APPENDIX G

Instrument Verification Memorandum

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Port Angeles Combat Range, Washington

Formerly Used Defense Sites

Remedial Investigation

Instrument Verification Memorandum

November 2013

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1.0 Introduction

This document details the Instrument Verification Strip (IVS) activities executed by HDR Inc., supporting the Remedial Investigation at Port Angeles Combat Range. The methods and instrumentation tested at the IVS support Digital Geophysical Mapping (DGM) at the Port Angeles Combat Range, Technical Approach Area 2. The purpose of the data collected at the IVS was to verify the proper performance of equipment (sensors, positioning systems, and geophysical equipment).

2.0 IVS Equipment and Personnel

Staff from HDR installed and performed data collection surveys over the IVS located east of the Open Area within the Technical Approach Area 2 on Monday, October 21, 2013.

The geophysical sensor system consisted of a single EM61-MK2 coil attached to a fiberglass frame that allows two geophysical team members to hold the coil, suspended above the ground, while maintaining a distance away from the coil large enough to prevent personnel interference.

The coils height above the ground surface is 12 inches (30 cm). An RTK GPS antenna is positioned directly above the center of the coil. Both the GPS antenna and the EM61-MK2 coil are powered by portable batteries located inside of the GPS antenna and backpack worn by the geophysical team member supporting the rear end of the litter. This backpack also contains the EM61 control box. The AVS Team member supporting the front end of the litter platform wears a harness with a laptop computer attached and is responsible for navigating to the survey lines and controlling the DAS. The AVS Team members also wear a waist strap with loops that attach to the litter platform handles to help maintain a fixed coil height and to allow occasional hands free operation when the front end team member is operating the computer.

The field team consists of Geophysical Lead Jon Jacobson and geophysical technician Robert Nelson. UXO technicians Byron Cook and Rick St Amand escorted the field team for anomaly avoidance.

3.0 IVS Objectives

The objective of the IVS is to validate proper functioning of the em61 litter system for the Technical Approach Area 2 in the PACR MRS.

4.0 IVS Layout

The IVS was installed east of the Open Area in a location free of tree canopy (**Figure 1**). Prior to the installation, the field team, escorted by two qualified UXO technicians, performed visual reconnaissance of the potential IVS area. Scrap surface metal was removed. Several areas were investigated with the UXO technicians and small non-MEC scrap metal such as nails and bits of wire were often found.

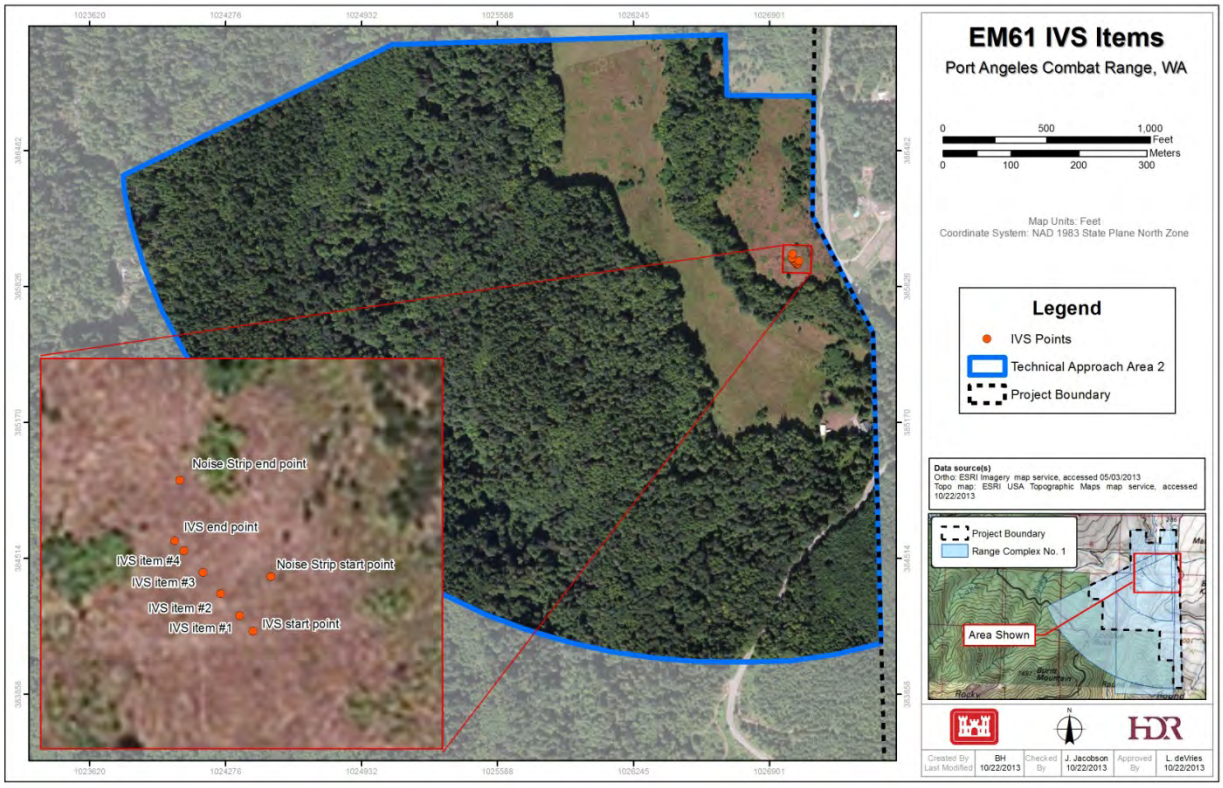
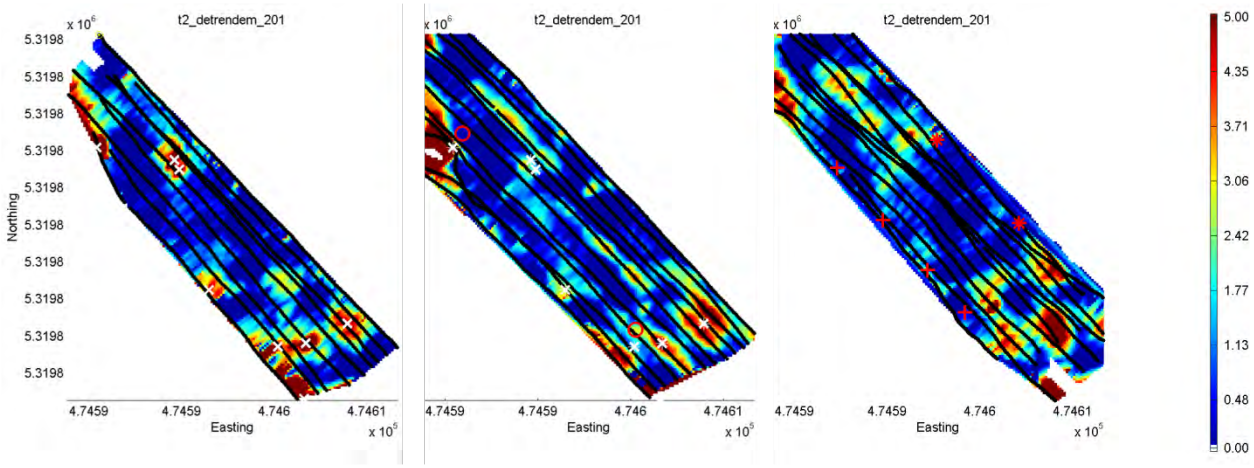


Figure 1 Location of IVS within Technical Approach Area 2

Following the visual reconnaissance, a full coverage survey was performed with the litter to locate a geophysical clean area. Prior and post survey calibration tests were performed. From the full coverage data (**Figure 2a**) anomalies were picked for investigation by the UXO technicians. Scrap metal was found and removed at anomaly locations and a second full coverage survey was performed over the same area (**Figure 2b**) to verify anomalies were removed. A lane was identified from the second survey large enough for the IVS and adjacent additional anomalies were identified and then investigated by the UXO technicians. After scrap metal was located at the anomaly locations and removed, a third full coverage survey was conducted and an area was identified where noise had been sufficiently reduced for IVS installation. The third full coverage survey (**Figure 2c**) covered the same area as the previous surveys, but extended further NE to allow for more options in placing the noise strip with adequate separation distance from the IVS lane.

Within the IVS area, HDR selected locations for seed items within a lane 1.5m wide by 12.5m, allowing sufficient space for the EM61 to return to noise level between items. Another lane was identified as suitable for the IVS noise strip. These locations were reacquired using RTK-GPS.



(a) Initial Full Coverage Survey

(b) After removal of scrap metal. IVS endpoints identified (red circle)

(c) A third full coverage survey to identify a noise strip (red asterisks). Red '+' are IVS item locations

Figure 2 Full Coverage Survey to Determine IVS Location. Anomalies identified from the initial full coverage survey (white X's) were investigated. A team of UXO technicians removed scrap metal at anomaly locations.

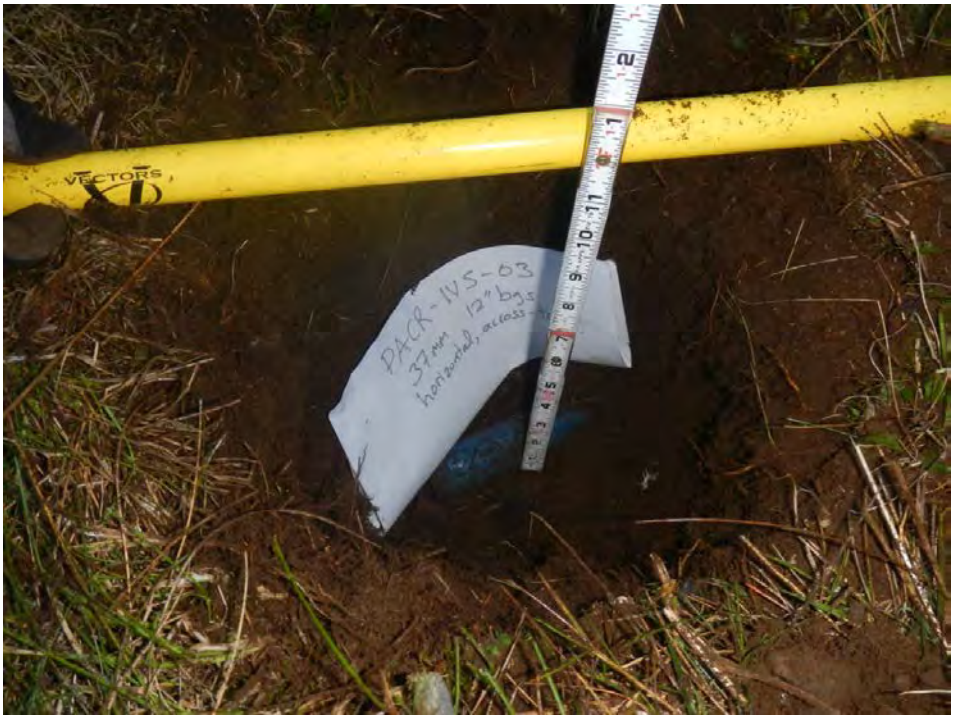
Seeds used for the IVS were 37mm projectiles. The IVS was constructed with item spacing of three meters to ensure the sensor response will return to background between item responses. Positions of the items were staked out using RTK GPS. Two seed items were placed at 6-inch depth and two were placed at 12-inch depth. For each depth, items were positioned one horizontally in an across track orientation and one vertical. Depths were measured to the center of mass for each 37mm. Before the seeds were buried, RTK-GPS measurements were made (**Table 1**) and photos were taken for each IVS item (**Photos 1 and 2**).

Table 1 Location of IVS seed items

IVS Item Number	Easting (m)	Northing (m)	Depth (inches)	Orientation
1	474599.19	5319761.22	6	Horizontal, Across-Track
2	474597.22	5319763.5	6	Vertical
3	474595.39	5319765.7	12	Horizontal, Across-Track
4	474593.38	5319767.95	12	Vertical

Photo 1 IVS Item 2 oriented vertically at 6 inch depth

Photo 2 IVS Item 3 oriented horizontally at 12 inch depth



5.0 IVS Data Collection

Data from the EM61 metal detectors were collected using the litter system as described in **Section 2.0**. Multiple passes in alternating directions of collection were conducted on October 21, 2013.

The litter was assembled onsite and equipment was sufficiently warmed up to minimize sensor drift. Standardization tests were performed prior to and after data collection. Both DGM systems passed the standardization tests per DQOs. Standardization test results are presented in Attachment A. After post-survey standardization tests were completed with one litter system, a second system was assembled and allowed to warm up for 15 minutes prior to standardization tests and data collection over the IVS. After data collection, the data were digitally delivered to the data processor for processing and data quality checks.

6.0 Data Analysis

The electromagnetic datasets were analyzed with the objective of verifying proper instrument response. The data sets were analyzed in UXOLab as well as Geosoft's Oasis Montaj, using the same data processing procedures outlined in Chapter 3, Section 3.4.8 Data Processing, of the PACR work plan. **Table 2** presents the summary of data collected for each of the four seed items at the PACR IVS.

Table 2 Channel 2 responses of the Litter EM61

	Line	IVS Item 1	IVS Item 2	IVS Item 3	IVS Item 4
Litter 1	1	18.88	140.63	14.4	31.26
	2	27.37	232.69	17.49	32.14
	3	22.16	136.17	15.85	29.23
	4	26.71	223.44	16.14	30.33
	5	21.6	157.03	15.74	28.23
	6	30.12	202.52	19.3	32.7
	7	22.25	178.61	15.34	31.75
	8	25.34	209.14	19.75	30.93
	9	21.86	169.15	15.56	32.05
	10	27.28	234.16	21.21	32.32
	11	21.08	132.83	12.84	24.6
	12	31.36	186.62	19.39	28.47
	13	23.19	153.29	13.43	26.22
	14	32.03	192.69	16.18	26.36
	15	21.6	155.59	14.09	29.68
	16	30.38	216.33	19.94	33.93
	17	19.94	146.93	15.89	28.36
	18	28.77	217.77	21.91	33.47
Litter 2	1	25.92	168.59	16.34	29.31
	2	26.32	218.66	22.47	32.99
	3	24.47	138.87	14.74	27.93
	4	26.53	224.87	20	29.34
	5	27.21	190.03	14.85	29.31
	6	32.9	261.32	19.18	34.99
	7	25.08	178.91	16.86	29.27
	8	26.49	210.31	20.17	31.18
	9	23.93	180.53	15.73	30.8
	10	26.81	226.32	21.71	33.9
	11	23.08	171.47	15.22	29.82
	12	26.65	203.99	20.82	34.75
	13	27.61	151.59	17.69	29.53
	14	34.14	235.37	22.51	35.58
	15	24.91	167.36	16.88	29.44
	16	34.34	250.01	21.8	32.8
	17	27.38	158.34	15.7	31.36
	18	25.34	200.18	20.23	28.35
Litter 1 Average		25.10667	182.5328	16.91389	30.11278
Litter 2 Average		27.17278	196.4844	18.49444	31.14722
Average		26.13972	189.5086	17.70417	30.63
Standard Deviation		3.875119	35.03604	2.821199	2.562357
Litter 1 Minimum		18.88	132.83	12.84	24.6
Litter 2 Minimum		23.08	138.87	14.74	27.93
Litter 1 Maximum		32.03	234.16	21.91	33.93
Litter 2 Maximum		34.34	261.32	22.51	35.58

The data in **Table 2** shows consistent responses from both systems, within 10%, but indicates a difference in values depending on direction of travel. Even line numbers represent data collected in a northwest direction of travel and odd line numbers a southeast direction of travel. When divided into direction of travel, the responses become more consistent:

Table 3 Litter 1 Channel 2 EM61 Responses over IVS Item 1

	NW direction responses (mV)	SE direction responses (mV)
1st pass	18.88	27.37
2nd pass	22.16	26.71
3rd pass	21.6	30.12
4th pass	22.25	25.34
5th pass	21.86	27.28
6th pass	21.08	31.36
7th pass	23.19	32.03
8th pass	21.6	30.38
9th pass	19.94	28.77
Average	21.39556	28.81778
Standard Deviation	1.293253	2.28906
Minimum	18.88	25.34
Maximum	23.19	32.03

Motion of the backpack can add noise to sensor readings from unsecured electronic components. The sensor battery used is a Li-ion, smaller and lighter than Geonics manufacturer's battery, and was securely fastened to the backpack. As well, survey over the IVS was performed at walking speed at a steady pace that was consistent in both directions.

