/2025	17:23
Venting Location:	TA 54, Bldg 1028 outside north			

enter 0 if this is first venting operations.

Integrated FTWC Dose (IFD) from previous venting: IFD = 0.0035 mrem

Calculate Today's Limi & Hold points:

CAP88 Planning Dose Conversation Factor: DCF_p = 1.40E-03 mrem/Ci

Dose Limit:	mrem 6	mrem (IFD) 0.0035		DL mrem 5.9965	
Corresponding Curie Limit:		DL/DCF_p (Ci)	4.283E+03		4,283 curies
Pause For Approval Dose:	mrem 4	mrem (IFD) 0.0035		PFA mrem 3.9965	
Pause for Approval (Ci)		PFA/DFC_p (Ci)	2.855E+03		2,855 curies
Pause for Evaluation Dose:	mrem 2	mrem (IFD) 0.0035		PFED mrem 1.9965	
Pause for Approval (Ci)		$PFED/DFC_p$ (Ci)	1.426E+03		1,426 curies

Concurrance limit for EPC-ES Dose Assessment: (Date/Time/Initial) n/a didn't extend past sunset

These limits communicated to the FTWC Venting PIC: (Date/Time/Initial) n/a didn't extend pas sunset

Current Venting Operation Date:

	Latitude	Longitude
GPS Coordinates of stack:	same as Day 1	

Stack exhaust flow rate: see flow trend sheet acfm

Basis for flow rate determination: Sierra 620s

4.3 Documentation of FTWC Flow Rate

Date:	9/24/2025	Location:	54-1028. Day 7	☑ 2 HP System	☐ 3/4 HP System	TRUE

1. Duct Setup per IWD? ☑ Yes ☐ No

Tested Duct Configuration:
1.Stack
2. Blower
3. Short 12" section
4. Long 5' section w/ rad monitoring
5. Long 5' sectoin w/ Sierra 620
6. short 12" section w/ FTWC inject

---

2. Bounding Condition: minimum velocity achieved on Sierra 620 using worst-case pressure & temp:

2 HP System:
2680 sfpm on Sierra 620 = 1476 acfm in duct — Yes - DF ☐ Yes ☐ No ☐ N/A

3/4 HP System:
1404 sfpm on Sierra 620 = 753 acfm in duct — ☐ Yes ☐ No ☑ N/A

3.

	˚F	˚R		˚F	˚R
T_{act} :	49	508.67	T_{std} :	70	529.67
	mbar			mbar	
P_{act} :	810		P_{std} :	1013.25	

$\frac{T_{act}}{T_{std}}$ = 0.960

$\frac{P_{std}}{P_{act}}$ = 1.261

Pressure Correction: -3.4 mbar for every 100ft difference above reference barometer.

TA-6 weather station:	7424 ft	**-6.4 mbar from TA-54**
TA-54 weather station:	6548 ft	23.4 mbar from TA-6
TA-54 -1028:	~ 6735 ft	8.5 mbar from TA-6 to TA-49
WETF dock :	~ 7608 ft	-6.3 mbar from TA-6

Type Pressure corrrection here: -6.4

Use Equation 18 to determine flow rate through the duct, based on Sierra 620 reading.

$$\dot{V}_{act} = \left(v_{inst} - 75\ std\ \frac{ft}{min}\right) * 0.5454\ ft^2 * \left(\frac{T_{act}}{529.67°R}\right) * \left(\frac{1013.25\ mbar}{P_{act}}\right) * 90\%$$

υ_{inst} 2790 std ft/min

$\frac{T_{act}}{T_{std}}$ = 0.960

$\frac{P_{std}}{P_{act}}$ = 1.261

Safety Basis value (WETF-26)

$\dot{V}_{act}$ = 1613.7 actual ft^3/min for Safety Basis concerns

EPA emissions calcs value

$\dot{V}_{act}$ = 1658.3 actual ft^3/min for stack emissions calculations (disregards 75 fpm error term; conservative)

Use equation 21 and 22 to determine minimum Seirra 620 reading based on limiting flows in the different duct systems (using 2HP or 3/4Hp blower)

Eq 21

$$v_{inst,2HP} = \left[\frac{1476\ actual\frac{ft^3}{min}}{90\% * 0.5454ft^2} * \frac{529.67°R}{T_{act}} * \frac{P_{act}}{1013.25\ mbar}\right] + 75\ std\frac{ft}{min}$$

2558.3 sfpm — 2 HP fan Threshold

Eq 22

$$v_{inst,3/4HP} = \left[\frac{753\ actual\frac{ft^3}{min}}{90\% * 0.5454ft^2} * \frac{529.67°R}{T_{act}} * \frac{P_{act}}{1013.25\ mbar}\right] + 75\ std\frac{ft}{min}$$

0.0 sfpm — 3/4 HP fan N/A

Sufficient flow in the duct for FTWC venting? ☐ Yes ☐ No ☐ N/A

---

4. EPA full traverse flow measurement performed per procedure 127? ☐ Yes ☐ No ☑ N/A

Actual flow rate measured in duct: _____ acfm

Sufficient flow in the duct for FTWC venting? ☐ Yes ☐ No ☐ N/A

Trending FTWC flow rate

Safety basis flow calculation - uses "-75" sfpm error term to ensure sufficient flow;

EPA compliance calculations do NOT use the "-75" term to ensure conservative emissions calcs.

Constants		
Temp: F to R	459.67	
T-std	529.67	Rankine
P-std	1013.25	mbar
Area	0.5454	ft2
Single-Point Corr Fact	90%	
Sierra Error Bar	-75	std ft/min
Min Flow (Area G, 2 HP)	1476	actual ft3/min
Min Flow (WETF, 3/4 HP)	753	actual ft3/min
flow unit conversion	0.02832	m3 per ft3

Actual flow rate determination

$$\dot{V}_{act} = \left(v_{inst} - 75\ std\frac{ft}{min}\right) * 0.5454\ ft^2 * \left(\frac{T_{act}}{529.67°R}\right) * \left(\frac{1013.25\ mbar}{P_{act}}\right) * 90\%$$

Minimum velocity determination

$$v_{inst,2HP} = \left[\frac{1476\ actual\frac{ft^3}{min}}{90\% * 0.5454 ft^2} * \frac{529.67°R}{T_{act}} * \frac{P_{act}}{1013.25\ mbar}\right] + 75\ std\frac{ft}{min}$$

0.3048 m/ft

Date	Time	Temp deg.F	Pressure mbar	Pressure Adjust mbar	Temp Corr Fact	Press Corr Fact	Sierra Reading std ft/min	Safety Basis Flow Rate act ft3/min	EPA Calcs Flow Rate act ft3/min	EPA Calcs Flow Rate act m3/min	Area G: Safety Basis Min Veloc std ft/min	WETF: Safety Basis Min Veloc std ft/min	Comment / Configuration	CAP88: EPA flow velocity m/s
9/24/2025	07:00	47	810	-6.4	0.957	1.261		(44)	0	0.0	2569	1347	setup gear	
9/24/2025	08:30	49	810	-6.4	0.960	1.261	2790	1,614	1,658	47.0	2559	1342	start ventilation system	15.4
9/24/2025	09:20	53	811	-6.4	0.968	1.259	2780	1,618	1,663	47.1	2542	1334		15.5
9/24/2025	10:03	57	811	-6.4	0.975	1.259	2750	1,613	1,658	47.0	2523	1324		15.4
9/24/2025	11:21	61	811	-6.4	0.983	1.259	2790	1,650	1,695	48.0	2505	1315		15.8
9/24/2025	13:50	66	810	-6.4	0.992	1.261	2680	1,600	1,646	46.6	2478	1301	zero psi. 1-hour wait	15.3
9/24/2025	14:08	68	809	-6.4	0.996	1.262	2690	1,614	1,661	47.0	2466	1295		15.5
9/24/2025	15:16	69	808	-6.4	0.998	1.264	3000	1,811	1,858	52.6	2459	1291	reconfig after switch vac cart	17.3
9/24/2025	16:11	71	808	-6.4	1.002	1.264	3190	1,936	1,983	56.2	2450	1287	evacuating	18.5
9/24/2025	16:30	71	808	-6.4	1.002	1.264	3190	1,936	1,983	56.2	2450	1287	evacuating	18.5
9/24/2025	17:10			-6.4			3190						close valve after evacuation	
9/24/2025	17:23			-6.4			0						fan off / ops day complete	
9/24/2025				-6.4										
9/24/2025				-6.4										
9/24/2025				-6.4										
9/24/2025				-6.4										
9/24/2025				-6.4										
9/24/2025				-6.4										
9/24/2025				-6.4										
9/24/2025				-6.4										
9/24/2025				-6.4										
9/24/2025				-6.4										
9/24/2025				-6.4										

Bubbler Emissions Calcs (usually max flow during ops) 1936 acfm

CAP88 flow: minimum flow for day 1646 acfm 15.3 m/s

Dave Fuehne 9/24/2025 6:27 PM

Emissions Tracking Worksheet

FTWC Venting Process: Day 7

Start date & time	
9/24/2025	7:30

This process emissions tracking:
Page 1 of 3

9/24/2025	17:23
End date & time	

Venting Location: TA 54, Bldg 1028 outside north

Stack Flow Rate *(without safety basis error compensation)*

$\dot{V}_{act}$ = 1658 actual ft^3/min = 46.9 m^3/min

Emitted Activity (Ci) = Concentration ($\mu Ci/m^3$) * Δt (min) * Flow (m^3/min) * 1E6 ($Ci/\mu Ci$)

ctrl+semicolon = inserts date
ctrl+shift+semicolon = inserts time

Total Activity for this sheet (Ci)	
2.575	see sheet 3

Reading		Concentration	Time Interval	Flow Rate	**Emitted Activity**		Running
Date	Time	(µCi/m3)	Δt (min)	(m^3/min)	(µCi)	(Ci)	Total Ci
9/24/2025	08:30:00	12.00	n/a	n/a	n/a	n/a	n/a
9/24/2025	08:33:00	46.00	3.0	46.9	6472	6.47E-03	6.472E-03
9/24/2025	08:34:00	14.00	1.0	46.9	657	6.57E-04	7.129E-03
9/24/2025	08:40:00	11.60	6.0	46.9	3264	3.26E-03	1.039E-02
9/24/2025	08:44:00	11.20	4.0	46.9	2101	2.10E-03	1.249E-02
9/24/2025	08:46:00	11.00	2.0	46.9	1032	1.03E-03	1.353E-02
9/24/2025	08:46:30	384.00	0.5	46.9	9005	9.00E-03	2.253E-02
9/24/2025	08:47:00	803.00	0.5	46.9	18830	1.88E-02	4.136E-02
9/24/2025	08:47:30	941.00	0.5	46.9	22066	2.21E-02	6.343E-02
9/24/2025	08:48:00	1290.00	0.5	46.9	30251	3.03E-02	9.368E-02
9/24/2025	08:48:30	1380.00	0.5	46.9	32361	3.24E-02	1.260E-01
9/24/2025	08:49:00	1500.00	0.5	46.9	35175	3.52E-02	1.612E-01
9/24/2025	08:50:00	1560.00	1.0	46.9	73164	7.32E-02	2.344E-01
9/24/2025	08:51:00	1560.00	1.0	46.9	73164	7.32E-02	3.075E-01
9/24/2025	08:52:00	1420.00	1.0	46.9	66598	6.66E-02	3.741E-01
9/24/2025	08:53:00	1200.00	1.0	46.9	56280	5.63E-02	4.304E-01
9/24/2025	08:54:00	1100.00	1.0	46.9	51590	5.16E-02	4.820E-01
9/24/2025	08:55:00	910.00	1.0	46.9	42679	4.27E-02	5.247E-01
9/24/2025	08:56:00	873.00	1.0	46.9	40944	4.09E-02	5.656E-01
9/24/2025	08:57:00	814.00	1.0	46.9	38177	3.82E-02	6.038E-01
9/24/2025	08:58:00	799.00	1.0	46.9	37473	3.75E-02	6.413E-01
9/24/2025	08:59:00	754.00	1.0	46.9	35363	3.54E-02	6.766E-01
9/24/2025	09:00:00	697.00	1.0	46.9	32689	3.27E-02	7.093E-01
9/24/2025	09:01:00	642.00	1.0	46.9	30110	3.01E-02	7.394E-01
9/24/2025	09:02:00	668.00	1.0	46.9	31329	3.13E-02	7.708E-01
9/24/2025	09:03:00	638.00	1.0	46.9	29922	2.99E-02	8.007E-01
9/24/2025	09:04:00	587.00	1.0	46.9	27530	2.75E-02	8.282E-01
9/24/2025	09:05:00	564.00	1.0	46.9	26452	2.65E-02	8.547E-01
9/24/2025	09:06:00	543.00	1.0	46.9	25467	2.55E-02	8.801E-01
9/24/2025	09:07:00	526.00	1.0	46.9	24669	2.47E-02	9.048E-01

Reading		Concentration	Time Interval	Flow Rate	**Emitted Activity**		Running
Date	Time	(µCi/m3)	Δt (min)	(m^3/min)	(µCi)	(Ci)	Total Ci
9/24/2025	09:08:00	510.00	1.0	46.9	23919	2.39E-02	9.287E-01
9/24/2025	09:09:00	518.00	1.0	46.9	24294	2.43E-02	9.530E-01
9/24/2025	09:10:00	490.00	1.0	46.9	22981	2.30E-02	9.760E-01
9/24/2025	09:11:00	492.00	1.0	46.9	23075	2.31E-02	9.991E-01
9/24/2025	09:12:00	485.00	1.0	46.9	22746	2.27E-02	1.022E+00
9/24/2025	09:13:00	468.00	1.0	46.9	21949	2.19E-02	1.044E+00
9/24/2025	09:14:00	460.00	1.0	46.9	21574	2.16E-02	1.065E+00
9/24/2025	09:15:00	477.00	1.0	46.9	22371	2.24E-02	1.088E+00
9/24/2025	09:16:00	468.00	1.0	46.9	21949	2.19E-02	1.110E+00
9/24/2025	09:17:00	459.00	1.0	46.9	21527	2.15E-02	1.131E+00
9/24/2025	09:18:00	453.00	1.0	46.9	21246	2.12E-02	1.152E+00
9/24/2025	09:19:00	460.00	1.0	46.9	21574	2.16E-02	1.174E+00
9/24/2025	09:20:00	442.00	1.0	47.1	20818	2.08E-02	1.195E+00
9/24/2025	09:21:00	463.00	1.0	47.1	21807	2.18E-02	1.217E+00
9/24/2025	09:23:00	445.00	2.0	47.1	41919	4.19E-02	1.259E+00
9/24/2025	09:25:00	451.00	2.0	47.1	42484	4.25E-02	1.301E+00
9/24/2025	09:27:00	420.00	2.0	47.1	39564	3.96E-02	1.341E+00
9/24/2025	09:29:00	438.00	2.0	47.1	41260	4.13E-02	1.382E+00
9/24/2025	09:31:00	435.00	2.0	47.1	40977	4.10E-02	1.423E+00
9/24/2025	09:33:00	443.00	2.0	47.1	41731	4.17E-02	1.465E+00
9/24/2025	09:35:00	430.00	2.0	47.1	40506	4.05E-02	1.505E+00
9/24/2025	09:37:00	420.00	2.0	47.1	39564	3.96E-02	1.545E+00
9/24/2025	09:39:00	429.00	2.0	47.1	40412	4.04E-02	1.585E+00
9/24/2025	09:41:00	421.00	2.0	47.1	39658	3.97E-02	1.625E+00
9/24/2025	09:43:00	429.00	2.0	47.1	40412	4.04E-02	1.665E+00
9/24/2025	09:45:00	416.00	2.0	47.1	39187	3.92E-02	1.704E+00
9/24/2025	09:47:00	407.00	2.0	47.1	38339	3.83E-02	1.743E+00
9/24/2025	09:52:00	426.00	5.0	47.1	100323	1.00E-01	1.843E+00
9/24/2025	09:57:00	415.00	5.0	47.1	97732	9.77E-02	1.941E+00
9/24/2025	10:02:00	399.00	5.0	47.1	93965	9.40E-02	2.035E+00
9/24/2025	10:07:00	383.00	5.0	47.1	90196	9.02E-02	2.125E+00
9/24/2025	10:12:00	372.00	5.0	47.1	87606	8.76E-02	2.212E+00
9/24/2025	10:17:00	372.00	5.0	47.1	87606	8.76E-02	2.300E+00
9/24/2025	10:22:00	363.00	5.0	47.1	85486	8.55E-02	2.386E+00
9/24/2025	10:25:00	333.00	3.0	47.1	47053	4.71E-02	2.433E+00
9/24/2025	10:28:00	300.00	3.0	47.1	42390	4.24E-02	2.475E+00
9/24/2025	10:30:00	229.00	2.0	47.1	21572	2.16E-02	2.497E+00
9/24/2025	10:31:00	155.00	1.0	47.1	7301	7.30E-03	2.504E+00
9/24/2025	10:32:00	110.00	1.0	47.1	5181	5.18E-03	2.509E+00
9/24/2025	10:33:00	60.00	1.0	47.1	2826	2.83E-03	2.512E+00
9/24/2025	10:34:00	20.70	1.0	47.1	975	9.75E-04	2.513E+00
9/24/2025	10:35:00	12.10	1.0	47.1	570	5.70E-04	2.513E+00
9/24/2025	10:45:00	9.80	10.0	47.1	4616	4.62E-03	2.518E+00
9/24/2025	10:55:00	9.04	10.0	47.1	4258	4.26E-03	2.522E+00
9/24/2025	11:05:00	9.68	10.0	47.1	4559	4.56E-03	2.527E+00
9/24/2025	11:15:00	8.77	10.0	47.1	4131	4.13E-03	2.531E+00
9/24/2025	11:28:00	10.80	13.0	48.0	6739	6.74E-03	2.538E+00

