



## Contents

Background .....	3
Overview .....	4
Domes located in Resource Conservation Recovery Act Permitted Storage Areas .....	4
Overview of Dome Skinning Needs .....	8
Dome 33 .....	8
Dome 48 .....	10
Dome 49 .....	11
Dome 153 .....	12
Dome 215 .....	13
Dome 224 .....	14
Dome 229 .....	15
Dome 230 .....	16
Dome 231 .....	18
Dome 232 .....	19
Dome 283 .....	20
Dome 375 .....	22
Risks .....	23
Assumptions .....	23
Appendix 1: Schedule .....	24
Appendix 2: Notes from Estimation .....	26

## Background

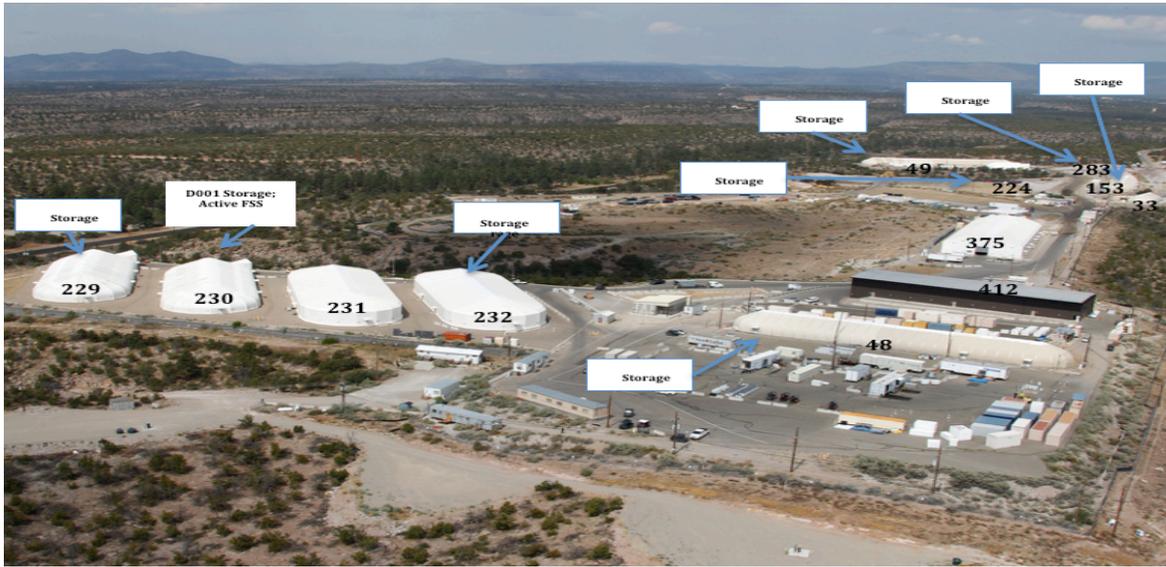
Technical Area 54, at Los Alamos National Laboratory (LANL) is situated in the east-central portion of the Laboratory on the Mesita del Buey between Pajarito Canyon to the south and Cañada del Buey to the north. TA-54 includes four MDAs designated as G, H, J, and L; a waste characterization, container 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 under-gone 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 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.



Inside Dome 215 a radioactive waste storage dome at TA-54

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 and weather insults to the fabric. When funding allows, patching of particular areas has occurred. However, these domes have 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.

Dome	Manufacturer	Install Date	Height of Dome	Sq. Ft. <sup>1</sup>	Content-Use	Environmental Violations	Violation Comments	Priority
33	Sprung	1994	24	7,850	Drum Venting <sup>2</sup>	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% <sup>2</sup>	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% <sup>2</sup>	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 <sup>2</sup>			
224	Canvas Specialty	1994	26	6,600	Mostly used for Gamma Spec <sup>2</sup>	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% <sup>2</sup>	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% <sup>2</sup>	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 <sup>2</sup>			
232	Rubb	1996	~35	21,820.2	Waste Storage 100% <sup>2</sup>			
283	Sprung	1995	26	15,000	Minimal Waste/MIL ISOCs (CCP) <sup>2</sup>	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 <sup>2</sup>			

<sup>1</sup>Dimensions 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 ½ the area of a circle with a radius equal to ½ 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.

<sup>2</sup>Domes approved as Designated Areas for radioactive material storage.

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

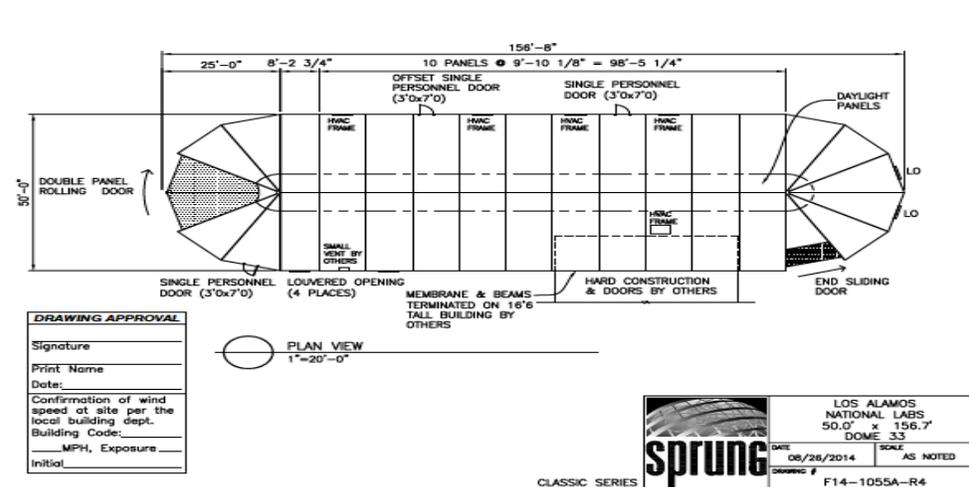
**Overview of Dome Skinning Needs**

There are 12 domes/buildings located at Area G and 1 dome at Area L. Domes 48, 49, 153, 229, 232, 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 48 and 224 requires reskin due to the deterioration of the fabric but will be decontaminated, decommissioned, and demolished and rather than reskinned. Dome houses the Drum Venting System (DVS) and will be reskinned so that DVS activities may continue without interruption. 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 the 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 estimates.

