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DEPARTMENT OF THE ARMY
ST. LOUIS DISTRICT, CORPS OF ENGINEERS
8945 LATTY AVENUE
BERKELEY, MISSOURI 63134

REPLY TO
ATTENTION OF:

April 26, 2001

Formerly Utilized Sites Remedial Action Program

SUBJECT: Draft Final Iowa Army Ammunition Plant Scoping Survey Plan for Firing Site 6 and 12, -- Response to Comments

Mr. Scott Marquess
U.S. Environmental Protection Agency
Region VII, Superfund Branch
901 North 5th Street
Kansas City, Kansas 66101

Dear Mr. Marquess:

Please find enclosed the responses to your comments on the Draft Final Iowa Army Ammunition Plant Scoping Survey Plan for Firing Site 6 and 12. If you have any questions regarding the responses to your comments, contact me at (314) 260-3915 or Mr. Dennis Chambers at (314) 260-3917.

Sincerely,

Sharon R. Cotner
FUSRAP Program Manager

Enclosure

CF: Iowa Army Ammunition Plant (Lt. Col. Elliott)
Iowa Dept. of Health (Mr. Don Flater)
U.S. Army Operations Support Command (Mr. Kevin Tiemeier)
U.S. Army Corps of Engineers, Omaha District (Mr. Kevin Howe)

RESPONSE TO EPA COMMENTS
IOWA ARMY AMMUNITION PLANT SCOPING SURVEY PLAN FOR FIRING SITE 6 AND 12, DRAFT FINAL

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1	**General.** The Scoping Survey Plan for Firing Sites 6 and 12 (scoping survey) provides very little detail. Most of the sampling procedures, methods for determining sampling locations, surveying procedures, instrument calibrations, daily instrument verifications, and analytical methodologies are listed in terms of a reference. Since this information has not been provided either within the text or as a supplement to the scoping survey, the referenced procedures can not be evaluated for their applicability. The scoping survey should be a self-contained document. One of the goals of the scoping survey is to produce data that can be used in the final status survey. It is, therefore, very important that methodologies for obtaining that data be reviewed for consistency with criteria for a Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM)-based final status survey.	The USACE has provided the EPA the FUSRAP Sampling and Analysis Guide (SAG) in CD format as part of the transmittal of this Scoping Survey Plan. The SAG details the sampling and survey procedures, instrument requirements, analytical methodologies, etc. that will be followed during this scoping survey. The SAG is the "QAPP-like" document that defines the procedures for defensible data collection. The SAG was developed by the USACE and reviewed and approved by EPA Region 7 for use by the St. Louis District and its contractors on the FUSRAP sites. The USACE does not agree that the scoping survey plan should be an all inclusive document when they have created a sampling plan for use on the FUSRAP sites that has been reviewed and approved by the EPA for use. The USACE concurs that all data be collected in such a matter that allows for its use in future evaluations that will be required to adequately assess the magnitude and extent and of radiological contamination at IAAAP. The USACE will clarify in Section 1.0 that the intent of this plan is to define activities to complete a limited scoping survey of FS 6 and 12 and that, although the intent of this plan is to maximize the use of all data collected, this survey is not designed as a radiological clearance survey for any portion of the site.
2	**General.** The screening level derived concentration guideline level (DCGL) was based upon a common minimum detectable concentration (MDC) of depleted uranium (DU) for a 2-inch by 2-inch sodium iodide scintillation detector (2x2NaI), as tabularized in NUREG-1507. NUREG-1507 presents a value of 56 pCi/g, and this is what is proposed for the screening level DCGL. While this is acceptable for a screening tool, there are several factors to keep in mind. First, the 56 pCi/g MDC as calculated in NUREG-1507 is based upon an assumption of U-235 representing 0.34% of the DU, while the dose modeling in the scoping survey was based upon an assumption of U-235 comprising only 0.0149%. The 2x2 NaI detects gamma radiation. The uranium isotopes in DU (U-238, U-234 and U-235) are primarily alpha emitters. While U-238 and U-234 each emit very low level gamma (13 keV) radiation, it is not reliable for detection with a 2x2 NaI. U-235 emits higher gamma energy and more frequently than U-238 and U-234, making the gamma emissions of U-235 more dependable for detection of DU. However, the primary method of detecting DU with a 2x2 NaI is through the gamma emissions of the daughter products of the uranium isotopes. Again, the daughters of U-235 have stronger gamma energy than the daughters of either U-238 or U-234. Thus, the more U-235 in the DU, the more gamma energy available for detection, and the lower the MDC for the 2x2 NaI. Therefore, it is likely that the 2x2 NaI may not have as low a detection limit as listed in NUREG-1507 if the site DU has less U-235 than assumed. In addition, the MDCs are instrument-specific based upon calibration. It is suggested	The NUREG 1507 MDC value for DU is based on a U-235 mass abundance of 0.34%. MDC modeling in the scoping survey plan was based on the assumption that DU at the IAAAP has a U-235 activity abundance of 1.49% (not 0.0149% as stated in the comment). Converting an activity abundance of 1.49% to mass abundance results in a value of 0.22%. While the USACE realizes the U-235 activity modeled in the scoping survey plan is slightly lower than the NUREG 1507 value, its impact is not significant in the overall DU MDC calculation with a "2x2" NaI. Microshield modeling against the activity response curve of a "2x2" NaI crystal shows that the primary gamma energies responsible for a "2x2" response are the 1001 kev line from Pa-234m (~48% of "2x2" response) and the 93 kev line from Th-234 (~29% of "2x2" response). Both these isotopes are daughter products of U-238. This occurs primarily due to the rather large activity abundance of U-238 in DU at 92% versus that of U-235 at 1.5%. The gamma energy lines for U-235 and its daughters around the 150 kev, 200 kev, and 300 kev regions only account for approximately 9% of the "2x2" NaI detectors response. The USACE will revise the plan to indicate that instrument-specific backgrounds will be verified to be within ± 2,000 cpm of the modeled background (i.e., 10,000 cpm) to validate the assumptions of the scan MDC values stated in the plan.

