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Symbol: EPC-DO: 18-428
LA-UR: 18-30874
Locates Action No.: U1801172
Date: DEC 04 2018

GROUND WATER
DEC 04 2018
BUREAU

Ms. Michelle Hunter, Chief
Ground Water Quality Bureau
New Mexico Environment Department
Harold Runnels Building, Room N2261
1190 St. Francis Drive
P.O. Box 26110
Santa Fe, NM 87502

Subject: DP-1132, Condition No. 41, Stabilization Work Plans, 100K Tank and Clarifier #1

Dear Ms. Hunter:

On August 29, 2018, the New Mexico Environment Department (NMED) issued Discharge Permit DP-1132 to the U.S. Department of Energy (DOE) and Los Alamos National Security, LLC for discharges of treated effluent from the TA-50 Radioactive Liquid Waste Treatment Facility (RLWTF). Subsequently, DP-1132 was transferred to Triad National Security, LLC (DOE/Triad). Pursuant to permit Condition No. 41, *Stabilization of Individual Units and Systems,* DOE/Triad is required to submit a work plan for the stabilization of a unit and system that has ceased operations. Stabilization work plans are attached for the following two units that have been removed from service pursuant to Discharge Permit Condition No. 40: (1) 100,000-gallon steel influent tank (100K tank), and (2) Clarifier #1. Upon NMED approval of the attached stabilization work plans, DOE/Triad will implement the plans in accordance with the approved scope and schedule.

Please contact Karen E. Armijo by telephone at (505) 665-7314 or by email at Karen.Armijo@nnsa.doe.gov, or Robert S. Beers by telephone at (505) 667-7969 or by email at bbeers@lanl.gov if you have questions regarding the enclosure work plans for stabilization of the 100K tank and Clarifier #1.

Very truly yours,

Enrique "Kiki" Torres
Division Leader
Environmental Protection & Compliance
Triad National Security, LLC

Very truly yours,

Karen E. Armijo
Permitting and Compliance Program Manager
National Nuclear Security Administration
U.S. Department of Energy

ET/KEA/MTS/RSB:jdm

Attachment(s): Attachment 1 DP-1132, Stabilization Plan for the 100K Tank
Attachment 2 DP-1132, Stabilization Plan for the Low-Level Clarifier #1

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ATTACHMENT 1

DP-1132, Stabilization Plan for the 100K Tank

EPC-DO: 18-428

LA-UR-18-30874

Date: DEC 0 4 2018

Radioactive Liquid Waste Treatment Facility
Stabilization Plan for the 100K Tank

Condition No. 41
Discharge Permit DP-1132

ATTACHMENT 1
EPC-DO-18-428
LA-UR-18-30874

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Table of Contents

1.0 STABILIZATION OBJECTIVE

This Stabilization Plan describes activities that will be undertaken to stabilize the 100,000 gallon (100K) Tank, a storage unit for low-level radioactive liquid wastes (RLW). This Plan has been prepared in accordance with the provisions specified in Condition 41 of Discharge Permit DP-1132, issued by the New Mexico Environment Department (NMED). Information is presented in the same sequence as the requirements listed in Condition 41.

The primary objective of stabilizing the 100K Tank is to decommission the tank. In addition, its two process lines will be emptied and capped thereby abating any potential for a release until closure can be completed at a future date.

2.0 DESCRIPTION OF THE 100K TANK

The 100K Tank is a cylindrical carbon steel tank with a square bottom sump; see Attachment C. The cylindrical portion of the tank has an inside diameter of 15 feet (ft), a total height of ~20 ft, with a distance of 19 ft to the 6-in.-diameter overflow pipe. An integral part of the tank is a 5-ft x 5-ft sump where the concrete slab indents 3 ft below the cylinder; see Attachment D. The total storage volume of the sump plus the cylinder is 101,000 gallons (gal.).

Secondary containment is provided by a concrete octagon that is 20.7 ft on a side by 8 ft high. The containment walls are 8 in. thick. The sump rests on a concrete slab; see Attachment D. The concrete slab beneath the tank and its sump is 12 in. thick. This secondary containment can hold 124,000 gal. of water.

The 100K Tank went into operation in 1982, nearly 20 years after the RLWTF began to treat water. The 100K Tank is within SWMU 50-001(a). There are no reports of past leaks, and there is no evidence of current leaks.

2.1 Function

The 100K Tank was used for storage of low-level RLW influent from the tank's installation in 1982 through 2000. Since the early 2000s, the tank has also been used for storage of RLW bottoms (also a low-level RLW stream). No treatment occurred within the tank.

The 100K Tank has only two process pipes and one overflow pipe: (1) a 4-in.-diameter carbon steel influent line, (2) a 6-in.-diameter outlet drainpipe, and (3) a 6-in.-diameter overflow line connecting to the outlet drainpipe; see Attachment B.

2.2 Historic Waste Streams

Low-level RLW influent and low-level RLW bottoms were the historic streams stored in the 100K Tank. Influent came from multiple generators at LANL and RLW bottoms are shipped to subcontractors for off-site treatment and disposal.

2.3 Low-level RLW Influent

- *Radioactivity levels* averaged approximately 50-100 nanocuries per liter (nCi/L) alpha activity. Three alpha-emitting radionuclides (Americium-241, Plutonium-238, and Plutonium-239) accounted for more than 99% of the alpha radioactivity in the influent. Beta-emitting radionuclides averaged less than 1 nCi/L. Tritium concentrations have historically averaged 25 nCi/L, but have averaged less than 10 nCi/L in recent years.

- *Non-radioactive constituents* included common metals (iron, sodium, silicon) and anions (nitrate, chloride, sulfate, phosphate) at parts per million (ppm) concentrations. Regulated metals were also present, but always at parts per billion (ppb) concentrations, far below levels that would make the influent a RCRA hazardous waste. Total dissolved solids concentration of influent was almost always less than 1000 ppm.

2.4 Low-level RLW Bottoms

- *Radioactivity levels* averaged approximately 500-800 nanocuries per liter (nCi/L) alpha activity. Three alpha-emitting radionuclides (Americium-241, Plutonium-238, and Plutonium-239) accounted for more than 99% of the alpha radioactivity in the influent. Beta-emitting radionuclides averaged less than 40 nCi/L. Tritium concentrations have historically averaged 25 nCi/L, but have averaged less than 10 nCi/L in recent years.

- *Non-radioactive constituents* included common metals (iron, sodium, silicon) and anions (nitrate, chloride, sulfate, phosphate), with sodium being the most prevalent metal. Regulated metals were also present, but always at parts per billion (ppb) concentrations, below levels that would make the influent a RCRA hazardous waste. Total dissolved solids concentration of bottoms were as high as 80,000 ppm.

3.0 STABILIZATION ACTIVITIES FOR THE 100K TANK

3.1 Remove Process Liquids from the 100K Tank

Liquids will be transferred from the 100K Tank to the Main Treatment Plant (microfilter, perchlorate ion exchange, and reverse osmosis) or shipped offsite for third-party treatment and disposal. Low-level radioactive liquid wastes will be treated in accordance with existing operating procedures prior to discharge.