**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 ft<sup>2</sup> 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. Dome 33 does not have any RCRA violations. There are 22 containers in Dome 33. The definitized cost for Dome 33 reskin is \$927,768.

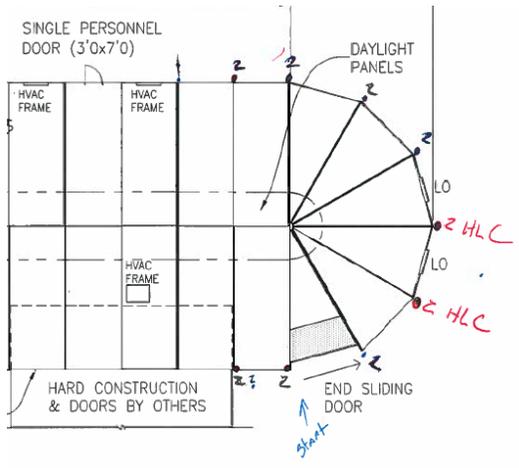


Dome 33 schematic.

Dome 33 reskin cost is approximately \$927,768. Work begins in FY2016 and work will complete FY17. 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 removal and fabric disposal.

Dome 33 has 6 Hilti bolts. The hold down capacity has been identified as marginal as a result of the engineer study. It is recommended that that the bolts be replaced because the bolts do not meet 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). After the award is issued, a Field Change Request or a Directed Order Change will be requested to Florida Expo for a new plate design. After LANL approval, the plates will be fabricated and installed.



Dome 33 external.

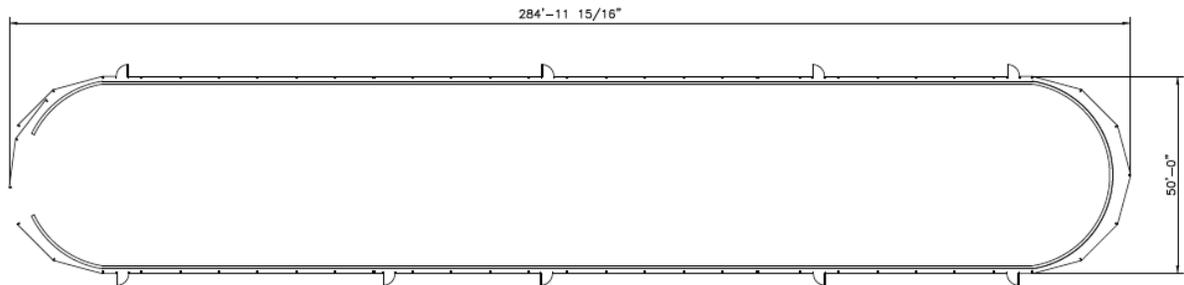


Drum Venting System housed in Dome 33.

*Dome 48*

Dome 48 has exterior dimensions of 285' x 50' with a peak height of 24' and consists of approximately 14,250 ft<sup>2</sup> of space based on the exterior dimensions. This dome currently houses no containers. Area G fire notification system is located in Dome 48. The cost for the reskin is \$1,735,484 and includes waste disposal.

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



DOME 48

Reskin cost estimate of Dome 48.

Dome 48 schematic.



Dome 48 interior.

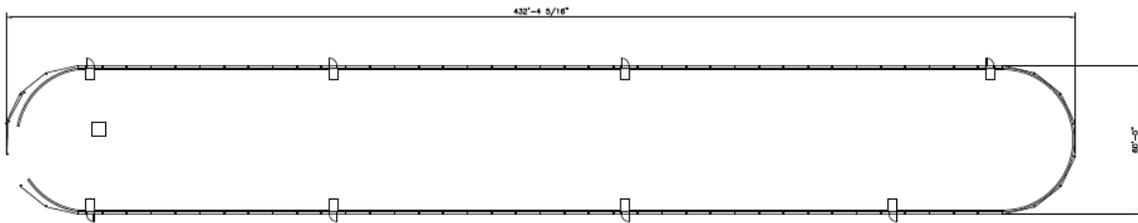
Dome 48 exterior.

*Dome 49*

Dome 49 has exterior dimensions of 440' x 60' with a peak height of 26' and consists of approximately 26,400 ft<sup>2</sup> of space based on the exterior dimensions. Dome 49 houses 914 containers. Cost to reskin dome is \$3,215,213.

54-0049	Square feet
	26400
<b>Material</b>	\$ 607,200
<b>Installation Subcontractor Labor</b>	\$ 1,848,000
<b>Technical Oversight Subcontractor Labor</b>	\$ 85,800
<b>Equipment</b>	\$ 114,321
<b>LANL Oversight Labor</b>	\$ 393,360
<b>LANL CM Labor</b>	\$ 166,531
<b>Total</b>	\$ 3,215,213

Reskin cost of Dome 49.



