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TECHNICAL MEMORANDUM REGARDING RCRA FACILITY INVESTIGATION
SUMPLEMENTAL SAMPLING ROUND 2 UNEXPLODED ORDNANCE 7 (UXO 7) SMALL
ARMS RANGE NSA CRANE IN
8/1/2012
TETRA TECH

Resource Conservation and Recovery Act (RCRA)

Technical Memorandum - RCRA Facility Investigation Supplemental Sampling (Round 2)

UXO 7 - Small Arms Range

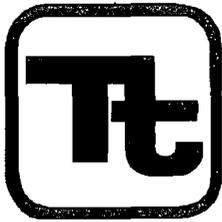
Naval Support Activity Crane Crane, Indiana



**Naval Facilities Engineering Command
Midwest**

**Contract Number N62472-03-D-0057
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TECHNICAL MEMORANDUM

DATE: August 17, 2012

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Project File – CTO F272

SUBJECT: NSA Crane UXO 7 Supplemental Soil Sampling Results and Proposed Additional Sampling Plan

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1.0 **BACKGROUND**

UXO 7 is located in the central portion of the Naval Support Activity (NSA) Crane installation, in a small valley that drains east into Turkey Creek (**Figure 1-1**). UXO 7 is an area at NSA Crane consisting of several small arms ranges including a 500-yard rifle range, pistol range, east trap range, and west trap range (**Figure 1-2**). These former small arms ranges have been the subject of two investigations for contaminants commonly associated with rifle and pistol range ammunition, primarily lead and copper; and also trap range contaminants, which are primarily PAHs and lead.

These small arms range sites were all initially investigated as part of an RFI in 2007 and additional information regarding the site history can be found in the UXO 7 RFI Report (Tetra Tech, 2009). The soil samples collected from the pistol range area generally had low-level detections of lead observed by X-Ray Fluorescence (XRF) in the field, and these soil lead concentrations were likely influenced by the lead-containing small arms ammunition fired on the pistol range. A minor subset (three) of the pistol range soil samples had lead detections above 150 parts per million (ppm) by XRF, including the hillside (range backstop) samples from behind the former pistol range target locations. The human health and ecological receptor risk assessments in the UXO 7 RFI report (Tetra Tech, 2009) for the southern zone indicated no significant risks and no additional sampling activities were recommended or performed for this zone. During the RFI field investigations, PAHs were found to present excess risk to human health in areas of the former trap ranges and lead was found to present excess risk to ecological receptors on the 500-yard Rifle Range (**Figures 1-3** and **1-4**), respectively. Supplemental sampling (Round 1) was conducted in November 2011 to more fully delineate the soil contamination, in order to support prescriptive removal action (Tetra Tech, 2011). Following is a discussion of the combined results of the RFI and Round 1 supplemental sampling and recommendations for future actions.

To better evaluate the human health and ecological risk at UXO 7, the former small arms ranges were grouped into three exposure units (northern zone, central zone, and southern zone) (**Figure 1-2**). The source of PAHs detected in soil from former trap ranges in the Central Zone is the tar pitch/bitumen binder materials which were used in the manufacturing of the clay pigeon targets. There were low-level detections of lead observed in trap range soil samples which likely originated in part from the lead shot in the ammunition cartridges fired from the shotguns. The lead concentrations detected in the trap range soil samples were collected during the original RFI sampling and those samples all had XRF readings below 50 ppm, indicating that soil lead contamination was not an issue at the trap ranges. These XRF results were confirmed by limited fixed-base laboratory (FBL) soil sample analyses. The lead risks associated with portions of the 500-yard Rifle Range (Rifle Range) located in the northern zone are a result of lead bullets fired at the Rifle Range.

Based on these risks, supplemental sampling was conducted in November 2011 (Round 1) to more fully delineate the lead and PAH contamination in order to support a prescriptive removal action (Tetra Tech, 2011). The majority of soil samples collected during the Round 1 supplemental sampling at UXO 7 were collected by hand auger from 0 to 2 feet below ground surface (bgs) (see [Table 1-1](#)). Additional samples, at depths greater than 2 feet bgs, were collected utilizing DPT. All soil samples collected in the northern zone of the Rifle Range were analyzed in the field for lead via XRF. Based on the XRF results, additional “step-out” samples were collected.

Select samples were then shipped to the FBL for lead analysis. PAH analysis at the FBL was conducted on samples collected from the East and West Trap Ranges because clay targets were only used within those two areas.

All field work performed for the 2007 RFI was performed in accordance with the procedures and methodologies described in the United States Environmental Protection Agency (USEPA)-approved QAPP Addendum No. 2 (TtNUS, 2007). The 2011 Round 1 supplemental soil sampling at UXO 7 was conducted in accordance with the Technical Memorandum Work Plan for Proposed Supplemental Sampling Activities at UXO 7, approved by the USEPA on October 21, 2011.

[Appendix A](#) of this Technical Memorandum contains a complete set of the validated analytical results from both the RFI sampling in 2007 and the RFI Round 1 supplemental sampling in 2011. [Appendix B](#) contains all supporting field forms and documentation, and [Appendix C](#) contains site photographs.

2.0 RESULTS

This section presents the combined results of the initial 2007 RFI and the 2011 Round 1 supplemental sampling for the East and West Trap Ranges and the areas within the northern zone of the Rifle Range. [Table 1-1](#) provides a summary of the samples collected during the Round 1 supplemental sampling event and the full analytical results from the RFI and the Round 1 supplemental sampling event can be found in [Appendix A](#).