Criterion: The 100K Tank will no longer contain process liquids.

Verification: Removal will be visually verified using photographs.

Documentation: The condition of the interior of the 100K Tank following removal of liquids will be documented through process records and will be used as input for the Stabilization Report.

3.2 Remove Process Solids from 100K Tank

Process solids will be removed (e.g. by hand or by employing a vacuum system), then either placed in approved waste containers or sent through the Secondary Treatment Plant to be processed through the vacuum filter.

Criterion: The 100K Tank will be a shell.

Verification: Removal will be visually verified (before and after photographs).

Documentation: The condition of the interior of the 100K Tank following removal of the solids will be documented through photographs and through radiological surveys of the interior walls of the 100K Tank. Operating records and photographs will be used as input for the Stabilization Report.

3.3 Flush the 100K Tank and Process Piping

Industrial water will be used to flush the 100K Tank. The tank flush may include the removal of solids adhering to tank walls using methods such as a high-pressure spray wand. Flush water will be transferred to the Main Treatment Plant (microfilter and reverse osmosis). The act of transferring flush water in and out of the 100K Tank will flush process piping. Flushing may need to be repeated until the stabilization criterion is met.

Criterion: Flushing will be adequate when flush water concentration decreases to <20 nCi/L.

Verification: Analytical results for flush water samples will be used to verify that the flush criterion has been met.

Documentation: Operating records and analytical data will be used as input for the Stabilization Report.

3.4 Remove Process Piping

Piping that carried process materials into or from the 100K Tank will be isolated by removal, by capping, or by applying blind flanges, thereby assuring that materials can no longer enter the 100K Tank, and that the 100K Tank will be in a stable condition until closure in accordance with the RLWTF Closure Plan (*LANL 2016*). Section 4.1 of this Stabilization Plan has a detailed list of the lines and how each will be isolated.

Criterion: All inlet and outlet lines will be isolated either by removing the line, by capping, or by applying a blind flange.

Verification: Isolation will be visually verified (before and after photographs).

Documentation: Before and after photographs will be taken of process pipe connections. Photographs and activity records will be used as input for the Stabilization Report.

3.5 Remove the Secondary Containment Wall

The secondary containment wall will be removed and disposed as municipal or industrial solid waste.

Criterion: The secondary containment wall will no longer exist.

Verification: Removal will be visually verified (before and after photographs).

Documentation: Before and after photographs will be taken of the secondary containment wall. Photographs and activity records will be used as input for the Stabilization Report.

3.6 Remove the 100K Tank

Prior to the 100K Tank removal, an enclosure with approved high-efficiency particulate air (HEPA) filtration will be constructed around the tank. The 100K Tank will then be removed (e.g. cutting) and disposed as solid low-level radioactive waste.

Criterion: The 100K Tank will no longer exist.

Verification: Removal will be visually verified (before and after photographs).

Documentation: Before and after photographs will be taken of the secondary containment wall. Photographs and activity records will be used as input for the Stabilization Report.

3.7 Remove the Secondary Containment Floor

The secondary containment floor will be removed and disposed as municipal or industrial solid waste.

Criterion: The secondary containment floor will no longer exist.

Verification: Removal will be visually verified (before and after photographs).

Documentation: Before and after photographs will be taken of the secondary containment wall. Photographs and activity records will be used as input for the Stabilization Report.

3.8 Isolate Support Systems

Compressed Air: Compressed air was once used to operate 100K Tank automated valves and has since been disconnected. Air lines disappear into the concrete slab; they will be removed during the removal of the secondary containment floor and disposed as municipal or industrial solid waste.

Electrical: Electric power was used to operate valves. A single line disappears into the concrete slab; it will be removed during removal of the secondary containment floor and disposed as municipal solid waste.

Industrial Water: Not applicable

Ventilation: Not applicable

4.0 OTHER STABILIZATION INFORMATION

4.1 The 100K Tank Conveyance Lines

The 100K Tank has one 4-in. inlet pipe into the bottom of the tank and two 6-in. pipes; one outlet pipe from the bottom of the tank and one overflow pipe from the top of the tank. The overflow pipe ties into the outlet drain pipe. The inlet pipe comes from the 17K tank in Building 50-0248, enters Building 50-0002, disappears into the ground, and comes back up and through the secondary containment wall to the 100K Tank. The outlet drain from the 100K Tank goes through the secondary containment wall, into the ground (where it enters building 50-0248) and connects to the 17K tank.

Stabilization will be achieved when the ~10-in. steel inlet pipe is severed and capped downstream of the last tee where valve WM2-TK75-V43 branches off. The 100K Tank 6-in. outlet pipe and overflow pipe will be stabilized when the pipe is severed and capped ~12- in. from the flange connected to the 17K tank.

4.2 Portions of the Closure Plan to Be Implemented

Stabilization of the 100K Tank pursuant to this Stabilization Plan will execute the following portions of Closure Plan-related activities at the RLWTF:

DP-1132, Condition 42.d, Methods to be used for decontamination of the site and equipment:

- Liquids will be removed within the 100K Tank and processed (treated) in the existing RLWTF.
- Solids will be removed from the 100K Tank, packaged (e.g., 55-gal. drums), then ship to a commercial facility for disposal as solid low-level radioactive waste.
- The interior surfaces of the 100K Tank will be cleaned (e.g., low-pressure and/or high-pressure wash).

DP-1132, Condition 42.h, Methods to be used to characterize waste generated during closure:

- Samples of solids removed from the 100K Tank will be sampled and analyzed for radioactivity (alpha radionuclides, beta radionuclides, and tritium) and RCRA toxicity-characteristic metals (arsenic, barium, cadmium, chromium, lead, mercury, selenium, and silver).

4.3 Portions of the Closure Plan to Be Implemented (continued)

DP-1132, Condition 42.j, Methods to be used to remove, transport, treat, recycle, and dispose of waste generated during closure:

- Liquids and solids from within the 100K Tank will be removed and treated in accordance with existing operating procedures for the 100K Tank and for the Main Treatment Plant .

4.4 Interim Measures and Controls for the 100K Tank

The activities described in Section 3 of this Stabilization Plan will prevent all future releases of (a) water contaminants to the environment, (b) water contaminants from moving into the groundwater, and (c) water contaminants from posing a threat to human health.

Succinctly, process solids and liquids will be removed from the 100K Tank so that it is empty. Inlet and outlet pipes will be removed or capped, or will have blind flanges applied so that new water and process wastes cannot be introduced to the unit. The 100K Tank itself along with the secondary containment floor and wall will be removed and disposed as solid low-level radioactive waste.

4.5 Soil and Groundwater Investigation

There are no reports of past leaks for The 100K Tank, and there is no evidence of current leaks. The 100K Tank is a part of SWMU 50-0001(a), defined as all of building 50-0001.