Reading		Concentration	Time Interval	Flow Rate	**Emitted Activity**		Running
Date	Time	(µCi/m3)	Δt (min)	(m^3/min)	(µCi)	(Ci)	Total Ci
9/24/2025	11:29:00	17.50	1.0	48.0	840	8.40E-04	2.539E+00
9/24/2025	11:29:30	137.00	0.5	48.0	3288	3.29E-03	2.542E+00
9/24/2025	11:30:00	175.00	0.5	48.0	4200	4.20E-03	2.546E+00
9/24/2025	11:30:30	201.00	0.5	48.0	4824	4.82E-03	2.551E+00
9/24/2025	11:31:00	223.00	0.5	48.0	5352	5.35E-03	2.556E+00
9/24/2025	11:31:30	247.00	0.5	48.0	5928	5.93E-03	2.562E+00
9/24/2025	11:32:00	266.00	0.5	48.0	6384	6.38E-03	2.569E+00
9/24/2025	11:32:30	272.00	0.5	48.0	6528	6.53E-03	2.575E+00
9/24/2025							
9/24/2025	move						
9/24/2025	to						
9/24/2025	next						
9/24/2025	sheet						
9/24/2025							
9/24/2025							

Emissions Tracking Worksheet

FTWC Venting Process: Day 7

Start date & time	
9/24/2025	7:30

This process emissions tracking:

Page 2 of 3

9/24/2025	17:23
End date & time	

Venting Location: TA 54, Bldg 1028 outside north

Stack Flow Rate *(without safety basis error compensation)*

$\dot{V}_{act}$ = 1695 actual ft^3/min = 48.0 m^3/min

Emitted Activity (Ci) = Concentration ($\mu Ci/m^3$) * Δt (min) * Flow (m^3/min) * 1E6 ($Ci/\mu Ci$)

ctrl+semicolon = inserts date
ctrl+shift+semicolon = inserts time

Total Activity for this sheet (Ci)	2.537
Total activity - all sheets	~~5.112~~ see sheet3

Reading		Concentration	Time Interval	Flow Rate	**Emitted Activity**		Running
Date	Time	(µCi/m3)	Δt (min)	(m^3/min)	(µCi)	(Ci)	Total Ci
9/24/2025	11:32:30	272.00	n/a	n/a	n/a	n/a	n/a
9/24/2025	11:33:00	272.00	0.5	48.0	6528	0.006528	2.582E+00
9/24/2025	11:33:30	285.00	0.5	48.0	6840	0.006840	2.588E+00
9/24/2025	11:34:00	288.00	0.5	48.0	6912	0.006912	2.595E+00
9/24/2025	11:34:30	290.00	0.5	48.0	6960	0.006960	2.602E+00
9/24/2025	11:35:00	289.00	0.5	48.0	6936	0.006936	2.609E+00
9/24/2025	11:35:30	299.00	0.5	48.0	7176	0.007176	2.616E+00
9/24/2025	11:36:00	290.00	0.5	48.0	6960	0.006960	2.623E+00
9/24/2025	11:36:30	290.00	0.5	48.0	6960	0.006960	2.630E+00
9/24/2025	11:37:00	302.00	0.5	48.0	7248	0.007248	2.638E+00
9/24/2025	11:38:00	301.00	1.0	48.0	14448	0.014448	2.652E+00
9/24/2025	11:39:00	302.00	1.0	48.0	14496	0.014496	2.667E+00
9/24/2025	11:40:00	305.00	1.0	48.0	14640	0.014640	2.681E+00
9/24/2025	11:41:00	303.00	1.0	48.0	14544	0.014544	2.696E+00
9/24/2025	11:46:00	299.00	5.0	48.0	71760	0.071760	2.767E+00
9/24/2025	11:51:00	283.00	5.0	48.0	67920	0.067920	2.835E+00
9/24/2025	12:00:00	262.00	9.0	48.0	113184	0.113184	2.949E+00
9/24/2025	12:10:00	257.00	10.0	48.0	123360	0.123360	3.072E+00
9/24/2025	12:20:00	249.00	10.0	48.0	119520	0.119520	3.191E+00
9/24/2025	12:30:00	232.00	10.0	48.0	111360	0.111360	3.303E+00
9/24/2025	12:40:00	217.00	10.0	48.0	104160	0.104160	3.407E+00
9/24/2025	12:50:00	206.00	10.0	48.0	98880	0.098880	3.506E+00
9/24/2025	13:00:00	196.00	10.0	48.0	94080	0.094080	3.600E+00
9/24/2025	13:10:00	179.00	10.0	48.0	85920	0.085920	3.686E+00
9/24/2025	13:20:00	172.00	10.0	48.0	82560	0.082560	3.768E+00
9/24/2025	13:33:00	156.00	13.0	48.0	97344	0.097344	3.866E+00
9/24/2025	13:41:00	44.00	8.0	48.0	16896	0.016896	3.883E+00
9/24/2025	13:44:00	8.74	3.0	48.0	1259	0.001259	3.884E+00
9/24/2025	14:00:00	9.06	16.0	48.0	6958	0.006958	3.891E+00
9/24/2025	14:20:00	8.87	20.0	48.0	8515	0.008515	3.899E+00

Reading		Concentration	Time Interval	Flow Rate	**Emitted Activity**		Running
Date	Time	(µCi/m3)	Δt (min)	(m^3/min)	(µCi)	(Ci)	Total Ci
9/24/2025	14:40:00	8.18	20.0	48.0	7853	0.007853	3.907E+00
9/24/2025	14:46:00	1300.00	6.0	48.0	374400	0.374400	4.282E+00
9/24/2025	14:47:00	599.00	1.0	48.0	28752	0.028752	4.310E+00
9/24/2025	14:48:00	384.00	1.0	48.0	18432	0.018432	4.329E+00
9/24/2025	14:48:30	1100.00	0.5	48.0	26400	2.64E-02	4.355E+00
9/24/2025	14:49:00	468.00	0.5	48.0	11232	1.12E-02	4.366E+00
9/24/2025	14:49:30	338.00	0.5	48.0	8112	8.11E-03	4.375E+00
9/24/2025	14:50:00	1120.00	0.5	48.0	26880	2.69E-02	4.401E+00
9/24/2025	14:50:30	1640.00	0.5	48.0	39360	3.94E-02	4.441E+00
9/24/2025	14:51:00	1820.00	0.5	48.0	43680	4.37E-02	4.485E+00
9/24/2025	14:51:30	470.00	0.5	48.0	11280	1.13E-02	4.496E+00
9/24/2025	14:52:30	223.00	1.0	48.0	10704	1.07E-02	4.506E+00
9/24/2025	14:53:00	964.00	0.5	48.0	23136	2.31E-02	4.530E+00
9/24/2025	14:53:30	1030.00	0.5	48.0	24720	2.47E-02	4.554E+00
9/24/2025	14:54:00	380.00	0.5	48.0	9120	9.12E-03	4.563E+00
9/24/2025	14:54:30	1090.00	0.5	48.0	26160	2.62E-02	4.590E+00
9/24/2025	14:55:00	1350.00	0.5	48.0	32400	3.24E-02	4.622E+00
9/24/2025	14:55:30	1100.00	0.5	48.0	26400	2.64E-02	4.648E+00
9/24/2025	14:56:00	525.00	0.5	48.0	12600	1.26E-02	4.661E+00
9/24/2025	14:56:30	1230.00	0.5	48.0	29520	2.95E-02	4.691E+00
9/24/2025	14:57:00	405.00	0.5	48.0	9720	9.72E-03	4.700E+00
9/24/2025	14:57:30	110.00	0.5	48.0	2640	2.64E-03	4.703E+00
9/24/2025	14:58:00	11.80	0.5	48.0	283	2.83E-04	4.703E+00
9/24/2025	14:59:00	538.00	1.0	48.0	25824	2.58E-02	4.729E+00
9/24/2025	14:59:30	1500.00	0.5	48.0	36000	3.60E-02	4.765E+00
9/24/2025	15:00:00	2520.00	0.5	48.0	60480	6.05E-02	4.825E+00
9/24/2025	15:00:30	1130.00	0.5	48.0	27120	2.71E-02	4.853E+00
9/24/2025	15:01:00	1800.00	0.5	48.0	43200	4.32E-02	4.896E+00
9/24/2025	15:01:30	1990.00	0.5	48.0	47760	4.78E-02	4.944E+00
9/24/2025	15:02:00	2310.00	0.5	48.0	55440	5.54E-02	4.999E+00
9/24/2025	15:02:30	2420.00	0.5	48.0	58080	5.81E-02	5.057E+00
9/24/2025	15:03:00	314.00	0.5	48.0	7536	7.54E-03	5.065E+00
9/24/2025	15:04:00	157.00	1.0	48.0	7536	7.54E-03	5.072E+00
9/24/2025	15:05:00	9.66	1.0	48.0	464	4.64E-04	5.073E+00
9/24/2025	15:06:00	9.33	1.0	48.0	448	4.48E-04	5.073E+00
9/24/2025	15:07:00	13.00	1.0	48.0	624	6.24E-04	5.07E+00
9/24/2025	15:09:00	8.99	2.0	48.0	863	8.63E-04	5.07E+00
9/24/2025	15:10:00	105.00	1.0	48.0	5040	5.04E-03	5.08E+00
9/24/2025	15:10:30	14.10	0.5	48.0	338	3.38E-04	5.08E+00
9/24/2025	15:11:00	12.90	0.5	48.0	310	3.10E-04	5.08E+00
9/24/2025	15:12:00	13.70	1.0	48.0	658	6.58E-04	5.08E+00
9/24/2025	15:12:30	27.70	0.5	48.0	665	6.65E-04	5.08E+00
9/24/2025	15:13:00	9.88	0.5	48.0	237	2.37E-04	5.08E+00
9/24/2025	15:14:00	8.74	1.0	48.0	420	4.20E-04	5.08E+00
9/24/2025	15:15:00	8.80	1.0	48.0	422	4.22E-04	5.08E+00
9/24/2025	15:19:00	8.53	4.0	51.6	1761	1.76E-03	5.08E+00
9/24/2025	15:20:00	41.40	1.0	51.6	2136	2.14E-03	5.09E+00

Reading		Concentration	Time Interval	Flow Rate	**Emitted Activity**		Running
Date	Time	(µCi/m3)	Δt (min)	(m^3/min)	(µCi)	(Ci)	Total Ci
9/24/2025	15:21:00	59.90	1.0	51.6	3091	3.09E-03	5.09E+00
9/24/2025	15:21:30	55.00	0.5	51.6	1419	1.42E-03	5.09E+00
9/24/2025	15:22:00	12.90	0.5	52.6	339	3.39E-04	5.09E+00
9/24/2025	15:23:00	8.45	1.0	52.6	444	4.44E-04	5.09E+00
9/24/2025	15:24:00	8.47	1.0	52.6	446	4.46E-04	5.09E+00
9/24/2025	15:25:00	7.99	1.0	52.6	420	4.20E-04	5.09E+00
9/24/2025	15:26:00	7.96	1.0	52.6	419	4.19E-04	5.09E+00
9/24/2025	15:27:00	7.95	1.0	52.6	418	4.18E-04	5.09E+00
9/24/2025	15:28:00	7.87	1.0	52.6	414	4.14E-04	5.09E+00
9/24/2025	15:29:00	7.80	1.0	52.6	410	4.10E-04	5.09E+00
9/24/2025	15:54:00	7.90	25.0	52.6	10388	1.04E-02	5.10E+00
9/24/2025	15:58:00	13.50	4.0	52.6	2840	2.84E-03	5.11E+00
9/24/2025	16:00:00	7.66	2.0	52.6	806	8.06E-04	5.11E+00
9/24/2025	16:02:00	14.00	2.0	52.6	1473	1.47E-03	5.11E+00
9/24/2025	16:03:00	41.90	1.0	52.6	2204	2.20E-03	5.11E+00

Emissions Tracking Worksheet

FTWC Venting Process: Day 7

Start date & time	
9/24/2025	7:30

This process emissions tracking:
Page 3 of 3

9/24/2025	17:23
End date & time	

Venting Location: TA 54, Bldg 1028 outside north

Stack Flow Rate *(without safety basis error compensation)*

$\dot{V}_{act}$ = 1658.32359 actual ft^3/min = 47.0 m^3/min

Emitted Activity (Ci) = Concentration ($\mu Ci/m^3$) * Δt (min) * Flow (m^3/min) * 1E6 ($Ci/\mu Ci$)

ctrl+semicolon = inserts date
ctrl+shift+semicolon = inserts time

Total Activity for this sheet (Ci)	4.609
Total activity - all sheets	9.721

D. Fuehne
9/24/2025 18:28

Reading		Concentration	Time Interval	Flow Rate	**Emitted Activity**		Running
Date	Time	($\mu Ci/m3$)	Δt (min)	(m^3/min)	(μCi)	(Ci)	Total Ci
9/24/2025	16:03:00	41.90	n/a	n/a	n/a	n/a	n/a
9/24/2025	16:04:00	357.00	1.0	52.6	18778	1.88E-02	5.13E+00
9/24/2025	16:05:00	180.00	1.0	52.6	9468	9.47E-03	5.14E+00
9/24/2025	16:06:00	9.70	1.0	52.6	510	5.10E-04	5.14E+00
9/24/2025	16:07:00	9.60	1.0	52.6	505	5.05E-04	5.14E+00
9/24/2025	16:07:30	4510.00	0.5	52.6	118613	1.19E-01	5.26E+00
9/24/2025	16:08:00	7590.00	0.5	52.6	199617	2.00E-01	5.46E+00
9/24/2025	16:08:30	8840.00	0.5	52.6	232492	2.32E-01	5.69E+00
9/24/2025	16:09:00	10500.00	0.5	52.6	276150	2.76E-01	5.97E+00
9/24/2025	16:09:30	11000.00	0.5	52.6	289300	2.89E-01	6.26E+00
9/24/2025	16:10:00	10200.00	0.5	52.6	268260	2.68E-01	6.53E+00
9/24/2025	16:11:00	9140.00	1.0	52.6	480764	4.81E-01	7.01E+00
9/24/2025	16:12:00	7370.00	1.0	56.2	414194	4.14E-01	7.42E+00
9/24/2025	16:13:00	6180.00	1.0	56.2	347316	3.47E-01	7.77E+00
9/24/2025	16:14:00	5010.00	1.0	56.2	281562	2.82E-01	8.05E+00
9/24/2025	16:15:00	3190.00	1.0	56.2	179278	1.79E-01	8.23E+00
9/24/2025	16:16:00	2920.00	1.0	56.2	164104	1.64E-01	8.39E+00
9/24/2025	16:17:00	2490.00	1.0	56.2	139938	1.40E-01	8.53E+00
9/24/2025	16:18:00	2310.00	1.0	56.2	129822	1.30E-01	8.66E+00
9/24/2025	16:20:00	1720.00	2.0	56.2	193328	1.93E-01	8.86E+00
9/24/2025	16:22:00	1370.00	2.0	56.2	153988	1.54E-01	9.01E+00
9/24/2025	16:24:00	969.00	2.0	56.2	108916	1.09E-01	9.12E+00
9/24/2025	16:29:00	619.00	5.0	56.2	173939	1.74E-01	9.29E+00
9/24/2025	16:32:00	466.00	3.0	56.2	78568	7.86E-02	9.37E+00
9/24/2025	16:35:00	394.00	3.0	56.2	66428	6.64E-02	9.44E+00
9/24/2025	16:40:00	277.00	5.0	56.2	77837	7.78E-02	9.52E+00
9/24/2025	16:45:00	181.00	5.0	56.2	50861	5.09E-02	9.57E+00
9/24/2025	16:50:00	159.00	5.0	56.2	44679	4.47E-02	9.61E+00
9/24/2025	16:56:00	110.00	6.0	56.2	37092	3.71E-02	9.65E+00
9/24/2025	17:00:00	90.80	4.0	56.2	20412	2.04E-02	9.67E+00

Reading		Concentration	Time Interval	Flow Rate	**Emitted Activity**		Running
Date	Time	(µCi/m3)	Δt (min)	(m^3/min)	(µCi)	(Ci)	Total Ci
9/24/2025	17:05:00	98.10	5.0	56.2	27566	2.76E-02	9.70E+00
9/24/2025	17:10:00	64.90	5.0	56.2	18237	1.82E-02	9.71E+00
9/24/2025	17:13:00	9.55	3.0	56.2	1610	1.61E-03	9.72E+00
9/24/2025	17:15:00	9.14	2.0	56.2	1027	1.03E-03	9.72E+00
9/24/2025	17:23:00	8.48	8.0	56.2	3813	3.81E-03	9.72E+00
9/24/2025	***End Ops***						
9/24/2025	***17:10:00***						
9/24/2025	***Fan off***						
9/24/2025	***17:23:00***						

Use this sheet for evaluation of a single release.
yellow = required field for proper calc | blue = optional data for complete report

Emissions from:	**TA - 54**	**Bldg - 1028**	**ES - FT**

Emissions calculation date: 10/30/2025 | HPAL barcode #:

	date	time
Time sample started:	24-Sep-2025	7:27 AM
Time sample ended:	24-Sep-2025	5:32 PM
Length of sample period:	10.1	HRS
Sample period downtime:	0.0	HRS

RADAIR Report Period ID:
Bubbler response (catalyst efficiency for HT): 1.00 | Cal Date: | Expires:

Bubbler flow rate	121	mL/min	at STP
	150	**mL/min**	at altitude
	5.30E-03	cfm	at altitude
	9.08E+04	mL/sample period	at altitude
FTWC flow rate (daily max)	1,936	cfm	
	3.32E+10	mL/sample period	at altitude
Ratio of flow rates:	3.65E+05	= (stack flow)/(sample flow)	

FTWC	*1,476 min*
	1,800 max

Weight of glycol and water in vials

	Full Wt	Vial Wt	Glycol Wt
W_1 (g)	116.49	83.80	32.7
W_2 (g)	114.49	82.00	32.5
W_3 (g)	109.41	84.20	25.2
W_4 (g)	115.99	82.40	33.6
W_5 (g)	115.59	83.10	32.5
W_6 (g)	116.13	83.60	32.5

Volume of glycol and water in vials

V_1	29.4	mL
V_2	29.2	mL
V_3	22.6	mL
V_4	30.2	mL
V_5	29.2	mL
V_6	29.2	mL

assumes glycol & water density of 1.113 g/mL

Typical weights
36 g avg
54 g max

Activity concentration in vials

C_1	8.48E+00	µCi/L
C_2	3.80E-03	µCi/L
C_3	2.50E-03	µCi/L
C_4	5.57E+02	µCi/L
C_5	4.22E+00	µCi/L
C_6	6.10E-03	µCi/L
bkgnd		µCi/L

*no value indicates less than MDA

Activity in vials

A_1	2.49E-01	µCi
A_2	1.11E-04	µCi
A_3	5.66E-05	µCi
A_4	1.68E+01	µCi
A_5	1.23E-01	µCi
A_6	1.78E-04	µCi

OK to analyze single vial.
Enter known values;
calcs are independent
of number of vials

MDA = 0.01 uCi/L

If there were any bubbler performance tests during this period:
HTO Stacked during Cal | HT Stacked during cal:
Ignore if no bubbler tests took place.