2.1 Trap Ranges

During the initial UXO 7 RFI sampling event, samples were collected and analyzed for both PAHs and metals. The analytical results indicated an excess human health risk from the PAHs. The United States Environmental Protection Agency (USEPA) has identified seven PAHs as potentially carcinogenic: benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, dibenzo(a,h)anthracene, and indeno-(1,2,3-cd)-pyrene. Of these PAHs, benzo(a)pyrene has been subjected to the most toxicological study and the USEPA has used the toxicological data to establish quantitative toxicological parameters (cancer slope factors and inhalation unit risks) for benzo(a)pyrene. All seven of these PAHs have a similar chemical structure and similar chemical properties. Laboratory

studies suggest that these chemicals act similarly from the perspective of carcinogenicity and that the carcinogenic potency of the individual PAHs can be evaluated with reference to the carcinogenic potency of benzo(a)pyrene. Therefore, the USEPA has developed a toxicity equivalency factor (TEF) for each potentially carcinogenic PAH that can be used to convert the concentration of that PAH to an equivalent concentration of benzo(a)pyrene. Since benzo(a)pyrene is often abbreviated BaP, this process is known as determining the BaP equivalent concentration.

Therefore, in addition to a direct comparison to individual PAH PALs, a total for calculated BaP equivalents was also done. The calculated screening value for BaP is 0.015 milligrams per kilogram (mg/kg) at a human health risk screening level of 1×10^{-6} .

2.1.1 PAHs

Table 2-1 lists the BaP equivalent results for all samples collected at the UXO 7 West Trap Range during the RFI and the Round 1 supplemental investigation. **Figure 2-1** identifies the soil samples with exceedances of the BaP human health screening criteria for the West Trap Range. **Table 2-2** lists the BaP equivalent results for all samples collected at the UXO 7 East Trap Range during the RFI and the Round 1 supplemental investigation. **Figure 2-2** identifies the soil samples with exceedances of the BaP Human Health screening criteria for the East Trap Range. Based on the collected soil samples from the UXO 7 trap ranges and the BaP equivalent concentrations calculated for those soil samples, there is PAH contamination present within the footprints of the former East and West Trap Ranges above the human health screening level of 0.015 mg/kg BaP equivalents (See **Figures 2-1** and **2-2**). Because the primary screening level of 0.015 mg/kg BaP equivalents for the human health screening level of 1×10^{-6} is particularly low (15 parts per billion), many of the soil samples collected from the former trap ranges that contain detectable levels of PAHs will likely exceed this screening level established for the human health risk level of 1×10^{-6} .

Additional samples (Round 2) are proposed to confirm the lateral and vertical extent of the BaP equivalent concentrations identified in soil samples from the West Trap Range and the East Trap Range, and a proposed sampling approach is further discussed in **Section 3.0**.

2.2 Rifle Range

During the initial UXO 7 RFI sampling event, samples were collected from various locations at the Rifle Range including the main target area, the impact hill behind the main target area, the 100-, 200-, 300-, 400-, and 500-yard firing positions (berms), the open areas between the firing positions, and the dirt mound located between the 300- and 400-yard firing positions. All samples were initially analyzed in the

field for lead via XRF with a subset of those samples selected for metals analysis at the FBL. Based on the analytical results, various concentrations of lead existed at the 500-yard Rifle Range.

2.2.1 Lead

Per an e-mail from Mr. Peter Ramanauskas, dated June 24, 2011, the EPA agreed upon a preliminary remediation goal (PRG) concentration of 192 mg/kg as an acceptable benchmark to be applied as a site-wide arithmetic average soil lead concentration for UXO 7. Lead concentrations greater than the Navy/EPA agreed upon average concentration of 192 mg/kg in the surface soil (defined as ground surface to two feet below ground surface [bgs]) remain in the northern zone of UXO 7 (**Table 2-3**). Specifically, these areas include the 400-yard firing berm (**Figure 2-3**), a small drainageway area located between the 400- and 500-yard firing berms (**Figure 2-4**), and a dirt mound whose origin is currently unknown (**Figure 2-5**). Lead concentrations in deeper soil (greater than two feet bgs) are not regarded as biologically available to ecological receptors, but could serve as potential exposure sources to future human receptors for construction workers, etc. Consequently, deeper subsurface soil samples (below 2 feet bgs) were compared against the direct contact human health criteria of 400 mg/kg and are shown in red font on **Figures 2-3, 2-4, and 2-5**.

3.0 ROUND 2 SUPPLEMENTAL SAMPLING

The additional Round 2 soil samples will be collected utilizing the SOPs and QA procedures outlined in the Supplemental Sampling Activities at UXO 7 Ranges approved October 21, 2011.

3.1 PAHs

The RFI and Round 1 supplemental sampling have shown the presence of PAH contamination at the East and West Trap Ranges which present excess risk to human receptors, and the presence of lead contamination at areas within the northern zone of the Rifle Range which present ecological risk. The PAH contamination at the West and East Trap Ranges has not been fully delineated. Additional sampling will be required at the two Trap Range sites to more completely bound and delineate the limits of the PAH soil contamination at these sites.