If the sensor is not kept in a level orientation, readings will deviate from expected responses and can result in directional bias. This can happen when surveying over steep or difficult terrain. As the terrain over the IVS was smooth and clear of obstacles, difficult terrain was not a factor and, aside from variations in height due to bounce from walking, the sensor was kept in a level orientation.

Given the litter's variable response due to handling variability inherent in man-portable platforms, such as height above ground fluctuations due to bounce, tilt of sensor and side-to-side sensor position relative to the target, the range of expected values will vary greater than more stable platforms such as a towed array. The accepted variation for these more stable platforms is +/-25%. The litter will produce a wider variability. **Figure 3** displays the slope-corrected plot of sensor elevation for line one of litter one, with the vertical axis exaggerated. Position is recorded using Glonass-compatible RTK GPS. While GPS vertical position is not as accurate as horizontal, the relative position can be used to show the variation in sensor height above ground due to bounce while walking. The response of the sensor to IVS item one during this pass was low even for the north-heading line direction. The coil is approximately 7 cm

higher than the lowest height above ground, resulting in a lower than predicted response. The coil is functioning correctly, however variability in sensor height above ground results in a wider range of expected responses. We estimate a +/- 5 cm variation in height during dynamic survey.

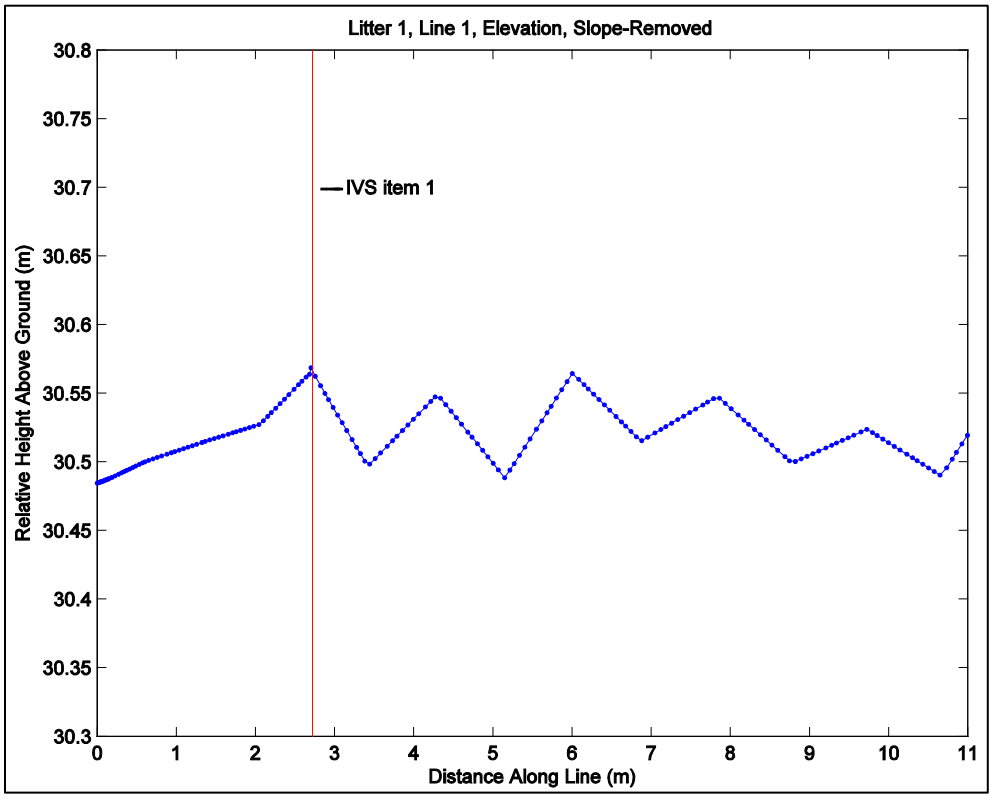


Figure 3 Fluctuations in sensor height during survey

Errors in the IVS item depth measurements could also contribute to deviations from the expected responses. Achieving accuracy of depth measurements is difficult due to a variety of factors, including estimation of location of center of mass, repositioning of the item due to resettling within the soil, and frost heaving of the item after burial. We have estimated that these factors contribute an error of +/- 5 cm in item depth measurements.

Small variations in depth yield a large variation in mV response. For example, a depth difference of 4cm shallower from our measured depth would result in an expected response of 223.5mV.

Daily QC checks will involve verifying that IVS item measurements are falling within PACR proposed limits. As well, daily quality tests, as outlined in Table 3-6 of the PACR Work Plan, will be used to verify system functionality and repeatability.

Figure 4 displays the IVS strip item mean peak responses and the NRL response curves for items in the most and least favorable orientation.

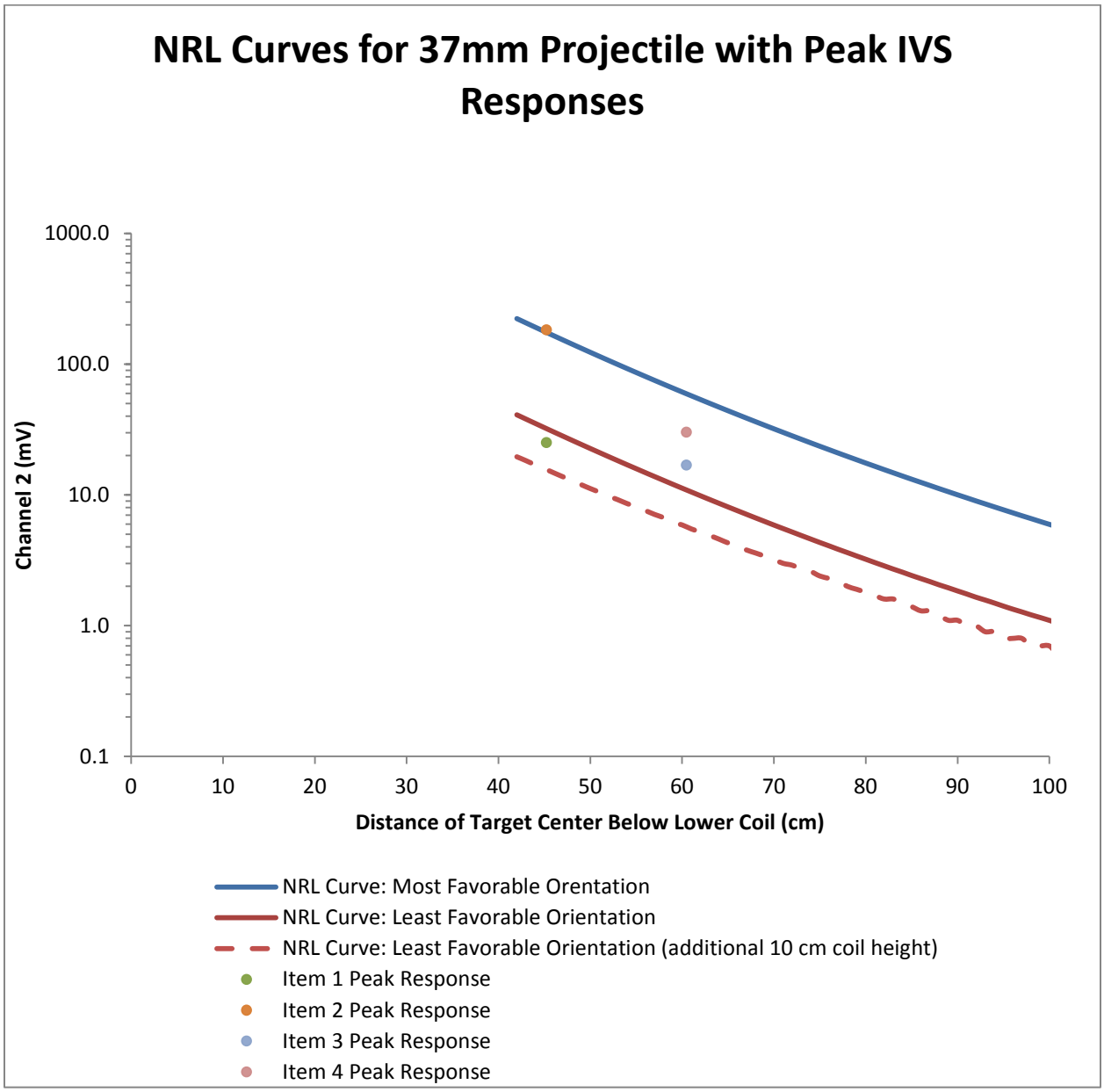


Figure 4 NRL Curves and IVS Responses

Table 4 presents the combined responses obtained by litter 1 and litter 2. HDR proposes using the predicted response presented here for each IVS item as the Data Quality Objective for the twice-daily IVS test for DGM at PACR. Response limits were based on the NRL predicted responses for a 37mm at each respective depth and on anticipated variation in distance from the coil inherent in litter motion as well as accuracy limits of measuring depth to COM of IVS items. Responses from the north line direction transects were used for comparison given that we will be collecting IVS data twice daily in this direction

Table 4 Combined Litter Observed and Expected Responses For PACR IVS Lane (ch2)

IVS number	Observed Mean	Observed Min	Observed Max	Predicted Response	PACR proposed low limit	PACR proposed high limit
1	23.45	18.88	27.61	30.4	14.8	44.4
2	159.77	132.83	190.03	165.5	114.9	241.2
3	15.40	12.84	17.69	10.5	7.6	21.1
4	29.34	24.6	32.05	57.4	22.2	57.4

Because the expected ordnance items and item depths are unknown, anomalies above noise level will be selected as items of interest. The noise level is determined by computing the mean and standard deviation for the data, and applying the following formula: Noise threshold = mean + 3 × standard deviation.

The background values used for threshold determination in production will be based on transect background levels. The threshold determined from background levels over planned transects was determined to be 12mV sum-channel response, based on the sum of all 4 channels. Noise levels will be reassessed for each transect and thresholds changed if there are changes in noise levels, pending concurrence with USACE.

With a 12mV threshold, the maximum depth of detection for a 37mm in its least favorable orientation is approximately 29cm (11.4 inches) below ground surface (**Figure 5**).

The 37mms were accurately mapped by each litter system, within the 30-centimeter allowable offset, and results are presented in **Figure 6**.

Background data obtained from the noise strip (**Figure 7**), surveyed in conjunction with the IVS, are at levels slightly higher than typical noise ranges at benign sites (ESTCP, 2009). Possible contributions for the slightly higher noise levels could be from local ferrous geology.