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	that once site-specific data has been obtained using specific instruments, an instrument-specific MDC be calculated and the calculated MDC be used as the screening level DCGL. It also suggested that the Residual Radioactivity (RESRAD) modeling be revised once site-specific isotopic activity ratios are known.	The USACE does intend to determine the actual DU activity ratios present at the IAAAP for future modeling purposes.
3	**General.** The various efforts by FUSRAP and the Army to characterize potential radiological contamination at the IAAP should be better coordinated. We believe that both agencies have compiled significant information relevant to past Atomic Energy Commission (AEC) operations. It is unclear how the historical research and ultimately the data collection needs will be compiled, documented and executed such that potential impacts of past operations of the AEC are comprehensively addressed. We wish to discuss this matter further with the involved parties. We are presently in possession of the "Work Plans for Supplemental Remedial Investigation for Line 1 and Firing Site" (March 29, 2001; TN&A), however, we have not completed our review of the document and are unsure how information in that document may relate to this issue.	The US Army Corps of Engineers is holding weekly conference calls to facilitate coordination on the Iowa AAP site. In addition, Army has been included in development and review of FUSRAP documents and FUSRAP personnel have been included in development and review of Army documents. Every effort has been made to avoid duplication of efforts and to ensure that both programs mesh. A single integrated FUSRAP schedule to address all radiological contaminants of concern requires that the IA AAP be officially designated as a FUSRAP site and the US Congress concurs with such designation. A schedule could subsequently be developed based on the level of Congressionally appropriated funds authorized for this site.
4	**General.** There is no specific discussion that addresses radionuclide constituents that are found in background. Procedures for determining background levels of radioactivity, including reference areas appropriate for the study areas, should be provided.	As stated in Section 5.3 of the plan, the USACE intends to collect soil samples for the purpose of determining the background uranium levels applicable to the IAAAP. Section 5.3 of the plan will be revised to indicate why reference area sampling is required (i.e., contaminant present in background) and to state that reference area samples will be collected from an area mutually agreeable to the IAAAP, USACE, EPA and State of Iowa. The decision for selection of the reference area will made at the beginning of the on site activities of the scoping survey project.
5	**General.** We are unclear of the status of the "Preliminary Assessment" (PA) report regarding past AEC operations at IAAP. Consistent with MARSSIM, a "Historical Site Assessment" (HSA) is the initial step in the process of conducting a complete radiological survey for a potentially impacted site. We are unclear as to how and when a PA or HSA will be completed for all of IAAP, including the Firing Sites which are the subject of this scoping survey. Consistent with General Comment #3, we believe a coordinated (FUSRAP/Army), comprehensive PA/HSA addressing all past AEC operations at the IAAP should be prepared.	Concur. A comprehensive PA/HSA addressing all past AEC operations at the IA AAP is scheduled to be completed within the next 120 days. Information derived from the radiological surveys and interviews will be incorporated into this PA.
6	**General.** The scoping survey frequently makes statements that samples "may" be collected or that certain activities "may" be performed, but makes no mention of the criteria which will ultimately be used to make such decisions in the field. Given these ambiguities, it is difficult to determine the exact nature of activities that the survey will encompass. The plan should provide much clearer definition of the true nature of the activities that are intended.	In response to comments from the IAAAP, clarification will be made to the plan with respect to the decision logic to be used to define where soil samples will be taken. Since sample numbers are limited to the amounts stated in the plan (i.e., 7 for FS 6 and 10 for FS 12), if the walkover surveys identify more areas than the allotted sample amounts, the survey supervisor will choose sample locations in an attempt to define the range of elevated activity that exists at each site. Specifically, this will be accomplished by collecting at least one sample in each new 10,000 cpm interval encountered during the

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		gamma walkover survey. For example, if 3 separate areas of elevated activity are identified but all are within 10,000 cpm of each other, only 1 sample will be collected. If no elevated areas of contamination are identified or if the range of gamma counts is so narrow that division is unreasonable, samples will be collected at systematic locations in accordance with the plan. The plan will be revised to include this additional detail.
7	**General.** The scoping survey should provide specific data quality objectives.	DQO's are incorporated throughout the text of Section 4.0 Survey Design. For clarity, the USACE will revise the plan to include a summary of DQO's in Section 4.0.
8	**General.** We recommend that sampling/surveying of the sediments at the confluence of Long Creek and Mathes Lake be obtained as part of this effort as an initial step in evaluating potential migration of contaminants away from the Firing Site and in scoping possible ecological and other risks.	The USACE will review the feasibility of performing such sampling during this limited scoping survey effort while on site and will confer with the IAAAP, EPA and State of Iowa about their decision. If sampling is performed it will conducted in accordance with the FUSRAP Sampling and Analysis Guide.
9	**Section 1.0, Introduction, page 1.** The second paragraph states that one of the objectives of this scoping survey is to augment future Historical Site Assessments (HSA). A scoping survey is typically conducted after the HSA has been completed and results of the scoping survey are used as input into either a characterization, remedial action support or final status survey. A thorough HSA should be completed for the IAAP to better guide data/sampling requirements. Please clarify what is meant by future HSAs. The text states that "...Historical records indicate that FS 6 and 12 are potentially contaminated with DU fines incorporated into the soil and that FS 12 is potentially contaminated with visible fragments of DU." Please define what size of DU that will be considered a "fine." Regarding the objectives listed here, we believe that the primary objectives of the survey are to identify (and recover) near-surface DU fragments and radiological "hot spots" in shallow soils, and to collect data to better plan a MARSSIM-consistent evaluation of the areas. A MARSSIM-consistent characterization of the areas will ultimately be needed in order to evaluate the need for and nature of potential remedies for the sites.	This purpose of this action is to perform a limited scoping survey of IAAAP at FS 6 and 12 in support of completing the Preliminary Assessment currently being prepared by the USACE. The use of "HSA" for future "assessments" may not be appropriate. The USACE will revise to plan to clarify that the purpose of this plan is to augment past HSA and provide data for the future site assessments. Any DU product that is not visible to the naked eye is considered a DU fine. Text will be added to the plan to clarify. Concur.
10	**Section 2.0, Site Background, page 4.** Through personnel interviews it was determined that the firing of DU spheres may have been conducted at Firing Site 6. However, the details of the nature of activities and possible related contaminants at Firing Site 6 do not appear to be well understood or well documented. Please discuss the details of the operations at Firing Site 6 that lead to the release of radiological contamination, and the potential for radiological contamination, other than DU, to be	The USACE is not aware of the potential for radiological contamination, other than DU, at FS 6 nor do they have any more details of the operation that occurred at FS 6 that lead to the potential release of radiological contamination. The plan will be revised to indicate that the information provided on FS 6 is all that is known at this time.