Activity of H-3 emitted from stack for given time period:
HTO 9.11E-02 Ci (includes response factor)
HT 6.19E+00 Ci (includes response factor)
Calculation based on operating times; allows for downtime

Based on flow ratio only:
6.28E+00 total Ci released
9.11E-02 Ci HTO
6.19E+00 Ci HT

Notes: 6.28E+00 total curies emitted

Report by: Rebecca Lattin **Signature:** _____ Date 9/24/2025

Review by: Dave Fuehne **Signature:** _____ Date 9/24/2025

Appendix A.8

Daily Operations Spreadsheets

Day 08

September 25, 2025

- Daily Limit Calculations
- Flow Rate Calculation
- Flow Rate Trending
- Emissions Tracking Log
- Bubbler Emissions Calculation

Daily Emissions Calculation Worksheet

This worksheet calculates emissions hold points and limits based on operations to-date

To QUICKLY insert the current date and time, press Ctrl+; (semi-colon) to add the date,
then press Space, then press Ctrl+Shift-; (semi-colon) to add the time

			Date	Time
Venting Process #	Day 8	Start of operations	9/25/2025	8:00
WCATS ID:	229 - evac	End of operations	9/25/2025	15:21
Venting Location:	TA 54, Bldg 1028 outside north			

Integrated FTWC Dose (IFD) from previous venting: IFD = 0.0035 mrem *enter 0 if this is first venting operations.*

Calculate Today's Limi & Hold points:

CAP88 Planning Dose Conversation Factor: DCF_p = 3.33E-04 mrem/Ci

Dose Limit:	mrem 6	mrem (IFD) 0.0035		DL mrem 5.9965	
Corresponding Curie Limit:		DL/DCF_p (Ci)	1.801E+04		18,008 curies
Pause For Approval Dose:	mrem 4	mrem (IFD) 0.0035		PFA mrem 3.9965	
Pause for Approval (Ci)		PFA/DFC_p (Ci)	1.200E+04		12,002 curies
Pause for Evaluation Dose:	mrem 2	mrem (IFD) 0.0035		PFED mrem 1.9965	
Pause for Approval (Ci)		$PFED/DFC_p$ (Ci)	5.995E+03		5,995 curies

Concurrance limit for EPC-ES Dose Assessment: (Date/Time/Initial) via text msg

These limits communicated to the FTWC Venting PIC: (Date/Time/Initial) RL to DH 9/25/25/07:18

Current Venting Operation Date:

	Latitude	Longitude
GPS Coordinates of stack:	same as Day 1	

Stack exhaust flow rate: 1505 acfm

Basis for flow rate determination: Sierra 620s

4.3 Documentation of FTWC Flow Rate

Date:	9/25/2025	Location:	54-1028. 229 evac	☑ 2 HP System	☐ 3/4 HP System	TRUE

1. Duct Setup per IWD? ☑ Yes ☐ No

this is flow rate at start of day.
See "flow trending" sheet for updates during day
-D.Fuehne 9/25/2025

Tested Duct Configuration:
1.Stack
2. Blower
3. Short 12" section
4. Long 5' section w/ rad monitoring
5. Long 5' sectoin w/ Sierra 620
6. short 12" section w/ FTWC inject

---

2. Bounding Condition: minimum velocity achieved on Sierra 620 using worst-case pressure & temp:

2 HP System:
2680 sfpm on Sierra 620 = 1476 acfm in duct ☐ Yes ☐ No ☐ N/A

3/4 HP System:
1404 sfpm on Sierra 620 = 753 acfm in duct ☐ Yes ☐ No ☑ N/A

3.

	˚F	˚R		˚F	˚R
T_{act} :	43	502.67	T_{std} :	70	529.67
	mbar			mbar	
P_{act} :	809		P_{std} :	1013.25	

$\frac{T_{act}}{T_{std}} =$ 0.949

$\frac{P_{std}}{P_{act}} =$ 1.262

Pressure Correction: -3.4 mbar for every 100ft difference above reference barometer.

TA-6 weather station:	7424 ft	**-6.4 mbar from TA-54**
TA-54 weather station:	6548 ft	23.4 mbar from TA-6
TA-54 -1028:	~ 6735 ft	8.5 mbar from TA-6 to TA-49
WETF dock :	~ 7608 ft	-6.3 mbar from TA-6

Type Pressure corrrection here: -6.4

Use Equation 18 to determine flow rate through the duct, based on Sierra 620 reading.

$$\dot{V}_{act} = \left(v_{inst} - 75\ std\ \frac{ft}{min}\right) * 0.5454\ ft^2 * \left(\frac{T_{act}}{529.67°R}\right) * \left(\frac{1013.25\ mbar}{P_{act}}\right) * 90\%$$

υ_{inst} 2609 std ft/min

$\frac{T_{act}}{T_{std}} =$	0.949
$\frac{P_{std}}{P_{act}} =$	1.262

Safety Basis value (WETF-26)

$\dot{V}_{act}$ = 1490.3 actual ft^3/min for Safety Basis concerns

EPA emissions calcs value

$\dot{V}_{act}$ = 1534.4 actual ft^3/min for stack emissions calculations
(disregards 75 fpm error term; conservative)

Use equation 21 and 22 to determine minimum Seirra 620 reading based on limiting flows in the different duct systems (using 2HP or 3/4Hp blower)

Eq 21

$$v_{inst,2HP} = \left[\frac{1476\ actual\frac{ft^3}{min}}{90\% * 0.5454ft^2} * \frac{529.67°R}{T_{act}} * \frac{P_{act}}{1013.25\ mbar}\right] + 75\ std\frac{ft}{min}$$

2584.8 sfpm — 2 HP fan Threshold

Eq 22

$$v_{inst,3/4HP} = \left[\frac{753\ actual\frac{ft^3}{min}}{90\% * 0.5454ft^2} * \frac{529.67°R}{T_{act}} * \frac{P_{act}}{1013.25\ mbar}\right] + 75\ std\frac{ft}{min}$$

0.0 sfpm — 3/4 HP fan N/A

Sufficient flow in the duct for FTWC venting? ☐ Yes ☐ No ☐ N/A

---

4. EPA full traverse flow measurement performed per procedure 127? ☐ Yes ☐ No ☑ N/A

Actual flow rate measured in duct: _____ acfm

Sufficient flow in the duct for FTWC venting? ☐ Yes ☐ No ☐ N/A

Trending FTWC flow rate

Safety basis flow calculation - uses "-75" sfpm error term to ensure sufficient flow;

EPA compliance calculations do NOT use the "-75" term to ensure conservative emissions calcs.

Constants		
Temp: F to R	459.67	
T-std	529.67	Rankine
P-std	1013.25	mbar
Area	0.5454	ft2
Single-Point Corr Fact	90%	
Sierra Error Bar	-75	std ft/min
Min Flow (Area G, 2 HP)	1476	actual ft3/min
Min Flow (WETF, 3/4 HP)	753	actual ft3/min
flow unit conversion	0.02832	m3 per ft3

Actual flow rate determination

$$\dot{V}_{act} = \left(v_{inst} - 75\ std\frac{ft}{min}\right) * 0.5454\ ft^2 * \left(\frac{T_{act}}{529.67°R}\right) * \left(\frac{1013.25\ mbar}{P_{act}}\right) * 90\%$$

Minimum velocity determination

$$v_{inst,2HP} = \left[\frac{1476\ actual\frac{ft^3}{min}}{90\% * 0.5454 ft^2} * \frac{529.67°R}{T_{act}} * \frac{P_{act}}{1013.25\ mbar}\right] + 75\ std\frac{ft}{min}$$

0.3048 m/ft

Date	Time	Temp deg.F	Pressure mbar	Pressure Adjust mbar	Temp Corr Fact	Press Corr Fact	Sierra Reading std ft/min	Safety Basis Flow Rate act ft3/min	EPA Calcs Flow Rate act ft3/min	EPA Calcs Flow Rate act m3/min	Area G: Safety Basis Min Veloc std ft/min	WETF: Safety Basis Min Veloc std ft/min	Comment / Configuration	CAP88: EPA flow velocity m/s
9/25/2025	07:03	43	809	-6.4	0.949	1.262	0	(44)	0	0.0	2585	1356	equip setup	0.0
9/25/2025	08:15	48	809	-6.4	0.958	1.262	2609	1,505	1,550	43.9	2561	1343		14.4
9/25/2025	08:23	48	809	-6.4	0.958	1.262	2650	1,529	1,574	44.6	2561	1343	Pressure bleed started	14.7
9/25/2025	09:11	55	810	-6.4	0.972	1.261	2650	1,549	1,594	45.1	2530	1328	stable rad; He pressure bleed	14.8
9/25/2025	10:40	58	810	-6.4	0.977	1.261	2630	1,546	1,591	45.0	2516	1320		14.8
9/25/2025	11:35	63	809	-6.4	0.987	1.262	2660	1,581	1,627	46.1	2489	1307		15.2
9/25/2025	12:38	67	809	-6.4	0.994	1.262	2630	1,574	1,621	45.9	2471	1298		15.1
9/25/2025	14:05	73	807	-6.4	1.006	1.266	2580	1,565	1,612	45.6	2438	1281	about to start 229 evacuation	15.0
9/25/2025	15:03	74	806	-6.4	1.008	1.267	2580	1,570	1,617	45.8	2431	1277	about 5 mins left in evac	15.1
9/25/2025	15:08	74	806	-6.4	1.008	1.267	2580	1,570	1,617	45.8	2431	1277	valve closed, pump off	15.1
9/25/2025	15:15			-6.4									begin equip breakdown	
9/25/2025	15:21			-6.4									all background/fan off	
9/25/2025				-6.4										
9/25/2025				-6.4										
9/25/2025				-6.4										
9/25/2025				-6.4										
9/25/2025				-6.4										
9/25/2025				-6.4										
9/25/2025				-6.4										
9/25/2025				-6.4										
9/25/2025				-6.4										
9/25/2025				-6.4										
9/25/2025				-6.4										

Bubbler Emissions Calcs (usually max flow during ops) 1627 actual ft3/min

CAP88 flow: minimum flow for day 1550 acfm = 14.4 m/sec

Emissions Tracking Worksheet

FTWC Venting Process: Day 8

Start date & time	
9/25/2025	8:00

This process emissions tracking:
Page 1 of 1

9/25/2025	15:21
End date & time	

Venting Location: TA 54, Bldg 1028 outside north

Stack Flow Rate *(without safety basis error compensation)*

$\dot{V}_{act}$ = 1534.35824 actual ft^3/min = 43.4 m^3/min

Emitted Activity (Ci) = Concentration ($\mu Ci/m^3$) * Δt (min) * Flow (m^3/min) * 1E6 ($Ci/\mu Ci$)

ctrl+semicolon = inserts date
ctrl+shift+semicolon = inserts time

Total Activity for this sheet (Ci)
1.501

Reading		Concentration	Time Interval	Flow Rate	**Emitted Activity**		Running
Date	Time	(µCi/m3)	Δt (min)	(m^3/min)	(µCi)	(Ci)	Total Ci
9/25/2025	08:02:00	9.84	n/a	n/a	n/a	n/a	n/a
9/25/2025	08:16:00	10.20	14.0	43.9	6269	6.27E-03	6.27E-03
9/25/2025	08:17:00	26.90	1.0	43.9	1181	1.18E-03	7.45E-03
9/25/2025	08:18:00	9.70	1.0	43.9	426	4.26E-04	7.88E-03
9/25/2025	08:22:00	9.90	4.0	43.9	1738	1.74E-03	9.61E-03
9/25/2025	08:26:00	1740.00	4.0	44.6	310416	3.10E-01	3.20E-01
9/25/2025	08:28:00	1600.00	2.0	44.6	142720	1.43E-01	4.63E-01
9/25/2025	08:29:00	1330.00	1.0	44.6	59318	5.93E-02	5.22E-01
9/25/2025	08:30:00	952.00	1.0	44.6	42459	4.25E-02	5.65E-01
9/25/2025	08:31:00	778.00	1.0	44.6	34699	3.47E-02	5.99E-01
9/25/2025	08:32:00	703.00	1.0	44.6	31354	3.14E-02	6.31E-01
9/25/2025	08:33:00	466.00	1.0	44.6	20784	2.08E-02	6.51E-01
9/25/2025	08:34:00	347.00	1.0	44.6	15476	1.55E-02	6.67E-01
9/25/2025	08:35:00	223.00	1.0	44.6	9946	9.95E-03	6.77E-01
9/25/2025	08:36:00	192.00	1.0	44.6	8563	8.56E-03	6.85E-01
9/25/2025	08:41:00	74.60	5.0	44.6	16636	1.66E-02	7.02E-01
9/25/2025	08:45:00	52.60	4.0	44.6	9384	9.38E-03	7.11E-01
9/25/2025	08:50:00	43.30	5.0	44.6	9656	9.66E-03	7.21E-01
9/25/2025	08:55:00	40.70	5.0	44.6	9076	9.08E-03	7.30E-01
9/25/2025	09:00:00	37.20	5.0	44.6	8296	8.30E-03	7.38E-01
9/25/2025	09:05:00	37.30	5.0	44.6	8318	8.32E-03	7.47E-01
9/25/2025	09:10:00	35.20	5.0	44.6	7850	7.85E-03	7.55E-01
9/25/2025	09:20:00	32.80	10.0	45.1	14793	1.48E-02	7.69E-01
9/25/2025	09:30:00	29.60	10.0	45.1	13350	1.33E-02	7.83E-01
9/25/2025	09:35:00	31.30	5.0	45.1	7058	7.06E-03	7.90E-01
9/25/2025	09:36:00	10.70	1.0	45.1	483	4.83E-04	7.90E-01
9/25/2025	09:38:00	8.69	2.0	45.1	784	7.84E-04	7.91E-01
9/25/2025	09:40:00	8.38	2.0	45.1	756	7.56E-04	7.92E-01
9/25/2025	10:00:00	8.21	20.0	45.1	7405	7.41E-03	7.99E-01
9/25/2025	10:20:00	8.10	20.0	45.1	7306	7.31E-03	8.06E-01

Reading		Concentration	Time Interval	Flow Rate	**Emitted Activity**		Running
Date	Time	(µCi/m3)	Δt (min)	(m^3/min)	(µCi)	(Ci)	Total Ci
9/25/2025	10:40:00	8.03	20.0	45.1	7243	7.24E-03	8.14E-01
9/25/2025	10:40:30	23.90	0.5	45.1	539	5.39E-04	8.14E-01
9/25/2025	10:41:00	28.70	0.5	45.1	647	6.47E-04	8.15E-01
9/25/2025	10:41:30	29.60	0.5	45.1	667	6.67E-04	8.16E-01
9/25/2025	10:42:00	30.00	0.5	45.1	677	6.77E-04	8.16E-01
9/25/2025	10:43:00	27.80	1.0	45.1	1254	1.25E-03	8.18E-01
9/25/2025	10:44:00	27.90	1.0	45.1	1258	1.26E-03	8.19E-01
9/25/2025	10:45:00	28.30	1.0	45.1	1276	1.28E-03	8.20E-01
9/25/2025	10:50:00	29.70	5.0	45.1	6697	6.70E-03	8.27E-01
9/25/2025	10:55:00	29.20	5.0	45.1	6585	6.58E-03	8.33E-01
9/25/2025	11:00:00	29.00	5.0	45.1	6540	6.54E-03	8.40E-01
9/25/2025	11:05:00	27.90	5.0	45.1	6291	6.29E-03	8.46E-01
9/25/2025	11:10:00	25.30	5.0	45.1	5705	5.71E-03	8.52E-01
9/25/2025	11:15:00	25.90	5.0	45.1	5840	5.84E-03	8.58E-01
9/25/2025	11:20:00	25.60	5.0	45.1	5773	5.77E-03	8.63E-01
9/25/2025	11:30:00	24.10	10.0	45.1	10869	1.09E-02	8.74E-01
9/25/2025	11:40:00	22.10	10.0	46.1	10188	1.02E-02	8.85E-01
9/25/2025	11:50:00	22.10	10.0	46.1	10188	1.02E-02	8.95E-01
9/25/2025	12:00:00	20.70	10.0	46.1	9543	9.54E-03	9.04E-01
9/25/2025	12:10:00	20.40	10.0	46.1	9404	9.40E-03	9.14E-01
9/25/2025	12:20:00	18.50	10.0	46.1	8529	8.53E-03	9.22E-01
9/25/2025	12:30:00	18.60	10.0	46.1	8575	8.57E-03	9.31E-01
9/25/2025	12:40:00	17.60	10.0	46.1	8114	8.11E-03	9.39E-01
9/25/2025	12:58:00	16.00	18.0	46.1	13277	1.33E-02	9.52E-01
9/25/2025	13:03:00	8.64	5.0	46.1	1992	1.99E-03	9.54E-01
9/25/2025	13:30:00	8.10	27.0	46.1	10082	1.01E-02	9.64E-01
9/25/2025	14:00:00	8.44	30.0	46.1	11673	1.17E-02	9.76E-01
9/25/2025	14:05:00	11.90	5.0	46.1	2743	2.74E-03	9.79E-01
9/25/2025	14:06:00	195.00	1.0	46.1	8990	8.99E-03	9.88E-01
9/25/2025	14:07:00	360.00	1.0	46.1	16596	1.66E-02	1.00E+00
9/25/2025	14:07:30	729.00	0.5	46.1	16803	1.68E-02	1.02E+00
9/25/2025	14:08:00	913.00	0.5	46.1	21045	2.10E-02	1.04E+00
9/25/2025	14:08:30	877.00	0.5	46.1	20215	2.02E-02	1.06E+00
9/25/2025	14:09:00	824.00	0.5	46.1	18993	1.90E-02	1.08E+00
9/25/2025	14:09:30	802.00	0.5	46.1	18486	1.85E-02	1.10E+00
9/25/2025	14:10:00	762.00	0.5	46.1	17564	1.76E-02	1.12E+00
9/25/2025	14:10:30	726.00	0.5	46.1	16734	1.67E-02	1.13E+00
9/25/2025	14:11:00	662.00	0.5	46.1	15259	1.53E-02	1.15E+00
9/25/2025	14:12:00	593.00	1.0	46.1	27337	2.73E-02	1.18E+00
9/25/2025	14:13:00	533.00	1.0	46.1	24571	2.46E-02	1.20E+00
9/25/2025	14:14:00	463.00	1.0	46.1	21344	2.13E-02	1.22E+00
9/25/2025	14:15:00	372.00	1.0	46.1	17149	1.71E-02	1.24E+00
9/25/2025	14:16:00	334.00	1.0	46.1	15397	1.54E-02	1.26E+00
9/25/2025	14:17:00	313.00	1.0	46.1	14429	1.44E-02	1.27E+00
9/25/2025	14:18:00	292.00	1.0	46.1	13461	1.35E-02	1.28E+00
9/25/2025	14:19:00	245.00	1.0	46.1	11295	1.13E-02	1.29E+00
9/25/2025	14:20:00	239.00	1.0	46.1	11018	1.10E-02	1.31E+00

