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Area G and Area L Domes

Author(s): Stevens, Patrice Ann
Baumer, Andrew Ronald II

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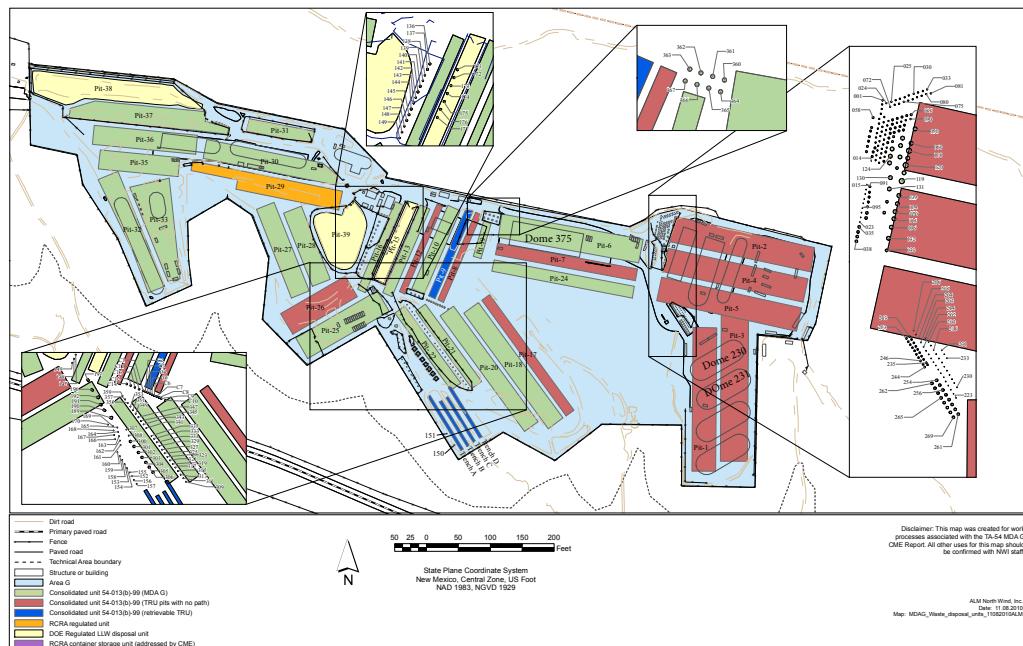
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Associate Directorate Environmental Management Infrastructure Plan for Area G and Area L Domes

13 September 2017

Patrice A. Stevens
Andrew R. Baumer II



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Background

Technical Area 54, at Los Alamos National Laboratory (LANL) is situated in the east-central portion of the Laboratory on the Mesita del Buey between Pajarito Canyon to the south and Cañada del Buey to the north. TA-54 includes four MDAs designated as G, H, J, and L; a waste characterization, container storage, and transfer facility; active TRU waste and MLLW waste storage and low-level waste (LLW) disposal operations at Area G; active hazardous and mixed low-level (MLLW) waste storage operations at Area L; and administrative and support areas. MDA J has previously undergone closure.

Area G is a waste management and disposal area, used for the disposal and storage of radioactive wastes since 1957. Since August 2015, Area G has been in warm standby and provides minimal operations to support safety, compliance, and nitrate salt remediation. Located within Area G, MDA G covers 63-acres. MDA G contains 334 active and inactive waste management units, which include 36 pits, 294 shafts, and 4 trenches. In 1971, Area G began use for the retrievable storage of TRU waste. There are two pits, four trenches and 60 shafts that contain retrievable TRU waste. Thirty-three of the shafts contain TRU waste that may present unique problems for retrieval. In 1986, segregation of MLLW was initiated at Area G for treatment and temporary storage or for off-site disposal. Area G is the only active LLW disposal facility at the Laboratory. Current operations at Area G include storage and characterization of TRU and mixed TRU waste destined for off-site disposal at the Waste Isolation Pilot Plant (WIPP) in southeastern New Mexico and the storage of MLLW destined for off-site treatment and/or disposal.

Several above-ground container storage units (CSUs) are currently used for storage of containerized MLLW and/or mixed TRU wastes. These consist of asphalt pads and associated fabric domes or other structures. As defined by the Consent Order, MDA G contains 229 of the 334 subsurface waste management units at Area G. These MDA G disposal units include 32 pits, 193 shafts, and 4 trenches and contain LLW, MLLW and TRU waste. The remaining 105 solid waste management units (SWMUs) include RCRA-regulated landfill and storage units and DOE-regulated LLW disposal units. The TA-54 closure project must ensure that continuing waste operations at Area G and their transition to an interim or enduring facility are coordinated with closure activities.



TA-54 showing MDAs G, H, J, and L.



Aerial photo of Area G as seen from the East.

Overview

The scope for the *Associate Directorate for Environmental Management (ADEM) Infrastructure Plan for Area G and Area L Domes* is based on the Integrated Prior List (IPL) derived from the Legacy Cleanup Bridge Contract Day 1 Baseline Change Proposal and environmental requirements for radioactive material storage. The infrastructure plan supports the maintenance for safe, compliant operations including the necessary support systems such as utilities, roads, and storage.

Domes located in Resource Conservation Recovery Act Permitted Storage Areas

There are 12 structures at TA-54 Areas G and L referred to as *domes* that are permitted for waste storage or house Permacon units in which waste is stored or processed. These consist of structures 54-33, 54-48, 54-49, 54-153, 54-215, 54-224, 54-229, 54-230, 54-231, 54-232, 54-283, and 54-375. Hereinafter, these structures are referred to as Dome 33, Dome 48, Dome 49, Dome 153, Dome 215, Dome 224, Dome 229, Dome 230, Dome 231, and Dome 375. All of the domes except Dome 215 (which is located in Area L) are located in Area G and are identified in the following aerial photo of Area G.