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	present at Firing Site 6. Based on aerial photographs of the area, we understand that the grounds near Firing Site 12 have been significantly disturbed within the recent past. This information is important to understanding the sampling requirements to characterize the area and should be discussed.	The USACE is aware of recent construction activities that have disturbed the Northeast portion of the area to be surveyed on FS 12. These areas are considered "disturbed" and in accordance with Section 5.1 of the plan these areas will be surveyed and sampled after the areas most likely to have elevated activity (i.e., land areas not visibly disturbed) have been addressed.
11	**Section 4.0, Survey Results, page 5.** As previously indicated, a MARSSIM-consistent evaluation of the Firing Site area, and other areas of the IAAP potentially impacted by releases of radiological contaminants will ultimately be required to evaluate risks and to determine the need for and nature of potential CERCLA response actions.	Concur.
12	**Section 4.1, Process Knowledge, page 6.** In item #1, the plan indicates that the design of the scoping survey will consider "all relevant operational history". This "operational history" is critical in designing the survey and should be comprehensively documented in a PA/HSA. This information is not included in the scoping survey in adequate detail and has not been provided in any other forum to date. The plan includes many other references to the need for consideration of "operational history" in planning sampling activities, but does not provide this information within the document. Operational history information should be provided. In item #2, please provide a reference for the specific activity and the abundance of U-238, U-235, and U-234 cited.	This limited scoping survey is being conducted in support of the PA/HSA. The USACE will provide the requested "operational history" as part of the PA/HSA. The plan will be revised to clarify that the design of this survey was based on the known, limited operational history of FS 6 and 12 as documented in Section 2.0 of this plan. The specific activity for DU and the activity abundances were derived using the isotopic specific activity values found in Table 8.4.1 of *The Health Physics and Radiological Health Handbook,* Revised Edition (1992) and the following typical mass abundance ratios for depleted uranium obtained as byproduct residues from the uranium enrichment process – U-238 = 99.78%, U-235 = 0.22%, U-234 = 0.00037%. It should be noted that it is possible to find cited values for DU mass abundances that differ slightly from the values used in this scoping survey plan due to the variability of the enrichment process. However, these differences should have little impact on the overall outcome of any modeling conducted.
13	**Section 4.2, Instrument Selection, page 6.** The fourth bullet states that all survey instruments will be operated and maintained in accordance with Science Applications International Corporation's (SAIC) Health Physics Program procedures. The text infers that this will include duplicate measurements and response checks. The applicable information from the SAIC document governing the operation and maintenance of instruments should be provided in the scoping survey, since the information in the SAIC document can not be reviewed and its applicability to the scoping determined. Since one of the goals of the scoping survey is to provide data	Section 4.2 will be revised to include the additional operation and calibration information from the SAIC HP procedures applicable to the performance of gamma walkover surveys with "2x2" and FIDLER NaI detectors.