DOME 49



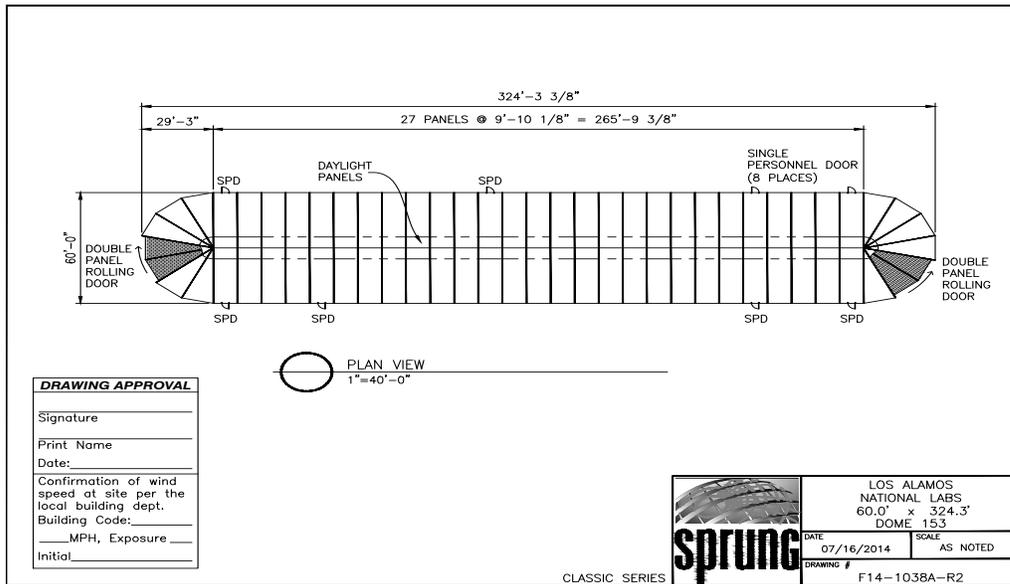
Dome 49 exterior.



Dome 49 interior.

*Dome 153*

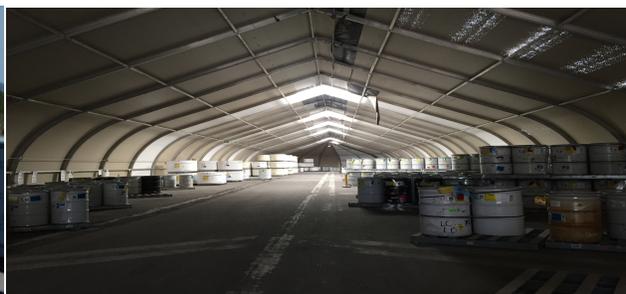
Dome 153 (IPL #10) has exterior dimensions of 60' x 326' with a peak height of 26' and consists of approximately 19,560 ft<sup>2</sup> of space. This dome houses approximately 567 containers. The dome has 8 single personnel doors and 8 top lights. The definitized cost estimate to reskin Dome 153 is \$1,735,484. This cost includes labor (LANS and subcontractor), equipment (booms), and cost of fabric. This cost includes labor, equipment (booms), and 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 and fabric disposal. There is no material disposal cost, because the new skin will be placed over the old skin.



Dome 153 schematic.



Dome 153 exterior.



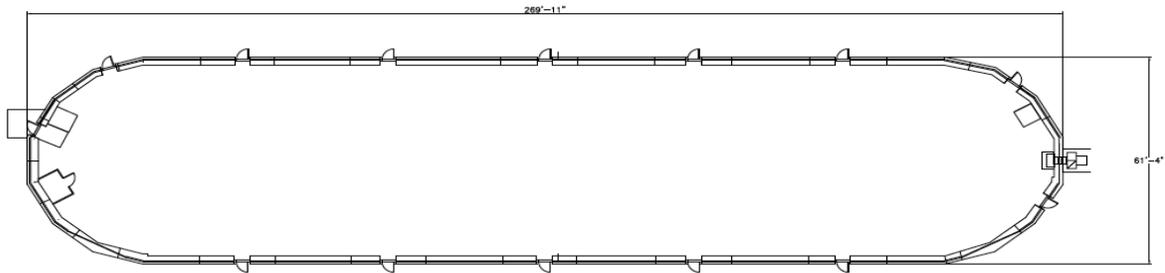
Dome 153 interior.

54-0153	Square feet
	14250
<b>Material</b>	\$ 327,750
<b>Installation Subcontractor Labor</b>	\$ 997,500
<b>Technical Oversight Subcontractor Labor</b>	\$ 46,313
<b>Equipment</b>	\$ 61,708
<b>LANL Oversight Labor</b>	\$ 212,325
<b>LANL CM Labor</b>	\$ 89,889
<b>Total</b>	\$ 1,735,484

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 ft<sup>2</sup> of space and houses ML-1 standard waste boxes (SWBs) and 55 gallon drums. ROM cost of reskinning dome 215 is \$3,215,213. The fire suppression system within Dome 215 requires replacement to meet environmental requirements and is not included in ROM cost estimate.



DOME 215

Dome 215 schematic.



Dome 215 exterior.



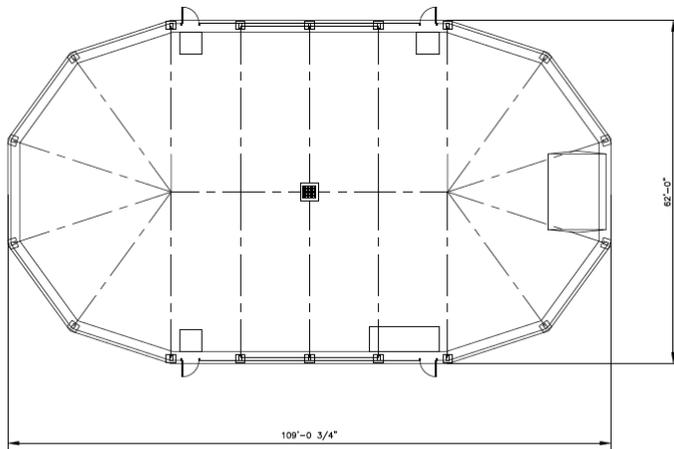
Dome 215 interior.