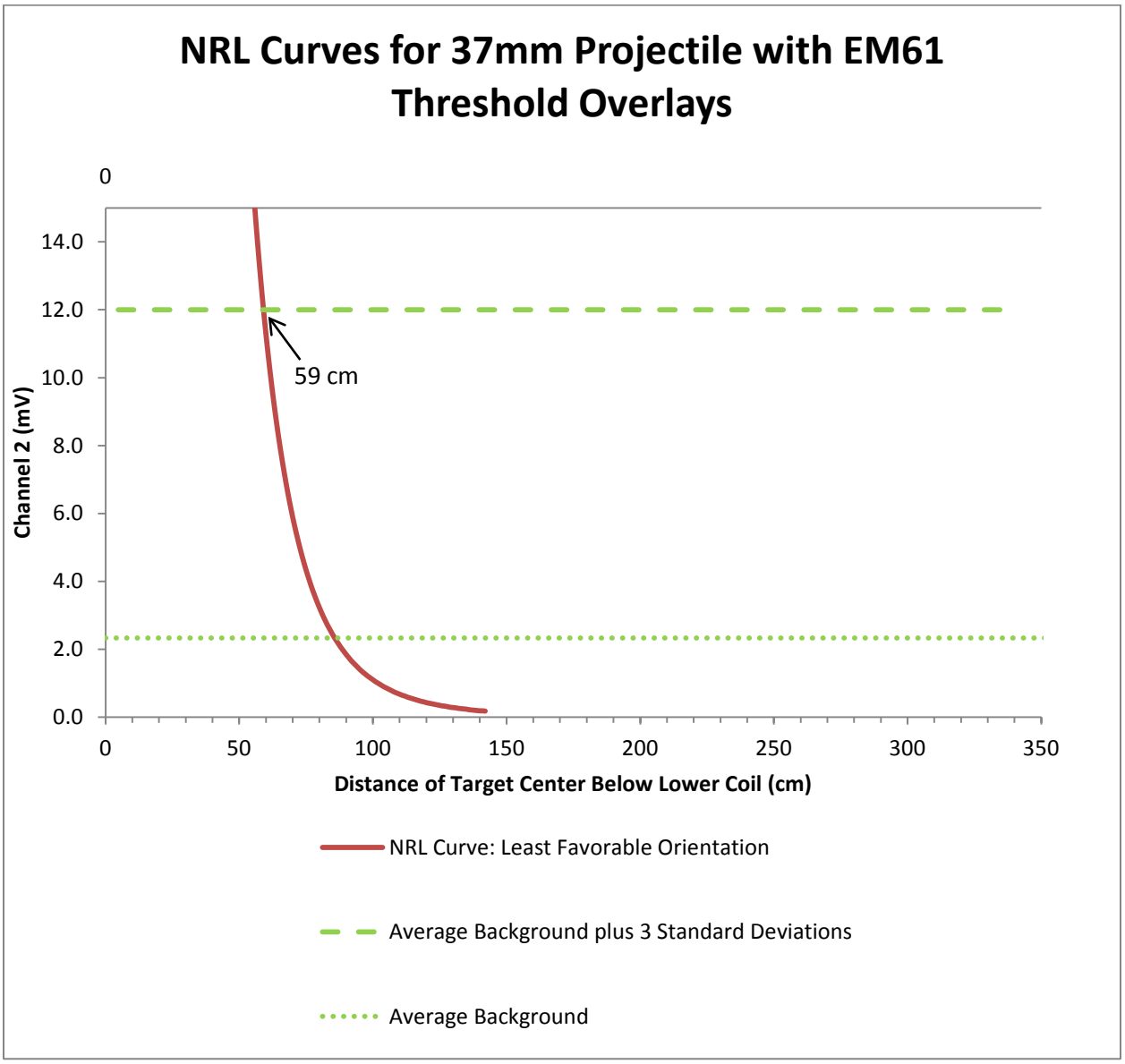


Figure 5 NRL Curves and Background Noise

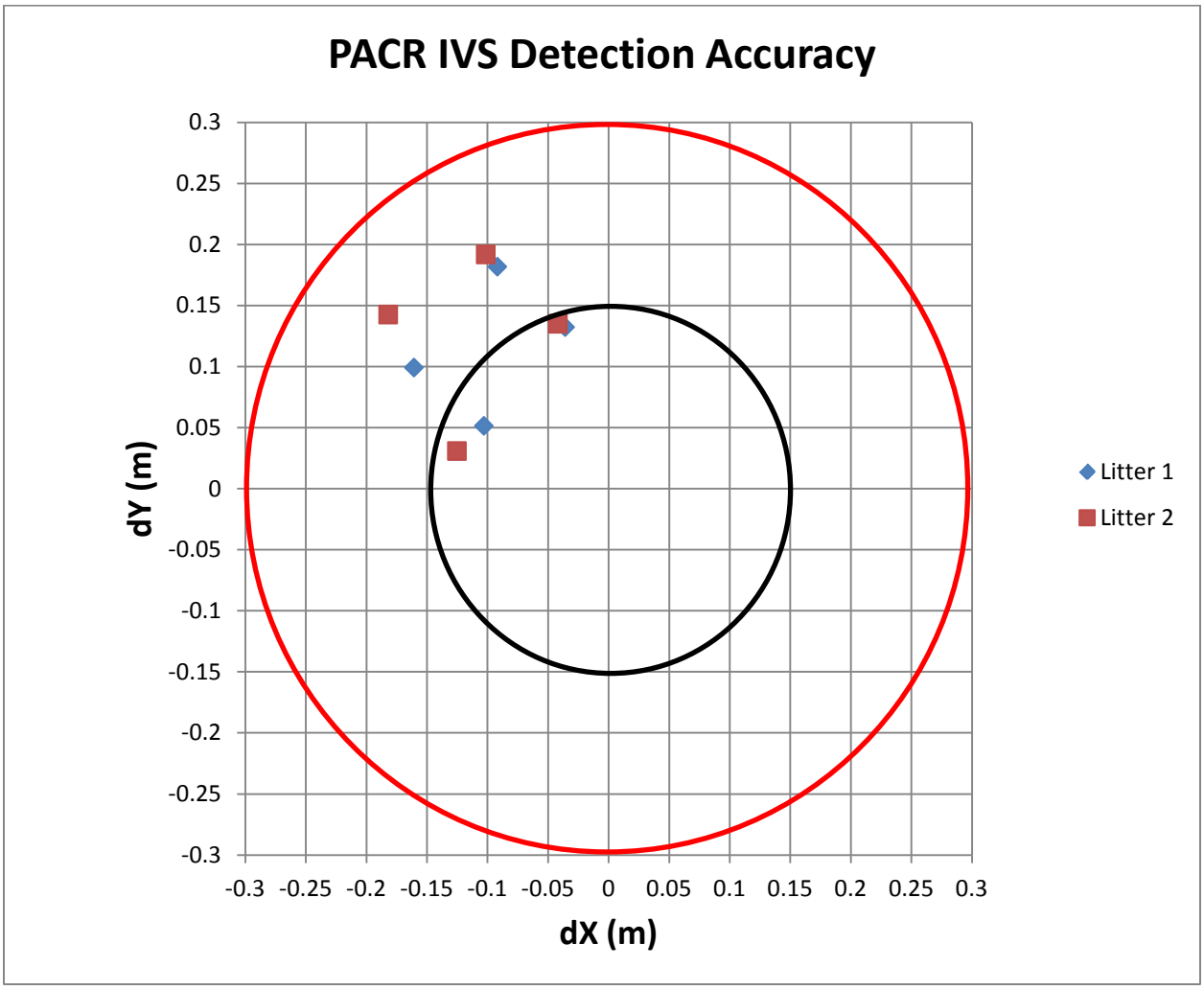


Figure 6 Scatter Plot of Mapped vs As-built positions of IVS Items

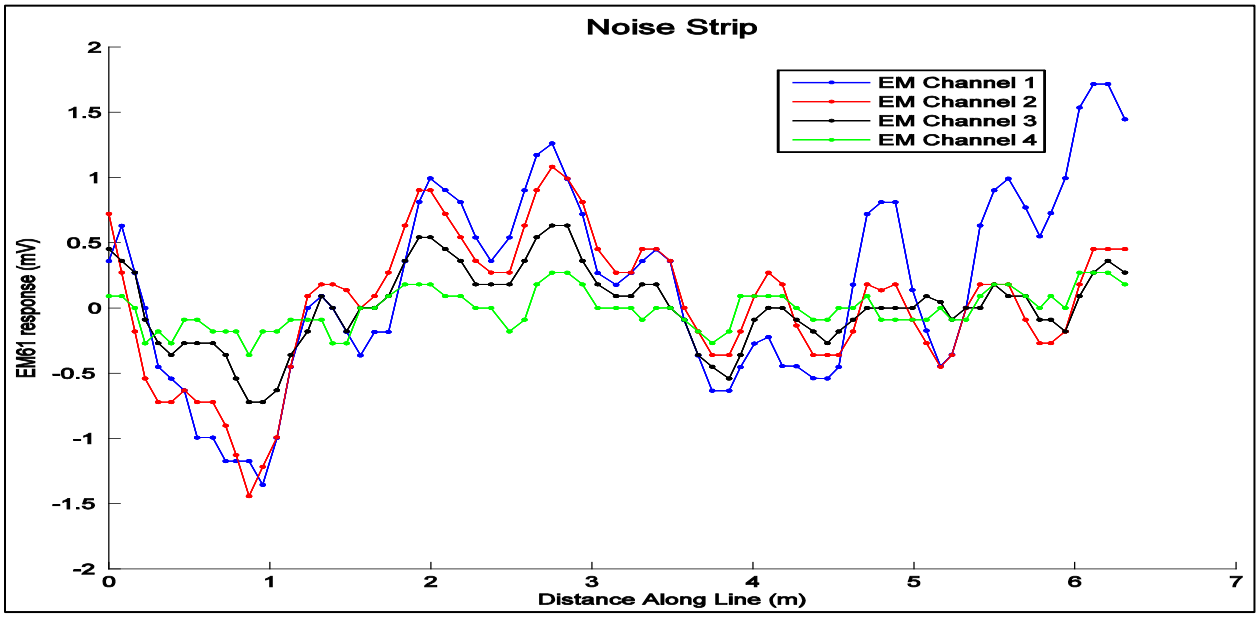


Figure 7 **Profiles of EM61 Litter Noise Strip**

Table 5 **EM Channel 2 values (mV) of Noise Strip**

	Channel 1	Channel 2	Channel 3	Channel 4
Peak-To-Peak	3.071985	2.526055	1.353183	0.631686
Mean	0.154547	0.020448	0.005744	-0.01121
RMS	0.722791	0.582844	0.318576	0.150697

7.0 Conclusions and Recommendations

Repeatability of sensor response verifies that both litter systems are functioning properly.

Responses over items fall within NRL most favorable and least favorable predicted responses.

Values obtained over the noise strip show that the conservative approach of selecting anomalies above noise will be appropriate given limitations of depth of detection.

Sensor responses should be reviewed daily to verify that responses are consistent within limits of PACR proposed limits.

8.0 Data Quality Objectives

Daily quality control checks will be performed before and after daily collection. The following are the DQOs for daily standardization tests and geophysical surveys conducted by HDR.

Table 6 Digital Geophysical Data Quality Objectives

Data Quality Objective	Test Method	Measurement Performance Criteria
Equipment warm-up (minimum 15 minutes)	A power on, conduct real time monitoring of EM61-MK2 instrument readings. Data is not recorded; this will be a visual check by the field team prior to starting calibration tests.	Drift of less than 3 mV over 3 minutes
Repeatable static data are being obtained from the DGM system	At the beginning and end of day, conduct a static background and spike test for each coil. Data will be collected for at least 60 seconds for each test.	Less than 2.5 mV peak to peak for static background, spike ±10% of standard item response after background corrections
Prevent noise related to loose pins or cable connectors	At the beginning of the day, conduct a cable shake test. Each cable will be tested for at least 5 seconds while monitored by the sensor operator.	Less than 2.5 mV peak to peak
Ensure instrument operators are not carrying any metallic objects that can interfere with the EM61-MK2 readings	At the beginning of the day, conduct a personnel test (applicable to single coil cart systems only).	Less than 2.5 mV peak to peak
Position of GPS is accurate	At the beginning of the day, the GPS unit's position will be compared with a known point during a point position test. Positions will be recorded for at least 60 seconds.	Within 10 cm of known values for point position test. Only positions with a PDOP below 4 will be accepted for DGM. Brief spikes of PDOP below 6 may be accepted in limited cases
Repeatable dynamic data are being obtained from the DGM system	At the beginning and end of the day, the geophysical instruments will collect data over an IVS.	± 25% of prior response; position of anomalies repeatable within 10 cm
Positioning of detected anomalies is accurate	Anomalies selected will be compared with known seed item locations to ensure compliance.	100% of all anomaly locations lie within a 3-6 ft. (1-2m) radius of a point on the ground surface directly above the source of the anomaly. For seeds outside of the 3-6 ft. (1-2m) radius, a corrective action will be conducted to determine the appropriate amount of failed data.
Down-line data density is sufficient to detect MEC items	Results of DGM surveys will be evaluated to ensure compliance.	100% of the data will not exceed 0.5 ft. (0.15m) except for areas that are unsurveyable because of cultural features. Lot size is the survey file.

Data Quality Objective	Test Method	Measurement Performance Criteria
Consistent detection of blind seed items during dynamic survey	Transects with fixed RTK GPS coverage will be seeded with ISOs or seed items and surveyed by geophysical personnel.	95% of the ISOs or seed items will be detected. Any misses will results in a root cause analysis and may result in a resurvey of all or a portion of the transect.

Attachment A

Daily Survey and Processing Summary

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Daily Survey and Processing Summary

Survey Date: 4/11/2013 Site:PACR Log Date: 2013294

LITTER 1

Raw Data File: E2013294AB Survey Type: Static/Spike

Processed Filename: 2013294_Litter1_Stand.xyz

Merging Parameters

Sensor Position	Position File	Sensor File	Forward Offset	Lateral Offset
1	P251329402AB.pos	E021329401AB.sen	0	0

Processor Name: Andrew Schrag Processing Status: Passed

Processing Comments:

QC Name: Jon Jacobson QC Status: Passed

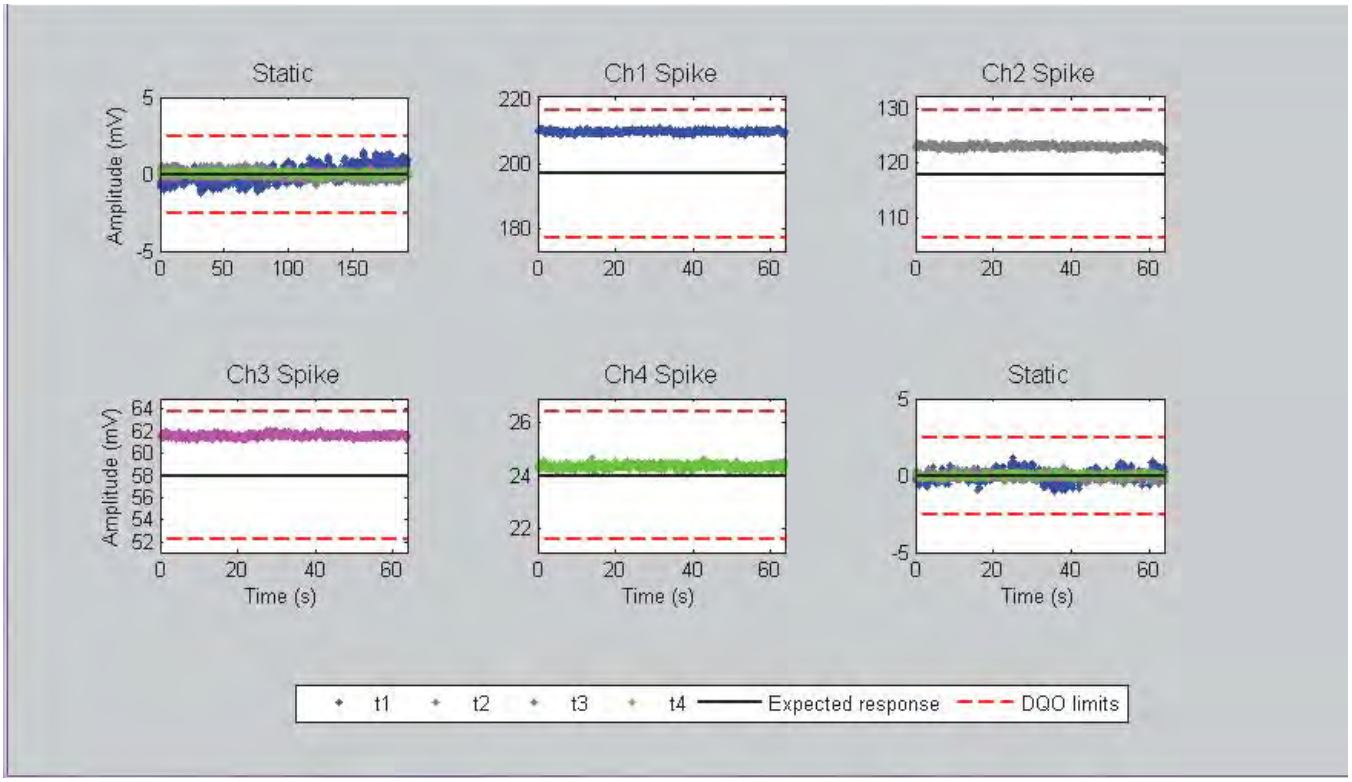
Daily Survey and Processing Summary

Survey Date: 4/11/2013 Site:PACR Log Date: 2013294

LITTER 1

Raw Data File: E2013294AB Survey Type: Static/Spike

Processed Filename: 2013294_Litter1_Stand.xyz



Daily Survey and Processing Summary

Survey Date: 4/11/2013 Site:PACR Log Date: 2013294

LITTER 1

Raw Data File: E2013294AC Survey Type: Cable Shake

Processed Filename: 2013294_Litter1_Stand.xyz

Merging Parameters

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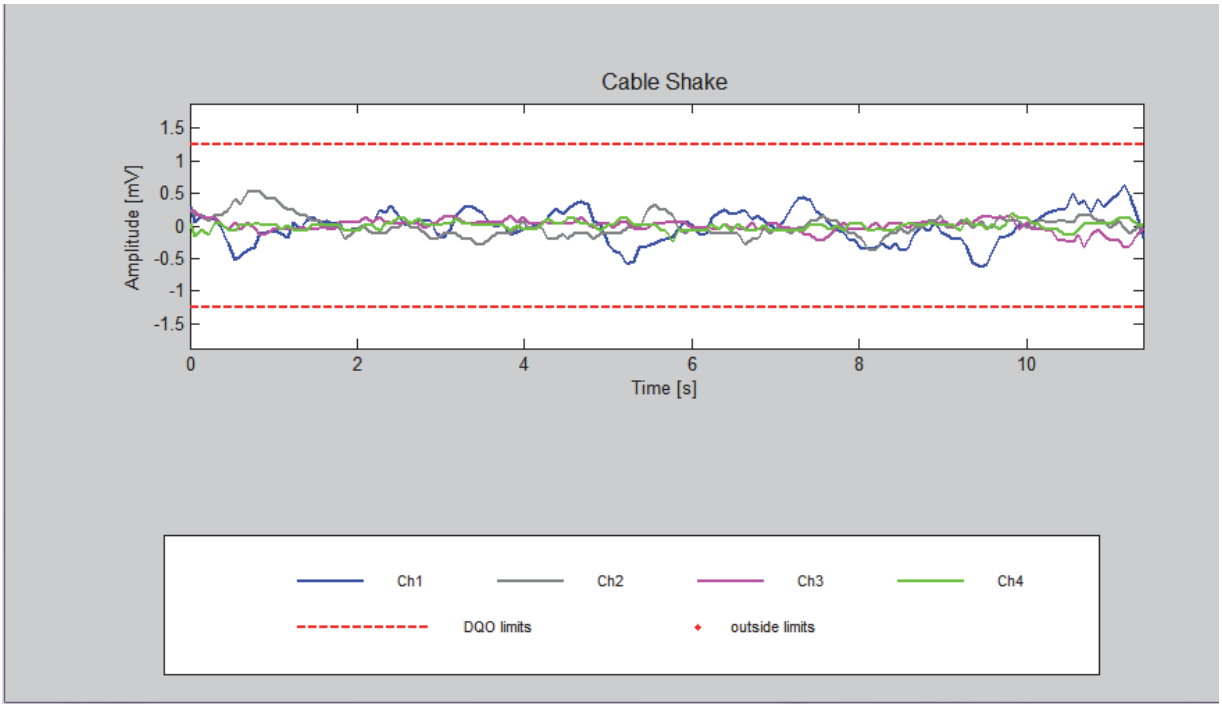