Several proposed Round 2 supplemental soil sampling locations to improve our understanding of the nature and extent of PAH contamination in the trap ranges soil are identified in **Table 3-1** and indicated on **Figures 3-1 and 3-2**. Although PAH contamination at the former trap range sites is expected to be confined in the upper 2-feet of soil, the proposed approach for supplemental sampling will extend to a depth of 6 feet bgs. Although all proposed samples will be collected and shipped to the FBL, not all samples may be analyzed. Only those samples located adjacent to former locations exhibiting BaP

contamination will be initially analyzed by the FBL, as identified on [Table 3-1](#). The remaining samples will be held at the FBL and only analyzed upon direction to do so by Tetra Tech with the decision based on BaP concentrations of the initial samples.

This sampling approach should provide confirmation that the PAH contamination in soil is typically not expected to be present at depths of more than two feet bgs.

3.1.1 West Trap Range

Additional soil sampling for PAHs at the West Trap Range will be needed in the north, south, and east portions of the skeet accumulation area to delineate the lateral and vertical extent of BaP equivalent concentrations in soil. Samples are also proposed at former locations to define the vertical extent of BaP equivalent concentrations identified in those locations.

1) Proposed Sampling at the West Trap Range ([Figure 3-1](#)):

- a. Collection of approximately 176 soil samples from 44 new sample locations at depths to 6 feet bgs (0-1, 1-2, 2-4, and 4-6).
- b. Collection of 10 soil samples at depth (2-4 and 4-6 ft. bgs) at five former sample locations that exhibited PAH contamination at the 1-2 ft. depth.
- c. All proposed samples will be collected and shipped to the FBL; however, only those samples located adjacent to former locations exhibiting BaP contamination will be analyzed by the FBL, as identified on [Table 3-1](#). The remaining samples will be held at the FBL and only analyzed upon direction to do so by Tetra Tech with the decision based on BaP concentrations of the initial samples. Should the initial interior samples indicate that BaP contamination is bounded both laterally and vertically, then the associated exterior samples will not be analyzed and will be properly disposed by the FBL.

3.1.2 East Trap Range

Additional soil sampling for PAHs at the East Trap Range will be needed in the north, south, east, and west portions of the skeet accumulation area to delineate the lateral and vertical extent of BaP equivalent concentrations in soil. Samples are also proposed at former locations to define the vertical extent of BaP equivalent concentrations identified in those locations.

2) Proposed Sampling at the East Trap Range ([Figure 3-2](#)):

- a. Collection of approximately 288 soil samples from 72 new sample locations at depths to 6 feet bgs (0-1, 1-2, 2-4, and 4-6).
- b. Collection of 16 soil samples at depth (2-4 and 4-6 ft. bgs) at eight former sample locations that exhibited PAH contamination at the 1-2 ft. depth.
- c. All proposed samples will be collected and shipped to the FBL; however, only those samples located adjacent to former locations exhibiting BaP contamination will be analyzed by the FBL, as identified on [Table 3-1](#). The remaining samples will be held at the FBL and only analyzed upon direction to do so by Tetra Tech with the decision based on BaP concentrations of the initial samples. Should the initial interior samples indicate that BaP contamination is bounded both laterally and vertically, then the associated exterior samples will not be analyzed and will be properly disposed by the FBL.

3.2 Lead

Various concentrations of lead have been detected at UXO 7. Lead concentrations greater than the Navy/EPA agreed upon concentration of 192 mg/kg remain in the northern zone of UXO 7 (**Table 2-3**). Specifically, these areas include the 400 yard firing berm (**Figure 3-3**), a small drainageway area located between the 400- and 500-yard firing berms (**Figure 3-4**), and a dirt mound whose origin is unknown (**Figure 3-5**). The lead contamination in these areas has not been completely bounded laterally or vertically, and additional sampling is required.

All proposed lead samples will undergo XRF field analysis, and the XRF field screening level for lead has been established at 125 ppm. Soil lead concentrations less than the field screening level of 125 ppm are not likely to exceed the Navy/EPA agreed upon lead concentration of 192 mg/kg.

The following subsections discuss previous sample results as well as the proposed sampling plan for each of the three areas.

3.2.1 400-Yard Firing Berm

In the southwest corner of the 400-yard firing berm, several sample locations exhibited a lead concentration greater than 192 mg/kg at the 1 to 2-foot depth (**Figure 2-3**). Five additional samples were collected in this area at a depth of 2 to 3-feet bgs with only locations X7-SB395 and X7-SB396 exhibiting lead concentrations greater than 192 mg/kg at 321 and 303 mg/kg, respectively. Due to these exceedances, two additional samples were collected at 3 to 4-feet bgs and while sample location X7-SB411 exhibited a lead concentration of 52 mg/kg, sample location X7-SB409 exhibited a lead concentration of 1,087 mg/kg.

In the central portion of the 400-yard firing berm, several sample locations exhibited a lead concentration greater than 192 mg/kg at the 1 to 2-foot depth (**Figure 2-3**). Three additional samples were collected in this area at a depth of 2 to 3-feet bgs with two locations slightly exceeding 192 mg/kg (X7-SB291 at 203 mg/kg and X7-SB296 at 280 mg/kg); and the other sample location (X7-SB295) exhibited a lead concentration of 477 mg/kg.