Aerial photo of Area G with domes authorized for waste storage identified.

These structures are comprised of a 4- to 6-inch thick asphalt pad, a 6-inch high concrete or asphalt ring wall, and a rigid aluminum frame that supports a tensioned fabric membrane cover or roof. A series of aluminum trusses spanning the width of the structures comprise the dome framework, as shown in the following figure.



Interior superstructure view from within Dome 215 at TA-54. Dome 215 houses commodities.

Each dome is equipped with a number of personnel doors and roll-up doors or large rolling doors for vehicle access, and is anchored to the pad or ring-wall with anchor bolts. The membrane material is a polyester fabric coated with UV-stabilized plasticized PVC. The membrane is integrally connected to the frame to ensure a fully-tensioned fit. Six of the domes at Area G require immediate replacement of the fabric or *reskin* to correct Resource

Conservation Recovery Act (RCRA) violations and correct non-conformance reports (NCRs). The degradation is due to age (end of life conditions) and weather insults to the fabric. When funding allows, patching of particular areas has occurred. However, these domes create the potential for environmental violations for the stored waste drums due to deteriorating fabric holes. All of the domes exceed the manufacturer's recommended life for the fabric. The cost estimates listed are for reskin of the domes, except for Dome 224. In some cases, the preferred end state may be demobilization and demolition.

Dome	Manufacturer	Install Date	Height of Dome	Sq. Ft. ¹	Content-Use	Environmental Violations	Violation Comments	Priority
33	Sprung	1994	24	7,850	Drum Venting ²	NRC2016-01	Dome Maintenance – multiple tears in fabric	1 (Reskin)
48	Sprung	1995	24	14,250	Currently non permitted/ no waste	NRC2016-08	North of doors G and B, center of dome, there is a hole in roof and fabric on the ground inside of dome. Please fix.	
49	Sprung	1995	26	26,400	Waste Storage 100% ²	NRC2015-14, NRC2015-20, NRC2016-04	Located between doors "B" and "G" on top of dome patch over skylight has come undone. Please repair. Located in center of dome in line with door D there is a tear in the skylight. Door E does not operate properly/hard to open.	
153	Sprung	1995	26	19,560	Waste Storage/100% ²	NRC2015-32	Located in between columns 85 and 87 there is a large tear in dome fabric. Pinholes present.	1 (Reskin)
215	Rubb	1995	26	15,960	Commodity Storage: ML-1 SWB and 55-Gal Drums ²			
224	Canvas Specialty	1994	26	6,600	Mostly used for Gamma Spec ²	NRC2016-06	Located in center of dome there is a big tear in roof.	1 (D&D)
229	Canvas Specialty	1994	~35	21,820.2	Waste Storage 100% ²	NRC2015-29	Located throughout dome there are several patches in dome fabric that have come undone. This is causing a lot of rain water to leak into dome. Please evaluate all patches. Tear located over sump.	
230	Canvas Specialty	2002	~35	21,820.2	Waste Storage 100% ²	Waste covered. No NRC issues at this time.	Near door C, large tear in dome fabric directly above FRP #57457. Please fix tear.	
231	Rubb	1996	~35	21,820.2	Permacon ²			
232	Rubb	1996	~35	21,820.2	Waste Storage 100% ²			
283	Sprung	1995	26	15,000	Minimal Waste/MIL ISOCs (CCP) ²	NRC2015-22, NRC2015-24, NRC2016-05	Located in center of dome between doors "C" and "H" there is a tear in skylight. Located in center of dome in between doors "E" and "F" skylight is torn. Located in the dome are several new tears.	1(Reskin)
375	Rubb	1999	~35	30,000	Nitrate Salts and Permacon ²			

¹Dimensions for the domes were derived from Attachment A of the LANL Hazardous Waste Facility Permit, December 2013. Both ends of all of the domes except Dome 375 and 283 are hemispherical. Approximate square feet for each of the other domes (except 375 and 283) was calculated by assuming the end of the dome has $\frac{1}{2}$ the area of a circle with a radius equal to $\frac{1}{2}$ the width of the dome. Dome 375 is rectangular and Dome 283 is hemispherical on one end, and my calculations of areas for Dome 375 and 283 reflect those configurations.

²Domes approved as Designated Areas for radioactive material storage.

List of Area G and L domes, manufacturers, and installation date.