Reading		Concentration	Time Interval	Flow Rate	**Emitted Activity**		Running
Date	Time	(µCi/m3)	Δt (min)	(m^3/min)	(µCi)	(Ci)	Total Ci
9/25/2025	14:21:00	226.00	1.0	46.1	10419	1.04E-02	1.32E+00
9/25/2025	14:22:00	225.00	1.0	46.1	10373	1.04E-02	1.33E+00
9/25/2025	14:23:00	222.00	1.0	46.1	10234	1.02E-02	1.34E+00
9/25/2025	14:24:00	212.00	1.0	46.1	9773	9.77E-03	1.35E+00
9/25/2025	14:25:00	199.00	1.0	46.1	9174	9.17E-03	1.36E+00
9/25/2025	14:30:00	145.00	5.0	46.1	33422	3.34E-02	1.39E+00
9/25/2025	14:35:00	106.00	5.0	46.1	24433	2.44E-02	1.41E+00
9/25/2025	14:40:00	83.80	5.0	46.1	19316	1.93E-02	1.43E+00
9/25/2025	14:45:00	66.30	5.0	46.1	15282	1.53E-02	1.45E+00
9/25/2025	14:50:00	56.80	5.0	46.1	13092	1.31E-02	1.46E+00
9/25/2025	14:55:00	47.10	5.0	46.1	10857	1.09E-02	1.47E+00
9/25/2025	15:00:00	43.30	5.0	46.1	9981	9.98E-03	1.48E+00
9/25/2025	15:05:00	37.40	5.0	46.1	8621	8.62E-03	1.49E+00
9/25/2025	15:08:00	33.60	3.0	46.1	4647	4.65E-03	1.49E+00
9/25/2025	15:10:00	11.20	2.0	46.1	1033	1.03E-03	1.50E+00
9/25/2025	15:15:00	10.40	5.0	46.1	2397	2.40E-03	1.50E+00
9/25/2025	15:21:00	9.21	6.0	46.1	2547	2.55E-03	1.50E+00
			0.0	46.1	0	0.00E+00	1.50E+00
			0.0	46.1	0	0.00E+00	1.50E+00

Use this sheet for evaluation of a single release.
yellow = required field for proper calc | blue = optional data for complete report

Emissions from:	**TA - 54**	**Bldg - 1028**	**ES - FT**

Emissions calculation date: 10/30/2025 | HPAL barcode #:

	date	time
Time sample started:	25-Sep-2025	7:31 AM
Time sample ended:	25-Sep-2025	3:20 PM
Length of sample period:	7.8	HRS
Sample period downtime:	0.0	HRS

RADAIR Report Period ID:
Bubbler response (catalyst efficiency for HT): 1.00 | Cal Date: | Expires:

Bubbler flow rate	115	mL/min	at STP
	150	**mL/min**	at altitude
	5.30E-03	cfm	at altitude
	7.04E+04	mL/sample period	at altitude
FTWC flow rate (daily max)	1,627	cfm	
	2.16E+10	mL/sample period	at altitude
Ratio of flow rates:	3.07E+05	= (stack flow)/(sample flow)	

FTWC	*1,476 min*
	1,800 max

Weight of glycol and water in vials

	Full Wt	Vial Wt	Glycol Wt
W_1 (g)	108.99	77.30	31.7
W_2 (g)	110.21	77.80	32.4
W_3 (g)	105.41	78.40	27.0
W_4 (g)	116.68	83.60	33.1
W_5 (g)	116.03	83.50	32.5
W_6 (g)	108.91	76.50	32.4

Volume of glycol and water in vials

V_1	28.5	mL
V_2	29.1	mL
V_3	24.3	mL
V_4	29.7	mL
V_5	29.2	mL
V_6	29.1	mL

assumes glycol & water density of 1.113 g/mL

Typical weights
36 g avg
54 g max

Activity concentration in vials

C_1	7.88E+00	µCi/L
C_2	0.00E+00	µCi/L
C_3	0.00E+00	µCi/L
C_4	5.00E+01	µCi/L
C_5	3.70E-01	µCi/L
C_6	0.00E+00	µCi/L
bkgnd		µCi/L

*no value indicates less than MDA

Activity in vials

A_1	2.24E-01	µCi
A_2	0.00E+00	µCi
A_3	0.00E+00	µCi
A_4	1.49E+00	µCi
A_5	1.08E-02	µCi
A_6	0.00E+00	µCi

OK to analyze single vial.
Enter known values;
calcs are independent
of number of vials

MDA = 0.01 uCi/L

If there were any bubbler performance tests during this period:
HTO Stacked during Cal | HT Stacked during cal:
Ignore if no bubbler tests took place.

Activity of H-3 emitted from stack for given time period:
HTO 6.89E-02 Ci (includes response factor)
HT 4.60E-01 Ci (includes response factor)
Calculation based on operating times; allows for downtime

Based on flow ratio only:
5.29E-01 total Ci released
6.89E-02 Ci HTO
4.60E-01 Ci HT

Notes: 5.29E-01 total curies emitted

based on bubbler quick count

Report by: Dave Fuehne **Signature:** _____ Date 9/25/2025

Review by: Rebecca Lattin **Signature:** _____ Date 9/25/2025

Appendix A.9

Daily Operations Spreadsheets

Day 09

September 29, 2025

- Daily Limit Calculations
- Flow Rate Calculation
- Flow Rate Trending
- Emissions Tracking Log
- Bubbler Emissions Calculation

Daily Emissions Calculation Worksheet

This worksheet calculates emissions hold points and limits based on operations to-date

To QUICKLY insert the current date and time, press Ctrl+; (semi-colon) to add the date,
then press Space, then press Ctrl+Shift-; (semi-colon) to add the time

			Date	Time
Venting Process #	Day 9	Start of operations	9/29/2025	7:26
WCATS ID:	227 evac	End of operations	9/29/2025	14:45
Venting Location:	TA 54, Bldg 1028 outside north			

enter 0 if this is first venting operations.

Integrated FTWC Dose (IFD) from previous venting: IFD = 0.0035 mrem

Calculate Today's Limi & Hold points:

CAP88 Planning Dose Conversation Factor: DCF_p = 3.33E-04 mrem/Ci

Dose Limit:	mrem 6	mrem (IFD) 0.0035		DL mrem 5.9965	
Corresponding Curie Limit:		DL/DCF_p (Ci)	1.801E+04		18,008 curies
Pause For Approval Dose:	mrem 4	mrem (IFD) 0.0035		PFA mrem 3.9965	
Pause for Approval (Ci)		PFA/DFC_p (Ci)	1.200E+04		12,002 curies
Pause for Evaluation Dose:	mrem 2	mrem (IFD) 0.0035		PFED mrem 1.9965	
Pause for Approval (Ci)		$PFED/DFC_p$ (Ci)	5.995E+03		5,995 curies

Concurrance limit for EPC-ES Dose Assessment: (Date/Time/Initial) MJCdG ~8:00

These limits communicated to the FTWC Venting PIC: (Date/Time/Initial) DF to DH 7:30

Current Venting Operation Date:

	Latitude	Longitude
GPS Coordinates of stack:		

Stack exhaust flow rate: acfm

Basis for flow rate determination:

4.3 Documentation of FTWC Flow Rate

Date:	29-Sep	Location:	54-1028 evac227	☑ 2 HP System	☐ 3/4 HP System	TRUE

1. Duct Setup per IWD? ☑ Yes ☐ No

Tested Duct Configuration:
1.Stack
2. Blower
3. Short 12" section
4. Long 5' section w/ rad monitoring
5. Long 5' sectoin w/ Sierra 620
6. short 12" section w/ FTWC inject

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2. Bounding Condition: minimum velocity achieved on Sierra 620 using worst-case pressure & temp:

2 HP System:
2680 sfpm on Sierra 620 = 1476 acfm in duct ☐ Yes ☐ No ☐ N/A

3/4 HP System:
1404 sfpm on Sierra 620 = 753 acfm in duct ☐ Yes ☐ No ☑ N/A

3.

	˚F	˚R		˚F	˚R
T_{act} :	44	503.67	T_{std} :	70	529.67
	mbar			mbar	
P_{act} :	806		P_{std} :	1013.25	

$\frac{T_{act}}{T_{std}}$ = 0.951

$\frac{P_{std}}{P_{act}}$ = 1.267

Pressure Correction: -3.4 mbar for every 100ft difference above reference barometer.

TA-6 weather station:	7424 ft	**-6.4 mbar from TA-54**
TA-54 weather station:	6548 ft	23.4 mbar from TA-6
TA-54 -1028:	~ 6735 ft	8.5 mbar from TA-6 to TA-49
WETF dock :	~ 7608 ft	-6.3 mbar from TA-6

Type Pressure corrrection here: -6.4

Use Equation 18 to determine flow rate through the duct, based on Sierra 620 reading.

$$\dot{V}_{act} = \left(v_{inst} - 75\ std\ \frac{ft}{min}\right) * 0.5454\ ft^2 * \left(\frac{T_{act}}{529.67°R}\right) * \left(\frac{1013.25\ mbar}{P_{act}}\right) * 90\%$$

υ_{inst} 2610 std ft/min

$\frac{T_{act}}{T_{std}}$ = 0.951

$\frac{P_{std}}{P_{act}}$ = 1.267

Safety Basis value (WETF-26)

$\dot{V}_{act}$ = 1499.4 actual ft^3/min for Safety Basis concerns

EPA emissions calcs value

$\dot{V}_{act}$ = 1543.8 actual ft^3/min for stack emissions calculations (disregards 75 fpm error term; conservative)

Use equation 21 and 22 to determine minimum Seirra 620 reading based on limiting flows in the different duct systems (using 2HP or 3/4Hp blower)

Eq 21

$$v_{inst,2HP} = \left[\frac{1476\ actual\ \frac{ft^3}{min}}{90\% * 0.5454 ft^2} * \frac{529.67°R}{T_{act}} * \frac{P_{act}}{1013.25\ mbar}\right] + 75\ std\ \frac{ft}{min}$$

2570.4 sfpm — 2 HP fan Threshold

Eq 22

$$v_{inst,3/4HP} = \left[\frac{753\ actual\ \frac{ft^3}{min}}{90\% * 0.5454 ft^2} * \frac{529.67°R}{T_{act}} * \frac{P_{act}}{1013.25\ mbar}\right] + 75\ std\ \frac{ft}{min}$$

0.0 sfpm — 3/4 HP fan N/A

Sufficient flow in the duct for FTWC venting? ☐ Yes ☐ No ☐ N/A

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4. EPA full traverse flow measurement performed per procedure 127? ☐ Yes ☐ No ☑ N/A

Actual flow rate measured in duct: _____ acfm

Sufficient flow in the duct for FTWC venting? ☐ Yes ☐ No ☐ N/A

Trending FTWC flow rate

Safety basis flow calculation - uses "-75" sfpm error term to ensure sufficient flow;

EPA compliance calculations do NOT use the "-75" term to ensure conservative emissions calcs.

Constants		
Temp: F to R	459.67	
T-std	529.67	Rankine
P-std	1013.25	mbar
Area	0.5454	ft2
Single-Point Corr Fact	90%	
Sierra Error Bar	-75	std ft/min
Min Flow (Area G, 2 HP)	1476	actual ft3/min
Min Flow (WETF, 3/4 HP)	753	actual ft3/min
flow unit conversion	0.02832	m3 per ft3

Actual flow rate determination

$$\dot{V}_{act} = \left(v_{inst} - 75\ std\frac{ft}{min}\right) * 0.5454\ ft^2 * \left(\frac{T_{act}}{529.67°R}\right) * \left(\frac{1013.25\ mbar}{P_{act}}\right) * 90\%$$

Minimum velocity determination

$$v_{inst,2HP} = \left[\frac{1476\ actual\ \frac{ft^3}{min}}{90\% * 0.5454 ft^2} * \frac{529.67°R}{T_{act}} * \frac{P_{act}}{1013.25\ mbar}\right] + 75\ std\frac{ft}{min}$$

0.3048 m/ft

Date	Time	Temp deg.F	Pressure mbar	Pressure Adjust mbar	Temp Corr Fact	Press Corr Fact	Sierra Reading std ft/min	Safety Basis Flow Rate act ft3/min	EPA Calcs Flow Rate act ft3/min	EPA Calcs Flow Rate act m3/min	Area G: Safety Basis Min Veloc std ft/min	WETF: Safety Basis Min Veloc std ft/min	Comment / Configuration	CAP88: EPA flow velocity m/s
9/29/2025	07:39	44	806	-6.4	0.951	1.267	2550	1,464	1,508	42.7	2571	1349	setup	14.0
9/29/2025	08:08	44	806	-6.4	0.951	1.267	2610	1,499	1,544	43.7	2571	1349	begin ops	14.4
9/29/2025	08:30	50	806	-6.4	0.962	1.267	2580	1,499	1,544	43.7	2542	1334	bleeding He	14.4
9/29/2025	09:14	54	807	-6.4	0.970	1.266	2560	1,497	1,542	43.7	2525	1325	Closing valve	14.4
9/29/2025	10:20	56	807	-6.4	0.974	1.266	2550	1,497	1,542	43.7	2516	1321	Opened valve	14.4
9/29/2025	11:06	60	806	-6.4	0.981	1.267	2540	1,504	1,550	43.9	2494	1309	New Temp	14.4
9/29/2025	12:20	64	806	-6.4	0.989	1.267	2530	1,510	1,556	44.1	2476	1300	he bleed done. Close ALM1	14.5
9/29/2025	13:20	66	805	-6.4	0.992	1.269	2520	1,511	1,558	44.1	2463	1294		14.5
9/29/2025	14:15	67	805	-6.4	0.994	1.269	2500	1,502	1,548	43.8	2459	1291	almost done with evacuation	14.4
9/29/2025	14:32			-6.4									closing valve; shut off vac pump	
9/29/2025	14:45			-6.4									fan off; equip breakdown	
9/29/2025				-6.4										
9/29/2025				-6.4										
9/29/2025				-6.4										
9/29/2025				-6.4										
9/29/2025				-6.4										
9/29/2025				-6.4										
9/29/2025				-6.4										
9/29/2025				-6.4										
9/29/2025				-6.4										
9/29/2025				-6.4										
9/29/2025				-6.4										
9/29/2025				-6.4										