In the southeast area of the berm, several sample locations exhibited a lead concentration greater than 192 mg/kg at the 1 to 2-foot depth (**Figure 2-3**). Seven additional samples were collected in this area at a depth of 2 to 3-feet bgs with five of those locations exhibiting lead concentrations below 192 mg/kg. Sample X7-SB301 had a lead concentration of 517 mg/kg at the 2 to 3-foot depth, and sample location X7-SB297 had a lead concentration of 232 mg/kg at the 2 to 3-foot depth. It should also be noted that sample location X7-SB417, which is located centrally to most of the above mentioned samples, had a

lead concentration of 159 mg/kg at 4 to 5-feet bgs; however, the 5 to-6 foot sample at this location, exhibited a lead concentration of 715 mg/kg.

- Proposed Sampling at the 400-yard Firing Berm (**Figure 3-3**):
 - a. Collection of approximately 64 soil samples from 16 new sample locations at depths to 4 feet bgs (0-1, 1-2, 2-3, and 3-4).
 - b. Collection of 54 soil samples from 27 former sample locations that exhibited lead contamination at depth.
 - c. All proposed samples will be collected and processed for XRF field analysis for lead. The two upper intervals will be analyzed by XRF. *If neither of the **two uppermost** soil samples evaluated by XRF indicates soil-lead concentrations greater than 125 ppm, then the deeper collected samples will not require analysis by XRF.* Additionally, should an interior sample exhibit an XRF lead concentration less than the field screening level of 125 ppm, then any proposed associated exterior sample will not be analyzed. Should a proposed exterior sample location exhibit an XRF lead concentration greater than the field screening level of 125 ppm, additional step-out samples will then be collected..
 - d. Should a proposed exterior sample location exhibit an XRF lead concentration greater than the field screening level of 125 ppm, additional step-out samples will then be collected.

3.2.2 Drainageway between 400 and 500-Yard Berm

Eight sample locations within the drainageway between the 400 and 500-yard firing berm exhibited lead concentrations greater than 192 mg/kg at the 1 to 2-foot depth with the highest being 616 mg/kg (**Figure 2-4**). Five additional samples were then collected in this area at depths of either 2 to 3-feet bgs or 3 to 4-feet bgs, with all samples exhibiting lead concentrations less than 90 mg/kg.

- Proposed Sampling at the Drainageway between 400-yard and 500-yard Berms (**Figure 3-4**):
 - a. Collection of approximately 44 soil samples from 11 new sample locations at depths to 4 feet bgs (0-1, 1-2, 2-3, and 3-4).
 - b. Collection of 20 soil samples from 10 former sample locations that exhibited lead contamination at depth.
 - c. All proposed samples will be collected and processed for XRF field analysis for lead. The two upper intervals will be analyzed by XRF. *If neither of the **two uppermost** soil samples evaluated by XRF indicates soil-lead concentrations greater than 125 ppm, then the deeper collected samples will not require analysis by XRF.* Additionally, should an interior sample exhibit an XRF lead concentration less than the field screening level of 125 ppm, then any proposed associated exterior sample will not be analyzed. Should a proposed exterior sample location exhibit an XRF lead concentration greater than the field screening level of 125 ppm, additional step-out samples will then be collected.
 - d. Should a proposed exterior sample location exhibit an XRF lead concentration greater than the field screening level of 125 ppm, additional step-out samples will then be collected.

3.2.3 Dirt Mound

The dirt mound exists along the gravel road between the 300 and 400-yard firing berm ([Figure 2-5](#)). The history of the mound is unknown; however, the height of the mound (estimated at approximately 10 feet above ground surface) would have partially blocked the shooters view of the main target area from the 400 and 500-yard firing positions and therefore is presumed to have been placed there after the Rifle Range was no longer operational. It appears as though the dirt mound sits atop a thick black plastic liner.

Three samples located on top of the dirt mound exhibited lead concentrations greater than 192 mg/kg at the 1 to 2-foot depth. These included locations X7-SB310 (374 mg/kg), X7-SB312 (249 mg/kg), and X7-SB313 (201 mg/kg). Three additional samples were then collected at 2 to 3-feet bgs with location X7-SB310 exhibiting a lead concentration of 209 mg/kg and location X7-SB313 having a lead concentration of 466 mg/kg.

To determine if lead contamination was reaching the base of the mound, a DPT rig was utilized to collect three samples along the base of the mound angled into the side of the mound to approximate depths of 2 to 4-feet below the interface of the dirt mound and the natural topography of the site. All three sample locations presented lead concentrations less than 25 mg/kg.

- Proposed Sampling at the Dirt Mound ([Figure 3-5](#)):
 - a. Collection of approximately 12 soil samples from 3 new sample locations at depths to 4 feet bgs (0-1, 1-2, 2-3, and 3-4).
 - b. Collection of 12 soil samples from 6 former sample locations that exhibited lead contamination at depth.
 - c. All proposed samples will be collected and processed for XRF field analysis for lead. The two upper intervals will be analyzed by XRF. *If neither of the **two uppermost** soil samples evaluated by XRF indicates soil-lead concentrations greater than 125 ppm, then the deeper collected samples will not require analysis by XRF.* Additionally, should an interior sample exhibit an XRF lead concentration less than the field screening level of 125 ppm, then any proposed associated exterior sample will not be analyzed. Should a proposed exterior sample location exhibit an XRF lead concentration greater than the field screening level of 125 ppm, additional step-out samples will then be collected.
 - d. Should a proposed exterior sample location exhibit an XRF lead concentration greater than the field screening level of 125 ppm, additional step-out samples will then be collected.