54-0215	Square feet
	26400
<b>Material</b>	\$ 607,200
<b>Installation Subcontractor Labor</b>	\$ 1,848,000
<b>Technical Oversight Subcontractor Labor</b>	\$ 85,800
<b>Equipment</b>	\$ 114,321
<b>LANL Oversight Labor</b>	\$ 393,360
<b>LANL CM Labor</b>	\$ 166,531
<b>Total</b>	\$ 3,215,213

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 5,800 ft<sup>2</sup> of space, houses Gamma Spec and approximately 9 containers. Demolition and completion ROM costs are \$2,200,000 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 is required. Cost estimate includes the packaging, handling, shipping, and disposal of generated LLW streams.



DOME 224

Dome 224 schematic.



Dome 224 exterior.



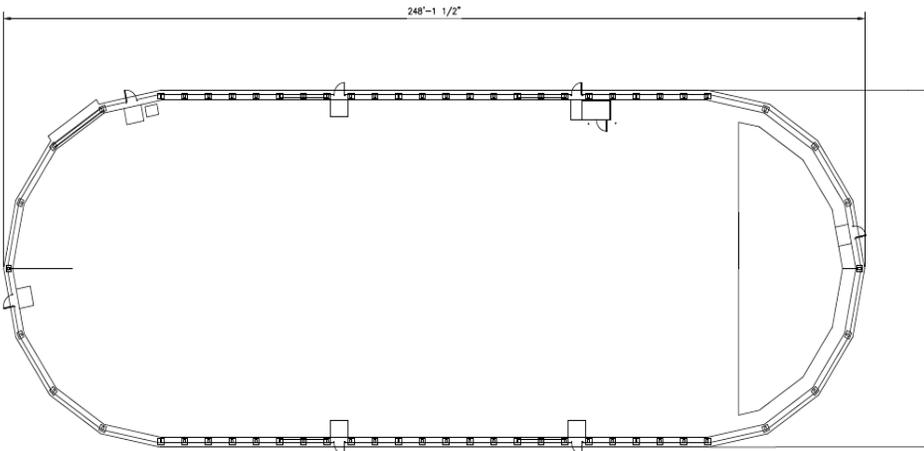
Dome 224 interior.



Dome 224 sump access.

*Dome 229*

Dome 229 has exterior dimensions of 89' x 246' with a peak height of 35' and consists of approximately 21,820.2 ft<sup>2</sup> of space. This dome houses 988 containers and dome operations must be relocated prior to the commencement of reskin. This cost does not include the relocation of drums and equipment. The reskin ROM cost is \$2,877,422. This cost includes labor, equipment (booms), fabric, and LLW disposal of the old fabric (\$220,000).





Dome 229 exterior.



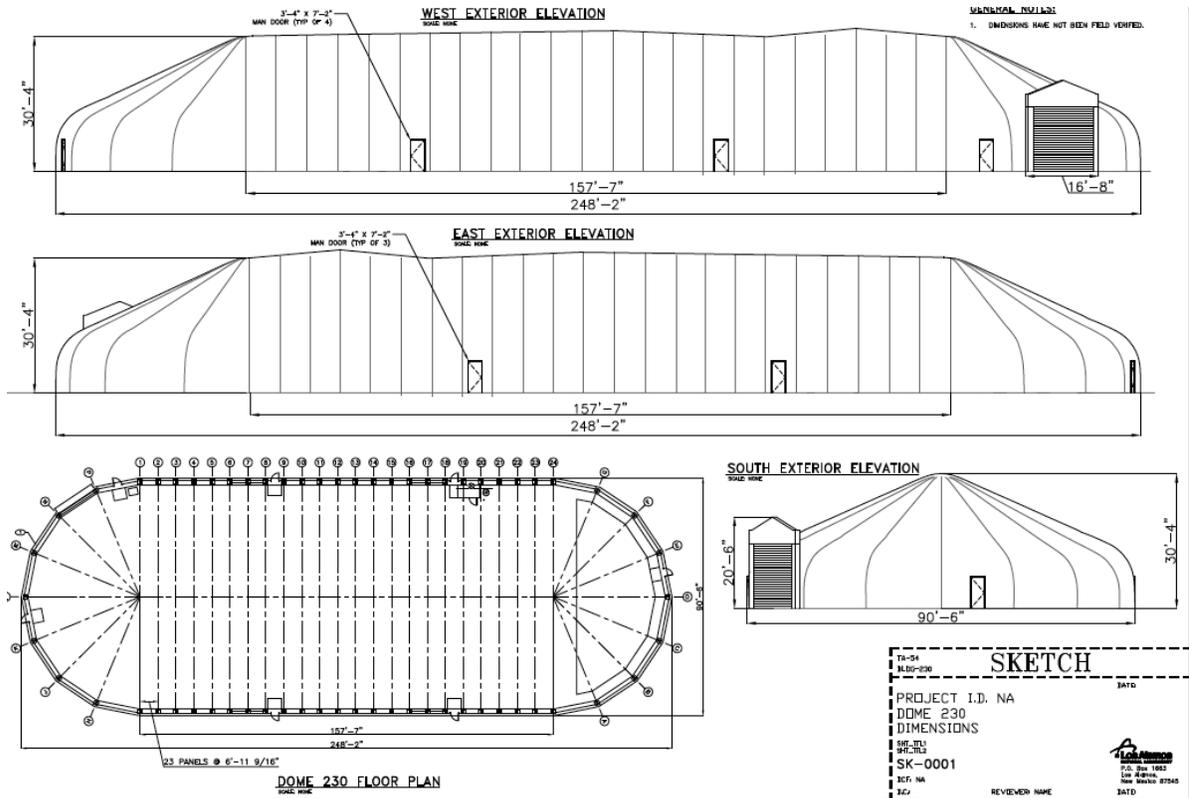
Dome 229 interior.