In addition, the 100K Tank itself is located southeast of building 50-0001. Exterior walls of the tank are visible to operators and other personnel. Had the 100K Tank developed a leak, then water would have been discovered in the secondary containment, and the origin of the leak would have been obvious.

However, the process line that brought RLW bottoms into the 100K Tank, and the drain line from the 100K tank, extend beneath the ground surface. Some portions of these lines are visible from the outside of the 100K Tank, inside of building 50-0248 and building 50-0002.

The investigation, characterization, cleanup, and corrective action requirements for potential releases of contaminants into soil, groundwater, and other environmental media from solid waste management units (SWMUs) and areas of concern (AOCs) associated with the RLWTF are contained within the Compliance Order of June 2016 entered into between the NMED and the DOE pursuant to the New Mexico Hazardous Waste Act - NMSA 1978, §74-4-10 and the New Mexico Solid Waste Act - NMSA 1978,§74-9-36(D). Accordingly, sampling will be conducted per an investigation work plan approved by the Hazardous Waste Bureau under the Consent Order during final closure.

4.6 Stabilization Report

Within 30 days of completion of stabilization activities, a Stabilization Report will be submitted to the NMED for approval. The report will describe stabilization activities. It will contain photographs, radioactive survey data, and other documentation specified in Section 3 of this Plan as evidence that stabilization has been completed.

4.7 Stabilization Schedule

Stabilization is expected to require approximately 30 months. Funding for the stabilization of the 100K Tank was requested for fiscal year 2019 (FY2019 began on October 1, 2018). Stabilization was initiated in October 2018 (planning and start of the procurement process). Removal of process liquids will occur by June 2019. Subcontractor mobilization will occur October 2019. The remaining stabilization steps (cleaning walls and pipes, removing process piping, demolition) will be completed by December 2020. The Stabilization Report will be submitted to NMED in early to mid 2021.

5.0 REFERENCES

New Mexico Environment Department, June 2016. Compliance Order on Consent U.S. Department of Energy, Los Alamos National Laboratory.

New Mexico Environment Department, 08-29-2018. Ground Water Discharge Permit DP-1132, Radioactive Liquid Waste Treatment Facility, Los Alamos National Laboratory.

LANL, April 2010. *Investigation Report for Upper Mortandad Canyon Aggregate Area*, Revision 1, EP-2010-0149, page 98.

6.0 APPENDICES AND ATTACHMENTS

Appendix	Title
1	*None*

Attachment	Title
A	*Stabilization Activities, Criterion, and Documentation for The 100K Tank*
B	*Drawing RLWTF-SD-INF – Influent Storage WM-90 - RLWTF support drawing As-Found, Influent Storage WM-90, Sheet D-6001. Revision 0, June 2015*
C	*Drawing AB57, As-Built Facility Rad Liquid Waste Treatment Plant, 100,000 Gallon Storage Tank Plan & Details, Sheet S41. Revision 1, Sept. 2001.*
D	*Drawing AB57, As-Built Facility Rad Liquid Waste Treatment Plant, 100,000 Gallon Storage Tank Plan & Details, Sheet S42. Revision 1, Sept. 2001.*

6.1 Attachment A

Stabilization Criteria and Documentation for the 100K Tank

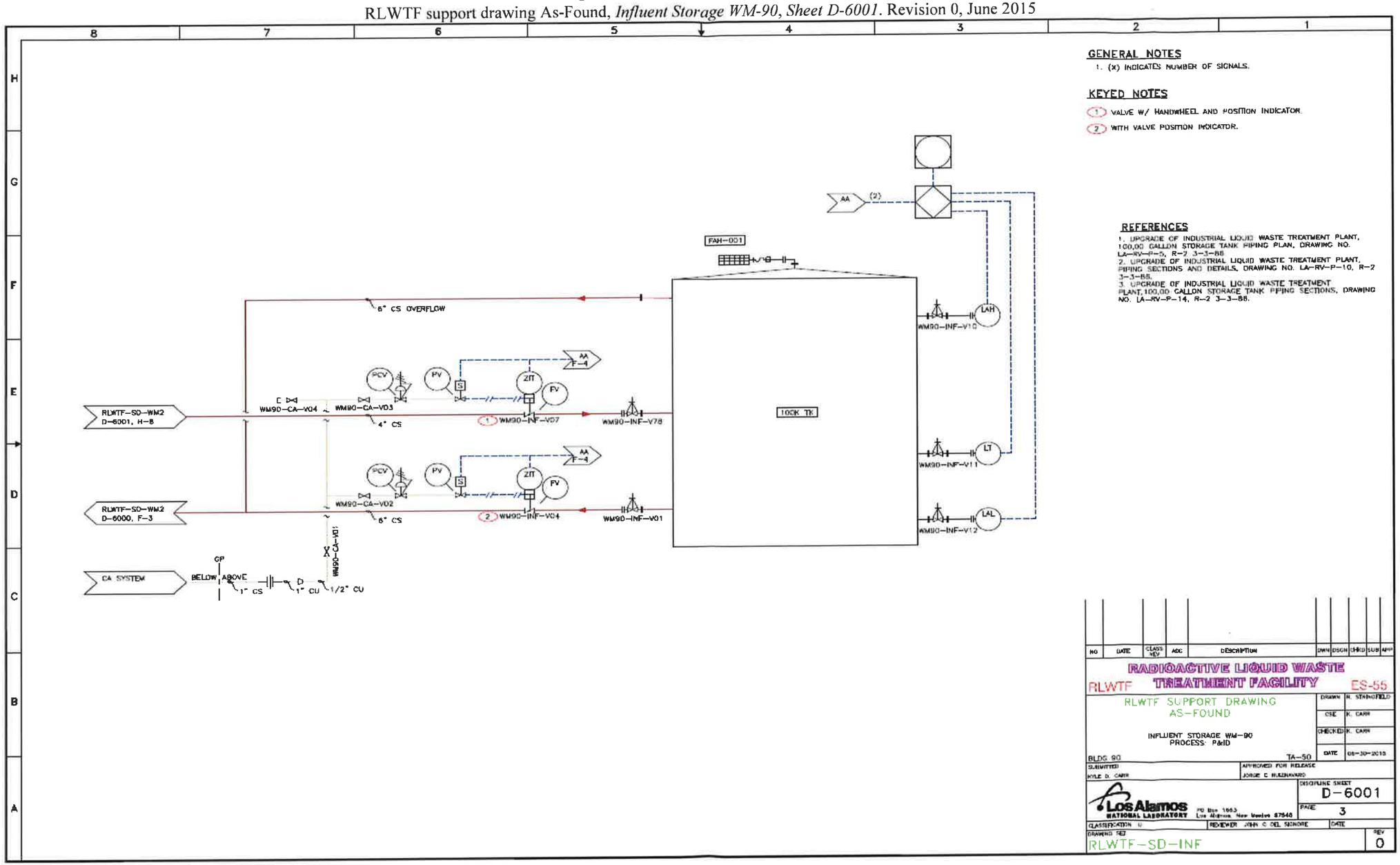
Activity	Criteria	Documentation
1. Remove Process Liquids	The 100K Tank no longer contains process liquids	Process records, including graph of tank levels over time
2. Remove Process Solids	The 100K Tank will be empty	Before and after photographs
3. Flush The 100K Tank and Process Piping	Flush water < 20 nCi/L	Flush water analytical results
4. Remove Process Piping	• Piping no longer exists • Piping cut and capped in WM2	Before and after photographs
5. Remove the Secondary Containment Wall	Secondary containment wall will no longer exist	Before and after photographs
6. Remove the 100K Tank	100K Tank no longer exists	Before and after photographs
7. Remove the Secondary Containment Floor	Concrete base no longer exists	Before and after photographs

In addition to above-listed documentation, activity logs and records will be used as documentation for all activities.