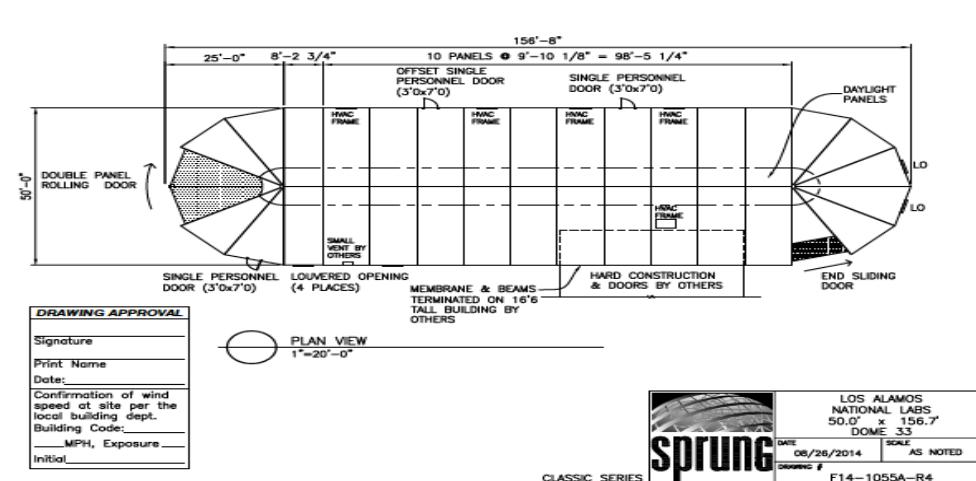
Overview of Dome Skinning Needs

There are 12 domes/buildings located at Area G and 1 dome located at Area L. Domes 48, 49, 153, 229, 232, and 283 require immediate dome membrane replacement to meet the RCRA and/or Nonconformance requirements for waste storage. These domes are located on RCRA pads. Dome 224 also requires reskin due to the deterioration of the fabric but will be decontaminated, decommissioned, and demolished rather than reskinned. Dome houses the Drum Venting System (DVS) and will be reskinned so that DVS activities may continue without interruption or so that the dome space may be used for waste storage, if DVS activities are discontinued. Dome 215 is not in Area G but is in Area L, and is no longer used for waste storage. It was constructed for the storage of MLLW, but is currently used for storage of commodities such as standard waste boxes, pipe-overpack containers, and drums.

The domes are approximately 30 years old. Sprung Structure constructed three of the domes and holds a patent for a proprietary dome reskin process. Sprung Structures provides work on domes originally constructed and skinned by Sprung. Cost estimates from Sprung are based on site visits, previous work performed at Area G, and conference calls. Cost estimate are derived from 2016 costs.

Dome 33

Dome 33 (IPL #10) has external dimensions of 50' x 157' with a peak height of 24' and consists of approximately 7,850 ft² of space. The dome has 3 single personnel doors and 3 top lights. A concrete-block building that is approximately 40' long and 34' wide is attached to the dome, and has two additional personnel doors. A double-panel door is located on the west end of the dome for vehicle access. A single-panel rolling door is located on the east end of the dome for container-handling access. Dome 33 houses the DVS equipment and empty drums. Fabric for Dome 33 was purchased in 2015. Dome 33 does not have any RCRA violations. There are 22 containers in Dome 33. The cost estimate for Dome 33 reskin (excluding fabric) is \$705,890.

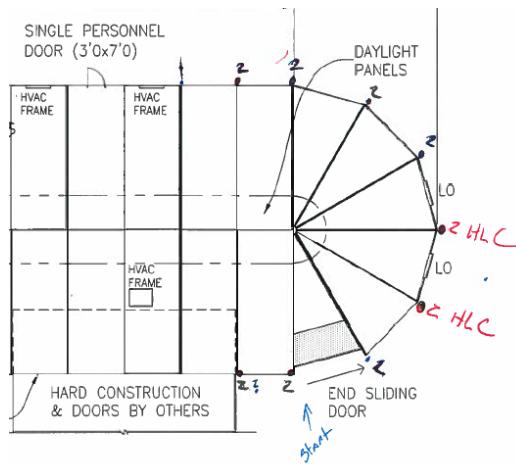


Dome 33 schematic.

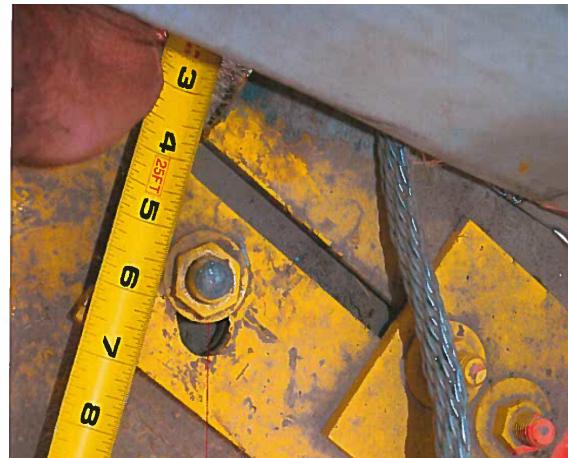
Reskin work begins in FY2016 and will complete FY2017. This includes labor and equipment (booms) and excludes fabric cost because the fabric is already in-house. An

anchor failure calculation must be performed to ensure the anchors hold the weight of the fabric. Dome 33 is a Sprung Structure. Sprung has a patented, proprietary method in which new fabric is installed over the deteriorating fabric eliminated the cost of equipment/container removal and fabric disposal.

Dome 33 has 6 Hilti bolts. The hold down capacity has been identified as marginal as a result of the engineering study. It is recommended that the bolts be replaced because the bolts do not meet current LANL building standards. Two of the 6 bolts are mounted on a supporting wall and are not part of the anchoring system and thus not a concern of engineering. The remaining 4 bolts are located on the east side of the dome, see below diagram note 2 HLC -HX and anchor 2 metal plates.



Dome 33 bolt location.



Bolt requiring replacement.

The two plates will be replaced by cutting off the existing bolts and fabricating 2 new anchoring plates. The new anchoring plates will then be anchored with Hilti M12 HSL (laboratory standard) and are included in the cost.



Dome 33 external.



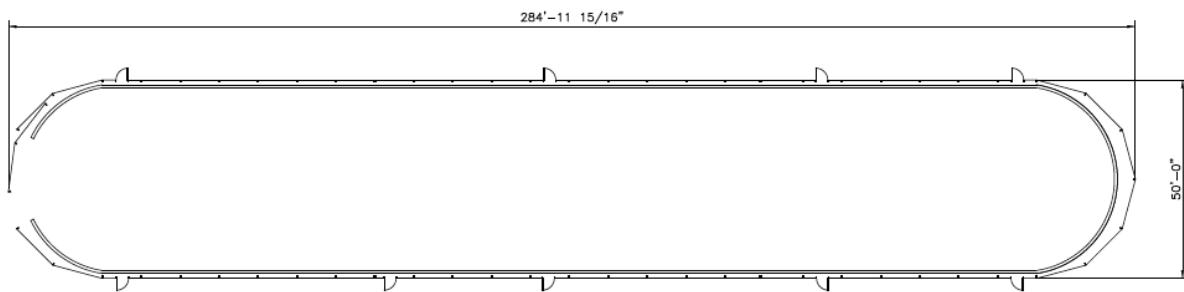
Drum Venting System housed in Dome 33.