54-0229	Square feet
	21820
<b>Material</b>	\$ 501,860
<b>Installation Subcontractor Labor</b>	\$ 1,527,400
<b>Technical Oversight Subcontractor Labor</b>	\$ 70,915
<b>Equipment</b>	\$ 94,488
<b>LANL Oversight Labor</b>	\$ 325,118
<b>LANL CM Labor</b>	\$ 137,641
<b>Waste Disposal</b>	\$ 220,000
<b>Total</b>	\$ 2,877,422

Cost estimate for Dome 229.

*Dome 230*

Dome 230 (IPL #10) has exterior dimensions of 89' x 246' with a peak height of 35' and consists of approximately 21,820.2 ft<sup>2</sup> of space. This dome houses 378 containers and dome operations must be relocated prior to the commencement of reskin. This includes the relocation of drums and equipment. The dome has 8 single personnel doors and 8 top lights. Current estimate from American Canvas to reskin Dome 230 is \$2,877,422. This cost includes labor, equipment (booms), fabric, and LLW disposal of the old fabric (\$220,00). The cost of LLW was estimated at \$20,000 per bin.



Dome 230 schematic.



Dome 230 exterior.



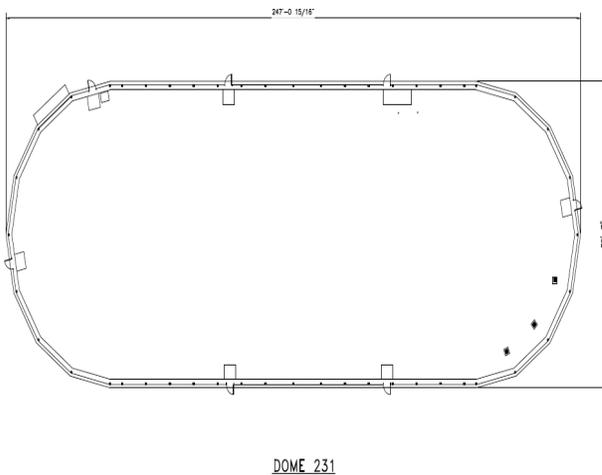
Dome 230 interior.

54-0230	Square feet
	21820
<b>Material</b>	\$ 501,860
<b>Installation Subcontractor Labor</b>	\$ 1,527,400
<b>Technical Oversight Subcontractor Labor</b>	\$ 70,915
<b>Equipment</b>	\$ 94,488
<b>LANL Oversight Labor</b>	\$ 325,118
<b>LANL CM Labor</b>	\$ 137,641
<b>Waste Disposal</b>	\$ 220,000
<b>Total</b>	\$ 2,877,422

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 ft<sup>2</sup> of space. Dome 231 contains a Permacon that is used for remediation of waste containers and houses 6 containers.



Dome 231 schematic.



Dome 231 exterior.



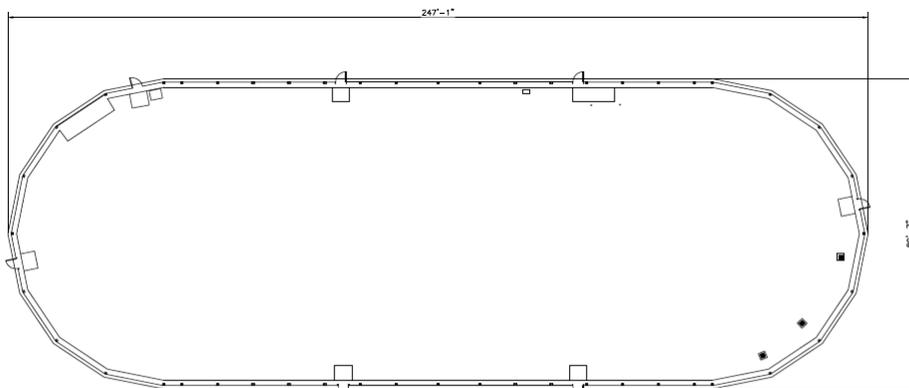
Permacon inside Dome 231.

54-0231	Square feet
	21820
<b>Material</b>	\$ 501,860
<b>Installation Subcontractor Labor</b>	\$ 1,527,400
<b>Technical Oversight Subcontractor Labor</b>	\$ 70,915
<b>Equipment</b>	\$ 94,488
<b>LANL Oversight Labor</b>	\$ 325,118
<b>LANL CM Labor</b>	\$ 137,641
<b>Waste Disposal</b>	\$ 220,000
<b>Total</b>	\$ 2,877,422

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 ft<sup>2</sup> of space. This dome houses 1030 containers and dome operations must be relocated prior to the commencement of reskin. This cost does not include the relocation of drums and equipment.





Dome 232 schematic.



Dome 232 interior.