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	of sufficient quality for use in the final status survey, these procedures on survey instruments need to be reviewed. Please revise the scoping survey to include the appropriate information from SAIC's Health Physics Program procedures manual.	
14	**Section 4.2, Instrument Selection, page 7.** The last sentence of the third paragraph under the subheading of 'Canberra Gamma Spectroscopy and Alpha Spectroscopy Laboratory Equipment,' states that the St. Louis District U.S. Army Corps of Engineers (USACE) Health Physicist (HP) will be responsible for determining what samples require isotopic uranium analysis. It is understood that for cost reasons, not all samples will undergo alpha spectroscopy (alpha spec). However, the scoping survey does not discuss what criteria will be used by the HP to determine which samples and how many samples will be analyzed using alpha spec. For example, it does not state whether a certain percentage of samples exhibiting the highest levels of radioactivity will be run through the alpha spec. Please provide a discussion of the criteria that will be used in determining which samples will be analyzed using the alpha spec and how many samples will be analyzed. It should be noted that enough samples should be analyzed through alpha spectrometry to statistically represent the ratios of DU at the site, as these ratios will be used to refine the RESRAD modeling and determination of site-specific DCGLs. Some samples should also be analyzed by a qualified independent third party laboratory.	In response to Iowa DPH comments, the USACE is revising Section 4.2 of the plan to clarify how samples will be selected for alpha spectroscopy. The last sentence of the referenced paragraph will be deleted and replaced with "A minimum of 7 investigation samples representing the range of contamination encountered at IAAAP will be analyzed by alpha spectroscopy to allow for valid statistical evaluation (i.e., student-T testing). Based on the outcome of the statistical evaluation up to 100% of all investigation soil samples may be analyzed by alpha spectroscopy." The QA split samples referenced in the last paragraph of Section 5.3 will be analyzed by an independent USACE-certified laboratory (i.e., Severn Trent Laboratories) in accordance with USACE procedures. The plan will be revised to clarify this intent.
15	**Section 4.2, Instrument Selection, page 7.** The last paragraph states that daily performance checks will be conducted in accordance with SAIC's St. Louis Health Physics Manual. As stated in previous comments, the procedures for conducting daily performance checks should be contained within the scoping survey. Included in this document should be performance criteria (e.g., +/- 20%), types of check-sources, among others. Please revise the scoping survey to include this information.	The last paragraph of Section 4.2 of the plan will be revised to indicate the acceptance criteria for performance checks and the type of check source that will be used.
16	**Section 4.3, Screening Level DCGL, page 8.** All comments related to the DCGL and modeling are addressed in comments for Appendices A and B. However, the third paragraph on this page appears to contradict itself. The first sentence states that the DCGL is only appropriate for areas contaminated with very fine particles of DU incorporated into the soil, but the last sentence states that the minimum size of DU detectable is more important. This paragraph leads the reader to believe the screening level DCGL is not appropriate for this scoping survey, since it is known that DU fragments in addition to fine particles of DU are present at Firing Site 12 and may also be present at Firing Site 6. Please revise the paragraph for clarity and please discuss the applicability of the screening level DCGL to both Firing Sites 6 and 12. As a matter of clarity, EPA methodologies for determining remediation goals for radiological contaminants are discussed in EPA OSWER Directive 9200.4-18;	The screening level DCGL of 56 pCi/g is applicable to both FS 6 and 12 since it is expected that uranium contaminated soil will be encountered at both sites. In this situation, the detectability of the contamination is based on the activity of soil homogeneously contaminated with uranium not the specific activity of pure uranium. The detectability of a pure DU fragment, which has been found at FS 12, must be considered differently since its specific activity is known. That is, for a fragment with known activity, detectability is affected only by size. Therefore, detectability of a DU fragment is based on size rather than activity. This "minimum detectable size" value is an important objective for the survey at FS 12. The text will be revised to clarify the intent of the screening level DCGL and the DU fragment detection value.

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	August, 1997. This Directive discusses EPA's dose-based criteria of 15 mrem/yr.	
17	**Section 5.1, Surface and General Area Gamma Measurements, page 9.** The first sentence states that a gross radiation survey using the 2x2 NaI will be conducted for all areas and in the next paragraph, states that 100% of the areas will be scanned "as time allows". Please clarify if this means that a 100% surface scan using the 2x2 NaI will be conducted at Firing Sites 6 and 12, and what percentage of these areas will be the focus of the survey if "time runs out." In addition, it is unclear how you define a "100% survey". If the survey is to originate from "ground zero" and proceed radially, it is uncertain how 100% coverage will be obtained, since as the surveyor proceeds away from ground zero, the distance between adjacent scan lines would increase. Please clarify. Further, the basis for the areal extent of the survey (100 m radius at FS 12; 30 m radius at FS 6) should be discussed.	The USACE's intent is to perform a surface gamma scan of 100% of the area defined in Figures 3 and 4 of the plan. However, due to current limitations, the survey crews will have a limited time on site to complete this survey. As stated in Section 5.1, the survey teams will focus on those areas most likely to have elevated areas of activity (i.e., land areas not visibly disturbed) then proceed to areas that have most likely been disturbed since historical AEC activities. The USACE is confident that they will be able to survey 80%-100% of each of the firing sites. Concur that definition of "area to be surveyed" is confusing. Intent is that area to be surveyed is defined as a circle with a radius of 30 meter and 100 meter for FS 6 and 12, respectively. The surveyors will actually cover this area from a north to south or east to west direction on survey paths of approximately 1 meter apart while moving the probe in a serpentine pattern, side to side to ensure 100% coverage of area surveyed. Text will be revised to clarify. The 100 meter radius was chosen for FS 12 based on being 120% of the distance that DU fragments were found during a site investigation conducted in November 2000. For FS 6, 30 meters was chosen as the area most likely to be contaminated based on discussions between the IAAAP, USACE, EPA and State of Iowa. The text will be revised to provide the basis for these surveys.
18	**Section 5.1, Surface and General Area Gamma Measurements, page 9.** The first paragraph states that an attempt will be made to correlate the responses of both the 2x2 NaI and the Field Instrument for the Detection of Low Energy Radiation (FIDLER) to determine which instrument provides the best sensitivity for detecting DU. If it is determined that the FIDLER has a greater sensitivity and is better at detecting the presence of DU, please discuss whether more than just the 20% or hot spot areas will be surveyed using the FIDLER. If it is determined that the FIDLER provided better data than the 2x2 NaI, please discuss whether a screening level DCGL, based upon the MDC of the FIDLER, will be calculated or if the proposed screening level DCGL will be modified to reflect a similar level in the FIDLER.	At this time, the USACE does not intend to survey more than 20% of the area with the FIDLER. Since the FIDLER is a more cumbersome/heavier instrument and, in the USACE's experience, susceptible to backscatter radiation, the USACE does not feel the FIDLER will provide any added detection capability beyond that of the "2x2" NaI. The intent is to use the results of the correlation study to design future site surveys if it is demonstrated that the FIDLER is a superior instrument. The USACE does not intend to adjust the selected screening level DCGL. The USACE feels they have adequately proven through conservative modeling that 56 pCi/g DU is protective of human health and the environment. A revision of this value at this point in the CERCLA process does not appear to be justified.
19	**Section 5.1, Surface and General Area Gamma Measurements, page 9.** The text states that the FIDLER may also be used for scanning soils. The discussion in the third paragraph discusses scanning speed, height of probe, use of audio, and an investigation level. Please clarify whether these parameters apply to just the 2x2 NaI or if they also apply to the FIDLER.	The text will be clarified to indicate that all of these parameters except the investigation apply to operation of the FIDLER. Since the FIDLER is intended to only be used in area of elevated activity as determined by the "2x2" NaI, the establishment of an investigation level is not necessary.