54-0333	Square feet
	7850
Material	\$ -
Installation Subcontractor Labor	\$ 486,700
Technical Oversight Subcontractor Labor	\$ 22,569
Equipment	\$ 30,138
LANL Oversight Labor	\$ 116,965
LANL CM Labor	\$ 49,518
Total	\$ 705,890

Dome 33 cost estimate.

Dome 48

Dome 48 has exterior dimensions of 285' x 50' with a peak height of 24' and consists of approximately 14,250 ft² of space based on the exterior dimensions. This dome does not house containers. Area G fire notification system is located in Dome 48. The cost for the reskin is \$1,735,484.



DOME 48

Dome 48 schematic.



Dome 48 interior.



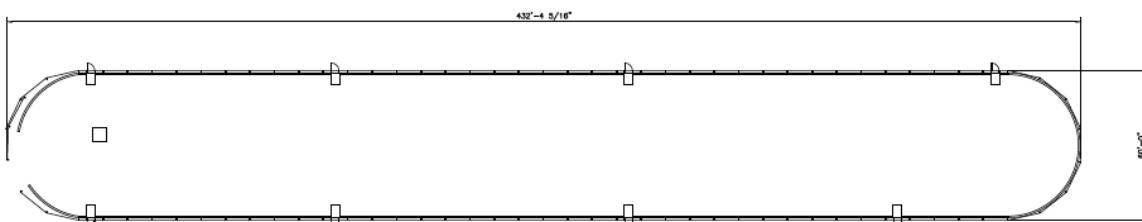
Dome 48 exterior.

54-0048	Square feet
	14250
Material	\$ 327,750
Installation Subcontractor Labor	\$ 997,500
Technical Oversight Subcontractor Labor	\$ 46,313
Equipment	\$ 61,708
LANL Oversight Labor	\$ 212,325
LANL CM Labor	\$ 89,889
Total	\$ 1,735,484

Reskin cost estimate of Dome 48.

Dome 49

Dome 49 has exterior dimensions of 440' x 60' with a peak height of 26' and consists of approximately 26,400 ft² of space based on the exterior dimensions. Dome 49 houses 914 containers. Cost to reskin dome is estimated at \$3,280,377. Cost to relocate the containers is \$65,164.



DOME 49



Dome 49 exterior.

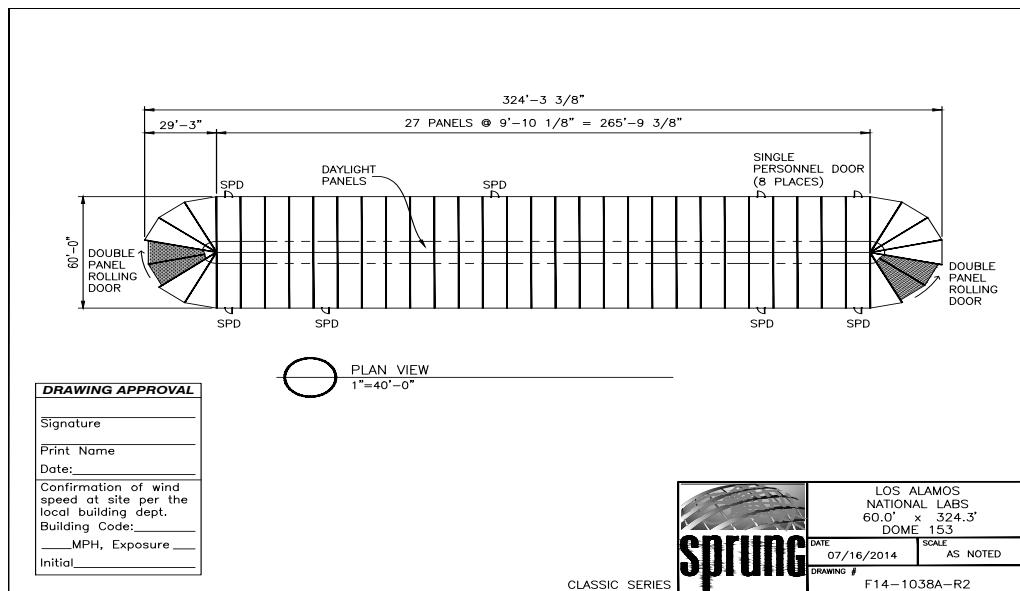
Dome 49 interior.

54-0049	Square feet
	26400
Material	\$ 607,200
Installation Subcontractor Labor	\$ 1,848,000
Technical Oversight Subcontractor Labor	\$ 85,800
Equipment	\$ 114,321
LANL Oversight Labor	\$ 393,360
LANL CM Labor	\$ 166,531
Drum Relocation	\$ 65,164
Total	\$ 3,280,377

Reskin cost of Dome 49.

Dome 153

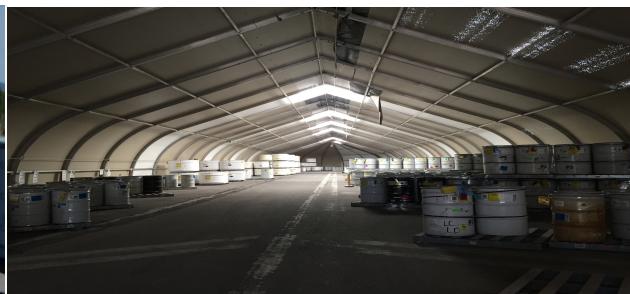
Dome 153 (IPL #10) has exterior dimensions of 60' x 326' with a peak height of 26' and consists of approximately 19,560 ft² of space. This dome houses approximately 567 containers. The dome has 8 single personnel doors and 8 top lights. The cost estimate for the reskin of Dome 153 is \$2,382,180. This cost includes labor (LANS and subcontractor), equipment (booms), and cost of fabric. Dome 153 is a Sprung Structure. Sprung has a patented method in which new fabric is installed over the deteriorating fabric eliminated the cost of equipment removal, fabric disposal, and movement of drums. There is no material disposal cost, because the new skin will be placed over the old skin. There is no cost for drum relocation.