REFERENCES

Tetra Tech, Inc. (Tetra Tech), 2011. Resource Conservation and Recovery Act Technical Memorandum – NSA Crane UXO 7 – Small Arms Ranges – Supplemental Work Plan. Naval Support Activity Crane, Crane, Indiana. October.

Tetra Tech, 2009. Resource Conservation and Recovery Act Facility Investigation for UXO 7 Ranges. Naval Surface Warfare Center, Crane Division, Crane, Indiana. July.

Tetra Tech, 2007. Resource Conservation and Recovery Act Facility Investigation Addendum No. 2 to the QAPP for SWMUs 8, 15, 18, 19, 20 and the Old Gun Tub Storage Lot for UXO 5 and UXO 7. Naval Surface Warfare Center, Crane Division, Crane, Indiana. August.

TABLE 3-2

**ROUND 2 PROPOSED SUPPLEMENTAL SOIL SAMPLING FOR LEAD
UXO 7 – NORTHERN ZONE AREAS
NSA CRANE, CRANE, INDIANA**

| Sample Location ⁽¹⁾ | Sample ID ⁽²⁾ | XRF | Lead ⁽³⁾ (SW 846-6010B) |
|--------------------------------------|--------------------------|------------------|---------------------------------------|
| CENTRAL AREA OF NORTHERN ZONE | | | |
| X7-SB044 | X7-SS044-0102 | 1 | TBD |
| | X7-SB044-0203 | 1 ⁽⁴⁾ | TBD |
| X7-SB045 | X7-SB045-0203 | 1 | TBD |
| | X7-SB045-0304 | 1 ⁽⁴⁾ | TBD |
| X7-SB046 | X7-SB046-0203 | 1 | TBD |
| | X7-SB046-0304 | 1 ⁽⁴⁾ | TBD |
| X7-SB181 | X7-SB181-0203 | 1 | TBD |
| | X7-SB181-0304 | 1 ⁽⁴⁾ | TBD |
| X7-SB291 | X7-SB291-0304 | 1 | TBD |
| | X7-SB291-0405 | 1 ⁽⁴⁾ | TBD |
| X7-SB295 | X7-SB295-0304 | 1 | TBD |
| | X7-SB295-0405 | 1 ⁽⁴⁾ | TBD |
| X7-SB296 | X7-SB296-0304 | 1 | TBD |
| | X7-SB296-0405 | 1 ⁽⁴⁾ | TBD |
| X7-SB297 | X7-SB297-0304 | 1 | TBD |
| | X7-SB297-0405 | 1 ⁽⁴⁾ | TBD |
| X7-SB298 | X7-SB298-0203 | 1 | TBD |
| | X7-SB298-0304 | 1 ⁽⁴⁾ | TBD |
| X7-SB300 | X7-SB300-0203 | 1 | TBD |
| | X7-SB300-0304 | 1 ⁽⁴⁾ | TBD |
| X7-SB301 | X7-SB301-0304 | 1 | TBD |
| | X7-SB301-0405 | 1 ⁽⁴⁾ | TBD |
| X7-SB303 | X7-SB303-0203 | 1 | TBD |
| | X7-SB303-0304 | 1 ⁽⁴⁾ | TBD |
| X7-SB349 | X7-SB349-0203 | 1 | TBD |
| | X7-SB349-0304 | 1 ⁽⁴⁾ | TBD |
| X7-SB351 | X7-SB351-0203 | 1 | TBD |
| | X7-SB351-0304 | 1 ⁽⁴⁾ | TBD |
| X7-SB358 | X7-SB358-0203 | 1 | TBD |
| | X7-SB358-0304 | 1 ⁽⁴⁾ | TBD |

TABLE 3-2

ROUND 2 PROPOSED SUPPLEMENTAL SOIL SAMPLING FOR LEAD
 UXO 7 – NORTHERN ZONE AREAS
 NSA CRANE, CRANE, INDIANA

| Sample Location ⁽¹⁾ | Sample ID ⁽²⁾ | XRF | Lead ⁽³⁾ (SW 846-6010B) |
|--------------------------------|--------------------------|------------------|---------------------------------------|
| X7-SB360 | X7-SB360-0203 | 1 | TBD |
| | X7-SB360-0304 | 1 ⁽⁴⁾ | TBD |
| X7-SB361 | X7-SB361-0203 | 1 | TBD |
| | X7-SB361-0304 | 1 ⁽⁴⁾ | TBD |
| X7-SB365 | X7-SB365-0203 | 1 | TBD |
| | X7-SB365-0304 | 1 ⁽⁴⁾ | TBD |
| X7-SB368 | X7-SB368-0203 | 1 | TBD |
| | X7-SB368-0304 | 1 ⁽⁴⁾ | TBD |
| X7-SB369 | X7-SB369-0203 | 1 | TBD |
| | X7-SB369-0304 | 1 ⁽⁴⁾ | TBD |
| X7-SB395 | X7-SB395-0304 | 1 | TBD |
| | X7-SB395-0405 | 1 ⁽⁴⁾ | TBD |
| X7-SB396 | X7-SB396-0304 | 1 | TBD |
| | X7-SB396-0405 | 1 ⁽⁴⁾ | TBD |
| X7-SB398 | X7-SB398-0203 | 1 | TBD |
| | X7-SB398-0304 | 1 ⁽⁴⁾ | TBD |
| X7-SB401 | X7-SB401-0203 | 1 | TBD |
| | X7-SB401-0304 | 1 ⁽⁴⁾ | TBD |
| X7-SB409 | X7-SB409-0405 | 1 | TBD |
| | X7-SB409-0506 | 1 ⁽⁴⁾ | TBD |
| X7-SB413 | X7-SB413-0405 | 1 | TBD |
| | X7-SB413-0506 | 1 ⁽⁴⁾ | TBD |
| X7-SB417 | X7-SB417-0607 | 1 | TBD |
| | X7-SB417-0708 | 1 ⁽⁴⁾ | TBD |
| X7-SB551 | X7-SS551-0001 | 1 | TBD |
| | X7-SS551-0102 | 1 ⁽⁴⁾ | TBD |
| | X7-SB551-0203 | 1 ⁽⁴⁾ | TBD |
| | X7-SB551-0304 | 1 ⁽⁴⁾ | TBD |
| X7-SB552 | X7-SS552-0001 | 1 | TBD |
| | X7-SS552-0102 | 1 ⁽⁴⁾ | TBD |
| | X7-SB552-0203 | 1 ⁽⁴⁾ | TBD |
| | X7-SB552-0304 | 1 ⁽⁴⁾ | TBD |