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20	**Section 5.2, Depleted Uranium Fragment Collection, page 12.** The plan should clearly state that DU fragments will be collected, as some contradictions exist in the text. Plans for disposal of the DU fragments should also be specified.	Only visible DU fragments will be collected. The USACE and its contractors will turn the properly containerized and labeled DU waste over to IAAAP for storage and future disposition. Text of plan will be revised to indicate that waste will be turned over to IAAAP for storage and future disposition.
21	**Section 5.3, Soil Sample Collection, page 12.** The last sentence of the first paragraph states that samples will be collected, logged, labeled, and analyzed for appropriate radiological constituents in accordance with the "Sampling and Analysis Guide for the St. Louis Site." Since this information has not been provided within the scoping survey, the procedures can not be reviewed for applicability and appropriateness. Please revise the scoping survey to include the applicable information from the "Sampling and Analysis Guide for the St. Louis Site."	See response to EPA Comment #1.
22	**Section 5.3, Soil Sample Collection, page 12.** The second paragraph states that subsurface soil samples may be taken if field observations warrant the need for additional information. Based on historical site information from Firing Site 12, contamination to a depth of 15 feet existed near ground zero. Since no prior sampling has apparently been conducted at Firing Site 6, please discuss how subsurface samples will be taken at and around ground zero at Firing Site 6 and how many subsurface samples will be taken.	Due to the potential UXO hazard that exists subsurface samples greater than 2' bgs cannot be obtained. Decisions to collect subsurface samples at either site will be based on a radiological screening survey of surface soil sample and borehole. If measurable elevated activity is identified, an annotation will be made in the logbook and a subsurface sample may be collected. The plan will be revised to clarify the decision logic to be used to decide if subsurface samples will be collected.
23	**Section 5.3, Soil Sample Collection, page 12.** The last three sentences of the second paragraph state that remaining samples will be collected from Class 2 survey units and that 30 samples for the Class 2 survey unit would be required. This is the first mention of a MARSSIM classification of survey units and it is unclear what is really meant by these sentences. First, the classification of survey units using the MARSSIM methodology is based upon pre-remediation levels of contamination. Since historical reports (Section 2.0, page 4) have indicated that contamination as high as 1,746 pCi/g has existed in Firing Site 12 and post-remediation surveys indicated the presence of radioactivity as high as 335 pCi/g, the proper classification of the survey units would be Class 1. If the standard deviation from the post-remediation efforts as listed on page 4 is 107 pCi/g, a DCGL of 56 pCi/g, and the lower bound of the gray region (LBGR) of one-half the DCGL is assumed, the resulting relative shift would be 0.26 (0.3). According to MARSSIM, the minimum number of samples that would be required would be 52 samples per survey unit. This is assuming a Type I error of 0.25 and a Type II error of 0.25. The last sentence also states that it is intended that the sample be applied to the final status survey. First, please clarify what is meant by "if any samples remain at either firing site."	The USACE intends to collect up to the number of samples stated in the plan for each firing site. Samples will first be collected at areas of elevated activity. If no areas of elevated activity exist or only a limited number of areas of elevated activity are encountered, the remaining number of samples will be collected at systematic locations to allow their use in future evaluations. In light of this comment, the classification of the firing sites and establishment of sampling locations in accordance with MARSSIM may be premature. Reference to discussion of sampling at Class 2 grid locations has been deleted from this plan.

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	Second, please provide justification of the method for classification and identification of the survey unit. Note that MARSSIM requires classification of survey units to be based upon pre-remediation measures, and that a Class 2 survey area means that contamination may be present but not above the DCGL. It is anticipated that both firing sites will need to be classified as Class 1 areas, due to historical evidence of radioactivity and the presence of visible DU fragments. Third, please provide the methodology and basis for the determination of the number of samples per survey unit. Fourth, if the samples collected during the scoping survey are to be applied in the final status survey, please discuss the sampling locations and grid methodology. MARSSIM requires samples from a Class 1 and Class 2 survey unit to be taken in a calculated triangular (or rectangular) grid pattern for final status surveys.	
24	**Section 5.3, Soil Sample Collection, page 12.** The first sentence of the last paragraph states that only seven surface soil samples will be collected from an appropriate reference area to determine background levels of natural uranium. Since natural uranium concentrations can vary significantly depending on type of soil and geology, subsurface soil samples should also be taken to determine the levels of natural uranium at depth. These subsurface background soil concentrations should be used for comparison to the subsurface soil samples to be taken in Firing Sites 6 and 12. Please revise the scoping survey to include subsurface background reference area sampling In addition, if a MARSSIM approach is to be applied and the data to be used in a final status survey, the number of samples calculated for each survey unit should also be collected from the background reference area. For example, if 52 soil samples are to be taken in each unit, then 52 background reference samples should also be taken. Please provide justification for collecting only seven reference area samples. Based upon the locations of Firing Sites 6 and 12 in relation to each other, more than one reference area may be warranted. Background reference areas should be representative of the type of soil/geologic conditions at the area under investigation. Therefore, a separate background reference area may be required for each firing site. Please provide a discussion of the applicability of the selected reference area to both Firing Sites 6 and 12.	The number of samples to be taken in the reference area is limited to seven. At least 7 samples of surface soils are necessary in order to perform a statistical evaluation of the data generated from these samples. The USACE agrees that for future evaluations, subsurface samples will need to be collected. At this time, the USACE does not intend to perform any formal MARSSIM evaluations of the data collected. The USACE concurs that when MARSSIM evaluations are conducted additional reference area samples will need to be collected based on the number of samples required for each survey unit. At least seven samples must be conducted at this time to allow for statistical evaluation of the data generated from these samples. Noted. Soil samples will be classified and logged in accordance with USACE requirements. This information can then be used in subsequent survey designs to assure that appropriate reference area(s) have been selected.
25	**Section 5.4, Field Logbook Entries, page 13.** Logbook entries should include the radiation reading for each sample taken, the instrument, instrument serial number, probe, probe serial number, and surveyor. Logbooks should also contain the daily source/response checks for each instrument. Please revise the list of items to be contained within the logbook to include these additional entries.	Plan will be revised to include radiological screening information for each sample taken. Daily response/source checks will be conducted in accordance with the USACE approved SAIC HP procedures and this information will be maintained as part of the project file in accordance with the USACE approved SAIC document management procedures.