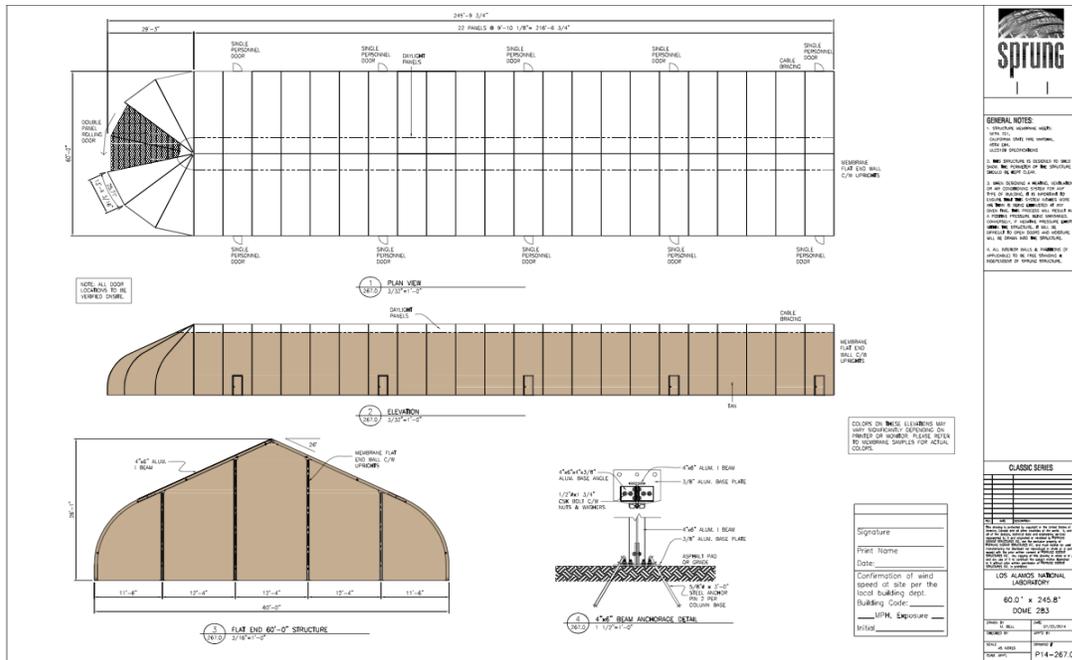
Dome 232 interior.

54-0232	Square feet
	21820
<b>Material</b>	\$ 501,860
<b>Installation Subcontractor Labor</b>	\$ 1,527,400
<b>Technical Oversight Subcontractor Labor</b>	\$ 70,915
<b>Equipment</b>	\$ 94,488
<b>LANL Oversight Labor</b>	\$ 325,118
<b>LANL CM Labor</b>	\$ 137,641
<b>Waste Disposal</b>	\$ 220,000
<b>Total</b>	\$ 2,877,422

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 ft<sup>2</sup> of space and houses 62 containers. The dome has 10 single personnel doors and 10 top lights. The definitized 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 eliminated 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. Conex box fire suppression costs are not included in the estimate but require replacement.



Dome 283 schematic.



Dome 283 exterior.



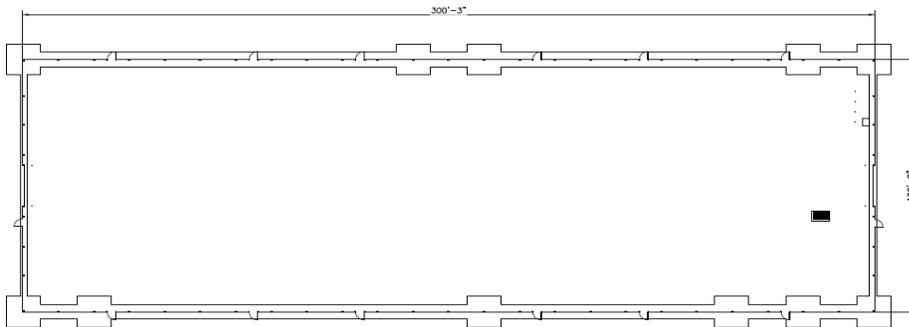
Dome 283 interior.

54-0283	Square feet
	15000
<b>Material</b>	\$ 345,000
<b>Installation Subcontractor Labor</b>	\$ 1,050,000
<b>Technical Oversight Subcontractor Labor</b>	\$ 48,750
<b>Equipment</b>	\$ 64,955
<b>LANL Oversight Labor</b>	\$ 223,500
<b>LANL CM Labor</b>	\$ 94,620
<b>Total</b>	\$ 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 ft<sup>2</sup> 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 \$3,653,651. This cost includes labor, equipment (booms), fabric, and waste disposal.



BLDG\_375

Dome 375 schematic.



Dome 375 exterior.



Permacon located inside Dome 375.

54-0375	Square feet
	30000
<b>Material</b>	\$ 690,000
<b>Installation Subcontractor Labor</b>	\$ 2,100,000
<b>Technical Oversight Subcontractor Labor</b>	\$ 97,500
<b>Equipment</b>	\$ 129,911
<b>LANL Oversight Labor</b>	\$ 447,000
<b>LANL CM Labor</b>	\$ 189,240
<b>Total</b>	\$ 3,653,651

Reskin cost estimate for Dome 375.

## Risks

Refer to the Legacy Bridge Cleanup Contract (LCBC) Day 1 Baseline Change Proposal Risk Register.

## 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 and work breakdown structure. The LANL Master Resource Dictionary was used for the development of labor rates and burdens. Planning and other pre-field activities were subject to standard application of appropriate labor categories and rates for both LANL and subcontractor support.