Dome 153 schematic.



Dome 153 exterior.



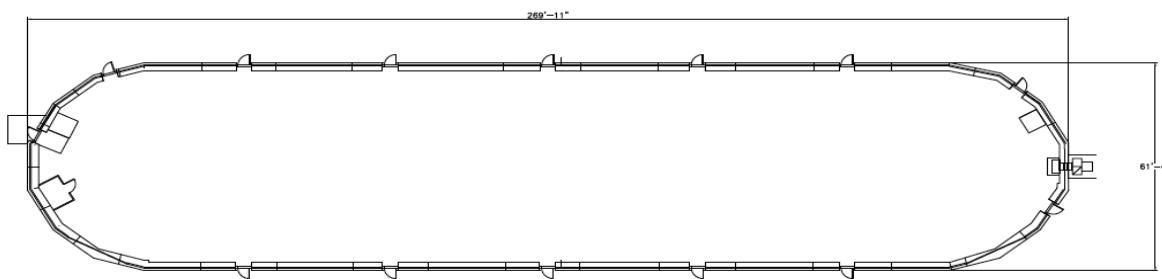
Dome 153 interior.

54-0153	Square feet
	19560
Material	\$ 449,880
Installation Subcontractor Labor	\$ 1,369,200
Technical Oversight Subcontractor Labor	\$ 63,570
Equipment	\$ 84,702
LANL Oversight Labor	\$ 291,444
LANL CM Labor	\$ 123,384
Total	\$ 2,382,180

Cost estimate for Dome 153.

Dome 215

Dome 215 has exterior dimensions of 40' x 150' with a peak height of 26' and consists of approximately 15,960 ft² of space and houses ML-1 standard waste boxes (SWBs) and 55 gallon drums. ROM cost of skin replacement for Dome 215 is estimated at \$3,302,099. The fire suppression system within Dome 215 requires replacement to meet fire protection requirements and is not included in ROM cost estimate. Cost of drum removal and replacement is approximately \$86,886.



DOME 215

Dome 215 schematic.



Dome 215 exterior.



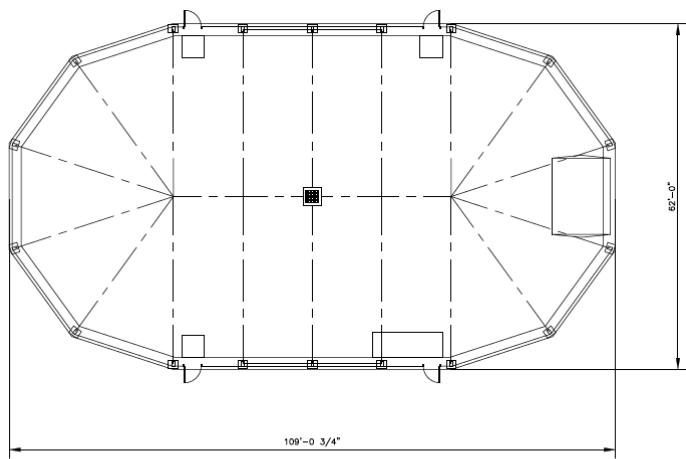
Dome 215 interior.

54-0215	Square feet
	26400
Material	\$ 607,200
Installation Subcontractor Labor	\$ 1,848,000
Technical Oversight Subcontractor Labor	\$ 85,800
Equipment	\$ 114,321
LANL Oversight Labor	\$ 393,360
LANL CM Labor	\$ 166,531
Drum Relocation	\$ 86,886
Total	\$ 3,302,099

Cost estimate for Dome 215.

Dome 224

Dome 224 has exterior dimensions of 60' x 110' with a peak height of 26' and consists of approximately 6,600 ft² of space, houses Gamma Spec and approximately 9 containers. Demolition and completion cost is \$2,648,290 including removal of the dome structure fabric shell (skin), superstructure (aluminum framing), slab, and foundation. The mitigation of water discharge from an unground source into an interior sump (includes soil sampling) was discovered. Therefore, the interior sump will be removed closing a PFITS action. There will be a backfill of voids created by demolition of the slab and foundation and fill/asphalting is required. Cost estimate includes the packaging, handling, shipping, and disposal of generated LLW streams. Cost to relocate the empty containers is \$2,715.



DOME 224

Dome 224 schematic.



Dome 224 exterior.



Dome 224 interior.



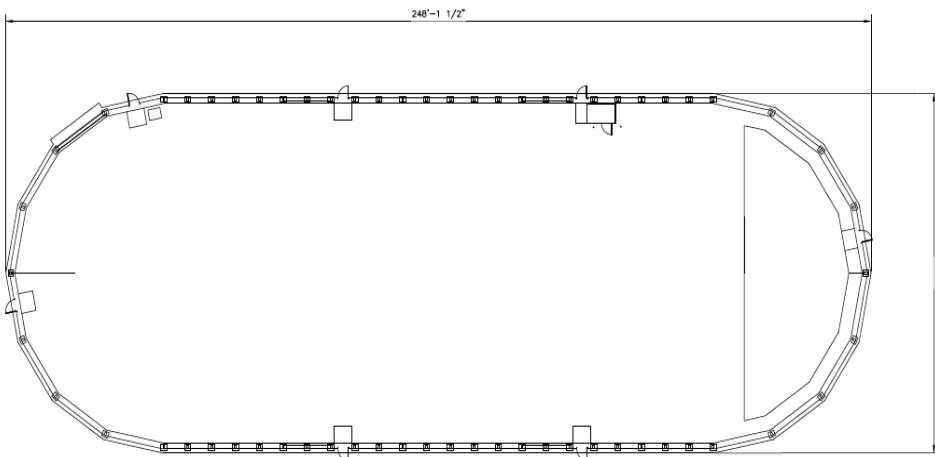
Dome 224 sump access.