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26	**Section 6.1, Site Safety and Health, page 13.** EPA has not been provided the Site Safety Plan referenced here. We believe it is critical that the safety plans address potential UXO hazards specific to the IAAP Firing Sites and that the field teams are appropriately briefed regarding procedures to deal with these risks.	The UXO plan developed by the Rock Island USACE and approved by the Huntsville UXO Center of Expertise will be included as Appendix C of this plan. All other site safety and health information will be covered by the USACE-approved *SAIC Site Safety and Health Plan for the FUSRAP Sites.*
27	**Section 9.0, Documentation of Findings, page 16.** The summary report should discuss whether any DU fragments were collected for disposal, the total amount of DU collected, and the locations of the fragments removed. Please revise the list of information to be contained in the scoping survey summary report to include this information.	The text will be revised to indicate the intent of including this information in the scoping survey summary report.
28	**Section 10.0, References, page 17.** Revision 1 of the MARSSIM was released in August 2000 (NUREG-1575, rev.1 / EPA 402-R-97-016, rev1). The revised MARSSIM should be used for all future work and used as a reference. The revised MARSSIM may be downloaded from the following EPA website: www.epa.gov/radiation/marssim.	Revision 1 of MARSSIM was used in reference to developing this plan. The reference section was merely not updated to reflect this fact. The plan will be revised to correctly indicate the current version of MARSSIM.
29	**Appendix A.1, IAAAP Scoping Survey Screening Level DCGL Risk/Dose Assessment, page 1.** The residential scenario is based upon an assumption that a person could reside on approximately 2.5 acres and that any potential contamination would be homogeneously spread over the entire residential site. The exposure pathways evaluated for the resident do not include the radon pathway, where radon is a decay product of DU. On page 6 of the report, the design of the scoping survey states that it will consider not only DU but also the associated radionuclides that result from radioactive decay and progeny in-growth. While it is noted that a depth of contamination of 0.15 meters will limit dose from the radon pathway, the radon pathway should be included in the dose assessment modeling. Please revise the modeling to include the radon pathway, to be consistent with stated objectives of the scoping survey and to include all potential exposure pathways.	The model will be re-run to include the radon pathway and the text will be revised to indicate this fact.
30	**Appendix A.1, IAAAP Scoping Survey Screening Level DCGL Risk/Dose Assessment, page 1.** RESRAD version 5.82 was used for the dose assessment. Please note that RESRAD version 6.0 was released in October 2000 and this newer version of RESRAD should be used for all subsequent modeling. RESRAD version 6.0 may be downloaded from the following Argonne National Laboratory site: http://web.ead.anl.gov/resrad.	There are only two differences between RESRAD Version 5.82 and RESRAD Version 6.0. Version 6.0 includes Time Integration Factors and Uncertainty Factors whereas Version 5.82 does not. For the time integration factors, when the maximum number of points for Dose and Risk are set to 1, both versions will result in equivalent outputs. Using the default time integration factor values for RESRAD 6.0 will result in a lower maximum dose estimate. As controversy continues to exist among different government entities about the uses of time-integration factors, the USACE used RESRAD Version 5.82 for this radiological risk assessment. If Version 6.0 is used with the same parameters as described in the previous

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		assessment, the resulting radiological doses and risks to residential receptor at t = 0 are 5.5 mrem/yr and 3E-05 and at t = 1000 years are 9.1 mrem/yr and 6E-05. The USACE will run the assessment in Appendix A using RESRAD Version 6.0 and revise the plan accordingly.
31	**Appendix A.2, Scenario Parameters, pages 1 and 2.** The exposure parameters for each medium for the residential receptor are presented on pages one and two. The parameters are a mixture of RESRAD default values and values taken from the EPA "Exposure Factor's Handbook." The following bullet points, outline the concerns with the assumed parameters. It appears that most of the intake rates were not selected based upon the site conditions. The ingestion rates listed in the modeling are supposed to be based upon the ingestion of food stuffs grown or raised on the contaminated site, which in this case is only 2.5 acres, and not just the total ingestion of all food from all sources. Many of the intake rates appear to be very high and may be based upon subsistence-type farming practices. A subsistence farmer, who grows 100% of all plant and animal products used for consumption and is also a subsistence fisher is not consistent with site conditions or the description of the site resident. If the default intake rates were modified in order to reflect more realistic conditions at the site, it does not appear that logical assumptions were used in determining what intakes should be used in place of the default values. It is advised that a review of the intake parameters and pathways included in the dose assessment be re-evaluated. While it is noted that the total dose using these intake rates was below the required 25 mrem/yr, the modeling input parameters do not appear to be realistic or justifiable. Also, it is advised that modifications as noted below are taken into account for future modeling and development of the site-specific DCGL. The ingestion rate of fruits, vegetables, and grains (718.32 kg/yr) appears to be extremely high for a resident living on only 2.5 acres. When the average intake rates from the "Exposure Factor's Handbook" were added, a value of around 771 g/day (270 kg/yr) was obtained. It appears that possibly the units of intake were not evaluated correctly. Please verify the ingestion rate for fruits, vegetables, and grains. The inhalation rate of 0.552 m^3/hour (4,835 m^3/yr, based on 365 days) appears low, especially if the resident is assumed to be gardening and raising animals for all of	See attached response. While the USACE recognizes the conservative nature of this assessment, the purpose and intent of this assessment was to simply prove that the selected screening level DCGL is protective of human health and the environment under any scenario. The text of Appendix A will be revised to clarify this intent. In addition, the USACE will revise the assessment in Appendix A using more reasonable scenarios as suggested by the commentor. Future assessments for the IAAAP will consider more reasonable site specific parameters.