Appendix 1: Schedule

Domes Summary Schedule										Run Date: 09-Aug-16 14:13; Data Date: 09-Aug-16											
#	Activity ID	Activity Name	Activity Duration	Predecessors	Successors	Start	Finish	Activity % Complete	Total Float	2016	2017	2018	2019	2020	2021	2022					
1	<b>Domes Summary Schedule</b>			1381		01-Aug-16 A	18-Mar-22		0												
2	<b>Dome 33</b>			78		01-Aug-16 A	21-Nov-16		1303												
3	Dome1000	Prepare & Award Subcontract	28		Dome1020	01-Aug-16 A	31-Aug-16	25.00%	0												
4	Dome1020	Installation of Fabric Cover	50	Dome1000	Dome1030, Dome1060	01-Sep-16	14-Nov-16	0%	0												
5	Dome1030	Project Closeout	5	Dome1020		15-Nov-16	21-Nov-16	0%	1303												
6	<b>Dome 153</b>			187		18-Aug-16	24-May-17		1181												
7	Dome1040	Prepare & Award Subcontract	20		Dome1050	18-Aug-16*	15-Sep-16	0%	0												
8	Dome1050	Fabrication of Fabric Cover	40	Dome1040	Dome1060	16-Sep-16	14-Nov-16	0%	0												
9	Dome1060	Installation of Fabric Cover	122	Dome1050, Dome1020	Dome1070, Dome1100	15-Nov-16	17-May-17	0%	0												
10	Dome1070	Project Closeout	5	Dome1060		18-May-17	24-May-17	0%	1181												
11	<b>Dome 203</b>			159		29-Feb-17	06-Oct-17		1087												
12	Dome1080	Prepare & Award Subcontract	20		Dome1090	29-Feb-17*	22-Mar-17	0%	0												
13	Dome1090	Fabrication of Fabric Cover	40	Dome1080	Dome1100	29-Mar-17	17-May-17	0%	0												
14	Dome1100	Installation of Fabric Cover	94	Dome1090, Dome1090	Dome1110, Dome1140	18-May-17	29-Sep-17	0%	0												
15	Dome1110	Project Closeout	5	Dome1100		02-Oct-17	06-Oct-17	0%	1087												
16	<b>Dome 49</b>			230		07-Jul-17	15-Jun-18		922												
17	Dome1120	Prepare & Award Subcontract	20		Dome1130	07-Jul-17*	09-Aug-17	0%	0												
18	Dome1130	Fabrication of Fabric Cover	40	Dome1120	Dome1140	04-Aug-17	29-Sep-17	0%	0												
19	Dome1140	Installation of Fabric Cover	165	Dome1130, Dome1100	Dome1150, Dome1180	02-Oct-17	06-Jun-18	0%	0												
20	Dome1150	Project Closeout	5	Dome1140		07-Jun-18	19-Jun-18	0%	922												
21	<b>Dome 48</b>			155		14-Mar-18	23-Oct-18		832												
22	Dome1160	Prepare & Award Subcontract	20		Dome1170	14-Mar-18*	10-Apr-18	0%	0												
23	Dome1170	Fabrication of Fabric Cover	40	Dome1160	Dome1180	11-Apr-18	06-Jun-18	0%	0												
24	Dome1180	Installation of Fabric Cover	90	Dome1170, Dome1140	Dome1190, Dome1220	07-Jun-18	15-Oct-18	0%	0												
25	Dome1190	Project Closeout	5	Dome1180		16-Oct-18	22-Oct-18	0%	832												
26	<b>Dome 229</b>			201		20-Jul-18	16-May-19		696												
27	Dome1200	Prepare & Award Subcontract	20		Dome1210	20-Jul-18*	16-Aug-18	0%	0												
28	Dome1210	Fabrication of Fabric Cover	40	Dome1200	Dome1220	17-Aug-18	15-Oct-18	0%	0												
29	Dome1220	Installation of Fabric Cover	136	Dome1210, Dome1180	Dome1230, Dome1260	16-Oct-18	09-May-19	0%	0												
30	Dome1230	Project Closeout	5	Dome1220		10-May-19	16-May-19	0%	696												
31	<b>Dome 230</b>			201		14-Feb-19	03-Dec-19		590												
32	Dome1240	Prepare & Award Subcontract	20		Dome1250	14-Feb-19*	14-Mar-19	0%	0												
33	Dome1250	Fabrication of Fabric Cover	40	Dome1240	Dome1260	15-Mar-19	09-May-19	0%	0												

Remaining Level of Effort  
 Remaining Work  
 Actual Level of Effort  
 Critical Remaining Work  
 Actual Work  
 Milestone