54-0224	Square feet
	6600
Predemolition Planning	\$ 214,757
Disconnect Utilities	\$ 308,055
Dome Demolition	\$ 167,332
Structure Demolition	\$ 180,637
Backfill	\$ 207,978
Compact Backfill & Place Asphalt	\$ 267,233
Project Closeout	\$ 142,061
Waste Packaging, Transportation & Disposal	\$ 1,174,102
Drum Relocation	\$ 2,715
Total	\$ 2,648,290

Cost estimate for Dome 224.

Dome 229

Dome 229 has exterior dimensions of 89' x 246' with a peak height of 35' and consists of approximately 21,820.2 ft² of space. This dome houses 988 containers and dome operations must be relocated prior to the commencement of reskin. The skin replacement ROM cost is \$2,944,758. This cost includes labor, equipment (booms), fabric, and LLW disposal of the old fabric (\$220,000). An additional cost for drum movement is \$67,336.



DOME 229



Dome 229 exterior.



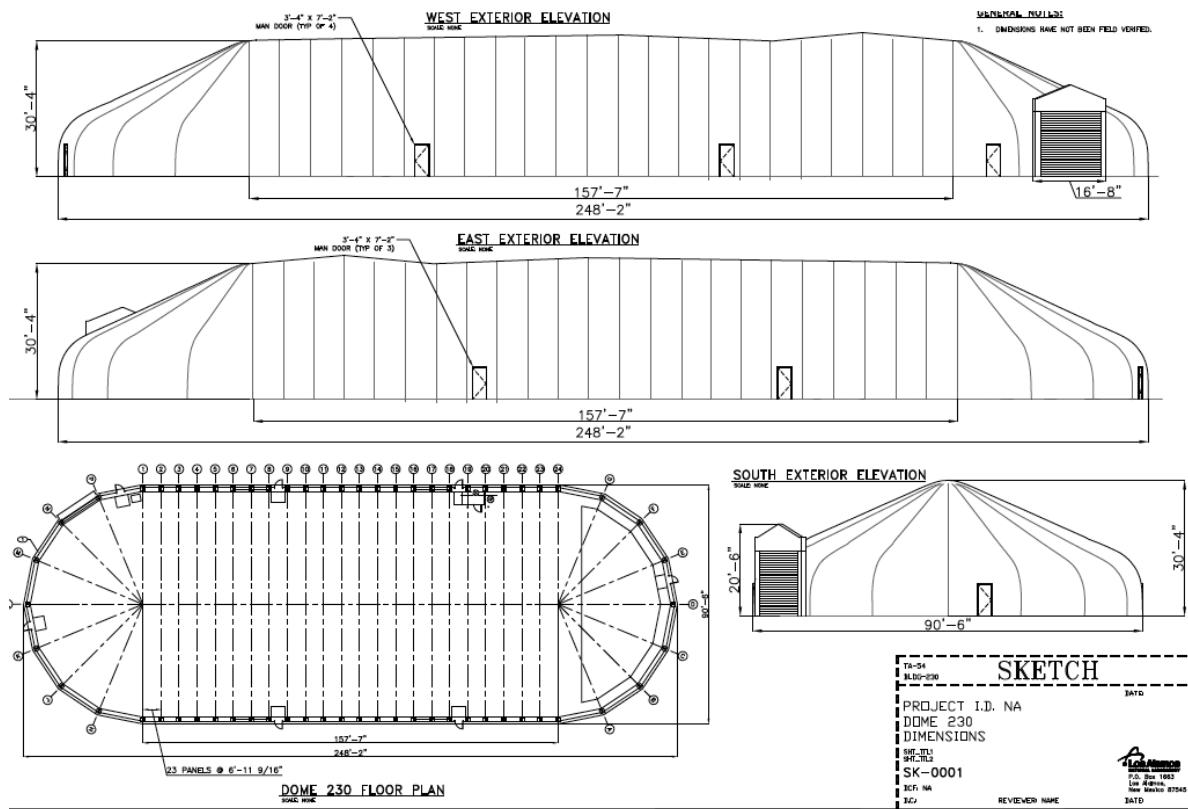
Dome 229 interior.

54-0229	Square feet
	21820
Material	\$ 501,860
Installation Subcontractor Labor	\$ 1,527,400
Technical Oversight Subcontractor Labor	\$ 70,915
Equipment	\$ 94,488
LANL Oversight Labor	\$ 325,118
LANL CM Labor	\$ 137,641
Waste Disposal	\$ 220,000
Drum Relocation	\$ 67,336
Total	\$ 2,944,758

Cost estimate for Dome 229.

Dome 230

Dome 230 has exterior dimensions of 89' x 246' with a peak height of 35' and consists of approximately 21,820.2 ft² of space. This dome houses 378 containers and dome operations must be relocated prior to the commencement of reskin. The cost for movement of drums and equipment is \$32,582. The dome has 8 single personnel doors and 8 top lights. Current estimate from American Canvas to reskin Dome 230 is \$2,910,004. This cost includes labor, equipment (booms), fabric, and waste disposal of the old fabric of approximately \$220,000.



Dome 230 schematic.



Dome 230 exterior.