6.2 Attachment B

Drawing RLWTF-SD-INF – Influent Storage WM-90

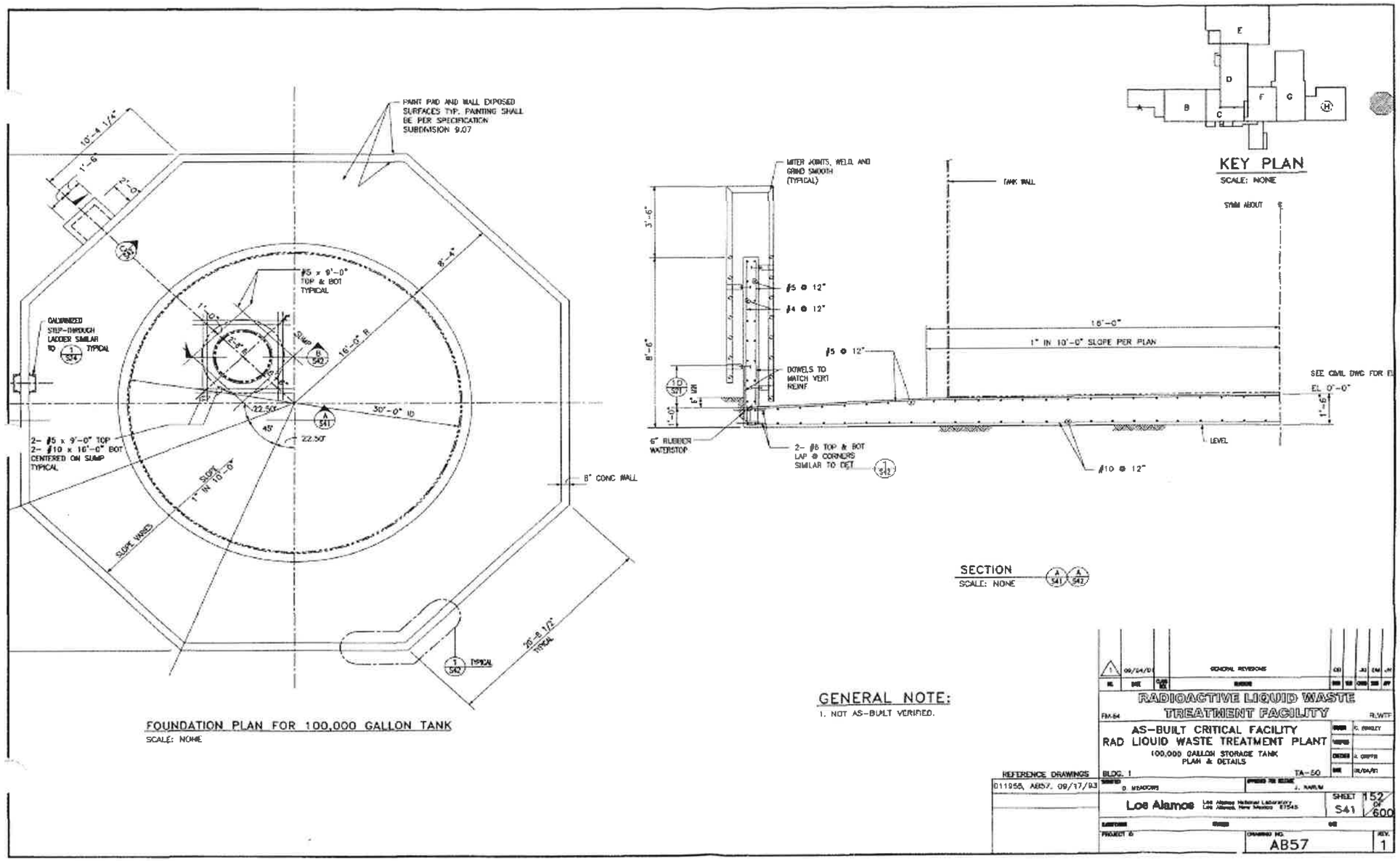
RLWTF support drawing As-Found, *Influent Storage WM-90, Sheet D-6001*. Revision 0, June 2015



6.3 Attachment C

Drawing AB57, As Built Critical Facility Rad Liquid Waste Treatment Plant – Sheet S41