Domes Summary Schedule										Run Date: 09-Aug-16 14:13; Data Date: 09-Aug-16											
#	Activity ID	Activity Name	Activity Duration	Predecessors	Successors	Start	Finish	Activity % Complete	Total Float	2016	2017	2018	2019	2020	2021	2022					
34	Dome1260	Installation of Fabric Cover	136	Dome1250, Dome1220	Dome1270, Dome1300	10-May-19	22-Nov-19	0%	0												
35	Dome1270	Project Closeout	5	Dome1260		25-Nov-19	03-Dec-19	0%	560												
36	<b>Dome 231</b>		<b>201</b>			<b>29-Aug-19</b>	<b>23-Jun-20</b>		<b>424</b>												
37	Dome1280	Prepare & Award Subcontract	20		Dome1290	28-Aug-19*	25-Sep-19	0%	0												
38	Dome1290	Fabrication of Fabric Cover	40	Dome1280	Dome1300	26-Sep-19	22-Nov-19	0%	0												
39	Dome1300	Installation of Fabric Cover	136	Dome1290, Dome1280	Dome1310, Dome1340	25-Nov-19	16-Jun-20	0%	0												
40	Dome1310	Project Closeout	5	Dome1300		17-Jun-20	23-Jun-20	0%	424												
41	<b>Dome 232</b>		<b>201</b>			<b>24-Mar-20</b>	<b>15-Jun-21</b>		<b>288</b>												
42	Dome1320	Prepare & Award Subcontract	20		Dome1330	24-Mar-20*	20-Apr-20	0%	0												
43	Dome1330	Fabrication of Fabric Cover	40	Dome1320	Dome1340	21-Apr-20	16-Jun-20	0%	0												
44	Dome1340	Installation of Fabric Cover	136	Dome1330, Dome1300	Dome1350, Dome1380	17-Jun-20	08-Jan-21	0%	0												
45	Dome1350	Project Closeout	5	Dome1340		11-Jan-21	15-Jan-21	0%	288												
46	<b>Dome 215</b>		<b>165</b>			<b>05-Oct-20</b>	<b>09-Jun-21</b>		<b>188</b>												
47	Dome1360	Prepare & Award Subcontract	20		Dome1370	05-Oct-20*	02-Nov-20	0%	0												
48	Dome1370	Fabrication of Fabric Cover	40	Dome1360	Dome1380	03-Nov-20	08-Jan-21	0%	0												
49	Dome1380	Installation of Fabric Cover	100	Dome1370, Dome1340	Dome1390, Dome1420	11-Jan-21	02-Jun-21	0%	0												
50	Dome1390	Project Closeout	5	Dome1380		03-Jun-21	09-Jun-21	0%	188												
51	<b>Dome 375</b>		<b>253</b>			<b>10-Mar-21</b>	<b>18-Mar-22</b>		<b>0</b>												
52	Dome1400	Prepare & Award Subcontract	20		Dome1410	10-Mar-21*	06-Apr-21	0%	0												
53	Dome1410	Fabrication of Fabric Cover	40	Dome1400	Dome1420	07-Apr-21	02-Jun-21	0%	0												
54	Dome1420	Installation of Fabric Cover	188	Dome1410, Dome1380	Dome1430	03-Jun-21	11-Mar-22	0%	0												
55	Dome1430	Project Closeout	5	Dome1420		14-Mar-22	18-Mar-22	0%	0												
56	<b>Dome 224</b>		<b>120</b>			<b>01-Aug-16A</b>	<b>31-Jan-17</b>		<b>1261</b>												
57	Dome1440	Prepare & Award Subcontract	40		Dome1450	01-Aug-16A	26-Sep-16	15%	1261												
58	Dome1450	Demolition of Dome	30	Dome1440	Dome1460	27-Sep-16	08-Nov-16	0%	1261												
59	Dome1460	Removal of Liner	20	Dome1450	Dome1465	09-Nov-16	09-Dec-16	0%	1261												
60	Dome1465	Site Restoration	20	Dome1460	Dome1470	12-Dec-16	17-Jan-17	0%	1261												
61	Dome1470	Project Closeout	10	Dome1465		18-Jan-17	31-Jan-17	0%	1261												

Remaining Level of Effort   
 Remaining Work  
 Actual Level of Effort   
 Critical Remaining Work  
 Actual Work   
 Milestone

## Appendix 2: Notes from Estimation

<b>Material</b>
Estimate based on 9/2014 estimates from Sprung for domes 54-33, 54-153, 54-283
Average per square foot cost in Sprung estimate= \$17.75
Escalated by 6% = \$18.81/ft2
ROM estimate w/NMGRT & G&A = \$23/ft2
<b>Installation Subcontractor Labor</b>
Estimate based on 7/2015 estimate from Florida Expo to install Sprung-provided material
Per square foot cost = \$55.58
Escalated by 3% = \$57.25/ft2
ROM estimate w/NMGRT & G&A = \$70/ft2
Square foot of material installed per day = 160
<b>Technical Oversight Subcontractor Labor</b>
Warranty is void if Sprung personnel do not provide technical oversight
Cost of technical oversight based on 9/2014 estimate from Sprung at \$40/hr
Escalated by 6% = \$42.50
ROM w/NMGRT & G&A = \$52/hr * 10 * number of days based on Florida Expo estimate
<b>Equipment</b>
Based on 9/2014 from Sprung estimate listing recommended equipment
-Manlift - \$650/week - Hertz
-2 Articulating boom lifts - \$1130/week - Hertz
-12,000 lb forklift -\$1083/week - United
-Total w/NMGRT & G&A = \$4850/week
<b>LANL Oversight Labor</b>
Safety oversight - \$162.42/hr * 4hr/day * number of days based on Florida Expo estimate
QA - \$162.42/hr * 2hr/day * number of days based on Florida Expo estimate
RCT - \$135.64/hr * 4hr/day * number of days based on Florida Expo estimate
JSS - \$216.95/hr * 4hr/day * number of days based on Florida Expo estimate
Total = \$2384/day
All rates from 2016 MRD escalated 2.4%
<b>LANL CM Labor</b>
Escorts - 2 laborers - 2 * \$71.40/hr * 10 hr/day * number of days based on Florida Expo estimate
Based on MOF-CM estimate to remove & reconnect ventilation and power on 54-33, 54-153 & 54-283
-Carpenter - 12.19 hr/Kft2 * \$110.94/hr = \$1352/Kft2
-Electrician - 15.61 hr/Kft2 * \$124.58/hr = \$1945/Kft2
-Roofers - 15.12 hr/Kft2 * \$84.44/hr = \$1277/Kft2
-Sheetmetal - 3.9 hr/Kft2 * \$122.45/hr = \$478/Kft2
-Superintendent - 4.88 hr/Kft2 * \$162.42/hr = \$793/Kft2
-Safety - 1 hr/Kft2 * \$162.42/hr = \$162/Kft2
-Total = \$6308/Kft2
All rates from 2016 MRD escalated 2.4%
<b>Waste Disposal</b>
-Non-Sprung structures are assumed to require the removal and disposal of existing fabric
-One 1280 cubic foot cargo container per 2000 ft2 of floor space rounded up to a whole number
-\$20,000 per cargo container for transport & disposal