Processor Name: Andrew Schrag Processing Status: Passed

Processing Comments:

QC Name: Jon Jacobson QC Status: Passed

Daily Survey and Processing Summary

Survey Date: 4/11/2013 Site:PACR Log Date: 2013294

LITTER 1

Raw Data File: E2013294AF Survey Type: Time Calibration

Processed Filename: 2013294_Litter1_Stand.xyz

Merging Parameters

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Processor Name: Andrew Schrag Processing Status: Passed

Processing Comments:

QC Name: Jon Jacobson QC Status: Passed

Daily Survey and Processing Summary

Survey Date: 4/11/2013 Site:PACR Log Date: 2013294

LITTER 1

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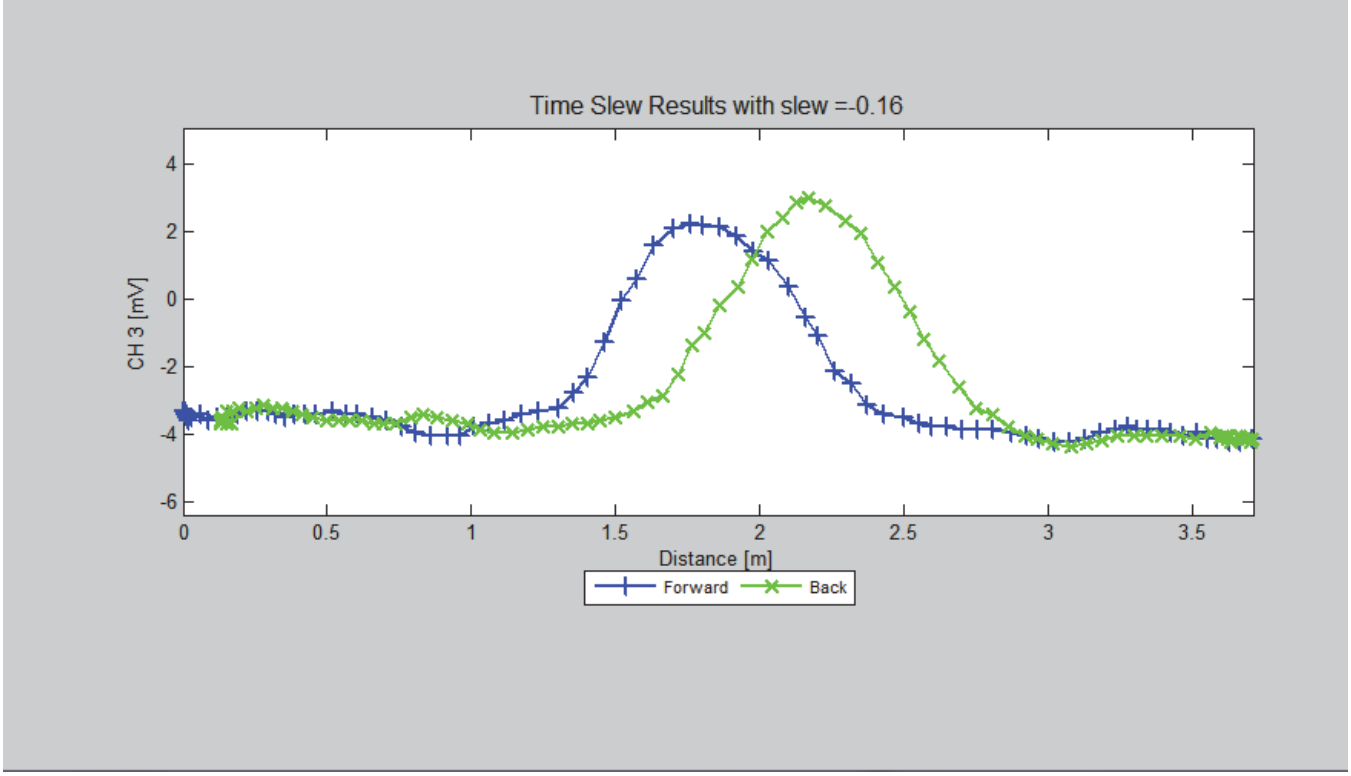

Daily Survey and Processing Summary

Survey Date: 4/11/2013 Site:PACR Log Date: 2013294

LITTER 1

Raw Data File: E2013294AK Survey Type: Static/Spike

Processed Filename: 2013294_Litter2_Stand.xyz

Merging Parameters

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Processor Name: Andrew Schrag Processing Status: Passed

Processing Comments:

QC Name: Jon Jacobson QC Status: Passed

Daily Survey and Processing Summary

Survey Date: 4/11/2013 Site:PACR Log Date: 2013294

LITTER 1

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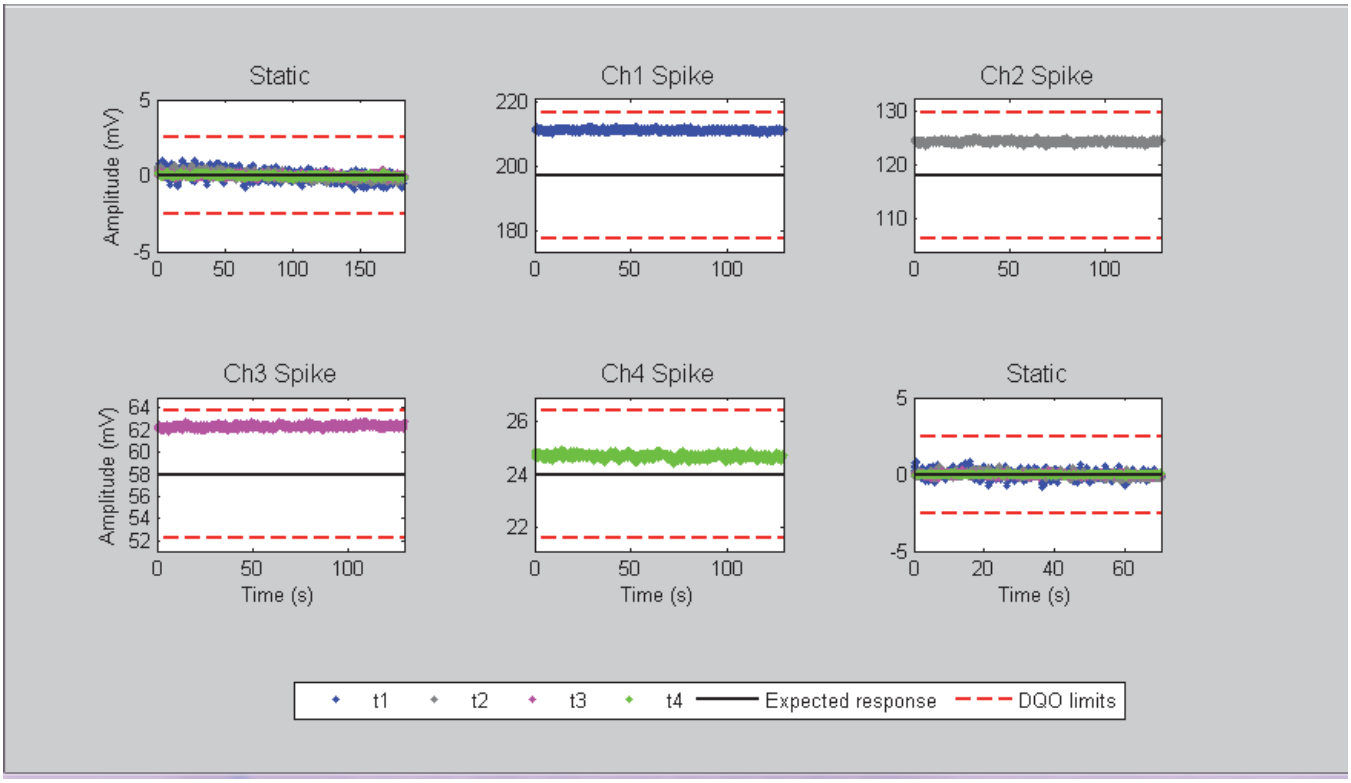

Daily Survey and Processing Summary

Survey Date: 4/11/2013 Site:PACR Log Date: 2013294

LITTER 2

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Processor Name: Andrew Schrag Processing Status: Passed

Processing Comments:

QC Name: Jon Jacobson QC Status: Passed

Daily Survey and Processing Summary

Survey Date: 4/11/2013 Site:PACR Log Date: 2013294

LITTER 2

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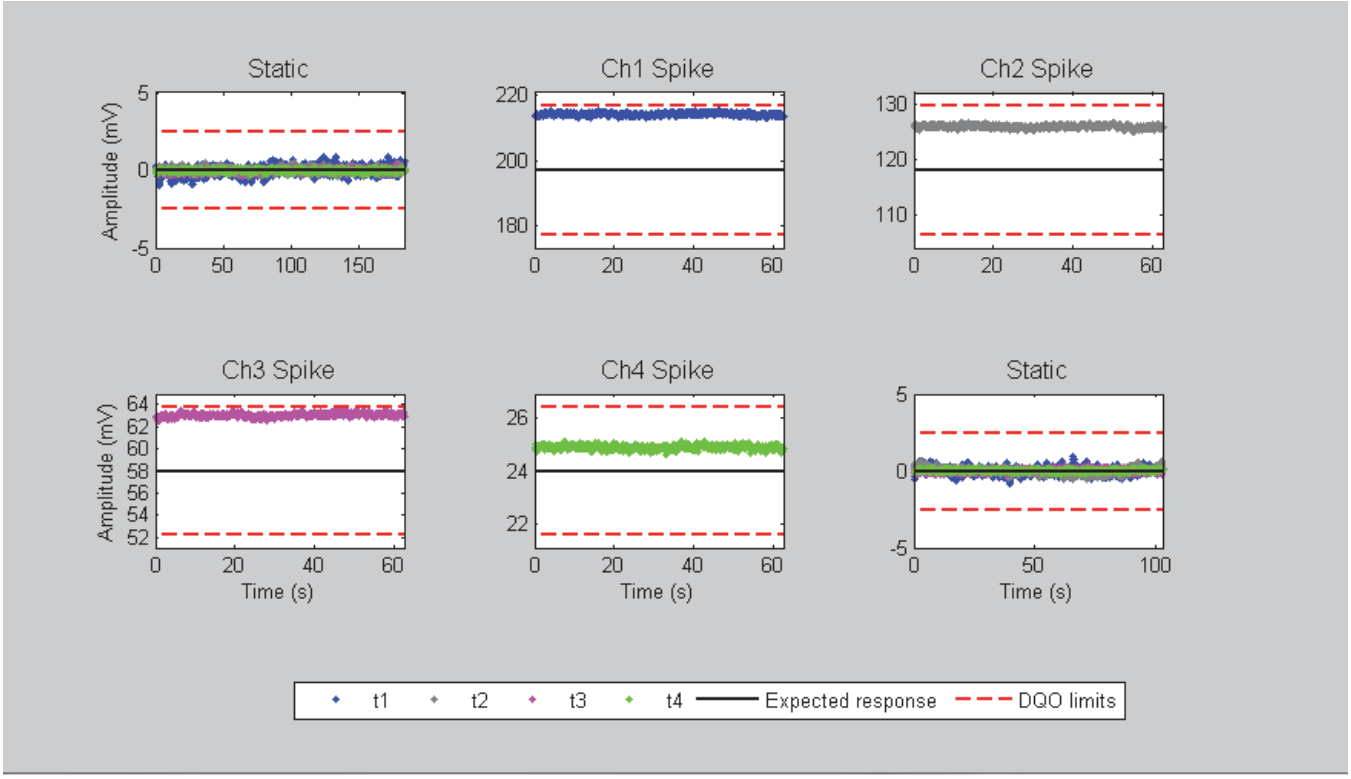

Daily Survey and Processing Summary

Survey Date: 4/11/2013 Site:PACR Log Date: 2013294

LITTER 2

Raw Data File: E2013294AN Survey Type: Cable Shake

Processed Filename: 2013294_Litter2_Stand.xyz

Merging Parameters

Sensor Position	Position File	Sensor File	Forward Offset	Lateral Offset
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Processor Name: Andrew Schrag Processing Status: Passed

Processing Comments:

QC Name: Jon Jacobson QC Status: Passed

Daily Survey and Processing Summary

Survey Date: 4/11/2013 Site:PACR Log Date: 2013294

LITTER 2

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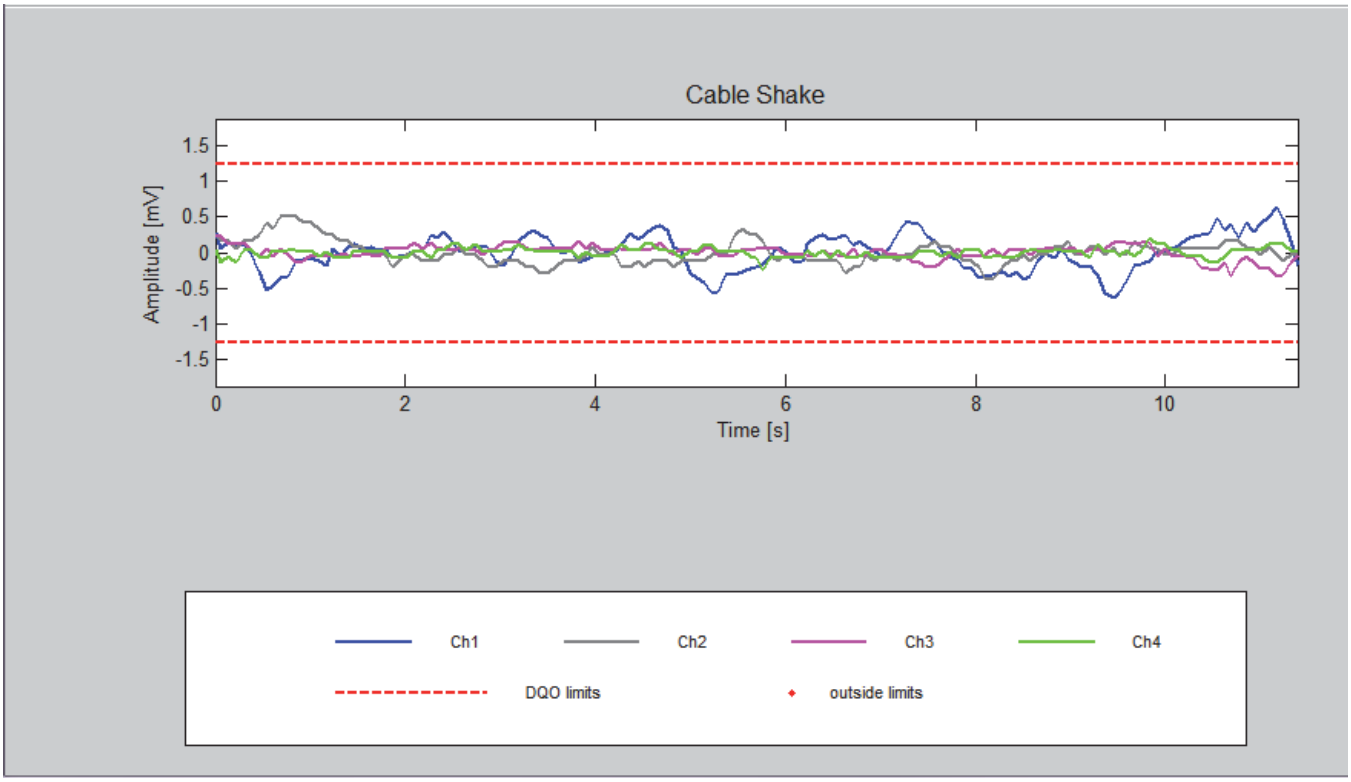
Processed Filename: 2013294_Litter2_Stand.xyz



Daily Survey and Processing Summary

Survey Date: 4/11/2013 Site:PACR Log Date: 2013294

LITTER 2

Raw Data File: E2013294AO Survey Type: Time Calibration

Processed Filename: 2013294_Litter2_Stand.xyz

Merging Parameters

Sensor Position	Position File	Sensor File	Forward Offset	Lateral Offset
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Processor Name: Andrew Schrag Processing Status: Passed

Processing Comments:

QC Name: Jon Jacobson QC Status: Passed

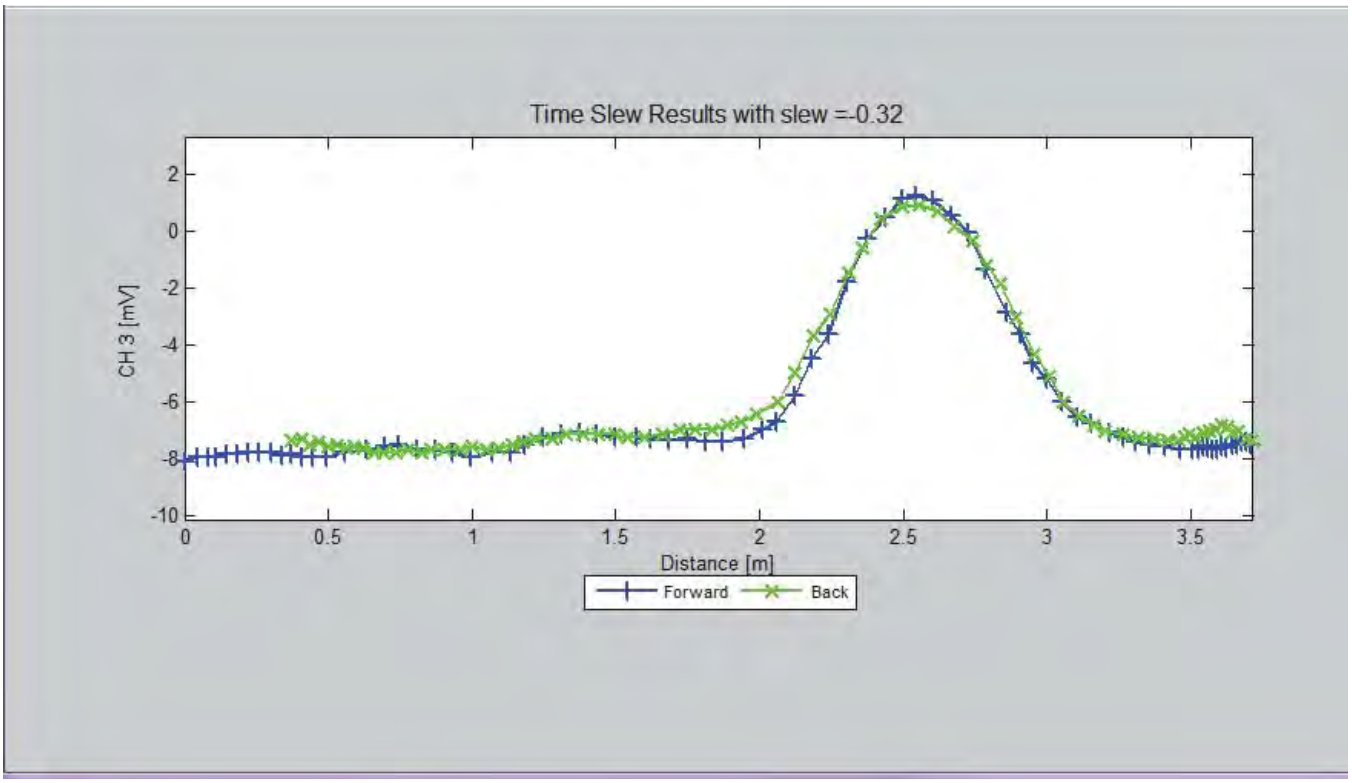
HDR Daily Survey and Processing Summary

Survey Date: 4/11/2013 Site:PACR Log Date: 2013294

LITTER 2

Raw Data File: E2013294AO Survey Type: Time Calibration

Processed Filename: 2013294_Litter2_Stand.xyz



Daily Survey and Processing Summary

Survey Date: 4/11/2013 Site:PACR Log Date: 2013294

LITTER 2

Raw Data File: E2013294AR Survey Type: Static/Spike

Processed Filename: 2013294_Litter2_Stand.xyz

Merging Parameters

Sensor Position	Position File	Sensor File	Forward Offset	Lateral Offset
1	P251329402AR.pos	E021329401AR.sen	0	0

Processor Name: Andrew Schrag Processing Status: Passed

Processing Comments:

QC Name: Jon Jacobson QC Status: Passed

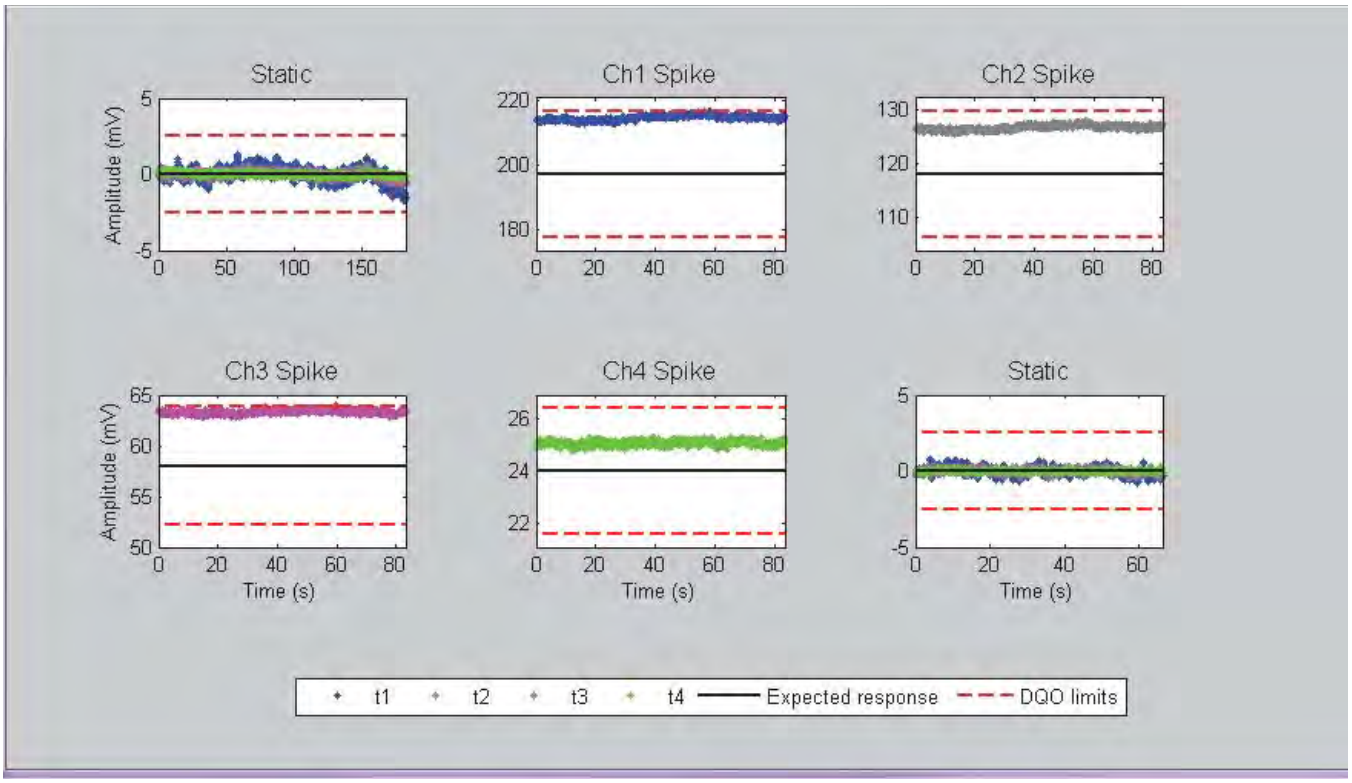
HDR Daily Survey and Processing Summary

Survey Date: 4/11/2013 Site:PACR Log Date: 2013294

LITTER 2

Raw Data File: E2013294AR Survey Type: Static/Spike

Processed Filename: 2013294_Litter2_Stand.xyz



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APPENDIX H

Ordnance Technical Data Sheets

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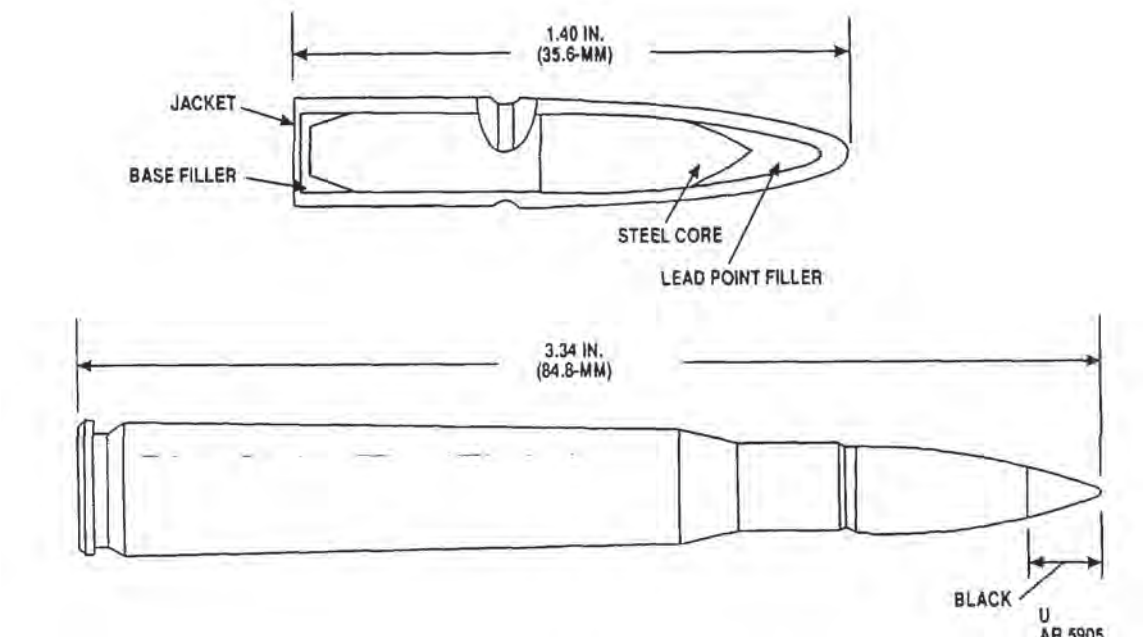
CARTRIDGE, CALIBER .30, ARMOR PIERCING, M2



Type Classification:

OBS - MSR 11756003.

Use:

Machine Guns, Caliber .30, M37, M1919A4 and M1919A6; and Rifle, Caliber .30, M1.

Description:

ARMOR PIERCING Cartridge. The cartridge is identified by a black bullet tip.

Function:

Penetration, fired at 7/8-inch thick homogeneous armor plate at 100 yards, will be not less than 0.42 inch.

Tabulated Data:

DODAC	1305-A202
UNO serial number	0012
UNO proper shipping name	Cartridges for weapons, inert projectile
Weight	424 gr
Length	3.34 in. (84.8 mm)
Tracer	NA
Primer	Percussion
Fuze	NA
Explosive:	
Type	NA
Weight	NA
Incendiary:	
Type	NA
Weight	NA
Propellant:	
Type	WC 852
Weight	55 gr
Projectile:	
Weight	165.7 gr

Performance:

Chamber pressure	54,000 psi
Velocity	2715 fps, 78 ft from muzzle

Shipping and Storage Data:

Quantity-distance class/ SCG	1.4S
Storage code	Class V
DOT shipping class	C
DOT designation	SMALL ARMS AMMUNITION
Drawing number	6138194

References:

SB 700-20
TM 1005-222-12P/1
TM 9-1300-206

SHELL, Practice, M44. This shell is used for practice firing in the 81-mm (figure 110c) trench mortar weapon.The body of the shell is made of cast iron and contains an inert filler. A small amount of black powder (0.20 pound) is placed below the fuze to give a spotting effect when the fuze functions. The body shape, size, and weight are identical to the M43 Shell. It has no adapter, however. The fuze screws directly into the nose of the shell. The shell body is painted blue with white stencil and is packed in the same manner as SHELL, H.E. M43.