Bubbler Emissions Calcs (usually max flow during ops) 1558 acfm 43.9 m3/min

CAP88 flow: minimum flow for day 1508 acfm = 14 m/sec

Emissions Tracking Worksheet

FTWC Venting Process: Day 9

Start date & time	
9/29/2025	7:26

This process emissions tracking:
Page 1 of 2

9/29/2025	14:45
End date & time	

Venting Location: TA 54, Bldg 1028 outside north

Stack Flow Rate *(without safety basis error compensation)*

$\dot{V}_{act}$ = 1543.77031 actual ft^3/min = 43.7 m^3/min

Emitted Activity (Ci) = Concentration ($\mu Ci/m^3$) * Δt (min) * Flow (m^3/min) * 1E6 ($Ci/\mu Ci$)

ctrl+semicolon = inserts date
ctrl+shift+semicolon = inserts time

Total Activity for this sheet (Ci)
13.586

Reading		Concentration	Time Interval	Flow Rate	**Emitted Activity**		Running
Date	Time	(µCi/m3)	Δt (min)	(m^3/min)	(µCi)	(Ci)	Total Ci
9/29/2025	08:00:00	9.40	n/a	n/a	n/a	n/a	n/a
9/29/2025	08:09:00	9.68	9.0	43.7	3807	3.81E-03	3.81E-03
9/29/2025	08:10:00	11.10	1.0	43.7	485	4.85E-04	4.29E-03
9/29/2025	08:11:00	9.80	1.0	43.7	428	4.28E-04	4.72E-03
9/29/2025	08:12:00	9.69	1.0	43.7	423	4.23E-04	5.14E-03
9/29/2025	08:15:00	9.29	3.0	43.7	1218	1.22E-03	6.36E-03
9/29/2025	08:18:00	9.40	3.0	43.7	1232	1.23E-03	7.59E-03
9/29/2025	08:19:00	9.80	1.0	43.7	428	4.28E-04	8.02E-03
9/29/2025	08:20:00	30.30	1.0	43.7	1324	1.32E-03	9.35E-03
9/29/2025	08:20:30	154.00	0.5	43.7	3365	3.36E-03	1.27E-02
9/29/2025	08:21:00	498.00	0.5	43.7	10881	1.09E-02	2.36E-02
9/29/2025	08:21:30	1010.00	0.5	43.7	22069	2.21E-02	4.57E-02
9/29/2025	08:22:00	1770.00	0.5	43.7	38675	3.87E-02	8.43E-02
9/29/2025	08:22:30	2510.00	0.5	43.7	54844	5.48E-02	1.39E-01
9/29/2025	08:23:00	3050.00	0.5	43.7	66643	6.66E-02	2.06E-01
9/29/2025	08:23:30	3610.00	0.5	43.7	78878	7.89E-02	2.85E-01
9/29/2025	08:24:00	4120.00	0.5	43.7	90022	9.00E-02	3.75E-01
9/29/2025	08:24:30	4570.00	0.5	43.7	99855	9.99E-02	4.75E-01
9/29/2025	08:25:00	5150.00	0.5	43.7	112528	1.13E-01	5.87E-01
9/29/2025	08:25:30	5460.00	0.5	43.7	119301	1.19E-01	7.06E-01
9/29/2025	08:26:00	5630.00	0.5	43.7	123016	1.23E-01	8.29E-01
9/29/2025	08:26:30	5770.00	0.5	43.7	126074	1.26E-01	9.55E-01
9/29/2025	08:27:00	6030.00	0.5	43.7	131756	1.32E-01	1.09E+00
9/29/2025	08:27:30	6160.00	0.5	43.7	134596	1.35E-01	1.22E+00
9/29/2025	08:28:00	6190.00	0.5	43.7	135252	1.35E-01	1.36E+00
9/29/2025	08:28:30	6200.00	0.5	43.7	135470	1.35E-01	1.49E+00
9/29/2025	08:29:00	6220.00	0.5	43.7	135907	1.36E-01	1.63E+00
9/29/2025	08:30:00	6400.00	1.0	43.7	279680	2.80E-01	1.91E+00
9/29/2025	08:31:00	6350.00	1.0	43.7	277495	2.77E-01	2.19E+00
9/29/2025	08:32:00	6320.00	1.0	43.7	276184	2.76E-01	2.46E+00

Reading		Concentration	Time Interval	Flow Rate	**Emitted Activity**		Running
Date	Time	(µCi/m3)	Δt (min)	(m^3/min)	(µCi)	(Ci)	Total Ci
9/29/2025	08:33:00	6290.00	1.0	43.7	274873	2.75E-01	2.74E+00
9/29/2025	08:34:00	6370.00	1.0	43.7	278369	2.78E-01	3.02E+00
9/29/2025	08:35:00	6190.00	1.0	43.7	270503	2.71E-01	3.29E+00
9/29/2025	08:36:00	6160.00	1.0	43.7	269192	2.69E-01	3.55E+00
9/29/2025	08:37:00	6130.00	1.0	43.7	267881	2.68E-01	3.82E+00
9/29/2025	08:38:00	6010.00	1.0	43.7	262637	2.63E-01	4.09E+00
9/29/2025	08:39:00	6120.00	1.0	43.7	267444	2.67E-01	4.35E+00
9/29/2025	08:40:00	5990.00	1.0	43.7	261763	2.62E-01	4.61E+00
9/29/2025	08:41:00	5860.00	1.0	43.7	256082	2.56E-01	4.87E+00
9/29/2025	08:42:00	5820.00	1.0	43.7	254334	2.54E-01	5.12E+00
9/29/2025	08:43:00	5790.00	1.0	43.7	253023	2.53E-01	5.38E+00
9/29/2025	08:44:00	5680.00	1.0	43.7	248216	2.48E-01	5.63E+00
9/29/2025	08:45:00	5660.00	1.0	43.7	247342	2.47E-01	5.87E+00
9/29/2025	08:46:00	5620.00	1.0	43.7	245594	2.46E-01	6.12E+00
9/29/2025	08:47:00	5430.00	1.0	43.7	237291	2.37E-01	6.36E+00
9/29/2025	08:48:00	5490.00	1.0	43.7	239913	2.40E-01	6.60E+00
9/29/2025	08:49:00	5450.00	1.0	43.7	238165	2.38E-01	6.83E+00
9/29/2025	08:50:00	5420.00	1.0	43.7	236854	2.37E-01	7.07E+00
9/29/2025	08:51:00	5290.00	1.0	43.7	231173	2.31E-01	7.30E+00
9/29/2025	08:52:00	5300.00	1.0	43.7	231610	2.32E-01	7.53E+00
9/29/2025	08:53:00	5310.00	1.0	43.7	232047	2.32E-01	7.77E+00
9/29/2025	08:55:00	5160.00	2.0	43.7	450984	4.51E-01	8.22E+00
9/29/2025	09:00:00	4940.00	5.0	43.7	1079390	1.08E+00	9.30E+00
9/29/2025	09:05:00	4640.00	5.0	43.7	1013840	1.01E+00	1.03E+01
9/29/2025	09:10:00	4450.00	5.0	43.7	972325	9.72E-01	1.13E+01
9/29/2025	09:14:00	4290.00	4.0	43.7	749892	7.50E-01	1.20E+01
9/29/2025	09:15:00	4490.00	1.0	43.7	196213	1.96E-01	1.22E+01
9/29/2025	09:16:00	857.00	1.0	43.7	37451	3.75E-02	1.23E+01
9/29/2025	09:17:00	242.00	1.0	43.7	10575	1.06E-02	1.23E+01
9/29/2025	09:18:00	81.60	1.0	43.7	3566	3.57E-03	1.23E+01
9/29/2025	09:19:00	34.70	1.0	43.7	1516	1.52E-03	1.23E+01
9/29/2025	09:20:00	24.10	1.0	43.7	1053	1.05E-03	1.23E+01
9/29/2025	09:21:00	27.30	1.0	43.7	1193	1.19E-03	1.23E+01
9/29/2025	09:24:00	22.20	3.0	43.7	2910	2.91E-03	1.23E+01
9/29/2025	09:26:00	23.30	2.0	43.7	2036	2.04E-03	1.23E+01
9/29/2025	09:28:00	24.70	2.0	43.7	2159	2.16E-03	1.23E+01
9/29/2025	09:30:00	22.80	2.0	43.7	1993	1.99E-03	1.23E+01
9/29/2025	09:32:00	21.40	2.0	43.7	1870	1.87E-03	1.23E+01
9/29/2025	09:34:00	17.20	2.0	43.7	1503	1.50E-03	1.23E+01
9/29/2025	09:36:00	15.20	2.0	43.7	1328	1.33E-03	1.23E+01
9/29/2025	09:38:00	18.00	2.0	43.7	1573	1.57E-03	1.23E+01
9/29/2025	09:40:00	19.50	2.0	43.7	1704	1.70E-03	1.23E+01
9/29/2025	09:42:00	16.40	2.0	43.7	1433	1.43E-03	1.23E+01
9/29/2025	09:44:00	12.90	2.0	43.7	1127	1.13E-03	1.23E+01
9/29/2025	09:46:00	15.50	2.0	43.7	1355	1.35E-03	1.23E+01
9/29/2025	09:48:00	18.10	2.0	43.7	1582	1.58E-03	1.23E+01
9/29/2025	09:50:00	16.10	2.0	43.7	1407	1.41E-03	1.23E+01

Reading		Concentration	Time Interval	Flow Rate	**Emitted Activity**		Running
Date	Time	(µCi/m3)	Δt (min)	(m^3/min)	(µCi)	(Ci)	Total Ci
9/29/2025	09:52:00	15.30	2.0	43.7	1337	1.34E-03	1.23E+01
9/29/2025	09:54:00	12.00	2.0	43.7	1049	1.05E-03	1.23E+01
9/29/2025	09:56:00	11.50	2.0	43.7	1005	1.01E-03	1.23E+01
9/29/2025	09:58:00	10.00	2.0	43.7	874	8.74E-04	1.23E+01
9/29/2025	10:00:00	10.70	2.0	43.7	935	9.35E-04	1.23E+01
9/29/2025	10:05:00	13.20	5.0	43.7	2884	2.88E-03	1.23E+01
9/29/2025	10:10:00	14.80	5.0	43.7	3234	3.23E-03	1.23E+01
9/29/2025	10:15:00	16.60	5.0	43.7	3627	3.63E-03	1.23E+01
9/29/2025	10:17:00	14.20	2.0	43.7	1241	1.24E-03	1.23E+01
9/29/2025	10:18:00	921.00	1.0	43.7	40248	4.02E-02	1.24E+01
9/29/2025	10:18:30	4110.00	0.5	43.7	89804	8.98E-02	1.25E+01
9/29/2025	10:19:00	4230.00	0.5	43.7	92425	9.24E-02	1.25E+01
9/29/2025	10:20:00	4120.00	1.0	43.7	180044	1.80E-01	1.27E+01
9/29/2025	10:25:00	3930.00	5.0	43.7	858705	8.59E-01	1.36E+01
			0.0	43.7	0	0.00E+00	1.36E+01

Emissions Tracking Worksheet

FTWC Venting Process: Day 9

Start date & time	
9/29/2025	7:26

This process emissions tracking:
Page 2 of 2

9/29/2025	14:45
End date & time	

Venting Location: TA 54, Bldg 1028 outside north

Stack Flow Rate *(without safety basis error compensation)*

$\dot{V}_{act}$ = 1543.77031 actual ft^3/min = 43.7 m^3/min

Emitted Activity (Ci) = Concentration (µCi/m^3) * Δt (min) * Flow (m^3/min) * 1E6 (Ci/µCi)

ctrl+semicolon = inserts date
ctrl+shift+semicolon = inserts time

Total Activity for this sheet (Ci)	55.937
Total activity - all sheets	69.523

Reading		Concentration	Time Interval	Flow Rate	**Emitted Activity**		Running
Date	Time	(µCi/m3)	Δt (min)	(m^3/min)	(µCi)	(Ci)	Total Ci
9/29/2025	10:25:00	3930.00	n/a	n/a	n/a	n/a	n/a
9/29/2025	10:30:00	3760.00	5.0	43.7	821560	8.22E-01	1.44E+01
9/29/2025	10:35:00	3560.00	5.0	43.7	777860	7.78E-01	1.52E+01
9/29/2025	10:40:00	3470.00	5.0	43.7	758195	7.58E-01	1.59E+01
9/29/2025	10:45:00	3320.00	5.0	43.7	725420	7.25E-01	1.67E+01
9/29/2025	10:50:00	3160.00	5.0	43.7	690460	6.90E-01	1.74E+01
9/29/2025	10:55:00	3040.00	5.0	43.7	664240	6.64E-01	1.80E+01
9/29/2025	11:00:00	2940.00	5.0	43.7	642390	6.42E-01	1.87E+01
9/29/2025	11:10:00	2740.00	10.0	43.9	1202860	1.20E+00	1.99E+01
9/29/2025	11:20:00	2550.00	10.0	43.9	1119450	1.12E+00	2.10E+01
9/29/2025	11:30:00	2340.00	10.0	43.9	1027260	1.03E+00	2.20E+01
9/29/2025	11:40:00	2200.00	10.0	43.9	965800	9.66E-01	2.30E+01
9/29/2025	11:50:00	1990.00	10.0	43.9	873610	8.74E-01	2.39E+01
9/29/2025	12:00:00	1880.00	10.0	43.9	825320	8.25E-01	2.47E+01
9/29/2025	12:10:00	1740.00	10.0	43.9	763860	7.64E-01	2.54E+01
9/29/2025	12:20:00	1660.00	10.0	43.9	728740	7.29E-01	2.62E+01
9/29/2025	12:21:00	435.00	1.0	43.9	19096	1.91E-02	2.62E+01
9/29/2025	12:22:00	10.70	1.0	43.9	470	4.70E-04	2.62E+01
9/29/2025	12:23:00	9.45	1.0	43.9	415	4.15E-04	2.62E+01
9/29/2025	12:30:00	9.18	7.0	44.1	2834	2.83E-03	2.62E+01
9/29/2025	12:40:00	8.90	10.0	44.1	3925	3.92E-03	2.62E+01
9/29/2025	13:00:00	7.93	20.0	44.1	6994	6.99E-03	2.62E+01
9/29/2025	13:20:00	7.91	20.0	44.1	6977	6.98E-03	2.62E+01
9/29/2025	13:28:00	8.14	8.0	44.1	2872	2.87E-03	2.62E+01
9/29/2025	13:28:30	148.00	0.5	44.1	3263	3.26E-03	2.62E+01
9/29/2025	13:29:00	561.00	0.5	44.1	12370	1.24E-02	2.62E+01
9/29/2025	13:29:30	10000.00	0.5	44.1	220500	2.21E-01	2.65E+01
9/29/2025	13:30:00	80300.00	0.5	44.1	1770615	1.77E+00	2.82E+01
9/29/2025	13:30:30	129000.00	0.5	44.1	2844450	2.84E+00	3.11E+01
9/29/2025	13:31:00	117000.00	0.5	44.1	2579850	2.58E+00	3.36E+01

Reading		Concentration	Time Interval	Flow Rate	**Emitted Activity**		Running
Date	Time	(µCi/m3)	Δt (min)	(m^3/min)	(µCi)	(Ci)	Total Ci
9/29/2025	13:31:30	111000.00	0.5	44.1	2447550	2.45E+00	3.61E+01
9/29/2025	13:32:00	105000.00	0.5	44.1	2315250	2.32E+00	3.84E+01
9/29/2025	13:32:30	97500.00	0.5	44.1	2149875	2.15E+00	4.06E+01
9/29/2025	13:33:00	88900.00	0.5	44.1	1960245	1.96E+00	4.25E+01
9/29/2025	13:33:30	85600.00	0.5	44.1	1887480	1.89E+00	4.44E+01
9/29/2025	13:34:00	76000.00	0.5	44.1	1675800	1.68E+00	4.61E+01
9/29/2025	13:34:30	73500.00	0.5	44.1	1620675	1.62E+00	4.77E+01
9/29/2025	13:35:00	66700.00	0.5	44.1	1470735	1.47E+00	4.92E+01
9/29/2025	13:35:30	61900.00	0.5	44.1	1364895	1.36E+00	5.05E+01
9/29/2025	13:36:00	58500.00	0.5	44.1	1289925	1.29E+00	5.18E+01
9/29/2025	13:36:30	56300.00	0.5	44.1	1241415	1.24E+00	5.31E+01
9/29/2025	13:37:00	52900.00	0.5	44.1	1166445	1.17E+00	5.42E+01
9/29/2025	13:37:30	47000.00	0.5	44.1	1036350	1.04E+00	5.53E+01
9/29/2025	13:38:00	44400.00	0.5	44.1	979020	9.79E-01	5.63E+01
9/29/2025	13:38:30	42200.00	0.5	44.1	930510	9.31E-01	5.72E+01
9/29/2025	13:39:00	39500.00	0.5	44.1	870975	8.71E-01	5.81E+01
9/29/2025	13:39:30	37200.00	0.5	44.1	820260	8.20E-01	5.89E+01
9/29/2025	13:40:00	34200.00	0.5	44.1	754110	7.54E-01	5.96E+01
9/29/2025	13:40:30	33100.00	0.5	44.1	729855	7.30E-01	6.04E+01
9/29/2025	13:41:00	31800.00	0.5	44.1	701190	7.01E-01	6.11E+01
9/29/2025	13:41:30	22900.00	0.5	44.1	504945	5.05E-01	6.16E+01
9/29/2025	13:42:00	20400.00	0.5	44.1	449820	4.50E-01	6.20E+01
9/29/2025	13:42:30	19600.00	0.5	44.1	432180	4.32E-01	6.24E+01
9/29/2025	13:43:00	17400.00	0.5	44.1	383670	3.84E-01	6.28E+01
9/29/2025	13:43:30	16500.00	0.5	44.1	363825	3.64E-01	6.32E+01
9/29/2025	13:44:00	15200.00	0.5	44.1	335160	3.35E-01	6.35E+01
9/29/2025	13:44:30	14200.00	0.5	44.1	313110	3.13E-01	6.38E+01
9/29/2025	13:45:00	13700.00	0.5	44.1	302085	3.02E-01	6.41E+01
9/29/2025	13:45:30	12700.00	0.5	44.1	280035	2.80E-01	6.44E+01
9/29/2025	13:46:00	11700.00	0.5	44.1	257985	2.58E-01	6.47E+01
9/29/2025	13:46:30	10700.00	0.5	44.1	235935	2.36E-01	6.49E+01
9/29/2025	13:47:00	10100.00	0.5	44.1	222705	2.23E-01	6.51E+01
9/29/2025	13:47:30	9550.00	0.5	44.1	210578	2.11E-01	6.54E+01
9/29/2025	13:48:00	9120.00	0.5	44.1	201096	2.01E-01	6.56E+01
9/29/2025	13:49:00	8080.00	1.0	44.1	356328	3.56E-01	6.59E+01
9/29/2025	13:50:00	7200.00	1.0	44.1	317520	3.18E-01	6.62E+01
9/29/2025	13:51:00	6280.00	1.0	44.1	276948	2.77E-01	6.65E+01
9/29/2025	13:52:00	5650.00	1.0	44.1	249165	2.49E-01	6.68E+01
9/29/2025	13:53:00	5060.00	1.0	44.1	223146	2.23E-01	6.70E+01
9/29/2025	13:54:00	4420.00	1.0	44.1	194922	1.95E-01	6.72E+01
9/29/2025	13:55:00	4040.00	1.0	44.1	178164	1.78E-01	6.73E+01
9/29/2025	13:56:00	3650.00	1.0	44.1	160965	1.61E-01	6.75E+01
9/29/2025	13:57:00	3310.00	1.0	44.1	145971	1.46E-01	6.77E+01
9/29/2025	13:58:00	3060.00	1.0	44.1	134946	1.35E-01	6.78E+01
9/29/2025	13:59:00	2710.00	1.0	44.1	119511	1.20E-01	6.79E+01
9/29/2025	14:00:00	2530.00	1.0	44.1	111573	1.12E-01	6.80E+01
9/29/2025	14:01:00	2310.00	1.0	44.1	101871	1.02E-01	6.81E+01