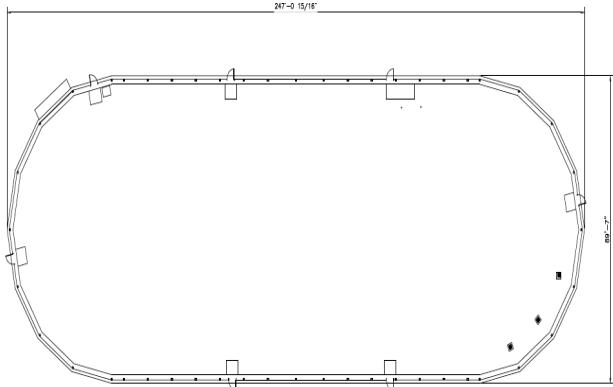
Dome 230 interior.

54-0230	Square feet
	21820
Material	\$ 501,860
Installation Subcontractor Labor	\$ 1,527,400
Technical Oversight Subcontractor Labor	\$ 70,915
Equipment	\$ 94,488
LANL Oversight Labor	\$ 325,118
LANL CM Labor	\$ 137,641
Waste Disposal	\$ 220,000
Drum Relocation	\$ 32,582
Total	\$ 2,910,004

Cost estimate for Dome 230.

Dome 231

Dome 231 has exterior dimensions of 89' x 246' with a peak height of 35' and consists of approximately 21,820.2 ft² of space. Dome 231 contains a Permacon that is used for remediation of waste containers and houses 6 other containers. Current estimate from American Canvas to reskin Dome 230 is \$2,882,852. This cost includes labor, equipment (booms), fabric, and waste disposal of the old fabric for approximately \$220,000. The cost of drum movement for drums in Dome 231 is \$5,430.



DOME 231



Dome 231 schematic.

Dome 231 exterior.



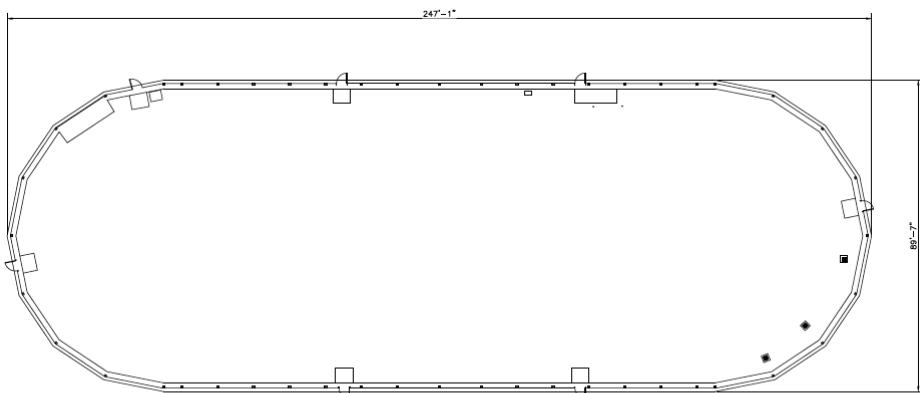
Permacon inside Dome 231.

54-0231	Square feet
	21820
Material	\$ 501,860
Installation Subcontractor Labor	\$ 1,527,400
Technical Oversight Subcontractor Labor	\$ 70,915
Equipment	\$ 94,488
LANL Oversight Labor	\$ 325,118
LANL CM Labor	\$ 137,641
Waste Disposal	\$ 220,000
Drum Relocation	\$ 5,430
Total	\$ 2,882,852

Cost estimate for reskin of Dome 231.

Dome 232

Dome 232 has exterior dimensions of 89' x 246' with a peak height of 35' and consists of approximately 21,820.2 ft² of space. This dome houses 1030 containers and dome operations must be relocated prior to the commencement of reskin. The cost to relocate the drums is \$86,886. Reskin cost estimate of Dome 232 is \$2,964,308.



DOME 232



Dome 232 schematic.



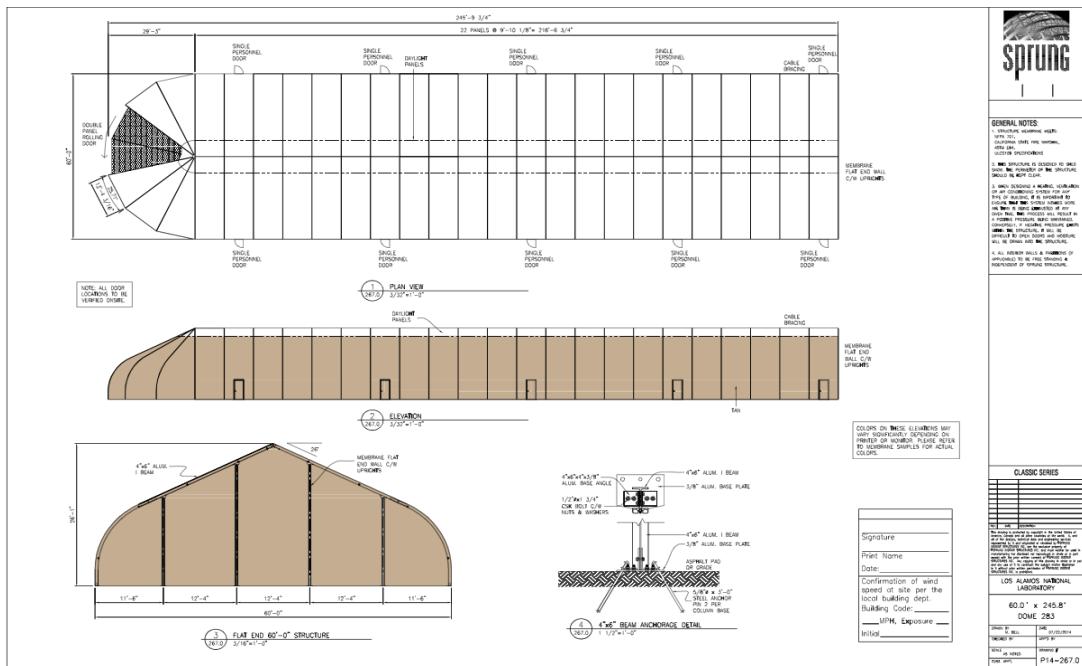
Dome 232 interior.