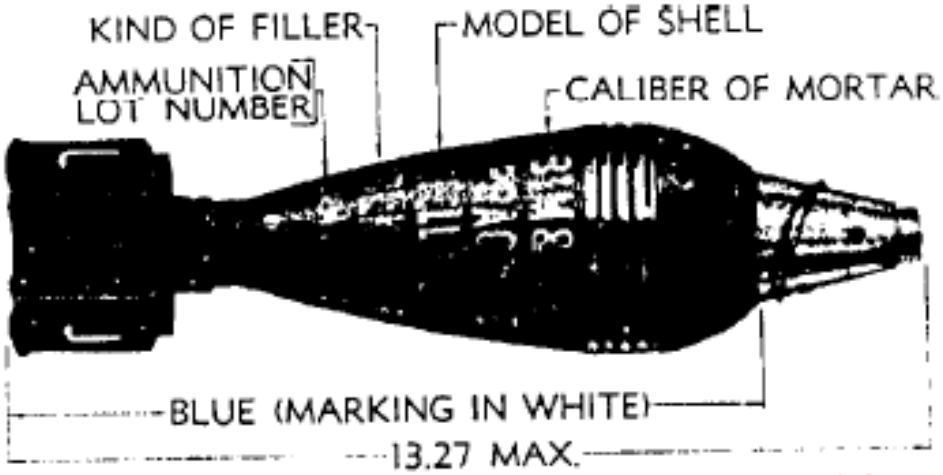
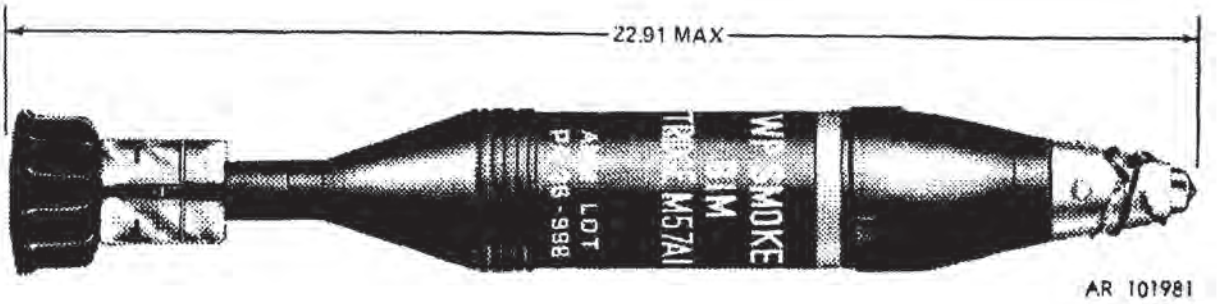
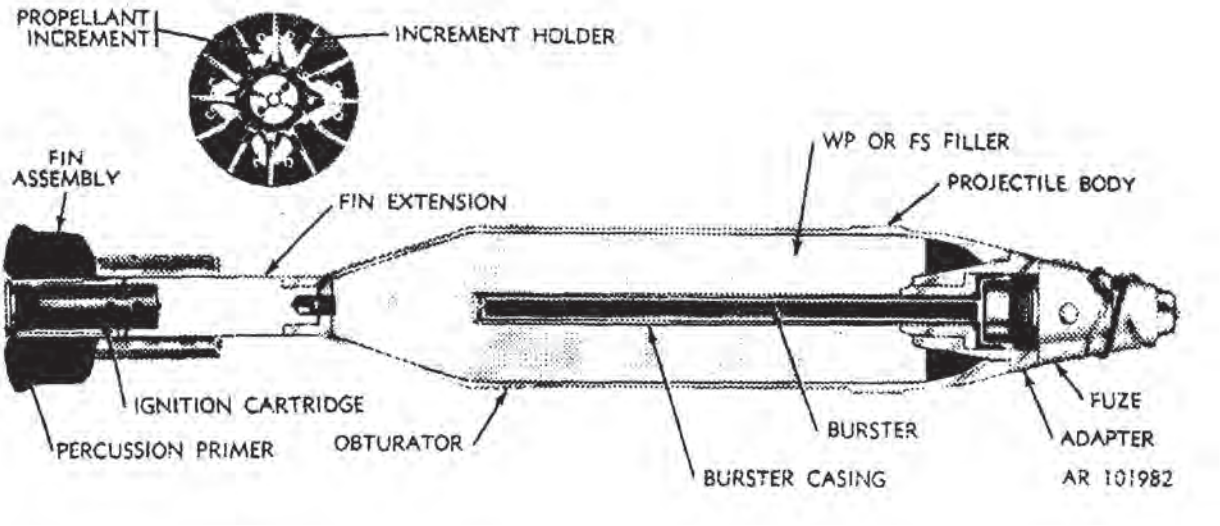


Figure 110B

CARTRIDGE, 81 MILLIMETER: SMOKE, WP, M57A1 AND M57





Type Classification:

With WP Filler: CON 11756003.
With FS Filler: OBS OTCM 37196 dtd 1961.

Use:

This cartridge is used against personnel and materiel as an incendiary device and also to produce screening smoke.

Description:

The complete round consists of a projectile body with a burster assembly, a point-detonating fuze, a fin assembly a propellant charge, and an ignition cartridge with a percussion primer. The projectile body is of relatively thin-walled steel, and is filled with white phosphorous (WP) or a liquid smoke filler (FS). The base of the projectile is internally threaded to accept the fin assembly, and the nose is fitted with a steel adapter. The adapter is internally threaded to accept the fuze, and is designed to hold the burster assembly. The burster assembly is a thin-walled steel tube filled with tetryl and extends into the smoke charge.

Functioning:

When the cartridge is loaded, it slides down the mortar tube until the percussion primer in the ignition cartridge strikes the firing pin in the base cap of the mortar. The primer ignites the ignition cartridge, and the cartridge ignites the propellant charge. Rapidly expanding gases from the burning propellant expel the projectile from the tube with the velocity required to reach the target. The fuze functions on impact, detonating the burster charge which ruptures the projectile and disperses the chemical filler. Both WP and FS react spontaneously on contact with the air; WP ignites producing a dense white smoke and some incendiary effect, while FS, combining with the moisture in the air, creates a cloud-like smoke screen without burning.

Difference Between Models:

The M57 is fitted with the M4 fin assembly and the M57A1 uses the M4A1 assembly. These differ in minor manufacturing details only. Cartridges with liquid smoke filler (FS) are classified as obsolete.

Tabulated Data:

Complete Round:	
Type	Smoke
Weight	11.38 lb
Length	22.91 in.
Cannon used with	M1, M29, M29A1
Projectile:	
Body material	Steel
Color	Grey w/yellow markings
Filler and weight	WP, 4.06 lb
Burster charge	Tetryl, 0.08 lb
Components:	
Burster assembly	M1
Ignition cartridge	M6
Propellant charge	M2A1
Percussion primer	M34
Fin assembly	M4, M4A1
Fuze	M525 series

Temperature Limits:

Firing:	
Lower limit	-40°F
Upper limit	+125°F
Storage:	
Lower limit	-80°F (for period not more than 3 days)
Upper limit	+160°F (for period not more than 4 hr/day)
*Packing	1 round in fiber container; 2 containers in wooden box
*Packing Box:	
Weight	43.0 lb
Dimensions	28 x 9-11/16 x 6-15/32 in.
Cube	1.0 cu ft

*NOTE: See DOD Consolidated Ammunition Catalog for complete packing data including NSN's.

Shipping and Storage Data:

UNO serial number	0245
Quantity-distance class	(12) 1.2
Storage compatibility group	H
DOT shipping class	A
DOT designation	AMMUNITION FOR CANNON WITH SMOKE PROJECTILES
DODAC	1315-C230
Drawing number	75-1-93

Ballistics:

Charge	Muzzle Velocity (fps)	Maximum Range (m)	(yd)
1**		630	700
2		1199	1300
3		1646	1800
4		2169	2872

**Charge 1 is the ignition cartridge and one increment charge; Charge 4 is the ignition cartridge and four increment charges.

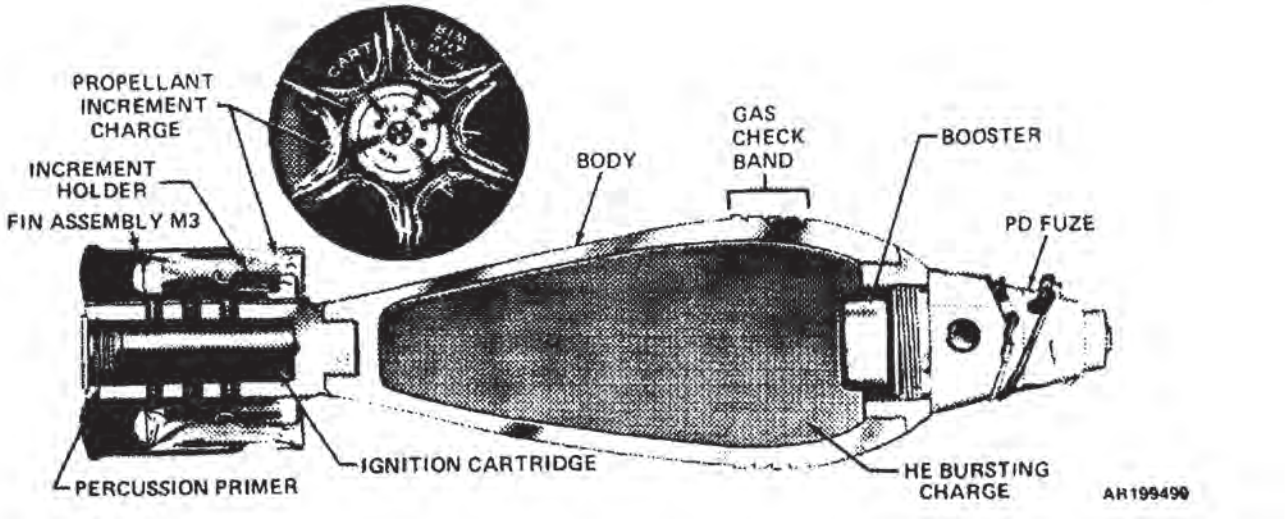
Limitations:

Store and transport WP rounds at temperatures below 111.4°F (melting point of WP). If impractical, store rounds on bases, so that if WP melts it will resolidify with void space in normal position in the nose of the projectile. Erratic performance may occur if voids exist inside of WP filler.

References:

AMC-P 700-3-3
SB 700-20
TM 9-1300-251-20
TM 9-3071-1

CARTRIDGE, 81 MILLIMETER: HE, M43A1 AND M43A1B1



Type Classification:

OBS 11756003.

Use:

This cartridge is used against personnel and light materiel, providing both fragmentation and blast effect.

Description:

The complete round consists of a projectile body, a point-detonating fuze, a tin assembly a propellant charge, and an ignition charge with a percussion primer. The projectile body is of forged steel, and is threaded internally at the nose to accept the fuze and at the base to accept the fin assembly. The projectile body is filled with Composition B high explosive.

Functioning:

When the cartridge is loaded, it slides down the mortar tube until the percussion primer in the ignition cartridge strikes the firing pin in the base cap of the mortar. The primer ignites the ignition cartridge, and the cartridge ignites the propellant charge. Rapidly expanding gases from the burning propellant expel the projectile from the tube and propel it to the target. The projectile is fin-stabilized in flight. The PD fuze functions on impact detonating the fuze booster charge and, in turn, the high explosive charge. The bursting charge shatters the projectile body, producing near optimum fragmentation and blast effect at the target.

Difference Between Models:

The two cartridges differ only in some minor metal parts.

Tabulated Data:

Complete Round:
- HE
- Weight: 07.5 lb
- Length: 13.32 in.
- Cannon used with: M1, M9, M29A1

Projectile:
- Body material: Forged steel
- Color: Olive drab w/yellow markings
- Filler and weight: Comp. B, 01.29 lb

Components:
- Ignition cartridge: M8 or M6
- Propellant charge: M1A1
- Percussion primer: M34
- Fin assembly: M3
- Fuze: PD, M525 series PD, M717

Temperature Limits:

Firing:
- Lower limit: -40°F
- Upper limit: +125°F

Storage:
- Lower limit: -80°F (for period not more than 3 days)
- Upper limit: +160°F (for period not more than 4 hr/day)

*Packing: 1 round in fiber containers; 4 containers in wooden box

*Packing box:
- Weight: 49.8 lb
- Dimensions: 17-3/4 x 9-11/16 x 10-15/32 in-
- Cube: 1.0 cu ft

*NOTE: See DOD Consolidated Ammunition catalog for complete packing data including NSN'S.

Shipping and Storage Data:

- UNO serial number: 0321
- Quantity-distance class: (08) 1,2
- Storage compatibility group: E
- Dot shipping class: A
- DOT designation: AMMUNITION FOR CANNON WITH EXPLOSIVE PROJECTILES
- DODAC: 1315-C225
- Drawing number: 9218433

Ballistics:

Charge	Muzzle Velocity (fps)	Maximum Range (m)	(yd)
** 0	238	517	565
1	351	1029	1111
2	443	1511	1649
3	519	1947	2120
4	590	2349	2560
5	656	2700	2950
6	719	3016	3290
7	779	3292	3590
8	834	3701	4050

**Charge 0 is the ignition cartridge only; Charge 1 is the ignition cartridge and one increment charge; Charge 8 is the ignition cartridge and eight increment charges.

References:

AMC-P 700-3-3
SB 700-20
TM 9-3071-1
TM 9-1300-251-20

35. Shell, Fixed, HE, M63, w/Fuze, BD, M58 for 37-mm Gun M6 (fig. 46)

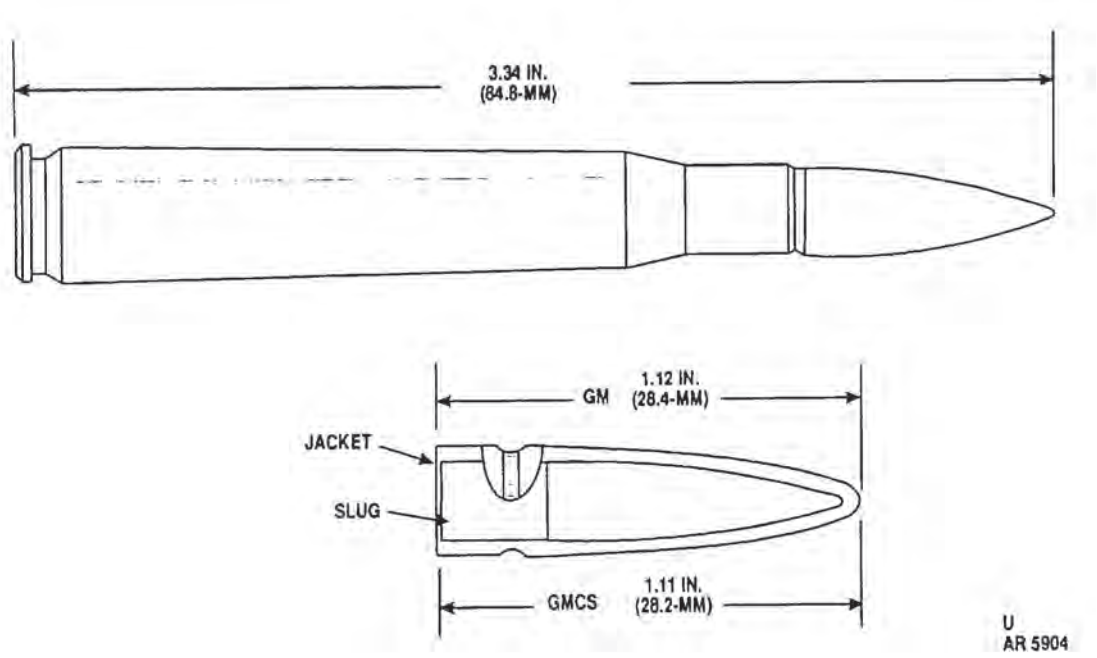
a. GENERAL. This shell is for use with 37-mm tank gun when fragmentation and blast effect are desired. The shell body is a relatively heavy steel casing. The nose is solid and formed to a long ogive. The base is threaded to receive the M58 base fuze which functions with nondelay action. This construction provides a maximum distribution of metal forward of the TNT bursting charge and for some penetration before detonation, increasing the effectiveness against targets such as sheltered or entrenched personnel, trucks, and light armored vehicles. The round is assembled with both brass and steel cartridge cases. Present muzzle velocity is 2,600 fps, but rounds of earlier manufacture may be encountered which are loaded to give 2,700 fps muzzle velocity.

b. DATA.