Reading		Concentration	Time Interval	Flow Rate	**Emitted Activity**		Running
Date	Time	(µCi/m3)	Δt (min)	(m^3/min)	(µCi)	(Ci)	Total Ci
9/29/2025	14:02:00	2150.00	1.0	44.1	94815	9.48E-02	6.82E+01
9/29/2025	14:03:00	1950.00	1.0	44.1	85995	8.60E-02	6.83E+01
9/29/2025	14:04:00	1860.00	1.0	44.1	82026	8.20E-02	6.84E+01
9/29/2025	14:05:00	1720.00	1.0	44.1	75852	7.59E-02	6.85E+01
9/29/2025	14:06:00	1590.00	1.0	44.1	70119	7.01E-02	6.85E+01
9/29/2025	14:07:00	1490.00	1.0	44.1	65709	6.57E-02	6.86E+01
9/29/2025	14:08:00	1390.00	1.0	44.1	61299	6.13E-02	6.87E+01
9/29/2025	14:09:00	1280.00	1.0	44.1	56448	5.64E-02	6.87E+01
9/29/2025	14:10:00	1240.00	1.0	44.1	54684	5.47E-02	6.88E+01
9/29/2025	14:12:00	1090.00	2.0	44.1	96138	9.61E-02	6.89E+01
9/29/2025	14:14:00	1000.00	2.0	44.1	88200	8.82E-02	6.90E+01
9/29/2025	14:16:00	870.00	2.0	44.1	76734	7.67E-02	6.90E+01
9/29/2025	14:18:00	819.00	2.0	44.1	72236	7.22E-02	6.91E+01
9/29/2025	14:20:00	762.00	2.0	44.1	67208	6.72E-02	6.92E+01
9/29/2025	14:22:00	700.00	2.0	44.1	61740	6.17E-02	6.92E+01
9/29/2025	14:24:00	644.00	2.0	44.1	56801	5.68E-02	6.93E+01
9/29/2025	14:26:00	600.00	2.0	44.1	52920	5.29E-02	6.93E+01
9/29/2025	14:28:00	558.00	2.0	44.1	49216	4.92E-02	6.94E+01
9/29/2025	14:31:00	517.00	3.0	44.1	68399	6.84E-02	6.95E+01
9/29/2025	14:32:00	510.00	1.0	44.1	22491	2.25E-02	6.95E+01
9/29/2025	14:33:00	513.00	1.0	44.1	22623	2.26E-02	6.95E+01
9/29/2025	14:34:00	253.00	1.0	44.1	11157	1.12E-02	6.95E+01
9/29/2025	14:35:00	16.40	1.0	44.1	723	7.23E-04	6.95E+01
9/29/2025	14:36:00	14.10	1.0	44.1	622	6.22E-04	6.95E+01
9/29/2025	14:37:00	12.50	1.0	44.1	551	5.51E-04	6.95E+01
9/29/2025	14:39:00	12.30	2.0	44.1	1085	1.08E-03	6.95E+01
9/29/2025	14:42:00	12.40	3.0	44.1	1641	1.64E-03	6.95E+01
9/29/2025	14:43:00	10.70	1.0	44.1	472	4.72E-04	6.95E+01
9/29/2025	14:45:00	9.93	2.0	44.1	876	8.76E-04	6.95E+01
9/29/2025			0.0	44.1	0	0.00E+00	6.95E+01
9/29/2025			0.0	44.1	0	0.00E+00	6.95E+01
9/29/2025			0.0	44.1	0	0.00E+00	6.95E+01
9/29/2025			0.0	44.1	0	0.00E+00	6.95E+01

Use this sheet for evaluation of a single release.
yellow = required field for proper calc | blue = optional data for complete report

Emissions from: TA - 54 | Bldg - 1028 | ES - FT

Emissions calculation date: 10/30/2025 | HPAL barcode #:

	date	time
Time sample started:	29-Sep-2025	7:26 AM
Time sample ended:	29-Sep-2025	2:53 PM
Length of sample period:	7.5	HRS
Sample period downtime:	0.0	HRS

RADAIR Report Period ID:
Bubbler response (catalyst efficiency for HT): 1.00 | Cal Date: | Expires:

Bubbler flow rate	115	mL/min	at STP
	150	**mL/min**	at altitude
	5.30E-03	cfm	at altitude
	6.71E+04	mL/sample period	at altitude
FTWC flow rate (daily max)	1,558	cfm	
	1.97E+10	mL/sample period	at altitude
Ratio of flow rates:	2.94E+05	= (stack flow)/(sample flow)	

FTWC	
	1,476 min
	1,800 max

Weight of glycol and water in vials

	Full Wt	Vial Wt	Glycol Wt
W_1 (g)	116.11	82.80	33.3
W_2 (g)	115.40	82.20	33.2
W_3 (g)	110.51	82.20	28.3
W_4 (g)	110.07	77.00	33.1
W_5 (g)	115.84	82.30	33.5
W_6 (g)	116.41	82.80	33.6

Volume of glycol and water in vials

V_1	29.9	mL
V_2	29.8	mL
V_3	25.4	mL
V_4	29.7	mL
V_5	30.1	mL
V_6	30.2	mL

assumes glycol & water density of 1.113 g/mL

Typical weights
36 g avg
54 g max

Activity concentration in vials

C_1	9.57E+00	µCi/L
C_2	1.00E-03	µCi/L
C_3	-1.30E-03	µCi/L
C_4	3.27E+03	µCi/L
C_5	1.01E+01	µCi/L
C_6	5.80E-03	µCi/L
bkgnd		µCi/L

*no value indicates less than MDA

Activity in vials

A_1	2.86E-01	µCi
A_2	2.98E-05	µCi
A_3	-3.31E-05	µCi
A_4	9.70E+01	µCi
A_5	3.05E-01	µCi
A_6	1.75E-04	µCi

OK to analyze single vial.
Enter known values;
calcs are independent
of number of vials

MDA = 0.01 uCi/L

If there were any bubbler performance tests during this period:
HTO Stacked during Cal | HT Stacked during cal:

Ignore if no bubbler tests took place.

Activity of H-3 emitted from stack for given time period:
HTO 8.42E-02 Ci (includes response factor)
HT 2.86E+01 Ci (includes response factor)
Calculation based on operating times; allows for downtime

Based on flow ratio only:
2.87E+01 total Ci released
8.42E-02 Ci HTO
2.86E+01 Ci HT

Notes: 2.87E+01 total curies emitted

this is the bubbler full report

Report by: Dave Fuehne **Signature:** Date 10/1/2025

Review by: Rebecca Lattin **Signature:** Date 10/1/2025

Appendix A.10

Daily Operations Spreadsheets

Days 10-13

October 5, 2025

October 10, 2025

October 11, 2025

October 12, 2025

- Daily Limit Calculations

No pressure mitigation was required for any of these three days, so only the daily limit calculation sheet was generated. They are all included here for completeness.

Daily Emissions Calculation Worksheet

This worksheet calculates emissions hold points and limits based on operations to-date

To QUICKLY insert the current date and time, press Ctrl+; (semi-colon) to add the date,
then press Space, then press Ctrl+Shift-; (semi-colon) to add the time

			Date	Time
Venting Process #	Day 10	Start of operations	10/5/2025	8:00
WCATS ID:	move 226	End of operations	10/5/2025	no venting
Venting Location:	TA 54, Bldg 1028 outside north			

Integrated FTWC Dose (IFD) from previous venting: IFD = 0.0051 mrem *enter 0 if this is first venting operations.*

Calculate Today's Limi & Hold points:

CAP88 Planning Dose Conversation Factor: DCF_p = 3.33E-04 mrem/Ci

Dose Limit:	mrem 6	mrem (IFD) 0.0051		DL mrem 5.9949	
Corresponding Curie Limit:		DL/DCF_p (Ci)	1.800E+04		18,003 curies
Pause For Approval Dose:	mrem 4	mrem (IFD) 0.0051		PFA mrem 3.9949	
Pause for Approval (Ci)		PFA/DFC_p (Ci)	1.200E+04		11,997 curies
Pause for Evaluation Dose:	mrem 2	mrem (IFD) 0.0051		PFED mrem 1.9949	
Pause for Approval (Ci)		$PFED/DFC_p$ (Ci)	5.991E+03		5,991 curies

Concurrance limit for EPC-ES Dose Assessment: (Date/Time/Initial) _____

These limits communicated to the FTWC Venting PIC: (Date/Time/Initial) _____

Current Venting Operation Date:

	Latitude	Longitude
GPS Coordinates of stack:	same as day 01	

Stack exhaust flow rate: n/a no venting acfm

Basis for flow rate determination: n/a

Daily Emissions Calculation Worksheet

This worksheet calculates emissions hold points and limits based on operations to-date

To QUICKLY insert the current date and time, press Ctrl+; (semi-colon) to add the date,
then press Space, then press Ctrl+Shift-; (semi-colon) to add the time

			Date	Time
Venting Process #	Day 11	Start of operations	10/10/2025	7:46
WCATS ID:	move FTWC 225	End of operations	10/10/2025	no venting
Venting Location:	TA 54, Bldg 1028 outside north			

Integrated FTWC Dose (IFD) from previous venting: IFD = 0.0123 mrem *enter 0 if this is first venting operations.*

Calculate Today's Limi & Hold points:

CAP88 Planning Dose Conversation Factor: DCF_p = 3.33E-04 mrem/Ci

Dose Limit:	mrem 6	mrem (IFD) 0.0123		DL mrem 5.9877	
Corresponding Curie Limit:		DL/DCF_p (Ci)	1.798E+04		17,981 curies
Pause For Approval Dose:	mrem 4	mrem (IFD) 0.0123		PFA mrem 3.9877	
Pause for Approval (Ci)		PFA/DFC_p (Ci)	1.198E+04		11,975 curies
Pause for Evaluation Dose:	mrem 2	mrem (IFD) 0.0123		PFED mrem 1.9877	
Pause for Approval (Ci)		$PFED/DFC_p$ (Ci)	5.969E+03		5,969 curies

Concurrance limit for EPC-ES Dose Assessment: (Date/Time/Initial) verified 10/9/25 Ritacco

These limits communicated to the FTWC Venting PIC: (Date/Time/Initial) DF to DH 10/10/2025 7:45 AM

Current Venting Operation Date:

	Latitude	Longitude
GPS Coordinates of stack:	Same as Day 01	

Stack exhaust flow rate: n/a no venting acfm

Basis for flow rate determination: n/a

Daily Emissions Calculation Worksheet

This worksheet calculates emissions hold points and limits based on operations to-date

To QUICKLY insert the current date and time, press Ctrl+; (semi-colon) to add the date,
then press Space, then press Ctrl+Shift-; (semi-colon) to add the time

			Date	Time
Venting Process #	Day 12	Start of operations	10/11/2025	7:03
WCATS ID:	move 229	End of operations	10/11/2025	no venting
Venting Location:	TA 54, Bldg 1028 outside north			

Integrated FTWC Dose (IFD) from previous venting: IFD = 0.0123 mrem *enter 0 if this is first venting operations.*

Calculate Today's Limi & Hold points:

CAP88 Planning Dose Conversation Factor: DCF_p = 3.33E-04 mrem/Ci

Dose Limit:	mrem 6	mrem (IFD) 0.0123		DL mrem 5.9877	
Corresponding Curie Limit:		DL/DCF_p (Ci)	1.798E+04		17,981 curies
Pause For Approval Dose:	mrem 4	mrem (IFD) 0.0123		PFA mrem 3.9877	
Pause for Approval (Ci)		PFA/DFC_p (Ci)	1.198E+04		11,975 curies
Pause for Evaluation Dose:	mrem 2	mrem (IFD) 0.0123		PFED mrem 1.9877	
Pause for Approval (Ci)		$PFED/DFC_p$ (Ci)	5.969E+03		5,969 curies

Concurrance limit for EPC-ES Dose Assessment: (Date/Time/Initial) same as yesterday / J.Gerard aapprove

These limits communicated to the FTWC Venting PIC: (Date/Time/Initial) KH to DH 7:00 10/11/2025

Current Venting Operation Date:

	Latitude	Longitude
GPS Coordinates of stack:	same as Day 1	

Stack exhaust flow rate: n/a no venting acfm

Basis for flow rate determination: n/a

Daily Emissions Calculation Worksheet

This worksheet calculates emissions hold points and limits based on operations to-date

To QUICKLY insert the current date and time, press Ctrl+; (semi-colon) to add the date,
then press Space, then press Ctrl+Shift-; (semi-colon) to add the time

			Date	Time
Venting Process #	Day 13	Start of operations	10/12/2025	7:18
WCATS ID:	move 227	End of operations	10/12/2025	no venting
Venting Location:	TA 54, Bldg 1028 outside north			

Integrated FTWC Dose (IFD) from previous venting: IFD = 0.0123 mrem *enter 0 if this is first venting operations.*

Calculate Today's Limi & Hold points:

CAP88 Planning Dose Conversation Factor: DCF_p = 3.33E-04 mrem/Ci

Dose Limit:	mrem 6	mrem (IFD) 0.0123		DL mrem 5.9877	
Corresponding Curie Limit:		DL/DCF_p (Ci)	1.798E+04		17,981 curies
Pause For Approval Dose:	mrem 4	mrem (IFD) 0.0123		PFA mrem 3.9877	
Pause for Approval (Ci)		PFA/DFC_p (Ci)	1.198E+04		11,975 curies
Pause for Evaluation Dose:	mrem 2	mrem (IFD) 0.0123		PFED mrem 1.9877	
Pause for Approval (Ci)		$PFED/DFC_p$ (Ci)	5.969E+03		5,969 curies

Concurrance limit for EPC-ES Dose Assessment: (Date/Time/Initial) same as yesterday / J.Gerard aapprove

These limits communicated to the FTWC Venting PIC: (Date/Time/Initial) KH to DH 7:00 10/11/2025

Current Venting Operation Date:

	Latitude	Longitude
GPS Coordinates of stack:	same as Day 1	

Stack exhaust flow rate: n/a no venting acfm

Basis for flow rate determination: n/a

Appendix B

Field Bubbler Calculation Worksheets

Area G Background Runs, May/June 2025

Week 0 – Pre-Operational, September 12-15

Week 1, September 15-22

Week 2, September 22-October 1

Week 3, October 1-14 (moving & post-operations)

Use this sheet for evaluation of a single release.
yellow = required field for proper calc blue = optional data for complete report

FIELD BUBBLER MEASUREMENT LOCATION Airnet 207

Emissions calculation date: 11/5/2025 HPAL barcode #:

	date	time
Time sample started:	28-May-2025	10:24 AM
Time sample ended:	18-Jun-2025	7:47 AM
Length of sample period:	501.4	HRS
Sample period downtime:	0.0	HRS

RADAIR Report Period ID:

Bubbler response (catalyst efficiency for HT): 1.00 Cal Date: Expires:

Bubbler flow rate & volume	115	mL/min	at STP
	150	**mL/min**	at altitude
	5.30E-03	cfm	at altitude
	4.52E+06	mL/sample period	at altitude
	4.51	cubic meters	

Weight of glycol and water in vials

	Full Wt	Vial Wt	Glycol Wt
W_1 (g)	111.80	79.6	32.2
W_2 (g)	112.25	78.1	34.2
W_3 (g)	115.99	81.0	35.0
W_4 (g)	110.86	77.9	33.0
W_5 (g)	112.45	76.8	35.7
W_6 (g)	112.28	76.8	35.5

Volume of glycol and water in vials

V_1	28.9	mL
V_2	30.7	mL
V_3	31.4	mL
V_4	29.6	mL
V_5	32.0	mL
V_6	31.9	mL

assumes glycol & water density of 1.113 g/mL

Activity concentration in vials

C_1	1.46E-02	µCi/L
C_2	3.80E-03	µCi/L
C_3	3.80E-03	µCi/L
C_4	6.50E-03	µCi/L
C_5	6.10E-03	µCi/L
C_6	5.20E-03	µCi/L
bkgnd		µCi/L

*no value or 0 indicates less than MDA

Activity in vials

A_1	4.22E-04	µCi
A_2	1.17E-04	µCi
A_3	1.19E-04	µCi
A_4	1.92E-04	µCi
A_5	1.95E-04	µCi
A_6	1.66E-04	µCi

Tritium Air Concentrations

			Dose (mrem)	
HTO vapor:	**146**	**pCi/m3 curies per cubic meter**	0.06	mrem
HT gas:	**123**	**pCi/m3 curies per cubic meter**	0.05	mrem
			0.10	mrem accumulated during this period

Dose Conversion:

Annual dose conversion Factor: *Dose is dominated by analytical uncertainty*

1 mrem =	150	pCi/m3 for one full year *(40 CFR 61 App E Table 2)*
1 yr =	8760	hrs
This run=	501.4	hrs
1 mrem=	2621	pCi/m3

This run was taken months before any FTWC operations; represents background HT/HTO concnetrations for this location. The dose shown above is dominated by analytical laboratory uncertainty. Bubbler ID: 007000

Report by: Rebecca Lattin Date 10/31/2025

Review by: Dave Fuehne Date 11/5/2025

Use this sheet for evaluation of a single release.
yellow = required field for proper calc blue = optional data for complete report

FIELD BUBBLER MEASUREMENT LOCATION Airnet 208

Emissions calculation date: 11/5/2025 HPAL barcode #:

	date	time
Time sample started:	04-Jun-2025	11:41 AM
Time sample ended:	18-Jun-2025	7:29 AM
Length of sample period:	331.8	HRS
Sample period downtime:	0.0	HRS

RADAIR Report Period ID:

Bubbler response (catalyst efficiency for HT): 1.00 Cal Date: Expires:

Bubbler flow rate	115	mL/min	at STP
& volume	**150**	**mL/min**	at altitude
	5.30E-03	cfm	at altitude
	2.99E+06	mL/sample period	at altitude
	2.99	cubic meters	