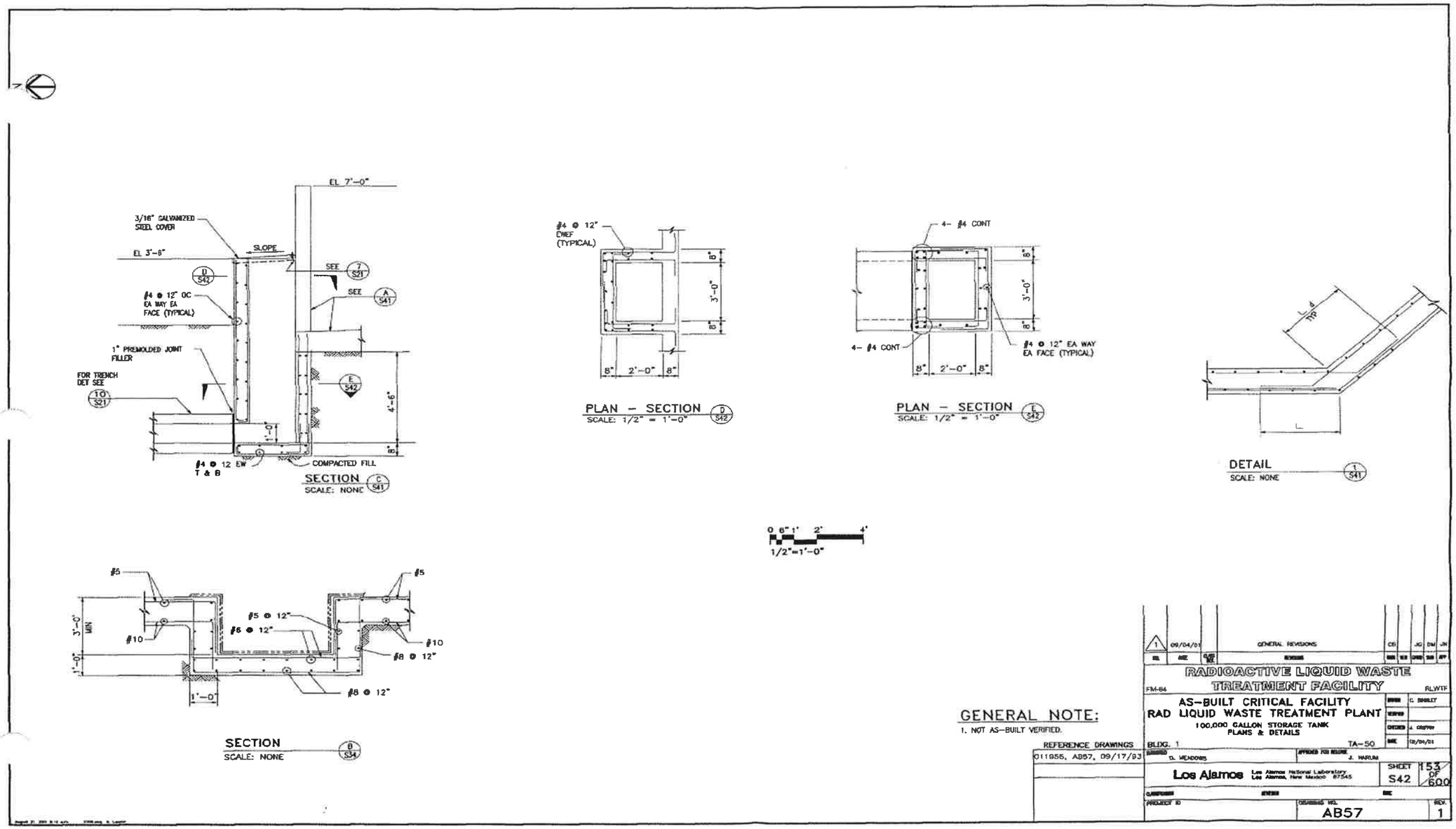
100,000 Gallon Storage Tank Plans & Details, Sheet S41. Revision 1, Sept. 2001



6.4 Attachment D

Drawing AB57, As Built Critical Facility Rad Liquid Waste Treatment Plant – Sheet S42

100,000 Gallon Storage Tank Plans & Details, Sheet S42. Revision 1, Sept. 2001



ATTACHMENT 2

DP-1132, Stabilization Plan for the Low-Level Clarifier #1

EPC-DO: 18-428

LA-UR-18-30874

Date: DEC 0 4 2018

Radioactive Liquid Waste Treatment Facility
Stabilization Plan for Low-Level Clarifier #1

Condition No. 41
Discharge Permit DP-1132

ATTACHMENT 2
EPC-DO-18-428
LA-UR-18-30874

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1.0 STABILIZATION OBJECTIVE AND CRITERIA

This Stabilization Plan describes activities that will be undertaken to stabilize Clarifier #1, a treatment unit for low-level radioactive liquid wastes (RLW). This Plan has been prepared in accordance with the provisions specified in Condition 41 of Discharge Permit DP-1132, issued by the New Mexico Environment Department (NMED). Information is presented in the same sequence as requirements are listed in Condition 41.

The primary objective of stabilizing the clarifier is to empty and isolate the unit so that it will pose no threat to the environment (groundwater and air) until closure.

2.0 DESCRIPTION OF CLARIFIER #1

Clarifier #1 is a concrete cylindrical tank with conical bottom. It has a working volume of about 28,000 gallons (gal.), and is designed to handle feed flow rates up to 120 gallons per minute (gpm). Clarifier #1 can be viewed as having five major components: (1) a concrete clarifier vessel, (2) a system for feeding treatment chemicals in a solid or powder form, (3) a liquid chemical feed system, (4) internal components, and (5) superstructure.

(1) ***Concrete vessel:*** The cylindrical portion is 11 feet (ft) 4 inches (in.) high and 20 ft in diameter; the cone has a depth of 18 in. The cement structural support for Clarifier #1 extends 16 in. below the slab floor of the building.

(2) ***System for feeding treatment chemicals:*** Solid treatment chemicals were delivered from a room one floor above the clarifier, using con-bottomed hoppers. Five hoppers were available to feed chemicals to the two clarifiers (#1 and #2). Two of the hoppers are 3 ft in diameter and 10 ft high; three are 2 ft in diameter. Hoppers extend into the room above the clarifiers. The hoppers are equipped with a motor-driven vibrator and had an air operated gate valve at the bottom of each hopper.

(3) ***Liquid chemical feed system:*** Liquid treatment chemicals were delivered from a system of two tanks, approximately 200 gal. each, located between two clarifiers.

2.0 DESCRIPTION OF CLARIFIER #1 (continued)

(4) ***Internal components:*** Internal components consist of a feed well and a solids rake. The feed well (or flocculator tank) is a 10-ft-diameter steel cylinder suspended in the middle of the clarifier. The well is open at the bottom, allowing solids to fall through the bottom of the well onto the floor of the clarifier. A solids rake moves solids to the conical central sump of the clarifier, from where they can be pumped to a collection tank, turning at a rate of approximately 2 revolutions per minute (rpm).

(5) ***Superstructure:*** A beam spans the top of the clarifier. The beam supports the suspended feed well, as well as the rake motor and drive mechanism.

Clarifier #1 went into operation in July 1963, and has been used ever since. Because it is located within Building 1 of Technical Area 50, Clarifier #1 is within SWMU 50-001(a). There are no reports of past leaks, and there is no evidence of current leaks.

2.1 Function

The clarifier system comprised the first portion of the existing Main Treatment Process in the RLWTF. It provided partial removal of metals, radioactive constituents, and other impurities from RLW influent.

The clarifier had two entry streams (RLW influent, treatment chemicals) and two exit streams (treated water, precipitated solids). Feed and chemicals entered from above through a flash mixer into the center feed well. Treated water exited at the bottom of the feed well, rose in the outer portion of the clarifier, and then overflowed the clarifier to the next treatment unit. Precipitated solids settled beneath the feed well; rakes slowly rotated across the bottom of the unit to move the settled solids to the middle of the cone. Clarifier solids were then periodically pumped from the bottom of the clarifier for storage and treatment in the Secondary Treatment Plant.

2.2 Historic Waste Streams

Chemicals and low-level RLW influent were the historic feed streams to Clarifier #1. Influent came from multiple generators at LANL, and was collected and stored in the 75,000-gal. (75K) tank at Building 50-002. Influent was then pumped from the 75K tank to the clarifiers, where chemicals such as lime (calcium hydroxide), caustic soda (sodium hydroxide), and iron sulfate were added to assist in precipitating impurities, including radionuclides.