TABLE 3-2

ROUND 2 PROPOSED SUPPLEMENTAL SOIL SAMPLING FOR LEAD
 UXO 7 – NORTHERN ZONE AREAS
 NSA CRANE, CRANE, INDIANA

| Sample Location ⁽¹⁾ | Sample ID ⁽²⁾ | XRF | Lead ⁽³⁾ (SW 846-6010B) |
|--------------------------------|--------------------------|------------------|---------------------------------------|
| X7-SB553 | X7-SS553-0001 | 1 | TBD |
| | X7-SS553-0102 | 1 ⁽⁴⁾ | TBD |
| | X7-SB553-0203 | 1 ⁽⁴⁾ | TBD |
| | X7-SB553-0304 | 1 ⁽⁴⁾ | TBD |
| X7-SB554 | X7-SS553-0001 | 1 | TBD |
| | X7-SS554-0102 | 1 ⁽⁴⁾ | TBD |
| | X7-SB554-0203 | 1 ⁽⁴⁾ | TBD |
| | X7-SB554-0304 | 1 ⁽⁴⁾ | TBD |
| X7-SB555 | X7-SS555-0001 | 1 | TBD |
| | X7-SS555-0102 | 1 ⁽⁴⁾ | TBD |
| | X7-SB555-0203 | 1 ⁽⁴⁾ | TBD |
| | X7-SB555-0304 | 1 ⁽⁴⁾ | TBD |
| X7-SB556 | X7-SS556-0001 | 1 | TBD |
| | X7-SS556-0102 | 1 ⁽⁴⁾ | TBD |
| | X7-SB556-0203 | 1 ⁽⁴⁾ | TBD |
| | X7-SB556-0304 | 1 ⁽⁴⁾ | TBD |
| X7-SB557 | X7-SS557-0001 | 1 | TBD |
| | X7-SS557-0102 | 1 ⁽⁴⁾ | TBD |
| | X7-SB557-0203 | 1 ⁽⁴⁾ | TBD |
| | X7-SB557-0304 | 1 ⁽⁴⁾ | TBD |
| X7-SB558 | X7-SS558-0001 | 1 | TBD |
| | X7-SS558-0102 | 1 ⁽⁴⁾ | TBD |
| | X7-SB558-0203 | 1 ⁽⁴⁾ | TBD |
| | X7-SB558-0304 | 1 ⁽⁴⁾ | TBD |
| X7-SB559 | X7-SS559-0001 | 1 | TBD |
| | X7-SS559-0102 | 1 ⁽⁴⁾ | TBD |
| | X7-SB559-0203 | 1 ⁽⁴⁾ | TBD |
| | X7-SB559-0304 | 1 ⁽⁴⁾ | TBD |
| X7-SB560 | X7-SS560-0001 | 1 | TBD |
| | X7-SS560-0102 | 1 ⁽⁴⁾ | TBD |
| | X7-SB560-0203 | 1 ⁽⁴⁾ | TBD |
| | X7-SB560-0304 | 1 ⁽⁴⁾ | TBD |