Weight of glycol and water in vials

	Full Wt	Vial Wt	Glycol Wt
W_1 (g)	114.83	82.0	32.8
W_2 (g)	116.90	82.2	34.7
W_3 (g)	117.08	82.0	35.1
W_4 (g)	116.30	82.1	34.2
W_5 (g)	119.26	82.1	37.2
W_6 (g)	113.18	82.0	31.2

Volume of glycol and water in vials

V_1	29.5	mL
V_2	31.2	mL
V_3	31.5	mL
V_4	30.7	mL
V_5	33.4	mL
V_6	28.0	mL

assumes glycol & water density of 1.113 g/mL

Activity concentration in vials

C_1	1.10E-03	µCi/L
C_2	1.60E-03	µCi/L
C_3	0.00E+00	µCi/L
C_4	6.50E-03	µCi/L
C_5	4.30E-03	µCi/L
C_6	1.60E-02	µCi/L
bkgnd		µCi/L

*no value or 0 indicates less than MDA

Activity in vials

A_1	3.24E-05	µCi
A_2	4.99E-05	µCi
A_3	0.00E+00	µCi
A_4	2.00E-04	µCi
A_5	1.44E-04	µCi
A_6	4.48E-04	µCi

Tritium Air Concentrations

			Dose (mrem)	
HTO vapor:	**28 pCi/m3**	**curies per cubic meter**	0.01	mrem
HT gas:	**265 pCi/m3**	**curies per cubic meter**	0.07	mrem
			0.07	mrem accumulated during this period

Dose Conversion:

Annual dose conversion Factor: *Dose is dominated by analytical uncertainty*

1 mrem = 150 pCi/m3 for one full year *(40 CFR 61 App E Table 2)*
1 yr = 8760 hrs
This run= 331.8 hrs
1 mrem= 3960 pCi/m3

This run was taken months before any FTWC operations; represents background HT/HTO concnetrations for this location. The dose shown above is dominated by analytical laboratory uncertainty. Bubbler ID: 2222065

Report by: Rebecca Lattin Date 10/31/2025

Review by: Dave Fuehne Date 11/5/2025

Use this sheet for evaluation of a single release.
yellow = required field for proper calc | blue = optional data for complete report

FIELD BUBBLER MEASUREMENT LOCATION — Airnet 137

Emissions calculation date: 11/5/2025 | HPAL barcode #:

	date	time
Time sample started:	12-Sep-2025	9:45 AM
Time sample ended:	15-Sep-2025	12:45 PM

RADAIR Report Period ID:

Length of sample period: 75.0 HRS
Sample period downtime: 0.0 HRS
Bubbler response (catalyst efficiency for HT): 1.00
Cal Date: Expires:

Bubbler flow rate & volume	115	mL/min	at STP
	150	**mL/min**	at altitude
	5.30E-03	cfm	at altitude
	6.75E+05	mL/sample period	at altitude
	0.68	cubic meters	

Weight of glycol and water in vials

	Full Wt	Vial Wt	Glycol Wt
W_1 (g)	117.41	82.0	35.4
W_2 (g)	115.99	82.3	33.7
W_3 (g)	97.35	82.1	15.3
W_4 (g)	123.74	82.2	41.5
W_5 (g)	117.88	82.3	35.6
W_6 (g)	116.02	82.6	33.4

Volume of glycol and water in vials

V_1	31.8	mL
V_2	30.3	mL
V_3	13.7	mL
V_4	37.3	mL
V_5	32.0	mL
V_6	30.0	mL

assumes glycol & water density of 1.113 g/mL

Activity concentration in vials

C_1	5.40E-03	µCi/L
C_2	3.60E-03	µCi/L
C_3	1.80E-03	µCi/L
C_4	9.00E-04	µCi/L
C_5	1.80E-03	µCi/L
C_6	1.40E-03	µCi/L
bkgnd		µCi/L

*no value or 0 indicates less than MDA

Activity in vials

A_1	1.72E-04	µCi
A_2	1.09E-04	µCi
A_3	2.47E-05	µCi
A_4	3.36E-05	µCi
A_5	5.75E-05	µCi
A_6	4.20E-05	µCi

Tritium Air Concentrations

			Dose (mrem)	
HTO vapor:	**452**	**pCi/m3 curies per cubic meter**	0.03	mrem
HT gas:	**197**	**pCi/m3 curies per cubic meter**	0.01	mrem
			0.04	mrem accumulated during this period

Dose Conversion:
Annual dose conversion Factor: *Dose is dominated by analytical uncertainty*
1 mrem = 150 pCi/m3 for one full year *(40 CFR 61 App E Table 2)*
1 yr = 8760 hrs
This run= 75.0 hrs
1 mrem= 17520 pCi/m3

Bubbler ID:
Vial C was loaded with distilled water; rapid evaporation was noted. Future samples for field bubblers will have glycol in all 6 vials.

Report by: Rebecca Lattin — Date 10/31/2025

Review by: Dave Fuehne — Date 11/5/2025

Use this sheet for evaluation of a single release.
yellow = required field for proper calc blue = optional data for complete report

FIELD BUBBLER MEASUREMENT LOCATION Airnet 207

Emissions calculation date: 11/5/2025 HPAL barcode #:

	date	time
Time sample started:	12-Sep-2025	10:58 AM
Time sample ended:	15-Sep-2025	12:18 PM

RADAIR Report Period ID:

Length of sample period: 73.3 HRS
Sample period downtime: 0.0 HRS
Bubbler response (catalyst efficiency for HT): 1.00
Cal Date:
Expires:

Bubbler flow rate & volume	115	mL/min	at STP
	150	**mL/min**	at altitude
	5.30E-03	cfm	at altitude
	6.60E+05	mL/sample period	at altitude
	0.66	cubic meters	

Weight of glycol and water in vials

	Full Wt	Vial Wt	Glycol Wt
W_1 (g)	119.53	82.1	37.4
W_2 (g)	115.24	82.0	33.2
W_3 (g)	98.94	81.7	17.2
W_4 (g)	128.62	81.6	47.0
W_5 (g)	107.27	81.7	25.6
W_6 (g)	118.79	81.9	36.9

Volume of glycol and water in vials

V_1	33.6	mL
V_2	29.9	mL
V_3	15.5	mL
V_4	42.2	mL
V_5	23.0	mL
V_6	33.1	mL

assumes glycol & water density of 1.113 g/mL

Activity concentration in vials

C_1	2.11E-01	µCi/L
C_2	1.98E-02	µCi/L
C_3	0.00E+00	µCi/L
C_4	2.30E-03	µCi/L
C_5	0.00E+00	µCi/L
C_6	9.00E-04	µCi/L
bkgnd		µCi/L

*no value or 0 indicates less than MDA

Activity in vials

A_1	7.11E-03	µCi
A_2	5.91E-04	µCi
A_3	0.00E+00	µCi
A_4	9.72E-05	µCi
A_5	0.00E+00	µCi
A_6	2.98E-05	µCi

Tritium Air Concentrations

				Dose (mrem)	
HTO vapor:	**11663**	**pCi/m3**	**curies per cubic meter**	0.65	mrem
HT gas:	**192**	**pCi/m3**	**curies per cubic meter**	0.01	mrem
				0.66	mrem accumulated during this period

Dose Conversion:
Annual dose conversion Factor: *Dose is dominated by analytical uncertainty*
1 mrem = 150 pCi/m3 for one full year *(40 CFR 61 App E Table 2)*
1 yr = 8760 hrs
This run= 73.3 hrs
1 mrem= 17918 pCi/m3

Bubbler ID:
Vial C was loaded with distilled water; rapid evaporation was noted. Future samples for field bubblers will have glycol in all 6 vials.

Report by: Rebecca Lattin Date 10/31/2025

Review by: Dave Fuehne Date 11/5/2025

Use this sheet for evaluation of a single release.
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FIELD BUBBLER MEASUREMENT LOCATION Airnet 392

Emissions calculation date: 11/5/2025 HPAL barcode #:

	date	time
Time sample started:	12-Sep-2025	9:06 AM
Time sample ended:	15-Sep-2025	12:20 PM

RADAIR Report Period ID:

Length of sample period: 75.2 HRS
Sample period downtime: 0.0 HRS
Bubbler response (catalyst efficiency for HT): 1.00
Cal Date:
Expires:

Bubbler flow rate & volume	115	mL/min	at STP
	150	**mL/min**	at altitude
	5.30E-03	cfm	at altitude
	6.77E+05	mL/sample period	at altitude
	0.68	cubic meters	

Weight of glycol and water in vials

	Full Wt	Vial Wt	Glycol Wt
W_1 (g)	118.18	82.4	35.8
W_2 (g)	111.10	77.3	33.8
W_3 (g)	92.45	77.0	15.5
W_4 (g)	123.47	82.5	41.0
W_5 (g)	112.87	77.5	35.4
W_6 (g)	116.97	83.6	33.4

Volume of glycol and water in vials

V_1	32.1	mL
V_2	30.4	mL
V_3	13.9	mL
V_4	36.8	mL
V_5	31.8	mL
V_6	30.0	mL

assumes glycol & water density of 1.113 g/mL

Activity concentration in vials

C_1	9.00E-04	µCi/L
C_2	0.00E+00	µCi/L
C_3	2.70E-03	µCi/L
C_4	5.00E-04	µCi/L
C_5	3.20E-03	µCi/L
C_6	1.40E-03	µCi/L
bkgnd		µCi/L

*no value or 0 indicates less than MDA

Activity in vials

A_1	2.89E-05	µCi
A_2	0.00E+00	µCi
A_3	3.75E-05	µCi
A_4	1.84E-05	µCi
A_5	1.02E-04	µCi
A_6	4.20E-05	µCi

Tritium Air Concentrations

			Dose (mrem)	
HTO vapor:	**98**	**pCi/m3 curies per cubic meter**	0.01	mrem
HT gas:	**239**	**pCi/m3 curies per cubic meter**	0.01	mrem
			0.02	mrem accumulated during this period

Dose Conversion:
Annual dose conversion Factor: *Dose is dominated by analytical uncertainty*
1 mrem = 150 pCi/m3 for one full year *(40 CFR 61 App E Table 2)*
1 yr = 8760 hrs
This run= 75.2 hrs
1 mrem= 17466 pCi/m3

Bubbler ID:
Vial C was loaded with distilled water; rapid evaporation was noted. Future samples for field bubblers will have glycol in all 6 vials.

Report by: Rebecca Lattin Date 10/31/2025

Review by: Dave Fuehne Date 11/5/2025

Use this sheet for evaluation of a single release.
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FIELD BUBBLER MEASUREMENT LOCATION Airnet 137

Emissions calculation date: 11/5/2025 HPAL barcode #:

	date	time
Time sample started:	15-Sep-2025	12:50 PM
Time sample ended:	22-Sep-2025	4:47 PM

RADAIR Report Period ID:

Length of sample period: 172.0 HRS
Sample period downtime: 0.0 HRS
Bubbler response (catalyst efficiency for HT): 1.00
Cal Date:
Expires:

Bubbler flow rate	115	mL/min	at STP
& volume	**150**	**mL/min**	at altitude
	5.30E-03	cfm	at altitude
	1.55E+06	mL/sample period	at altitude
	1.55	cubic meters	

Weight of glycol and water in vials

	Full Wt	Vial Wt	Glycol Wt
W_1 (g)	118.27	81.6	36.7
W_2 (g)	117.02	82.0	35.0
W_3 (g)	115.36	82.2	33.2
W_4 (g)	112.76	79.5	33.3
W_5 (g)	112.99	79.7	33.3
W_6 (g)	116.67	83.6	33.1

Volume of glycol and water in vials

V_1	32.9	mL
V_2	31.5	mL
V_3	29.8	mL
V_4	29.9	mL
V_5	29.9	mL
V_6	29.7	mL

assumes glycol & water density of 1.113 g/mL

Activity concentration in vials

C_1	6.40E-03	µCi/L
C_2	0.00E+00	µCi/L
C_3	0.00E+00	µCi/L
C_4	4.30E-03	µCi/L
C_5	0.00E+00	µCi/L
C_6	0.00E+00	µCi/L
bkgnd		µCi/L

*no value or 0 indicates less than MDA

Activity in vials

A_1	2.11E-04	µCi
A_2	0.00E+00	µCi
A_3	0.00E+00	µCi
A_4	1.28E-04	µCi
A_5	0.00E+00	µCi
A_6	0.00E+00	µCi

Tritium Air Concentrations

			Dose (mrem)
HTO vapor:	**136 pCi/m3**	**curies per cubic meter**	0.02 mrem
HT gas:	**83 pCi/m3**	**curies per cubic meter**	0.01 mrem
			0.03 mrem accumulated during this period

Dose Conversion:

Annual dose conversion Factor: *Dose is dominated by analytical uncertainty*
1 mrem = 150 pCi/m3 for one full year *(40 CFR 61 App E Table 2)*
1 yr = 8760 hrs
This run= 172.0 hrs
1 mrem= 7642 pCi/m3

Bubbler ID:

Report by: Rebecca Lattin Date 10/31/2025

Review by: Dave Fuehne Date 11/5/2025

Use this sheet for evaluation of a single release.
yellow = required field for proper calc | blue = optional data for complete report

FIELD BUBBLER MEASUREMENT LOCATION — Airnet 207

Emissions calculation date: 11/5/2025 | HPAL barcode #:

	date	time
Time sample started:	15-Sep-2025	12:18 PM
Time sample ended:	23-Sep-2025	10:20 AM

RADAIR Report Period ID:

Length of sample period: 190.0 HRS
Sample period downtime: 0.0 HRS
Bubbler response (catalyst efficiency for HT): 1.00
Cal Date:
Expires:

Bubbler flow rate & volume	115	mL/min	at STP
	150	**mL/min**	at altitude
	5.30E-03	cfm	at altitude
	1.71E+06	mL/sample period	at altitude
	1.71	cubic meters	

Weight of glycol and water in vials

	Full Wt	Vial Wt	Glycol Wt
W_1 (g)	114.16	80.6	33.6
W_2 (g)	118.00	83.6	34.4
W_3 (g)	111.29	77.0	34.3
W_4 (g)	118.85	82.7	36.2
W_5 (g)	116.19	82.3	33.9
W_6 (g)	114.26	80.6	33.7

Volume of glycol and water in vials

V_1	30.2	mL
V_2	30.9	mL
V_3	30.8	mL
V_4	32.5	mL
V_5	30.4	mL
V_6	30.2	mL

assumes glycol & water density of 1.113 g/mL

Activity concentration in vials

C_1	7.00E-04	µCi/L
C_2	0.00E+00	µCi/L
C_3	0.00E+00	µCi/L
C_4	0.00E+00	µCi/L
C_5	0.00E+00	µCi/L
C_6	0.00E+00	µCi/L
bkgnd		µCi/L

*no value or 0 indicates less than MDA

Activity in vials

A_1	2.11E-05	µCi
A_2	0.00E+00	µCi
A_3	0.00E+00	µCi
A_4	0.00E+00	µCi
A_5	0.00E+00	µCi
A_6	0.00E+00	µCi

Tritium Air Concentrations

			Dose (mrem)
HTO vapor:	**12 pCi/m3**	**curies per cubic meter**	0.00 mrem
HT gas:	**0 pCi/m3**	**curies per cubic meter**	0.00 mrem
			0.00 mrem accumulated during this period

Dose Conversion:
Annual dose conversion Factor:
Dose is dominated by analytical uncertainty

1 mrem = 150 pCi/m3 for one full year *(40 CFR 61 App E Table 2)*
1 yr = 8760 hrs
This run= 190.0 hrs
1 mrem= 6915 pCi/m3

Bubbler ID:

Report by: Rebecca Lattin — Date 10/31/2025

Review by: Dave Fuehne — Date 11/5/2025

Use this sheet for evaluation of a single release.
yellow = required field for proper calc blue = optional data for complete report

FIELD BUBBLER MEASUREMENT LOCATION Airnet 392

Emissions calculation date: 11/5/2025 HPAL barcode #:

	date	time
Time sample started:	15-Sep-2025	12:25 PM
Time sample ended:	22-Sep-2025	4:22 PM
Length of sample period:	171.9	HRS
Sample period downtime:	0.0	HRS

RADAIR Report Period ID:
Bubbler response (catalyst efficiency for HT): 1.00
Cal Date:
Expires:

Bubbler flow rate & volume	115	mL/min	at STP
	150	**mL/min**	at altitude
	5.30E-03	cfm	at altitude
	1.55E+06	mL/sample period	at altitude
	1.55	cubic meters	

Weight of glycol and water in vials

	Full Wt	Vial Wt	Glycol Wt
W_1 (g)	118.04	81.9	36.1
W_2 (g)	117.33	82.0	35.3
W_3 (g)	115.89	81.8	34.1
W_4 (g)	115.07	81.9	33.2
W_5 (g)	114.99	82.0	33.0
W_6 (g)	114.75	81.8	33.0

Volume of glycol and water in vials

V_1	32.5	mL
V_2	31.7	mL
V_3	30.6	mL
V_4	29.8	mL
V_5	29.6	mL
V_6	29.6	mL

assumes glycol & water density of 1.113 g/mL

Activity concentration in vials

C_1	5.00E-04	µCi/L
C_2	5.00E-04	µCi/L
C_3	0.00E+00	µCi/L
C_4	3.60E-03	µCi/L
C_5	0.00E+00	µCi/L
C_6	1.40E-03	µCi/L
bkgnd		µCi/L

*no value or 0 indicates less than MDA

Activity in vials

A_1	1.62E-05	µCi
A_2	1.59E-05	µCi
A_3	0.00E+00	µCi
A_4	1.07E-04	µCi
A_5	0.00E+00	µCi
A_6	4.14E-05	µCi

Tritium Air Concentrations

			Dose (mrem)
HTO vapor:	**21 pCi/m3**	**curies per cubic meter**	0.00 mrem
HT gas:	**96 pCi/m3**	**curies per cubic meter**	0.01 mrem
			0.02 mrem accumulated during this period

Dose Conversion:
Annual dose conversion Factor:
1 mrem = 150 pCi/m3 for one full year *(40 CFR 61 App E Table 2)*
1 yr = 8760 hrs
This run= 171.9 hrs
1 mrem= 7642 pCi/m3