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	their food intake. A typical inhalation rate for an average person is 8,400 m^3/yr, almost twice the inhalation rate assumed. Please justify the applied inhalation rate or modify it to be at least 8,400 m^3/yr. The exposure time listed is 18.4 hours per day. However, this is not consistent with the combined indoor and outdoor fractions of time the resident would be on-site (17.6 hours/day). Please revise for consistency. The outdoor fraction is only assumed to be two hours per day. This is not consistent with the amount of time that will be required to grow and raise the amount of plants and animals listed as being ingested from the residence (e.g., subsistence farming). Please revise the outdoor fraction for consistency with site conditions. The ingestion rate of meat and poultry is listed as 111.7 kg/yr. Again, this appears to be very high. An average person typically consumes approximately 63 kg/yr of meat and poultry. Please provide justification for the intake rate using regional or local data or check the intake rate for consistency with the scenario assumptions. The fish consumption rate is listed as 15.33 kg/yr. Mathes Lake and the other surrounding water bodies at Iowa Army Ammunition Plant (IAAAP) are stated as only supporting recreational fishing. The ingestion rate of fish listed is more consistent with subsistence fishing. A typical ingestion rate of freshwater fish for a recreational fisher for the 95th percentile is 8.75 kg/yr and the average ingestion rate is 2.31 kg/yr. Please review the ingestion rate of fish and revise as applicable. Seafood consumption was listed as 0.9 kg/yr. All of the surface water bodies in and around IAAAP are fresh water lakes or rivers, which do not support seafood. It does not seem likely that any other seafood would be consumed from local surface water bodies, unless this pathway is to account for crawfish and any other fresh water organisms that may be ingested. It is suggested that the seafood ingestion pathway be omitted as an ingestion route. The gamma shielding factor is listed as 0.4. However, it appears that this is actually the indoor dust filtration factor. The default gamma shielding factor (version 6.0) is 0.7. Please verify the gamma shielding factor used in the modeling.	
32	**Appendix A.3, Soil Concentration Determination, page 2.** The depth of contamination is listed as being 0.15 meters. However, based on historical reports discussed on page 4 of the main text, it appears that depth of contamination in Firing	Due to lack of site-specific data (depth of groundwater, area of contamination, subsurface soil characteristics, etc), the depth of contamination was assumed to be 0.15 m. Firing Site 12 was used historically for destructive testing of multiple

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	Site 12 was up to 15 feet near ground zero. Since the scoping report does not discuss any characterization or prior remedial activities at Firing Site 6, it appears that there is a potential that contamination could extend beyond the top 0.15 meters of soil in Firing Site 6, similar to pre-remediation conditions at Firing Site 12. Please justify the assumption that the depth of contamination in Firing Site 6 extends to only 0.15 meters below the ground surface. In addition, the historical discussion on page 4 of the main text of the scoping survey indicates that Firing Site 12 was plowed after removal of highly contaminated surface soils. The text does not indicate the depth to which the soil was plowed, however, it appears that the surface soil below the top 0.15 meters could have been disturbed (typical plow depth is 0.2 to 0.25 meters). Therefore, contamination could exist below the 0.15 meters. Please confirm the depth of contamination for Firing Site 12.	hydrodynamic shots of DU and as a result, contamination to a significant depth could be expected. However, the area of this vertical contamination is limited to approximately 400 square feet or approximately 40 square meters. Again, it should be noted that the radiological risk assessment performed here assumes homogeneous mixing of contamination at a depth of 6 inches over a 10,000 square meter area in an effort to prove the protectiveness of the screening level DCGL. Future assessments will consider site specific information. Currently, there is no evidence to suggest that hydro-shots were tested at Firing Site 6. The known historical use of this site would suggest that contamination would be more limited to the surface of the site. In addition, the purpose of this scoping survey is to confirm that there is no immediate threat to the public and/or environment and not to perform extensive characterization for purposes of a baseline risk assessment.
33	**Appendix A.3, Soil Concentration Determination, page 3.** The hydrological data is summarized in a table on page 3. The caption indicates that RESRAD default values were used. The RESRAD default value (Version 6.0) for erosion rate is actually 0.001 m/yr. This may be a difference between model versions. However, please verify whether a site-specific erosion rate or a default value was applied. It is noted that the value applied is more conservative than the default RESRAD (Version 6.0) erosion rate.	Noted as an incorrect reference to the RESRAD default value. The value of 0.00006 m/yr is typically utilized in other FUSRAP site assessments and was adopted for this radiological risk assessment. The text and assessment will be revised using the RESRAD default value.
34	**Appendix B, 2"x 2' NaI Detector Scan Detection of Depleted Uranium Fragments.** The methodology presented in Appendix B, use of the NUREG-1507 equations coupled with Microshield model outputs, for determining the maximum size of DU fragment that can be detected during a normal survey (scan), is sound. Based upon calculations, it was determined that the maximum size of DU that could be detected (under the listed assumptions) on the surface is 6 cm^3 and at 5 cm below the surface, 10 cm^3. However, one of the primary objectives of the scoping survey, as stated on page one of the text, is that all identifiable fragments of DU will have been containerized. Since the scanning process will only be able to identify 6 cm^3 and 10 cm^3, DU fragments at the surface and at 5 cm below ground surface respectively, please discuss how smaller fragments will be identified. In addition, the dose modeling is based upon an assumption of contamination to a depth of 15 cm. Therefore, it appears that pieces of DU could exist up to 15 cm below ground surface. In addition, as discussed in prior comments, historical evidence has not been presented to indicate that Firing Site 6 has undergone remedial activities. Therefore, if Firing Site 6 is in any way similar to Firing Site 12, contamination and DU fragments could exist (at least around ground zero) up to a	The most reasonably available technology was used in determining the size DU fragments that could be detectable during site surveys. Due to the conservative nature of some of the assumptions, the survey crew may be able to actually detect smaller DU fragments. However, if fragments smaller than 6 cm^3 on the surface and 10 cm^3 at 5 cm below the surface are not detected during the gamma scan or visually by the surveyor, they will not be collected. DU fragments below 5 cm may or may not be detected during the scoping survey. This depth was chosen as a reasonable limit for a surveyor to "dig and search" for a DU fragment while keeping with the limited nature of a scoping survey. All areas of elevated activity suspected to be the result of DU fragments yet the surveyor is not able to find with a reasonable amount of effort will be mapped and logged for use in future site investigations. Contamination at FS 6 will be detected below a depth of 5