Weight of complete round	3.08 lb
Length of complete round	14.09 in
Length of fuzed projectile	6.02 in
Length of cartridge case	8.75 in
Width of rotating band	0.74 in
Type of base	Square
Radius of ogive	8.97 cal.
Muzzle velocity	2,600 fps
Maximum range	9,500 yd

Figure 46. Shell, fixed, HE, M63, w/fuze, BD, M58, for 37-mm gun M6.

CARTRIDGE, CALIBER .30, BALL, M2



Type Classification:

OBS - MSR 11756003.

Use:

Machine Guns, Caliber .30, M37, M1919A4 and M1919A6; and Rifle, Caliber .30, M1. The cartridge is intended for use against personnel or unarmored targets.

Description:

BALL Cartridge. The cartridge is identified by a plain bullet tip.

Tabulated Data:

DODAC 1305-A212
UNO serial number 0012
UNO proper shipping
name ..... Cartridges for weapons, inert projectile
Weight ..... 416 gr
Length ..... 3.34 in. (84.8 mm)
Tracer ..... NA
Primer ..... Percussion
Fuze ..... NA
Explosive:
Type ..... NA
Weight ..... NA
Incendiary:
Type ..... NA
Weight ..... NA
Propellant:
Type ..... IMR 4895
Weight ..... 50 gr

Performance:

Chamber pressure ..... 50,000 psi
Velocity ..... 2740 fps, 78 ft from muzzle

Shipping and Storage Data:

Quantity-distance class/
SCG 1.4S
Storage code ..... Class V
DOT shipping class C
DOT designation ..... SMALL ARMS AMMUNITION
Drawing number 6137544

References:

SB 700-20
TM 9-1005-222-12P/1
TM 9-1300-206

SHELL, CHEMICAL, M64.

General. This round is a new type of chemical round, the projectile being equipped with a full length burster. It disperses the chemical agents more efficiently than does the older type chemical round (see SHELL, chemical, Mk. II, in section on 75-mm guns) since the entire projectile is split open. It may be expected that a chemical shell of this type will also be standardized for the 75-mm guns in the near future.

Projectile M64 figure 174. This projectile is similar to the H.E. Projectile M48 with the exception of an adapter for the burster casing in the nose, and the absence of a base plate. The burster casing is a press-fit in the adapter provided for it. The burster assembles within the burster casing. The standard fillers (chemical agents) for this shell are H, WP, and FS. The marking for these fillers will be similar to that for the same fillers in the SHELL, chemical, Mk. II. There are five weight zones in this projectile. The components associated with it in the complete round are:

Fuze M57. Discussed in chapter on 75-mm gun ammunition.
Burster M8.
Burster Casing M6.
Cartridge Casing M5A1 AND M5A1B1.
Propelling Charge. FNH, 4 zone, base and increment.
Primer M1B1A2. Discussed in chapter on 75-mm gun ammunition.

NOTE: This round is standard for manufacture and issue and is issued fuzed. It is a boresafe round.

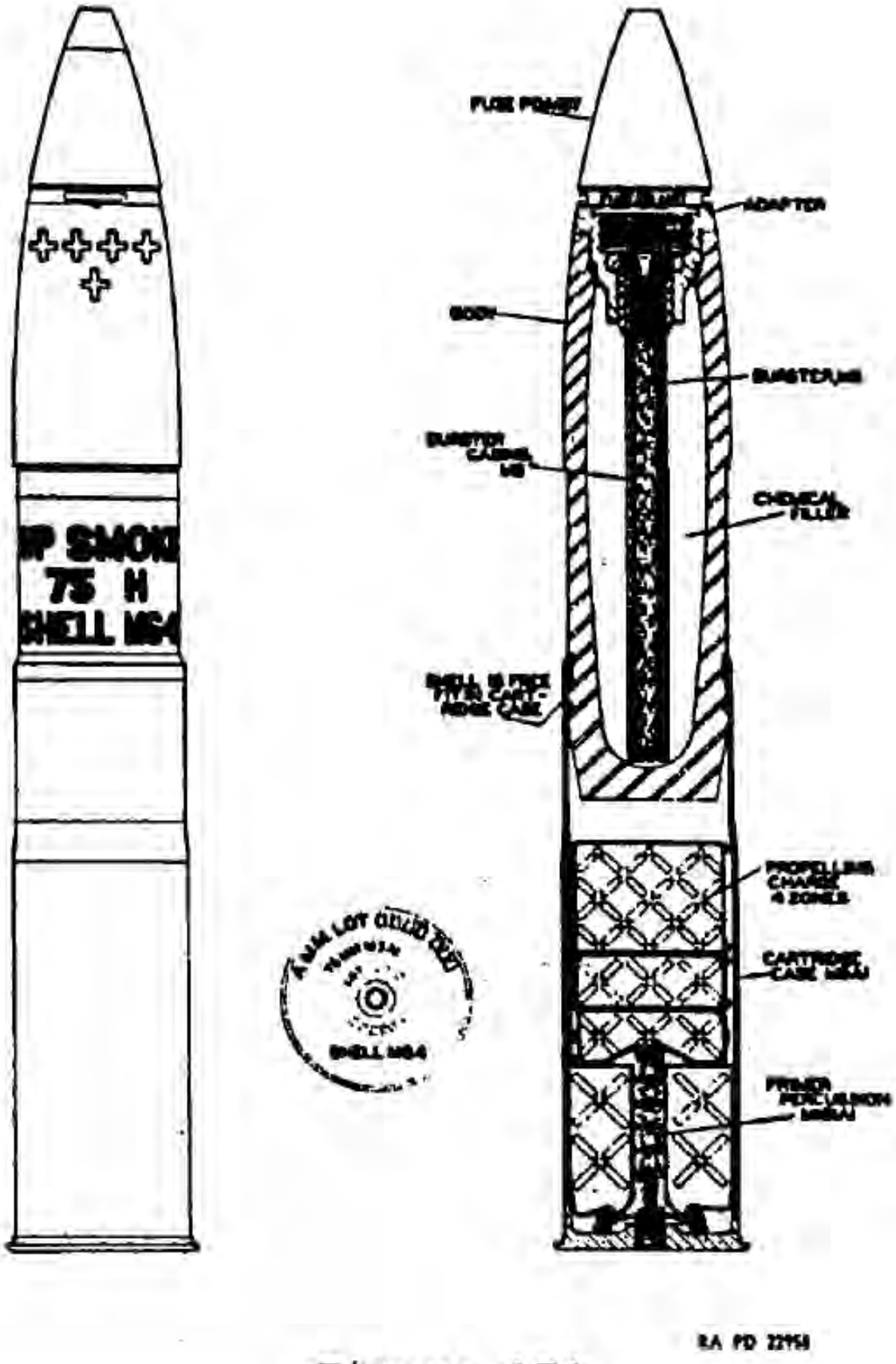
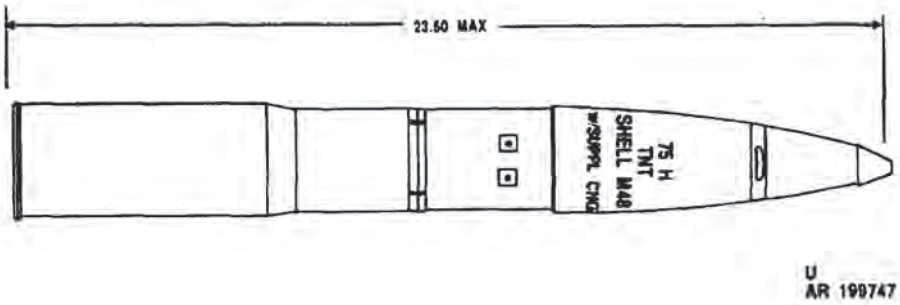
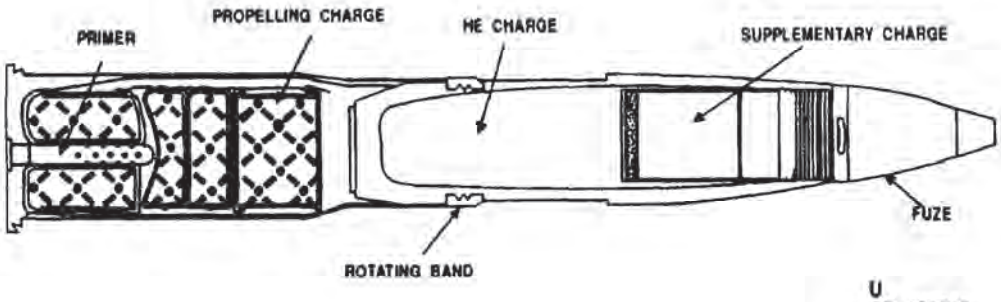

FUZE POINT
ADAPTER
BODY
BURSTER
CHEMICAL FILLER
PROPELLING CHARGE 4 ZONES
CARTRIDGE CASE M64
PRIMER PERCUSSION M60A1
SHELL M64
RA PD 22153

Figure 174

CARTRIDGE, 75-MILLIMETER HE, M48



U
AR 199747



U
AR 199746

Type Classification:

OBS MSR 11756003.

Use:

Cartridge M48 is a high explosive type round used for fragmentation, mining, and blast effects. The cartridge is used in 75-mm Howitzer M1A1.

Description:

The projectile of this cartridge is loosely assembled in the cartridge case because of the necessity for removal to adjust the propelling charge. The projectile is made with either a normal or deep fuze cavity. The deep fuze cavity type may be issued with or without a supplementary charge. As issued, the projectile may be fuzed or assembled with a closing plug. Impact, mechanical time-superquick, or proximity fuzes may be used. The propelling charge consists of a four-increment charge (base charge plus three increments) assembled in the cartridge case. A percussion primer is fitted in the base of the cartridge case.

Functioning:

When the percussion primer is struck by the firing pin of the weapon, a small amount of black powder in the primer tube is ignited. Sparks and flame from the black powder ignite the propelling charge. Gases from the burning propelling charge drive the projectile through the bore of the weapon. Spin is imparted to the projectile by the engagement of the rotating band with the rifling in the bore. This spin stabilizes the projectile in flight. When the fuze functions, either over or on the target, the bursting charge detonates with both blast and fragmentation effect.

Tabulated Data:

Complete round:	
Type	HE
Weight	18.24 lb
Length	23.50 in.
Cannon used with	M1A1
Projectile:	
Body material	Forged steel
Color	Olive drab w/yellow markings
Filler and weight	TNT or 50/50 amatol, 1.49 lb

Components:	
Cartridge case	M5A1, M5A1B1
Propelling charge	M1
Primer	M1, M1A1, M1A2, M1B1A2 or M64
Fuze:	
PD	M557
PROX.	M513 series
MTSQ	M520 series, M564
Performance:	
Maximum range	8796 meters
Muzzle velocity	1250 fps

Temperature Limits:

Firing:	
Lower limit	-40°F
Upper limit	+125°F
Storage:	
Lower limit	-80°F (for period not more than 3 days)
Upper limit	+160°F (for period not more than 4 hr/day)
*Packing	1 round per fiber container; 2 fiber containers per wooden box
*Packing Box:	
Weight	53.0 lb
Dimensions	27-15/16 x 9-5/8 x 6-11/32 in.
Cube	1.01 cu ft

*NOTE: See DOD Consolidated Ammunition Catalog for complete packing data including NSN's.

Shipping and Storage Data:

Quantity-distance class	4
Storage compatibility group	E
DOT shipping class	A
DOT designation	AMMUNITION FOR CANNON WITH EXPLOSIVE PROJECTILES
DODAC	1315-C027 - w/PD fuze, 1315-C028 - w/o fuze
UNO serial number	0321
UNO proper shipping name	Cartridges for weapons
Drawing number	75-1-59

Operational Characteristic

When assembling an impact or mechanical time fuze to a deep cavity projectile, assure that a supplementary charge is installed, as some deep cavity projectiles do not contain a supplementary charge when issued.

References:

SB 700-20
AMC-P 700-3-3
TM 9-1300-251-20

APPENDIX I

Demilitarization Documentation

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Invoice

Date	Invoice #
1/15/2014	11514

29925 Highway 108
Cold Springs, CA 95335

HDR Environmental
12850 E. Control Tower Rd.
Centennial, CO 80112

PO #	Terms
	Net 30

Quantity	Description	Rate	Amount
	50 lbs. of MDAS MIN. CHG. Rob Irons 303 323-9517	250.00	250.00
		Total	$250.00

Timberline Environmental Services, Inc.
Office: (209) 965-3118 Fax: (209) 965-4721

Certificate of Destruction

Sealed Container Generating Contractor **HDR**

Generating Location **Port Angeles**

Gross Weight **50 lbs**

[I certify that the items/assets/material received were demilitarized in accordance with guidelines contained in DoD 4160.21-M-1 and having been smelted are only identifiable by their basic content.]

COD# **011514-4** *Date* **01/15/14**

Certifying Official **Terry Northcutt** *Title* **President**

Signature _____

TES Inc. 29925 Hwy 108, Cold Springs, CA 95335 209-965-3118 caoffice@timberlineenvsv.com

DD FORM 1348-1A, JUL 91 (EG) ISSUE RELEASE/RECEIPT DOCUMENT

PREVIOUS EDITION MAY BE USED

1	2	3	4	5	6	7	23	24	25	26	27	28	29	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80
DOC	DEST		RI FROM		M&S		UNIT	ISS	QUANTITY					SER	SUPPLEMENTARY ADDRESS					SIG	FUND	DISTRIBUTION				PROJECT				PRI	REQD	DEL DATE			ADV			RI		O/P	COND	MGT	UNIT PRICE							

1. TOTAL PRICE		
DOLLARS	CTS	

2. SHIP FROM	3. SHIP TO
HDR	Timberline Environmental Services Inc.
4. MARK FOR	

5. DOC DATE	6. NMFC	7. FRT RATE	8. TYPE CARGO	9. PS

10. QTY. REC'D	11 UP	12. UNIT WEIGHT	13. UNIT CUBE	14. UFC	15. SL

24. DOCUMENT NUMBER & SUFFIX (30-44)

CONTAINER NUMBER:
USACE/PACR/HDR/0001/4493345/4493323

SEAL NUMER:
4493345, 4493323

25. NATIONAL STOCK NO. & ADD (8-22)

50 lbs. Material Documented as Safe (MDAS)

16. FREIGHT CLASSIFICATION NOMENCLATURE

Ferrous metal scrap

17. ITEM NOMENCLATURE

MDAS

18. TY CONT	19. NO CONT	20. TOTAL WEIGHT	21. TOTAL CUBE

22. RECEIVED BY	23. DATE RECEIVED
	12/17/13

26. RIC (4-6)
UI (23-24)
QTY (25-29)
CON CODE (71)
DIST (55-56)
UP (74-80)

"This certifies and verifies that the material listed has been 100% inspected and to the best of our knowledge and belief, are inert and/ or free of explosives or related materials."