TABLE 3-2

ROUND 2 PROPOSED SUPPLEMENTAL SOIL SAMPLING FOR LEAD
 UXO 7 – NORTHERN ZONE AREAS
 NSA CRANE, CRANE, INDIANA

| Sample Location ⁽¹⁾ | Sample ID ⁽²⁾ | XRF | Lead ⁽³⁾ (SW 846-6010B) |
|---|--------------------------|------------------|---------------------------------------|
| X7-SB561 | X7-SS561-0001 | 1 | TBD |
| | X7-SS561-0102 | 1 ⁽⁴⁾ | TBD |
| | X7-SB561-0203 | 1 ⁽⁴⁾ | TBD |
| | X7-SB561-0304 | 1 ⁽⁴⁾ | TBD |
| X7-SB562 | X7-SS562-0001 | 1 | TBD |
| | X7-SS562-0102 | 1 ⁽⁴⁾ | TBD |
| | X7-SB562-0203 | 1 ⁽⁴⁾ | TBD |
| | X7-SB562-0304 | 1 ⁽⁴⁾ | TBD |
| X7-SB563 | X7-SS563-0001 | 1 | TBD |
| | X7-SS563-0102 | 1 ⁽⁴⁾ | TBD |
| | X7-SB563-0203 | 1 ⁽⁴⁾ | TBD |
| | X7-SB563-0304 | 1 ⁽⁴⁾ | TBD |
| X7-SB564 | X7-SS564-0001 | 1 | TBD |
| | X7-SS564-0102 | 1 ⁽⁴⁾ | TBD |
| | X7-SB564-0203 | 1 ⁽⁴⁾ | TBD |
| | X7-SB564-0304 | 1 ⁽⁴⁾ | TBD |
| X7-SB565 | X7-SS565-0001 | 1 | TBD |
| | X7-SS565-0102 | 1 ⁽⁴⁾ | TBD |
| | X7-SB565-0203 | 1 ⁽⁴⁾ | TBD |
| | X7-SB565-0304 | 1 ⁽⁴⁾ | TBD |
| X7-SB566 | X7-SS566-0001 | 1 | TBD |
| | X7-SS566-0102 | 1 ⁽⁴⁾ | TBD |
| | X7-SB566-0203 | 1 ⁽⁴⁾ | TBD |
| | X7-SB566-0304 | 1 ⁽⁴⁾ | TBD |
| NORTHERNMOST AREA OF NORTHERN ZONE | | | |
| X7-SB055 | X7-SB055-0203 | 1 | TBD |
| | X7-SB055-0304 | 1 ⁽⁴⁾ | TBD |
| X7-SB174 | X7-SB174-0203 | 1 | TBD |
| | X7-SB174-0304 | 1 ⁽⁴⁾ | TBD |
| X7-SB190 | X7-SB190-0203 | 1 | TBD |
| | X7-SB190-0304 | 1 ⁽⁴⁾ | TBD |

TABLE 3-2

ROUND 2 PROPOSED SUPPLEMENTAL SOIL SAMPLING FOR LEAD
 UXO 7 – NORTHERN ZONE AREAS
 NSA CRANE, CRANE, INDIANA

| Sample Location ⁽¹⁾ | Sample ID ⁽²⁾ | XRF | Lead ⁽³⁾ (SW 846-6010B) |
|--------------------------------|--------------------------|------------------|---------------------------------------|
| X7-SB274 | X7-SB274-0203 | 1 | TBD |
| | X7-SB274-0304 | 1 ⁽⁴⁾ | TBD |
| X7-SB275 | X7-SB275-0203 | 1 | TBD |
| | X7-SB275-0304 | 1 ⁽⁴⁾ | TBD |
| X7-SB277 | X7-SB277-0203 | 1 | TBD |
| | X7-SB277-0304 | 1 ⁽⁴⁾ | TBD |
| X7-SB278 | X7-SB278-0203 | 1 | TBD |
| | X7-SB278-0304 | 1 ⁽⁴⁾ | TBD |
| X7-SB283 | X7-SB283-0203 | 1 | TBD |
| | X7-SB283-0304 | 1 ⁽⁴⁾ | TBD |
| X7-SB285 | X7-SB285-0102 | 1 | TBD |
| | X7-SB285-0203 | 1 ⁽⁴⁾ | TBD |
| X7-SB342 | X7-SB342-0203 | 1 | TBD |
| | X7-SB342-0304 | 1 ⁽⁴⁾ | TBD |
| X7-SB567 | X7-SB567-0001 | 1 | TBD |
| | X7-SB567-0102 | 1 ⁽⁴⁾ | TBD |
| | X7-SB567-0203 | 1 ⁽⁴⁾ | TBD |
| | X7-SB567-0304 | 1 ⁽⁴⁾ | TBD |
| X7-SB568 | X7-SB568-0001 | 1 | TBD |
| | X7-SB568-0102 | 1 ⁽⁴⁾ | TBD |
| | X7-SB568-0203 | 1 ⁽⁴⁾ | TBD |
| | X7-SB568-0304 | 1 ⁽⁴⁾ | TBD |
| X7-SB569 | X7-SB569-0001 | 1 | TBD |
| | X7-SB569-0102 | 1 ⁽⁴⁾ | TBD |
| | X7-SB569-0203 | 1 ⁽⁴⁾ | TBD |
| | X7-SB569-0304 | 1 ⁽⁴⁾ | TBD |
| X7-SB570 | X7-SB570-0001 | 1 | TBD |
| | X7-SB570-0102 | 1 ⁽⁴⁾ | TBD |
| | X7-SB570-0203 | 1 ⁽⁴⁾ | TBD |
| | X7-SB570-0304 | 1 ⁽⁴⁾ | TBD |
| X7-SB571 | X7-SB571-0001 | 1 | TBD |
| | X7-SB571-0102 | 1 ⁽⁴⁾ | TBD |