Treatment chemicals:

- Lime: Bags of powdered lime were dissolved in water and then fed to the flash mixer where the lime and RLW influent were mixed.
- Iron sulfate: Bags of powdered iron sulfate were dissolved in water and then fed to the flash mixer where the iron sulfate and RLW influent were mixed.
- Caustic soda: Solutions of sodium hydroxide (25% or 50% strength) were fed directly into the flash mixer.

Low-level RLW influent: Radioactivity levels averaged 50-100 nanocuries per liter (nCi/L) alpha activity. Three alpha-emitting radionuclides (Americium-241, Plutonium-238, and Plutonium-239) accounted for more than 99% of the alpha radioactivity in the influent. Beta-emitting radionuclides averaged less than 1 nCi/L. Tritium concentrations have historically averaged 25 nCi/L, but have averaged less than 10 nCi/L in recent years.

Low-level RLW influent: Non-radioactive constituents included common metals (iron, sodium, silicon) and anions (nitrate, chloride, sulfate, phosphate) at parts per million (ppm) concentrations. Regulated metals were also present, but always at parts per billion (ppb) concentrations, far below levels that would make the influent a RCRA hazardous waste. Total dissolved solids concentration of influent averaged less than 1000 ppm.

3.0 STABILIZATION ACTIVITIES FOR CLARIFIER #1

3.1 Dismantle Pilot-Scale Reverse Osmosis Unit

Upon entering Room 116, where Clarifier #1 is located, one immediately encounters a pilot-scale reverse osmosis unit that was used for testing purposes. This unit impedes access to Clarifier #1, liquid chemical feed skids, and Flash Mixer dissolution tanks. The unit also has four process lines that empty directly into the top of Clarifier #1. For both of these reasons, the pilot-scale reverse osmosis unit will be dismantled and removed. Unit components will be disposed as solid low-level radioactive waste.

Criterion: The pilot-scale unit will be removed.

Verification: Removal will be visually verified.

Documentation: Before and after photographs will be taken in Room 116. Photographs and activity records will be used as input for the Stabilization Report.

3.2 Remove Unused Chemicals

Treatment chemicals in solid form were stored one floor above the clarifier, in Room 216, and fed to the clarifier via feed chute. A physical inventory of remaining solid treatment chemicals will be taken and documented. Chemicals, either will then be used in other processes at the RLWTF, or will be disposed in compliance with state and federal regulations.

Treatment chemicals in liquid form were stored in Room 116, before being fed to Clarifier #1. A physical inventory of remaining solid treatment chemicals will be taken and documented. Chemicals either will then be used in other processes at the RLWTF, or will be disposed in compliance with state and federal regulations.

Unused chemicals for both Clarifier #1 and Clarifier #2 will be removed when Clarifier #1 is stabilized. The reporting and documentation for this activity will, however, be reported in the Stabilization Reports for both clarifiers.

Criterion:	No solid or liquid clarifier treatment chemicals will remain.
Verification:	Removal will be visually verified.
Documentation:	Before and after inventory data and photographs will be taken in Rooms 116 and 216. Photographs and activity records (e.g., disposition of unused chemicals) will provide input for the Stabilization Report.

3.3 Dismantle Chemical Feed Systems

Two systems were installed to feed treatment chemicals into the clarifiers. The original (1963) system fed chemicals in solid or powder form; a system installed in 2006 fed chemicals in a liquid form.

Solid chemicals were fed from a room above Clarifier #1 via gravity feed chute. The feed system consisted of feed chutes (five total) and dissolution tanks (two). Dismantled components (chute segments, dissolution tanks, and piping) will be characterized and disposed as solid low-level radioactive waste. Details:

- Three overhead cylindrical feed hoppers from Room 216: The bins neck down from approximately 24-in. diameter to 6-in. diameter, pass through a slide valve, and then are taped shut. Vibrators above the slide valve were used to assist the flow of solid chemical. The 6-in-diameter pipe beneath the slide-valve has been truncated, the dissolution tanks have been removed, and the opening has been taped over. Stabilization will consist of confirming that the bins are empty, then removing the hoppers.

- From Room 216, two 36-in. diameter overhead feed chutes delivered solid chemicals (lime and ferric sulfate) into separate 100-gal. feed tanks. Stabilization will consist of confirming that the feed chutes are empty, them removing the hoppers. The opening into Room 216 will be sealed.

- Chemical dissolution tanks: Two feed tanks received solid chemicals (lime and ferric sulfate) from Room 216 via two feed chutes (see above). Industrial water (1963-2000) or gravity filter effluent (post-2000) was added to the tanks to dissolve the chemicals. Each tank will be rinsed with water, and the rinsate will be emptied into Flash Mixer #2, and then into Clarifier #2. Both tanks, and the 3-in.-diameter drainpipes from the tanks into the flash mixers, will be disposed as solid low-level radioactive waste. Openings into Flash Mixer #1 will be capped.

Two liquid chemical feed skids were erected in 2006 so that chemicals could be purchased in liquid form, and fed to the Flash Mixers without using the dissolution tanks. Each skid included a pump, piping, valves, and a small liquid chemical feed and storage tank (~200 gal.). One skid fed liquid chemicals to Flash Mixer #1 (for Clarifier #1), and the other fed liquid chemicals to Flash Mixer #2 (for Clarifier #2). Both skids will be dismantled, removed, and discarded as solid low-level radioactive waste. Openings into the top of Flash Mixer #1 will be capped.

3.3 Dismantle Chemical Feed Systems (continued)

Criterion: Feed systems for solid and liquid treatment chemicals will be removed.

Verification: Removal will be visually verified.

Documentation: Before and after photographs will be taken in Room 116. Dismantling, characterization, and disposal activities will be documented. Photographs and activity records will be used as input for the Stabilization Report.

Chemical feed systems for both Clarifier #1 and Clarifier #2 will be removed when Clarifier #1 is stabilized. The reporting and documentation for this activity will, however, be reported in the Stabilization Reports for both clarifiers.

3.4 Remove Process Liquids and Solids

Liquids and solids will be transferred from Clarifier #1 to other treatment units for low-level radioactive liquid wastes, where the solids and liquids will be treated, in accordance with existing operating procedures. Specifically, solids will be pumped to TK-8 in Room 61, then processed through the rotary vacuum filter. Clarifier liquids will be processed through the Main Treatment Plant (microfilter, perchlorate ion exchange, and reverse osmosis) prior to discharge to the environment. Vacuum filter solids will be characterized, then disposed. It is anticipated that vacuum filter solids will be disposed as solid low-level radioactive waste.

Criterion: Clarifier #1 will be empty.

Verification: Removal will be visually verified.

Documentation: The condition of the interior of the Clarifier #1 following removal of liquids and solids will be documented through photographs and through radiological surveys of the interior walls of the clarifier. Operating records and photographs will be used as input for the Stabilization Report.