27. ADDITIONAL DATA

Rick St. Amand SUXOS
Cell Number: 303-717-4278
HDR
12850 East Control Tower Rd
Centennial CO
303-925-1062

Byron Cook UXOQCS
Cell Number: 719-648-9729
HDR
12850 East Control Tower Rd
Centennial CO
303-925-1062

Adobe Designer 7.0

HDR

Chain of Custody Form

Project Location: Port Angeles Combat Range, WA		Contract No: W9128F-10-D-0058		DO No: 006	Page 1 of 1
Line	**Description**	**Source (e.g., Grid or Range Identifier)**	**Container/Serial Number**	**Container Type**	**Unit Wt.**
1	MDAS	Port Angeles Combat Range	USACE/PACR/HDR/0001	Small tool box	50 lbs
2					
3		Nothing Follows			
4					
5					

Inspector's certification: This certifies that the MPPEH residue, MD, MDAS, and Range Residue and/or Explosive Contaminated Property listed has been 100 percent properly inspected and, to the best of our knowledge and belief, are free of any explosive hazards.

Printed/typed name: Rick St.Amand HDR	Signature:	Date: 13 Dec 13

Verifier certification: This certifies that the MPPEH residue, MD, MDAS , and Range Residue and/or Explosive Contaminated Property listed has been 100 percent properly inspected and, to the best of our knowledge and belief, are free of any explosive hazards.

Printed/typed name: Byron Cook	Signature: Byron D. Cook	Date: 13 Dec 13

Transporter(s)	Transporter 1 acknowledgment of receipt of materials properly sealed/secured.		
	Printed/typed name:	Signature:	Date:
	Transporter 2 acknowledgment of receipt of materials properly sealed/secured.		
	Printed/typed name:	Signature:	Date:
Final Disposition	Facility owner or operator: Certification of receipt of AEDA/Range Residue materials, except as noted above. Acknowledgment of receipt of materials properly sealed/secured.		
	Printed/typed name: Terry Nathcutt	Signature:	Date: 12/17/13

APPENDIX J

Summary of Lead in Soils – X-ray Fluorescence Screening Data

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XRF Reading No.	Date & Time	Type	Duration (sec)	Depth (inches)	Pb (mg/kg)	Munitions Response Site/Observations
421	11/14/2013 8:44	SOIL	30.9	0-6	< LOD	Range Complex No. 1 (a)/Natural Feature
422	11/14/2013 8:48	SOIL	30.6	0-6	< LOD	Range Complex No. 1 (a)/Natural Feature
423	11/14/2013 8:50	SOIL	30.6	0-6	< LOD	Range Complex No. 1 (a)/Natural Feature
424	11/14/2013 8:53	SOIL	30.6	0-6	< LOD	Range Complex No. 1 (a)/Natural Feature
425	11/14/2013 8:55	SOIL	30.9	0-6	< LOD	Range Complex No. 1 (a)/Natural Feature
426	11/14/2013 8:57	SOIL	31.0	0-6	< LOD	Range Complex No. 1 (a)/Natural Feature
427	11/14/2013 8:59	SOIL	30.6	0-6	< LOD	Range Complex No. 1 (a)/Natural Feature
428	11/14/2013 9:01	SOIL	30.6	0-6	< LOD	Range Complex No. 1 (a)/Natural Feature
429	11/14/2013 9:03	SOIL	30.4	0-6	11	Range Complex No. 1 (a)/Natural Feature
430	11/14/2013 9:06	SOIL	30.5	0-6	< LOD	Range Complex No. 1 (a)/Natural Feature
431	11/14/2013 9:08	SOIL	30.6	0-6	11	Range Complex No. 1 (a)/Natural Feature
432	11/14/2013 9:11	SOIL	30.3	0-6	< LOD	Range Complex No. 1 (a)/Natural Feature
433	11/14/2013 9:13	SOIL	30.6	0-6	< LOD	Range Complex No. 1 (a)/Natural Feature
434	11/14/2013 9:15	SOIL	30.6	0-6	< LOD	Range Complex No. 1 (a)/Natural Feature
435	11/14/2013 9:17	SOIL	30.7	0-6	< LOD	Range Complex No. 1 (a)/Natural Feature
436	11/14/2013 9:19	SOIL	30.7	0-6	< LOD	Range Complex No. 1 (a)/Natural Feature
437	11/14/2013 9:21	SOIL	30.8	0-6	11	Range Complex No. 1 (a)/Natural Feature
438	11/14/2013 9:23	SOIL	30.6	0-6	< LOD	Range Complex No. 1 (a)/Natural Feature
439	11/14/2013 9:26	SOIL	30.6	0-6	< LOD	Range Complex No. 1 (a)/Natural Feature
440	11/14/2013 9:30	SOIL	30.6	0-6	< LOD	Range Complex No. 1 (a)/Natural Feature
441	11/14/2013 9:32	SOIL	30.6	0-6	< LOD	Range Complex No. 1 (a)/Natural Feature
442	11/14/2013 9:34	SOIL	30.6	0-6	< LOD	Range Complex No. 1 (a)/Natural Feature
443	11/14/2013 9:36	SOIL	30.6	0-6	< LOD	Range Complex No. 1 (a)/Natural Feature
444	11/14/2013 9:38	SOIL	30.7	0-6	< LOD	Range Complex No. 1 (a)/Natural Feature
445	11/14/2013 9:39	SOIL	30.4	0-6	< LOD	Range Complex No. 1 (a)/Natural Feature
446	11/14/2013 9:41	SOIL	30.6	0-6	< LOD	Range Complex No. 1 (a)/Natural Feature
447	11/14/2013 9:43	SOIL	30.6	0-6	< LOD	Range Complex No. 1 (a)/Natural Feature
448	11/14/2013 9:45	SOIL	30.6	0-6	< LOD	Range Complex No. 1 (a)/Natural Feature
449	11/14/2013 9:47	SOIL	30.6	0-6	< LOD	Range Complex No. 1 (a)/Natural Feature
450	11/14/2013 9:49	SOIL	30.6	0-6	< LOD	Range Complex No. 1 (a)/Natural Feature
451	11/14/2013 9:51	SOIL	30.6	0-6	< LOD	Range Complex No. 1 (a)/Natural Feature
452	11/14/2013 9:53	SOIL	30.6	0-6	< LOD	Range Complex No. 1 (a)/Natural Feature
453	11/14/2013 9:55	SOIL	30.6	0-6	< LOD	Range Complex No. 1 (a)/Natural Feature
454	11/14/2013 9:57	SOIL	30.7	0-6	< LOD	Range Complex No. 1 (a)/Natural Feature
455	11/14/2013 10:00	SOIL	31.0	0-6	< LOD	Range Complex No. 1 (a)/Natural Feature
456	11/14/2013 10:03	SOIL	30.6	0-6	< LOD	Range Complex No. 1 (a)/Natural Feature
457	11/14/2013 10:05	SOIL	30.7	0-6	< LOD	Range Complex No. 1 (a)/Natural Feature
458	11/14/2013 10:07	SOIL	31.0	0-6	< LOD	Range Complex No. 1 (a)/Natural Feature
459	11/14/2013 10:08	SOIL	30.7	0-6	< LOD	Range Complex No. 1 (a)/Natural Feature
460	11/14/2013 10:10	SOIL	30.7	0-6	< LOD	Range Complex No. 1 (a)/Natural Feature

XRF Reading No.	Date & Time	Type	Duration (sec)	Depth (inches)	Pb (mg/kg)	Munitions Response Site/Observations
461	11/14/2013 10:12	SOIL	31.0	0-6	< LOD	Range Complex No. 1 (a)/Natural Feature
462	11/14/2013 10:14	SOIL	30.6	0-6	< LOD	Range Complex No. 1 (a)/Natural Feature
463	11/14/2013 10:16	SOIL	30.6	0-6	< LOD	Range Complex No. 1 (a)/Natural Feature
464	11/14/2013 10:18	SOIL	30.6	0-6	< LOD	Range Complex No. 1 (a)/Natural Feature
465	11/14/2013 10:20	SOIL	30.4	0-6	< LOD	Range Complex No. 1 (a)/Natural Feature
466	11/14/2013 10:22	SOIL	30.4	0-6	< LOD	Range Complex No. 1 (a)/Natural Feature
467	11/14/2013 10:24	SOIL	30.7	0-6	< LOD	Range Complex No. 1 (a)/Natural Feature
468	11/14/2013 10:26	SOIL	30.7	0-6	< LOD	Range Complex No. 1 (a)/Natural Feature
487	11/21/2013 13:49	SOIL	30.6	0-6	< LOD	Range Complex No. 1 (a)/Natural Feature
488	11/21/2013 13:52	SOIL	30.6	0-6	< LOD	Range Complex No. 1 (a)/Natural Feature
489	11/21/2013 13:54	SOIL	30.5	0-6	13	Range Complex No. 1 (a)/Natural Feature
490	11/21/2013 13:55	SOIL	30.4	0-6	< LOD	Range Complex No. 1 (a)/Natural Feature
491	11/21/2013 13:57	SOIL	30.4	0-6	< LOD	Range Complex No. 1 (a)/Natural Feature
492	11/21/2013 13:59	SOIL	30.7	0-6	< LOD	Range Complex No. 1 (a)/Natural Feature
493	11/21/2013 14:01	SOIL	30.4	0-6	< LOD	Range Complex No. 1 (a)/Natural Feature
494	11/21/2013 14:03	SOIL	30.6	0-6	12	Range Complex No. 1 (a)/Natural Feature
495	11/21/2013 14:06	SOIL	30.6	0-6	< LOD	Range Complex No. 1 (a)/Natural Feature
496	11/21/2013 14:08	SOIL	30.4	0-6	< LOD	Range Complex No. 1 (a)/Natural Feature
497	11/21/2013 14:10	SOIL	30.4	0-6	< LOD	Range Complex No. 1 (a)/Natural Feature
498	11/21/2013 14:11	SOIL	30.6	0-6	< LOD	Range Complex No. 1 (a)/Natural Feature
499	11/21/2013 14:14	SOIL	30.6	0-6	< LOD	Range Complex No. 1 (a)/Natural Feature
500	11/21/2013 14:16	SOIL	30.6	0-6	< LOD	Range Complex No. 1 (a)/Natural Feature
501	11/21/2013 14:18	SOIL	30.6	0-6	< LOD	Range Complex No. 1 (a)/Natural Feature
502	11/21/2013 14:20	SOIL	30.7	0-6	< LOD	Range Complex No. 1 (a)/Natural Feature
503	11/21/2013 14:23	SOIL	30.6	0-6	< LOD	Range Complex No. 1 (a)/Natural Feature
504	11/21/2013 14:25	SOIL	30.5	0-6	13	Range Complex No. 1 (a)/Natural Feature
505	11/21/2013 14:28	SOIL	30.4	0-6	< LOD	Range Complex No. 1 (a)/Natural Feature
506	11/21/2013 14:31	SOIL	30.6	0-6	< LOD	Range Complex No. 1 (a)/Natural Feature
507	11/21/2013 14:54	SOIL	30.7	0-6	< LOD	Range Complex No. 1/Unfired Small Arms Debris
508	11/21/2013 14:57	SOIL	30.3	0-6	< LOD	Range Complex No. 1/Unfired Small Arms Debris
509	11/21/2013 14:59	SOIL	30.6	0-6	< LOD	Range Complex No. 1/Unfired Small Arms Debris
510	11/21/2013 15:01	SOIL	30.3	0-6	< LOD	Range Complex No. 1/Unfired Small Arms Debris
511	11/21/2013 15:03	SOIL	30.7	0-6	< LOD	Range Complex No. 1/Unfired Small Arms Debris
512	11/21/2013 15:06	SOIL	31.3	0-6	12	Range Complex No. 1
513	11/21/2013 15:07	SOIL	30.6	0-6	< LOD	Range Complex No. 1
514	11/21/2013 15:11	SOIL	31.0	0-6	< LOD	Range Complex No. 1
516	11/21/2013 15:15	SOIL	30.5	0-6	64	Range Complex No. 1
517	11/21/2013 15:17	SOIL	30.4	0-6	< LOD	Range Complex No. 1
518	11/21/2013 15:19	SOIL	30.4	0-6	< LOD	Range Complex No. 1
520	11/21/2013 15:22	SOIL	30.5	0-6	111	Range Complex No. 1

XRF Reading No.	Date & Time	Type	Duration (sec)	Depth (inches)	Pb (mg/kg)	Munitions Response Site/Observations
521	11/21/2013 15:25	SOIL	30.5	0-6	22	Range Complex No. 1
539	11/22/2013 13:46	SOIL	31.0	0-6	< LOD	Range Complex No. 1
540	11/22/2013 13:49	SOIL	30.6	0-6	< LOD	Range Complex No. 1
541	11/22/2013 13:51	SOIL	30.7	0-6	< LOD	Range Complex No. 1
542	11/22/2013 13:54	SOIL	30.4	0-6	13	Range Complex No. 1
543	11/22/2013 13:56	SOIL	30.6	0-6	< LOD	Range Complex No. 1
544	11/22/2013 13:58	SOIL	30.6	0-6	< LOD	Range Complex No. 1
545	11/22/2013 14:00	SOIL	30.6	0-6	< LOD	Range Complex No. 1
546	11/22/2013 14:02	SOIL	31.0	0-6	< LOD	Range Complex No. 1
547	11/22/2013 14:04	SOIL	30.6	0-6	< LOD	Range Complex No. 1
548	11/22/2013 14:07	SOIL	30.7	0-6	12	Range Complex No. 1
549	11/22/2013 14:09	SOIL	30.7	0-6	< LOD	Range Complex No. 1
550	11/22/2013 14:12	SOIL	30.6	0-6	< LOD	Range Complex No. 1
551	11/22/2013 14:15	SOIL	30.7	0-6	< LOD	Range Complex No. 1
552	11/22/2013 14:17	SOIL	30.7	0-6	< LOD	Range Complex No. 1
553	11/22/2013 14:19	SOIL	30.4	0-6	10	Range Complex No. 1
554	11/22/2013 14:20	SOIL	30.7	0-6	< LOD	Range Complex No. 1
555	11/22/2013 14:22	SOIL	30.6	0-6	9	Range Complex No. 1
556	11/22/2013 14:24	SOIL	30.5	0-6	11	Range Complex No. 1
557	11/22/2013 14:26	SOIL	30.6	0-6	34	Range Complex No. 1
558	11/22/2013 14:28	SOIL	30.3	0-6	< LOD	Range Complex No. 1
559	11/22/2013 14:31	SOIL	30.6	0-6	< LOD	Range Complex No. 1
560	11/22/2013 14:33	SOIL	30.3	0-6	< LOD	Range Complex No. 1
561	11/22/2013 14:35	SOIL	30.6	0-6	< LOD	Range Complex No. 1
562	11/22/2013 14:38	SOIL	30.6	0-6	13	Range Complex No. 1
563	11/22/2013 14:39	SOIL	30.7	0-6	< LOD	Range Complex No. 1
564	11/22/2013 14:41	SOIL	30.6	0-6	< LOD	Range Complex No. 1
565	11/22/2013 14:43	SOIL	30.6	0-6	< LOD	Range Complex No. 1
566	11/22/2013 14:45	SOIL	30.6	0-6	12	Range Complex No. 1
567	11/22/2013 14:47	SOIL	30.4	0-6	< LOD	Range Complex No. 1
568	11/22/2013 14:49	SOIL	30.4	0-6	14	Range Complex No. 1
569	11/22/2013 14:51	SOIL	30.6	0-6	< LOD	Range Complex No. 1
570	11/22/2013 14:53	SOIL	30.5	0-6	9	Range Complex No. 1

Notes:
LOD = Limit of detection - approximately 10 mg/kg

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