Dose is dominated by analytical uncertainty

Bubbler ID:

Report by: Rebecca Lattin Date 10/31/2025

Review by: Dave Fuehne Date 11/5/2025

Use this sheet for evaluation of a single release.
yellow = required field for proper calc blue = optional data for complete report

FIELD BUBBLER MEASUREMENT LOCATION Airnet 137

Emissions calculation date: 11/5/2025 HPAL barcode #:

	date	time
Time sample started:	22-Sep-2025	4:52 PM
Time sample ended:	01-Oct-2025	2:08 PM
Length of sample period:	213.3	HRS
Sample period downtime:	0.0	HRS

RADAIR Report Period ID:

Bubbler response (catalyst efficiency for HT): 1.00 Cal Date: Expires:

Bubbler flow rate & volume	115	mL/min	at STP
	150	**mL/min**	at altitude
	5.30E-03	cfm	at altitude
	1.92E+06	mL/sample period	at altitude
	1.92	cubic meters	

Weight of glycol and water in vials

	Full Wt	Vial Wt	Glycol Wt
W_1 (g)	118.14	80.8	37.3
W_2 (g)	120.97	83.7	37.3
W_3 (g)	112.18	77.4	34.8
W_4 (g)	114.46	81.8	32.7
W_5 (g)	116.22	82.3	33.9
W_6 (g)	111.09	77.8	33.3

Volume of glycol and water in vials

V_1	33.5	mL
V_2	33.5	mL
V_3	31.2	mL
V_4	29.3	mL
V_5	30.5	mL
V_6	29.9	mL

assumes glycol & water density of 1.113 g/mL

Activity concentration in vials

C_1	0.00E+00	µCi/L
C_2	0.00E+00	µCi/L
C_3	0.00E+00	µCi/L
C_4	6.89E-02	µCi/L
C_5	5.90E-03	µCi/L
C_6	1.80E-03	µCi/L
bkgnd		µCi/L

*no value or 0 indicates less than MDA

Activity in vials

A_1	0.00E+00	µCi
A_2	0.00E+00	µCi
A_3	0.00E+00	µCi
A_4	2.02E-03	µCi
A_5	1.80E-04	µCi
A_6	5.38E-05	µCi

Tritium Air Concentrations

			Dose (mrem)	
HTO vapor:	**0**	**pCi/m3 curies per cubic meter**	0.00	mrem
HT gas:	**1175**	**pCi/m3 curies per cubic meter**	0.19	mrem
			0.19	mrem accumulated during this period

Dose Conversion:

Annual dose conversion Factor: *Dose is dominated by analytical uncertainty*

1 mrem =	150	pCi/m3 for one full year *(40 CFR 61 App E Table 2)*
1 yr =	8760	hrs
This run=	213.3	hrs
1 mrem=	6161	pCi/m3

Bubbler ID:

Report by: Rebecca Lattin Date 10/31/2025

Review by: Dave Fuehne Date 11/5/2025

Use this sheet for evaluation of a single release.
yellow = required field for proper calc blue = optional data for complete report

FIELD BUBBLER MEASUREMENT LOCATION Airnet 207

Emissions calculation date: 11/5/2025 HPAL barcode #:

	date	time
Time sample started:	23-Sep-2025	10:25 AM
Time sample ended:	01-Oct-2025	9:34 AM
Length of sample period:	191.1	HRS
Sample period downtime:	0.0	HRS

RADAIR Report Period ID:
Bubbler response (catalyst efficiency for HT): 1.00 Cal Date: Expires:

Bubbler flow rate & volume	115	mL/min	at STP
	150	**mL/min**	at altitude
	5.30E-03	cfm	at altitude
	1.72E+06	mL/sample period	at altitude
	1.72	cubic meters	

Weight of glycol and water in vials

	Full Wt	Vial Wt	Glycol Wt
W_1 (g)	119.39	83.5	35.9
W_2 (g)	118.62	83.5	35.1
W_3 (g)	118.98	83.7	35.3
W_4 (g)	116.04	82.2	33.8
W_5 (g)	117.81	84.3	33.5
W_6 (g)	114.87	81.7	33.2

Volume of glycol and water in vials

V_1	32.2	mL
V_2	31.6	mL
V_3	31.7	mL
V_4	30.4	mL
V_5	30.1	mL
V_6	29.8	mL

assumes glycol & water density of 1.113 g/mL

Activity concentration in vials

C_1	3.20E-03	µCi/L
C_2	0.00E+00	µCi/L
C_3	0.00E+00	µCi/L
C_4	4.00E-04	µCi/L
C_5	5.00E-04	µCi/L
C_6	0.00E+00	µCi/L
bkgnd		µCi/L

*no value or 0 indicates less than MDA

Activity in vials

A_1	1.03E-04	µCi
A_2	0.00E+00	µCi
A_3	0.00E+00	µCi
A_4	1.22E-05	µCi
A_5	1.51E-05	µCi
A_6	0.00E+00	µCi

Tritium Air Concentrations

			Dose (mrem)	
HTO vapor:	**60 pCi/m3**	**curies per cubic meter**	0.01	mrem
HT gas:	**16 pCi/m3**	**curies per cubic meter**	0.00	mrem
			0.01	mrem accumulated during this period

Dose Conversion:
Annual dose conversion Factor: *Dose is dominated by analytical uncertainty*
1 mrem = 150 pCi/m3 for one full year *(40 CFR 61 App E Table 2)*
1 yr = 8760 hrs
This run= 191.1 hrs
1 mrem= 6874 pCi/m3

Bubbler ID:

Report by: Rebecca Lattin Date 10/31/2025

Review by: Dave Fuehne Date 11/5/2025

Use this sheet for evaluation of a single release.
yellow = required field for proper calc blue = optional data for complete report

FIELD BUBBLER MEASUREMENT LOCATION Airnet 392

Emissions calculation date: 11/5/2025 HPAL barcode #:

	date	time
Time sample started:	22-Sep-2025	4:22 PM
Time sample ended:	01-Oct-2025	2:28 PM
Length of sample period:	214.1	HRS
Sample period downtime:	0.0	HRS

RADAIR Report Period ID:

Bubbler response (catalyst efficiency for HT): 1.00 Cal Date: Expires:

Bubbler flow rate	115	mL/min	at STP
& volume	**150**	**mL/min**	at altitude
	5.30E-03	cfm	at altitude
	1.93E+06	mL/sample period	at altitude
	1.93	cubic meters	

Weight of glycol and water in vials

	Full Wt	Vial Wt	Glycol Wt
W_1 (g)	120.14	82.5	37.6
W_2 (g)	117.76	82.1	35.7
W_3 (g)	116.78	82.5	34.3
W_4 (g)	115.34	82.2	33.1
W_5 (g)	114.14	82.2	31.9
W_6 (g)	115.45	82.7	32.8

Volume of glycol and water in vials

V_1	33.8	mL
V_2	32.0	mL
V_3	30.8	mL
V_4	29.8	mL
V_5	28.7	mL
V_6	29.4	mL

assumes glycol & water density of 1.113 g/mL

Activity concentration in vials

C_1	2.30E-03	µCi/L
C_2	7.70E-03	µCi/L
C_3	1.40E-03	µCi/L
C_4	0.00E+00	µCi/L
C_5	0.00E+00	µCi/L
C_6	0.00E+00	µCi/L
bkgnd		µCi/L

*no value or 0 indicates less than MDA

Activity in vials

A_1	7.78E-05	µCi
A_2	2.47E-04	µCi
A_3	4.31E-05	µCi
A_4	0.00E+00	µCi
A_5	0.00E+00	µCi
A_6	0.00E+00	µCi

Tritium Air Concentrations

			Dose (mrem)	
HTO vapor:	**191**	**pCi/m3 curies per cubic meter**	0.03	mrem
HT gas:	**0**	**pCi/m3 curies per cubic meter**	0.00	mrem
			0.03	mrem accumulated during this period

Dose Conversion:

Annual dose conversion Factor: *Dose is dominated by analytical uncertainty*

1 mrem = 150 pCi/m3 for one full year *(40 CFR 61 App E Table 2)*
1 yr = 8760 hrs
This run= 214.1 hrs
1 mrem= 6137 pCi/m3

Bubbler ID:

Report by: Rebecca Lattin Date 10/31/2025

Review by: Dave Fuehne Date 11/5/2025

Use this sheet for evaluation of a single release.
yellow = required field for proper calc blue = optional data for complete report

FIELD BUBBLER MEASUREMENT LOCATION Airnet 207

Emissions calculation date: 11/5/2025 HPAL barcode #:

	date	time
Time sample started:	01-Oct-2025	9:35 AM
Time sample ended:	15-Oct-2025	9:31 AM

RADAIR Report Period ID:

Length of sample period: 335.9 HRS
Sample period downtime: 0.0 HRS
Bubbler response (catalyst efficiency for HT): 1.00
Cal Date:
Expires:

Bubbler flow rate	115	mL/min	at STP
& volume	**150**	**mL/min**	at altitude
	5.30E-03	cfm	at altitude
	3.03E+06	mL/sample period	at altitude
	3.02	cubic meters	

Weight of glycol and water in vials

	Full Wt	Vial Wt	Glycol Wt
W_1 (g)	120.06	76.8	43.3
W_2 (g)	112.19	76.9	35.3
W_3 (g)	119.27	83.5	35.8
W_4 (g)	117.64	77.3	40.3
W_5 (g)	114.51	79.6	34.9
W_6 (g)	115.50	79.9	35.6

Volume of glycol and water in vials

V_1	38.9	mL
V_2	31.7	mL
V_3	32.1	mL
V_4	36.2	mL
V_5	31.4	mL
V_6	32.0	mL

assumes glycol & water density of 1.113 g/mL

Activity concentration in vials

C_1	2.70E-03	µCi/L
C_2	9.00E-04	µCi/L
C_3	2.30E-03	µCi/L
C_4	1.80E-03	µCi/L
C_5	2.70E-03	µCi/L
C_6	1.80E-03	µCi/L
bkgnd		µCi/L

*no value or 0 indicates less than MDA

Activity in vials

A_1	1.05E-04	µCi
A_2	2.85E-05	µCi
A_3	7.39E-05	µCi
A_4	6.52E-05	µCi
A_5	8.47E-05	µCi
A_6	5.76E-05	µCi

Tritium Air Concentrations

			Dose (mrem)
HTO vapor:	**69 pCi/m3**	**curies per cubic meter**	0.02 mrem
HT gas:	**69 pCi/m3**	**curies per cubic meter**	0.02 mrem
			0.04 mrem accumulated during this period

Dose Conversion:
Annual dose conversion Factor: *Dose is dominated by analytical uncertainty*
1 mrem = 150 pCi/m3 for one full year *(40 CFR 61 App E Table 2)*
1 yr = 8760 hrs
This run= 335.9 hrs
1 mrem= 3911 pCi/m3

Bubbler ID:

Report by: Rebecca Lattin Date 10/31/2025

Review by: Dave Fuehne Date 11/5/2025

Use this sheet for evaluation of a single release.
yellow = required field for proper calc | blue = optional data for complete report

FIELD BUBBLER MEASUREMENT LOCATION — Airnet 390

Emissions calculation date: 11/5/2025 | HPAL barcode #:

	date	time
Time sample started:	03-Oct-2025	9:23 AM
Time sample ended:	14-Oct-2025	12:09 PM

RADAIR Report Period ID:

Length of sample period: 266.8 HRS
Sample period downtime: 0.0 HRS
Bubbler response (catalyst efficiency for HT): 1.00
Cal Date:
Expires:

Bubbler flow rate	115	mL/min	at STP
& volume	**150**	**mL/min**	at altitude
	5.30E-03	cfm	at altitude
	2.40E+06	mL/sample period	at altitude
	2.40	cubic meters	

Weight of glycol and water in vials

	Full Wt	Vial Wt	Glycol Wt
W_1 (g)	121.60	83.3	38.3
W_2 (g)	119.47	82.5	37.0
W_3 (g)	117.32	82.1	35.2
W_4 (g)	116.34	82.6	33.7
W_5 (g)	115.84	82.1	33.7
W_6 (g)	115.35	82.1	33.3

Volume of glycol and water in vials

V_1	34.4	mL
V_2	33.2	mL
V_3	31.6	mL
V_4	30.3	mL
V_5	30.3	mL
V_6	29.9	mL

assumes glycol & water density of 1.113 g/mL

Activity concentration in vials

C_1	1.40E-03	µCi/L
C_2	1.80E-03	µCi/L
C_3	0.00E+00	µCi/L
C_4	0.00E+00	µCi/L
C_5	0.00E+00	µCi/L
C_6	0.00E+00	µCi/L
bkgnd		µCi/L

*no value or 0 indicates less than MDA

Activity in vials

A_1	4.82E-05	µCi
A_2	5.98E-05	µCi
A_3	0.00E+00	µCi
A_4	0.00E+00	µCi
A_5	0.00E+00	µCi
A_6	0.00E+00	µCi

Tritium Air Concentrations

			Dose (mrem)	
HTO vapor:	**45 pCi/m3**	**curies per cubic meter**	0.01	mrem
HT gas:	**0 pCi/m3**	**curies per cubic meter**	0.00	mrem
			0.01	mrem accumulated during this period

Dose Conversion:
Annual dose conversion Factor:
Dose is dominated by analytical uncertainty

1 mrem = 150 pCi/m3 for one full year *(40 CFR 61 App E Table 2)*
1 yr = 8760 hrs
This run= 266.8 hrs
1 mrem= 4926 pCi/m3

Bubbler ID:

Report by: Rebecca Lattin — Date 10/31/2025

Review by: Dave Fuehne — Date 11/5/2025

Use this sheet for evaluation of a single release.
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FIELD BUBBLER MEASUREMENT LOCATION Airnet 392

Emissions calculation date: 11/5/2025 HPAL barcode #:

	date	time
Time sample started:	01-Oct-2025	2:31 PM
Time sample ended:	14-Oct-2025	11:25 AM
Length of sample period:	308.9	HRS
Sample period downtime:	0.0	HRS

RADAIR Report Period ID:

Bubbler response (catalyst efficiency for HT): 1.00 Cal Date: Expires:

Bubbler flow rate & volume	115	mL/min	at STP
	150	**mL/min**	at altitude
	5.30E-03	cfm	at altitude
	2.78E+06	mL/sample period	at altitude
	2.78	cubic meters	

Weight of glycol and water in vials

	Full Wt	Vial Wt	Glycol Wt
W_1 (g)	123.05	83.2	39.9
W_2 (g)	118.04	80.8	37.2
W_3 (g)	112.04	76.5	35.5
W_4 (g)	113.43	79.5	33.9
W_5 (g)	110.03	76.2	33.8
W_6 (g)	109.48	76.2	33.3

Volume of glycol and water in vials

V_1	35.8	mL
V_2	33.5	mL
V_3	31.9	mL
V_4	30.5	mL
V_5	30.4	mL
V_6	29.9	mL

assumes glycol & water density of 1.113 g/mL

Activity concentration in vials

C_1	2.00E-03	µCi/L
C_2	2.00E-04	µCi/L
C_3	2.00E-04	µCi/L
C_4	0.00E+00	µCi/L
C_5	1.60E-03	µCi/L
C_6	7.00E-04	µCi/L
bkgnd		µCi/L

*no value or 0 indicates less than MDA

Activity in vials

A_1	7.16E-05	µCi
A_2	6.69E-06	µCi
A_3	6.39E-06	µCi
A_4	0.00E+00	µCi
A_5	4.86E-05	µCi
A_6	2.09E-05	µCi

Tritium Air Concentrations

			Dose (mrem)	
HTO vapor:	**30 pCi/m3**	**curies per cubic meter**	0.01	mrem
HT gas:	**25 pCi/m3**	**curies per cubic meter**	0.01	mrem
			0.01	mrem accumulated during this period

Dose Conversion:

Annual dose conversion Factor: *Dose is dominated by analytical uncertainty*

1 mrem =	150	pCi/m3 for one full year *(40 CFR 61 App E Table 2)*
1 yr =	8760	hrs
This run=	308.9	hrs
1 mrem=	4254	pCi/m3

Bubbler ID:

Report by: Rebecca Lattin Date 10/31/2025

Review by: Dave Fuehne Date 11/5/2025

Appendix C

Summary of CAP88 Input Parameters

CAP88 Input Parameters

Day	Date	Wind File Duration	Precip. (cm)	Humidity (g/m3)	Temp. (deg.C)	Stack Flow (m/sec)	HTO Ci	HT Ci	MEI Location
Day 01	9/15/25	1500-1800	0.01	5.03	24.10	16.90	1.79E-04	0	4759 m NNE
Day 02	9/16/25	1100-1730	0.01	8.23	23.33	13.15	0	5.25	4759 m NNE
Day 03	9/17/25	1000-1930	0.01	6.34	23.89	14.33	12.2	18.2	2523 m E
Day 04	9/20/25	0815-1500	0.01	7.55	20.00	11.90	2.7E-04	3.44E-02	2080 m ESE
Day 05	9/21/25	0900-1545	0.01	6.4	21.67	14.40	6.03E-04	6.21	4820 m SW
Day 06	9/23/25	0900-1300	0.01	7.82	16.67	15.50	6.18E-03	2.25E-01	4820 m SW
Day 07	9/24/25	0830-1730	0.01	5.28	17.78	15.30	1.41E-01	9.58	4820 m SW
Day 08	9/25/25	0800-1515	0.01	5.89	17.78	14.40	1.96E-01	1.31	4820 m SW
Day 09	9/29/25	0715-1445	0.01	7.95	15.00	14.00	2.04E-01	69.3	2308 m SE

Note – CAP88 requires a non-zero entry for precipitation; for days with zero measured precipitation, we entered 0.01 cm.

Parameters common to all runs:

Atmospheric Mixing Height	1160 meters (avg for September)
Stack Height	2 meters
Stack Diameter	0.25 meters
Agricultural Data	Local (assumes all food is sourced at receptor location)

Receptor locations are shown in Table 2.

Meteorological data files are available upon request for independent verification of CAP88 runs.
Contact David Fuehne, davef@lanl.gov