3.5 Flush Clarifier #1 and Process Piping

Industrial water will be used to flush clarifier inlet waste lines and the interior walls of the clarifier, in order to reduce residual internal contamination. Flush water will collect in the clarifier, then be transferred the Main Treatment Plant (microfilter and reverse osmosis) prior to discharge pursuant to DP-1132. The act of transferring flush water out of Clarifier #1 will also flush outlet piping. Flushing may need to be repeated until the stabilization criterion is met.

Criterion: Flushing will be adequate when flush water concentration decreases to <20 nCi/L.

Verification: Analytical results for flush water samples will be used to verify that the flush criterion has been met.

Documentation: Operating records and analytical data will be used as input for the Stabilization Report.

3.6 Remove Superstructure and Internal Components

Superstructure: The beam that spans the top of the clarifier, and the rake motor and drive mechanism, will be removed. The 10-ft-diameter feed well, the solids rake, and their support mechanisms will then be removed from inside the clarifier. Components will be discarded as low-level radioactive waste.

Criterion: The superstructure and internal components of Clarifier #1 will be gone, leaving only the walls and floor of the concrete vessel.

Verification: Removal will be visually verified.

Documentation: Before and after photographs will be taken of the inside of Clarifier #1. Photographs and activity records will provide input for the Stabilization Report.

3.7 Clean and Seal Interior Clarifier Surfaces

Interior surfaces will then be cleaned using measures such as low-pressure spraying or a high-pressure spray wand. Cleaning materials such as water will collect in the clarifier, then be transferred the Main Treatment Plant for processing through the microfilter. Cleaning measures may need to be repeated until the stabilization criterion is met. Residual contamination will then be fixed by applying a brush/roll-on fixative (e.g., paint) to the interior clarifier surfaces

Criterion: Cleaning will be complete when interior surfaces have no residual solids and liquids. Sealing of residual contamination will be complete when contamination levels of painted surfaces have been reduced to <20 dpm per 100 cm^2.

Verification: Cleaning will be visually verified. Radioactive survey results will be used to verify that the sealing criterion has been met.

Documentation: Photographs of the interior walls of the clarifier will be taken prior to cleaning, after cleaning, and after sealing. Radiological surveys will be taken after surfaces have been sealed. Operating records, photographs and radioactive survey data will be used as input for the Stabilization Report.

3. 8 Isolate Inlet and Outlet Lines

Piping that carried chemicals, process materials, and industrial water into or from clarifier will be isolated by removal, by capping, or by applying blind flanges, thereby assuring that materials can no longer enter Clarifier #1, and that Clarifier #1 will be in a stable condition until closure in accordance with the RLWTF Closure Plan (*LANL 2016*). Section 4.1 of this Stabilization Plan has a detailed list of the lines and how each will be isolated.

Criterion: All inlet and outlet lines will be isolated either by removing the line, by capping the line, or by applying a blind flange.

Verification: Isolation will be visually verified.

Documentation: Before and after photographs will be taken of process pipe connections. Photographs and activity records will be used as input for the Stabilization Report.

3.9 Isolate Support Systems

Industrial Water: Water lines into Clarifier are discussed in Section 4.1.

Compressed Air: Not applicable. Compressed air was not used to operate Clarifier #1 components (e.g., clarifier rakes, sludge pumps).

Ventilation: Not applicable. Rooms 16 and 116 receive general room ventilation. There are no clarifier-specific systems to stabilize.

4.0 OTHER STABILIZATION INFORMATION

4.1 Clarifier #1 Conveyance Lines

Process streams enter Clarifier #1 directly (into the top of the Clarifier #1) and indirectly (via Flash Mixer #1). All chemical streams, both solid and liquid, entered indirectly via the Flash Mixer #1. One industrial water line enters directly.

A. Lines into the top of Clarifier #1:

1. Four process lines enter from a pilot-scale reverse osmosis unit installed adjacent to Clarifier #1 (three PVC and one carbon steel). The pilot unit and these lines will be disposed as solid low-level radioactive waste.

2. One industrial water line comes down from the ceiling of Room 116, then elbows into the top of the clarifier. This line will be removed back to Isolation Valve #2, and will then be capped.

3. Reverse osmosis concentrate entered through a 1-in. PVC line. The line raises overhead, then drops back to floor level where influent first enters Room 116. This line will be removed back to its intersection with the influent line.

B. Lines into Flash Mixer #1:

Eight pipes enter Flash Mixer #1. Three are process lines, and five are chemical feed lines. Process influent and clarifier recycle enter the sides of the Flash Mixer; all other lines enter at the top of the Flash Mixer #1.

1. RLW Influent (a 3-in. steel pipe into the side of Flash Mixer #1): Remove the pipe back to a spool piece that is ~2 ft upstream of 116-INF-V20. Then remove the spool piece, and blind flange both open ends. Cap or plug the opening into the side of the Flash Mixer.

2. Reverse osmosis concentrate (a 1-in. PVC pipe into the top of Flash Mixer #1): Remove the pipe back to where it tees into the influent line to Flash Mixer #2, leaving a short (4-in. to 6-in.) stub. Then cap the stub, and cap or plug the opening into Flash Mixer #1.

3. Clarifier recirculation line into the side the Flash Mixer #1: The pipe will be removed back to valve 116-SRL-V01. The valve will be capped, and the opening into Flash Mixer #1 will be capped.

4.1 Clarifier #1 Conveyance Lines (continued)

4. Dissolved lime (a 3-in.-diameter pipe into the top of Flash Mixer #1): The tank that fed Flash Mixer #1, and the dissolved lime pipe, will be removed. The opening into Flash Mixer #1 will be capped.

5. Dissolved ferric sulfate (a 3-in.-diameter pipe into the top of Flash Mixer #1): The tank that fed Flash Mixer #1, and the dissolved ferric sulfate pipe, will be removed. The opening into Flash Mixer #1 will be capped.

6. Liquid sodium hydroxide (a 3/8-in. line into the top of Flash Mixer #1): This line will be removed back to the first flange, and then opening closed with a blind flange. The opening into the top of Flash Mixer #1 will be capped.

7. Liquid chemicals from Skid #1 (a 3/8-in. line into the top of Flash Mixer #1): This line will be removed back to Skid #1, and Skid #1 will then be removed. The opening into the top of Flash Mixer #1 will be capped.

8. Liquid chemicals from Skid #2 (a 3/8-in. line into the top of Flash Mixer #1): This line will be removed back to Skid #2, and Skid #2 will then be removed. The opening into the top of Flash Mixer #1 will be capped.

C. Process Lines Out of Clarifier #1:

NOTE Sludge from the bottom of Clarifier #1 can be sent to the 75K, the WM2 sludge tank, or TK8. The three lines share a common drain line located at floor level. Capping the drain line before it splits will block these three lines.

1. Sludge to 75K tank: Remove the tee located ~8 in. from the exterior wall of Clarifier #1. Apply blind flanges to the three openings.

2. Sludge to the WM2 sludge tank: Remove the tee located ~8 in. from the exterior wall of Clarifier #1. Apply blind flanges to the three openings.