54-0232	Square feet
	21820
Material	\$ 501,860
Installation Subcontractor Labor	\$ 1,527,400
Technical Oversight Subcontractor Labor	\$ 70,915
Equipment	\$ 94,488
LANL Oversight Labor	\$ 325,118
LANL CM Labor	\$ 137,641
Waste Disposal	\$ 220,000
Drum Relocation	\$ 86,886
Total	\$ 2,964,308

Reskin cost estimate of Dome 232.

Dome 283

Dome 283 (IPL #10) has exterior dimensions of 60' x 250' with a peak height of 26' and consists of approximately 15,000 ft² of space and houses 62 containers. The dome has 10 single personnel doors and 10 top lights. The cost to reskin Dome 283 is \$1,826,825. This cost includes labor (LNS and subcontractor), equipment (booms), and cost of fabric. This cost includes labor, equipment (booms) fabric. Dome 283 is a Sprung Structure. Sprung has a patented method in which new fabric is installed over the deteriorating fabric eliminating the cost of equipment removal and fabric disposal. For Dome 283, there is no cost for material disposal since the new skin will be placed over the old skin. There is no cost for drum relocation. Conex box fire suppression costs are not included in the estimate but require replacement.



Dome 283 schematic.



Dome 283 exterior.



Dome 283 interior.

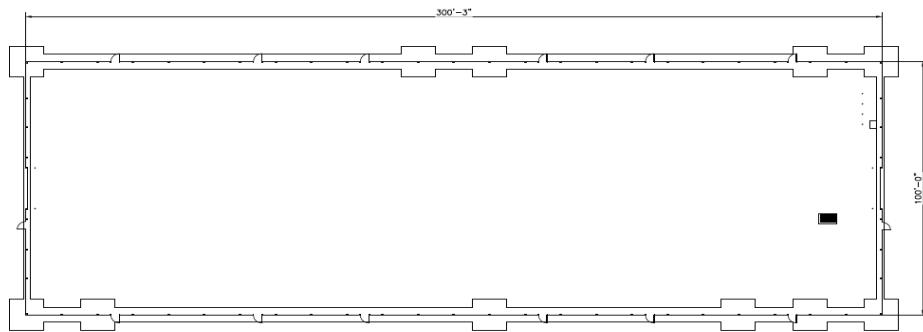
54-0283	Square feet
	15000
Material	\$ 345,000
Installation Subcontractor Labor	\$ 1,050,000
Technical Oversight Subcontractor Labor	\$ 48,750
Equipment	\$ 64,955
LANL Oversight Labor	\$ 223,500
LANL CM Labor	\$ 94,620
Total	\$ 1,826,825

Reskin cost estimate for Dome 283.

Dome 375

Dome 375 has exterior dimensions of 100' x 300' with a peak height of 26' and consists of approximately 30,000 ft² of space. Dome 375 houses the largest permacon facility utilizing 3 cells with an active fire suppression and detection system. The permacon is specifically used

for the Large Item Size reduction or LISR. Large items, such as oversized gloveboxes, require resizing in order to package in WIPP compliant containers. The large items require resize and decon prior to packaging and shipment to WIPP. Currently, Dome 375 permacon currently houses a total of 184 containers of which 48 are the Remediated Nitrate Salt (RNS) waste inventory drums overpacked in standard waste boxes. The RNS drums are scheduled for remediation in FY2017. Current estimate from Sprung Structure to reskin Dome 375 is \$3,664,511. This cost includes labor, equipment (booms), fabric, and waste disposal. Cost for the 136 drum relocation is \$10,860.



BLDG 375

Dome 375 schematic.



Dome 375 exterior.



Permacon located inside Dome 375.

54-0375	Square feet
	30000
Material	\$ 690,000
Installation Subcontractor Labor	\$ 2,100,000
Technical Oversight Subcontractor Labor	\$ 97,500
Equipment	\$ 129,911
LANL Oversight Labor	\$ 447,000
LANL CM Labor	\$ 189,240
Drum Relocation	\$ 10,860
Total	\$ 3,664,511

Reskin cost estimate for Dome 375.

Risks

Refer to the Legacy Bridge Cleanup Contract (LCBC) Day 1 Baseline Change Proposal Risk Register Risk Qualitative Summary for PBS 013, dated 8_25_16, Aggregate Risk ID WW-11.

Assumptions

Several assumptions were made in the development of the cost, scope, and schedule of infrastructure upgrades.

- Changes to the Area G Safety Basis may interrupt the project schedule incurring an increase in cost and schedule.
- Sufficient technical support and expertise are available to support the work planning documents as needed to accomplish the work.
- Subject matter expertise was obtained to validate the assumptions to increase certainty.
- No readiness assessments are required to perform any work scope associated with the activities.
- Quality assurance and process engineering requirements resources are planned appropriately resulting in project schedule impacts.
- Delays in hiring necessary resources, such as radiation protection technicians, and subcontractors result in project schedule delays.
- Operational resources (e.g. operators, RCTs, SOMs, etc.) are available to complete fieldwork in a timely manner.
- Processing rates can be met and overtime is not required to meet the schedule.
- Transportation and disposal will utilize existing contracts but will require funds for disposal where applicable. Commercial facilities may be utilized rather than Nevada National Security Site.
- A combination of available data, projected knowledge, technical judgment, and experienced opinions were used for project planning. Planning and other pre-field activities were subject to standard application of appropriate labor categories and rates for both LANL and subcontractor support.

Appendix: Schedule