TABLE 3-2

ROUND 2 PROPOSED SUPPLEMENTAL SOIL SAMPLING FOR LEAD
 UXO 7 – NORTHERN ZONE AREAS
 NSA CRANE, CRANE, INDIANA

| Sample Location ⁽¹⁾ | Sample ID ⁽²⁾ | XRF | Lead ⁽³⁾ (SW 846-6010B) |
|---|--------------------------|------------------|---------------------------------------|
| X7-SB571 | X7-SB571-0203 | 1 ⁽⁴⁾ | TBD |
| | X7-SB571-0304 | 1 ⁽⁴⁾ | TBD |
| X7-SB572 | X7-SB572-0001 | 1 | TBD |
| | X7-SB572-0102 | 1 ⁽⁴⁾ | TBD |
| | X7-SB572-0203 | 1 ⁽⁴⁾ | TBD |
| | X7-SB572-0304 | 1 ⁽⁴⁾ | TBD |
| X7-SB573 | X7-SB573-0001 | 1 | TBD |
| | X7-SB573-0102 | 1 ⁽⁴⁾ | TBD |
| | X7-SB573-0203 | 1 ⁽⁴⁾ | TBD |
| | X7-SB573-0304 | 1 ⁽⁴⁾ | TBD |
| X7-SB574 | X7-SB574-0001 | 1 | TBD |
| | X7-SB574-0102 | 1 ⁽⁴⁾ | TBD |
| | X7-SB574-0203 | 1 ⁽⁴⁾ | TBD |
| | X7-SB574-0304 | 1 ⁽⁴⁾ | TBD |
| X7-SB575 | X7-SB575-0001 | 1 | TBD |
| | X7-SB575-0102 | 1 ⁽⁴⁾ | TBD |
| | X7-SB575-0203 | 1 ⁽⁴⁾ | TBD |
| | X7-SB575-0304 | 1 ⁽⁴⁾ | TBD |
| X7-SB576 | X7-SB576-0001 | 1 | TBD |
| | X7-SB576-0102 | 1 ⁽⁴⁾ | TBD |
| | X7-SB576-0203 | 1 ⁽⁴⁾ | TBD |
| | X7-SB576-0304 | 1 ⁽⁴⁾ | TBD |
| X7-SB577 | X7-SB577-0001 | 1 | TBD |
| | X7-SB577-0102 | 1 ⁽⁴⁾ | TBD |
| | X7-SB577-0203 | 1 ⁽⁴⁾ | TBD |
| | X7-SB577-0304 | 1 ⁽⁴⁾ | TBD |
| SOUTHERNMOST AREA OF NORTHERN ZONE | | | |
| X7-SB038 | X7-SB038-0203 | 1 | TBD |
| | X7-SB038-0304 | 1 ⁽⁴⁾ | TBD |
| X7-SB039 | X7-SB039-0203 | 1 | TBD |
| | X7-SB039-0304 | 1 ⁽⁴⁾ | TBD |

TABLE 3-2

ROUND 2 PROPOSED SUPPLEMENTAL SOIL SAMPLING FOR LEAD
 UXO 7 – NORTHERN ZONE AREAS
 NSA CRANE, CRANE, INDIANA

| Sample Location ⁽¹⁾ | Sample ID ⁽²⁾ | XRF | Lead ⁽³⁾ (SW 846-6010B) |
|---|--------------------------|--------------------------|---------------------------------------|
| X7-SB310 | X7-SB310-0304 | 1 | TBD |
| | X7-SB310-0405 | 1 ⁽⁴⁾ | TBD |
| X7-SB312 | X7-SB312-0203 | 1 | TBD |
| | X7-SB312-0304 | 1 ⁽⁴⁾ | TBD |
| X7-SB313 | X7-SB313-0304 | 1 | TBD |
| | X7-SB313-0405 | 1 ⁽⁴⁾ | TBD |
| X7-SB371 | X7-SS371-0102 | 1 | TBD |
| | X7-SB371-0203 | 1 ⁽⁴⁾ | TBD |
| X7-SB578 | X7-SB578-0001 | 1 | TBD |
| | X7-SB578-0102 | 1 ⁽⁴⁾ | TBD |
| | X7-SB578-0203 | 1 ⁽⁴⁾ | TBD |
| | X7-SB578-0304 | 1 ⁽⁴⁾ | TBD |
| X7-SB579 | X7-SB579-0001 | 1 | TBD |
| | X7-SB579-0102 | 1 ⁽⁴⁾ | TBD |
| | X7-SB579-0203 | 1 ⁽⁴⁾ | TBD |
| | X7-SB579-0304 | 1 ⁽⁴⁾ | TBD |
| X7-SB580 | X7-SB580-0001 | 1 | TBD |
| | X7-SB580-0102 | 1 ⁽⁴⁾ | TBD |
| | X7-SB580-0203 | 1 ⁽⁴⁾ | TBD |
| | X7-SB580-0304 | 1 ⁽⁴⁾ | TBD |
| Total Soil Samples – Rifle Range | | 206⁽⁴⁾ | 25 |

- 1 X7 = UXO 7. SB = Soil boring.
- 2 SS = Surface soil. SB = Subsurface Soil. Last four digits of sample ID indicate depth below ground surface in feet.
- 3 A maximum of 25 samples will be shipped to the fixed-base laboratory for lead analysis. The majority of these samples will be selected from those exhibiting an XRF lead concentration ranging from 125 to 500 ppm.
- 4 All proposed samples will be collected and processed for XRF field analysis for lead; however, if the **two uppermost** sample intervals at a specific location exhibit XRF lead concentrations less than 125 ppm, then the collected lower sample intervals at that specific location will not undergo XRF analysis. Additionally, should an interior sample exhibit an XRF lead concentration less than 125 ppm, then any proposed associated exterior sample will not be analyzed. Should a proposed exterior sample location exhibit an XRF lead concentration greater than 125 ppm, additional step-out samples will be collected..