3. Sludge to TK8: Remove the tee located ~8 in. from the exterior wall of Clarifier #1. Apply blind flanges to the three openings.

4.1 Clarifier #1 Conveyance Lines (continued)

4. Feed to the gravity filter: This 10-in. steel pipe drops into Room 16. The 10-in. pipe runs directly from Clarifier #1 to Clarifier #2, about 10 ft above the floor of Room 16. Feed to the gravity filter drops vertically into either a 10-in. feed line to the gravity filter, or into a 6-in. line, that bypasses the gravity filter. Stabilization will be achieved by removing valves 016-GFB-V04 (10-in. diameter), 016-GFB-V02 (four-in. diameter) and 016-ISOL-V08 (10-in. diameter), and by applying blind flanges to the two openings that result when each valve is removed (total of six openings). Stabilization will occur when the gravity filter is stabilized and is, therefore, not considered part of the Stabilization of Clarifier #1.

5. Drain for Flash Mixer #1: This 4-in. steel pipe drops into Room 16, then makes a 60-degree turn to travel horizontally. This will be stabilized by removing the spool piece (~3-ft in length) that is located immediately after the 90-degree turn. Apply blind flanges to the two openings.

6. CL#1 overflow: Overflow is directed to a sump in the floor of Room 16, from which overflow would be pumped to the 75K influent tank in Building 50-02. The overflow line size reduces, from 6-in. diameter to 2-in. diameter, about 8 ft above the sump. A blind flange will be inserted at this size-reduction flange.

4.2 Portions of the Closure Plan to be Implemented

Stabilization of Clarifier #1 pursuant to this Stabilization Plan will execute the following portions of Closure Plan-related activities at the RLWTF:

DP-1132, Condition 42.d, Methods to be used for decontamination of the site and equipment:

- Sludge and liquids will be removed within Clarifier #1 and processed (treated) in the existing RLWTF;
- The interior surfaces of the clarifier will be cleaned (e.g., low-pressure and/or high-pressure wash; and
- Residual contamination will be fixed by applying a brush/roll-on fixative such as paint to the interior clarifier surfaces.

4.2 Portions of the Closure Plan to be Implemented (continued)

DP-1132, Condition 42.h, Methods to be used to characterize waste generated during closure:

- Samples of sludge removed from the clarifiers will be sampled and analyzed for radioactivity (alpha radionuclides, beta radionuclides, and tritium) and RCRA toxicity-characteristic metals (arsenic, barium, cadmium, chromium, lead, mercury, selenium, and silver).

DP-1132, Condition 42.j, Methods to be used to remove, transport, treat, recycle, and dispose of waste generated during closure:

- Liquids and sludge from within the clarifiers will be removed and treated in accordance with existing operating procedures for Clarifier #1, for the Main Treatment Plant, and for the vacuum filter in the Secondary Treatment Plant.

4.3 Interim Measures and Controls for Clarifier #1

The activities described in Section 3 of this Stabilization Plan will prevent all future releases of (a) water contaminants to the environment, (b) water contaminants from moving into the groundwater, and (c) water contaminants from posing a threat to human health.

Succinctly, process solids and liquids will be removed from the clarifier, so that it is empty. Inlet and outlet lines will be removed or capped, or will have blind flanges applied so that new water and process wastes cannot be introduced to the unit. And chemical feed systems will be removed and discarded so that chemicals cannot be re- introduced to Clarifier #1.Soil and Groundwater Investigation

There are no reports of past leaks for Clarifier #1, and no evidence of current leaks. Clarifier #1 is a part of SWMU 50-001(a), defined as all of Building 50-001.

In addition, Clarifier #1 itself is located within Rooms 16 and 116 of Building 50-001. Walls of the unit are visible to operators and other personnel. Had the clarifier developed a leak, then water would have been visible on the floor of Room 16, and the origin of the leak would have been evident.

However, the structural support for Clarifier #1, the process line that brought low-level RLW influent to Clarifier #1, and the process line that removed sludge from Clarifier #1 extend beneath the floor of Room 16 (Note: the floor of Room 16 is part of the slab for Building 50-001).

The investigation, characterization, cleanup and corrective action requirements for potential releases of contaminants into soil, groundwater and other environmental media from solid waste management units (SWMUs) and areas of concern (AOCs) associated with the RLWTF are contained within the Compliance Order of June 2016 entered into between the NMED and the DOE pursuant to the New Mexico Hazardous Waste Act, NMSA 1978, §74-4-10 and the New Mexico Solid Waste Act, NMSA 1978, §74-9-36(D). Accordingly, sampling will be conducted per an investigation work plan approved by the Hazardous Waste Bureau under the Consent Order during final closure.

4.4 Stabilization Report

Within 30 days of completion of stabilization activities, a Stabilization Report will be submitted to the NMED for approval. The report will describe stabilization activities, and will contain photographs, radioactive survey data, and other documentation specified in Section 3 of this Plan as evidence that stabilization has been completed.

4.5 Stabilization Schedule

Stabilization is expected to require approximately 30 months. Funding for the stabilization of Clarifier #1 was requested for fiscal year 2019 (FY2019 began on October 1, 2019). Stabilization was initiated in October 2019 (planning and start of the procurement process). Removal of excess chemicals, and treatment of process liquids and solids will occur during 2019. Removal of feed systems, superstructure, and internal components will occur in 2020. The Stabilization Report will be submitted to NMED in early to mid 2021.

5.0 REFERENCES

New Mexico Environment Department, June 2016. *Compliance Order on Consent U.S.Department of Energy Los Alamos National Laboratory.*

New Mexico Environment Department, 08-29-2018. *Groundwater Discharge Permit DP-1132, Radioactive Liquid Waste Treatment Facility, Los Alamos National Laboratory.*

LANL, April 2010. *Investigation Report for Upper Mortandad Canyon Aggregate Area, Revision 1,* EP-2010-0149, page 98.

6.0 ATTACHMENT A

Attachment A, Stabilization Criteria and Documentation for Clarifier #1

Activity	Criteria	Documentation
1. Dismantle Pilot-Scale Reverse Osmosis Unit	Remove the unit.	Before and after photographs
2. Remove unused chemicals	No solid or liquid chemicals remain.	Before and after inventory data and photographs
3. Dismantle chemical feed systems	Remove solid and liquid systems.	Before and after photographs
4. Remove process liquids and solids	Clarifier #1 will be empty.	Before and after photographs
5. Flush Clarifier #1 and process piping	Flush water < 20 nCi/L	Flush water analytical results
6. Remove Superstructure and internal components	Remove feed well, solids rake and motor, and support beam.	Before and after photographs
7. Clean and seal interior clarifier surfaces	• Cleaning: No residual solids • Sealing: Contamination < 20 dpm/100 cm^2	• Cleaning: before and after photographs • Sealing: radiation survey results
8. Isolate inlet and outlet lines	Remove or cap the line, or apply a blind flange.	Before and after photographs

In addition to above-listed documentation, activity logs and records will be used as documentation for all activities.