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	depth of 15 feet below ground surface. Please discuss how contamination at a depth of below 5 cm will be identified at Firing Site 6. It may be helpful to develop a table comparing depth and sizes of DU that can be confidently identified with the proposed 2x2 NaI.	cm by collecting soil samples from 15 cm cores. (Note that interviews with past site personnel suggest that DU at FS 6 was in the form of 1/16 inch shell between an inner and outer shell of explosives. Based on this, it is unlikely that visible fragment of DU will be identified at FS 6.)
35	**Appendix B.1, NaI 2-inch by 2-inch Scintillation Detector Scan Detection of Depleted Uranium Fragments, page 1.** Revision 1 of the MARSSIM was released in August 2000 (NUREG-1575rev.1). The revised MARSSIM should be used for all future work and used as a reference. The revised MARSSIM may be downloaded from the following EPA website: www.epa.gov/radiation/marssim.	Revision 1 of MARSSIM was used in reference to developing this plan. The reference section was merely not updated to reflect this fact. The plan will be revised to correctly indicate the current version of MARSSIM.

RESPONSE TO COMMENT #31 - APPENDIX A.2, SCENARIO PARAMETERS, PAGES 1 AND 2.

Since site-specific information regarding land characteristics was not readily available, a conservative assessment was conducted. The maximum of either the RESRAD default value or the EPA Exposure Factors Handbook 95% upper confidence level value was used in the exposure assessment methodology. The intent of this assessment was to illustrate that the concentration of depleted uranium (56 pCi/g) that was readily detectable with field instrumentation was also protective of human health and the environment. In the event that risk based remedial goals are to be developed through the BRA/RI/FS/PP process, the risk assessment would indeed incorporate more reasonable parameters given anticipated future land use. The risk assessment presented in this document was not intended to serve as the basis for the determination of a site-specific DCGL only to prove that the chosen screening level DCGL is protective.

The following sections describe the sources for those parameters that were noted in the comments.

INGESTION OF FRUITS, VEGETABLES AND THE GRAINS

	Fruit (g/kg-day)	Vegetables (g/kg-day)	Grain (g/kg-day)	Total Ingestion Rate (g/kg-day)	Ingestion* Rate (kg/yr)
Average	3.4	4.3	4.1	11.8	260
95th Percentile	12	10	10.8	32.8	718.32

*RESRAD default value = 160 kg/yr
*NRC default value (Farmers) = 112 kg/yr
*EPA's resident value = 69 kg/yr

INHALATION RATE, EXPOSURE TIME & OUTDOOR FRACTION

The inhalation rate was chosen to be 0.552 m^3/hr as this represents the average of adult male and female inhalation rates for long-term exposures. Note in Table 5-23 of EPA's "Exposure Factors Handbook", the long-term exposures for adult females and males are 11.3 m^3/day and 15.2 m^3/day, respectively. In this assessment, the inhalation rate was assumed to be the average inhalation rate for both male and female (13.25 m^3/day or 0.552 m^3/hr).

Exposure Time = 18.4 hours/day. The rational behind this assumption was taken from Table 1-2 of Chapter 1 of EPA's handbook. According to handbook, the recommendations for time spent indoors and outdoors at one's residence by residential receptors are 16.4 hours/day and 2 hours/day respectively. Since the exposure frequency for the receptor was assumed to be 350 days/yr rather than 365 days/yr, the outdoor (0.655) and indoor (0.0799) fractions are correct.

INGESTION RATE OF MEAT AND POULTRY

From Table 1-2, Exposure Factor Handbook,

	Ingestion Rate (g/kg-day)	Ingestion Rate* (kg/yr)
Average	2.1	63
95th Percentile	5.1	111.7

*NRC Farmer = 65.1 kg/yr

FISH CONSUMPTION

As mentioned, the fish consumption rate was based on 95 percentile and general population intake rate. This parameter is high for the recreational purposes associated with fishing in this area; however, provides a very conservative assessment of the dose contribution from this pathway.

SEAFOOD CONSUMPTION

It is noted that in a more reasonable assessment, the seafood ingestion pathway would not apply.

GAMMA SHIELDING FACTOR

It is true that the default shield factor used in the RESRAD code for external gamma radiation is 0.7. But this assessment assumed 40% (60% reduction) for indoor exposures. The footnote in the table will be deleted.