NWI Land Management

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July 14, 2000

Mr. Mike McCann
U.S. Nuclear Regulatory Commission
Region III
801 Warrenville Rd.
Lisle, Illinois 60532

Re: Former Michigan Chemical Company Low Level Radioactive Disposal Site Breckenridge, Michigan

Dear Mr. McCann:

This correspondence is submitted pursuant to the June 11, 1999 and February 22, 2000 correspondence from NWI Land Management (NWI) regarding the former Michigan Chemical Company low level radioactive disposal site in Breckenridge, Michigan (Site or Breckenridge Disposal Site). The June 11, 1999 correspondence proposed phases of activities to be performed to bring this Site to an acceptable closure, and indicated that monthly progress reports would be submitted describing the progress being made regarding the scheduled activities. The February 22, 2000 correspondence was submitted pursuant to a January 21, 2000 meeting between the U.S. Nuclear Regulatory Commission (NRC), NWI, and SCIENTECH NES, Inc (NES), NWI's radiological consultant, and contained a revised schedule and phases of activities. In the February 22, 2000 correspondence and subsequent progress reports, NWI indicated that a work plan is intended to be submitted to the NRC proposing to conduct additional characterization activities at the Site.

Attached is a report prepared by SCIENTECH NES, Inc. entitled "Breckenridge Site, Characterization/ Remediation Work Plan", dated June 2000. The Work Plan details the activities proposed to be performed to better characterize the Site for the purpose of refining a dose assessment for the Site. Limited remediation of surface radioactivity is also described.

If you have any questions regarding this matter, please feel free to contact me.

Sincerely,

John Hock, P.E.
Environmental Project Manager

cc: Bruce Jorgensen, NRC *w/o attachment*
George Harvell *w/ attachment*
Ken Kasper, SCIENTECH NES *w/o attachment*

JUL 17 2000

BRECKENRIDGE SITE
BETHANY TOWNSHIP, MICHIGAN

CHARACTERIZATION / REMEDIATION WORK PLAN

JUNE 2000

Prepared for:

NWI Land Management Corporation
3041 Woodcreek Dr. Suite 210
Downer's Grove, Illinois 60515

Project Application	*Prepared By*	*Date*
3078	Eric Nielsen	7/13/00

APPROVALS:

Title	*Signature*	*Date*
Technical Reviewer	FOR KEN KASPER	7/13/00
Department Manager		7/13/00

Revision Log

Revision Number	Affected Pages	CRA Number	Approval

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1.0 BACKGROUND AND INTRODUCTION

1.1 INTRODUCTION

The Breckenridge Disposal Site (Site) was used between the years 1967 and 1970 for the disposal of process wastes from a yttrium recovery industrial operation conducted by Michigan Chemical Corporation (MCC). These disposal activities were authorized under Atomic Energy Commission License SMB-0833 and performed in accordance with 10 CFR 20.304, "*Disposal by Burial in the Soil.*" The buried waste material is a solid waste byproduct, known as filtercake, which originated from the yttrium extraction process. The filtercake is a dense, clay-like material containing residual uranium and thorium. After Site operations ceased, SMB-0833 was properly terminated. This Work Plan details the activities to be performed to better characterize the Site for the purpose of refining a dose assessment for the Site. Limited remediation of surface radioactivity is also described.

1.2 SITE DESCRIPTION

The Breckenridge Disposal Site is located on Madison Road in Bethany Township, Gratiot County, approximately 7.5 km east-northeast of St. Louis, Michigan. The affected area of the Site has been identified as approximately 0.7 acres, which is located on a narrow, triangular shaped 2.2 acre parcel of land that is currently owned by NWI Land Management (NWI) . The parcel is bounded on the north by Madison Road and on the east by Bush Creek. The land is basically level. The southern tip of the property is covered with tall trees and brush. At the northern end is a deep chemical disposal well, which is capped and no longer used. The depth of the well is over 1100 meters (Michigan 1980). The surrounding land use is primarily agricultural; the nearest residence is approximately 0.2 kilometers east of the Site. Figure 1 is a diagram of the Breckenridge property.

1.3 BACKGROUND

In 1981, Oak Ridge Associated Universities (ORAU) performed a radiological assessment of the Breckenridge Disposal Site under contract with the United States Nuclear Regulatory Commission (NRC). The assessment examined the surface and outer boundaries of the disposal area. The report from the survey indicated that the average level of radionuclides was below the NRC guideline for areas accessible to the public and that no migration of materials from the Site was identified.

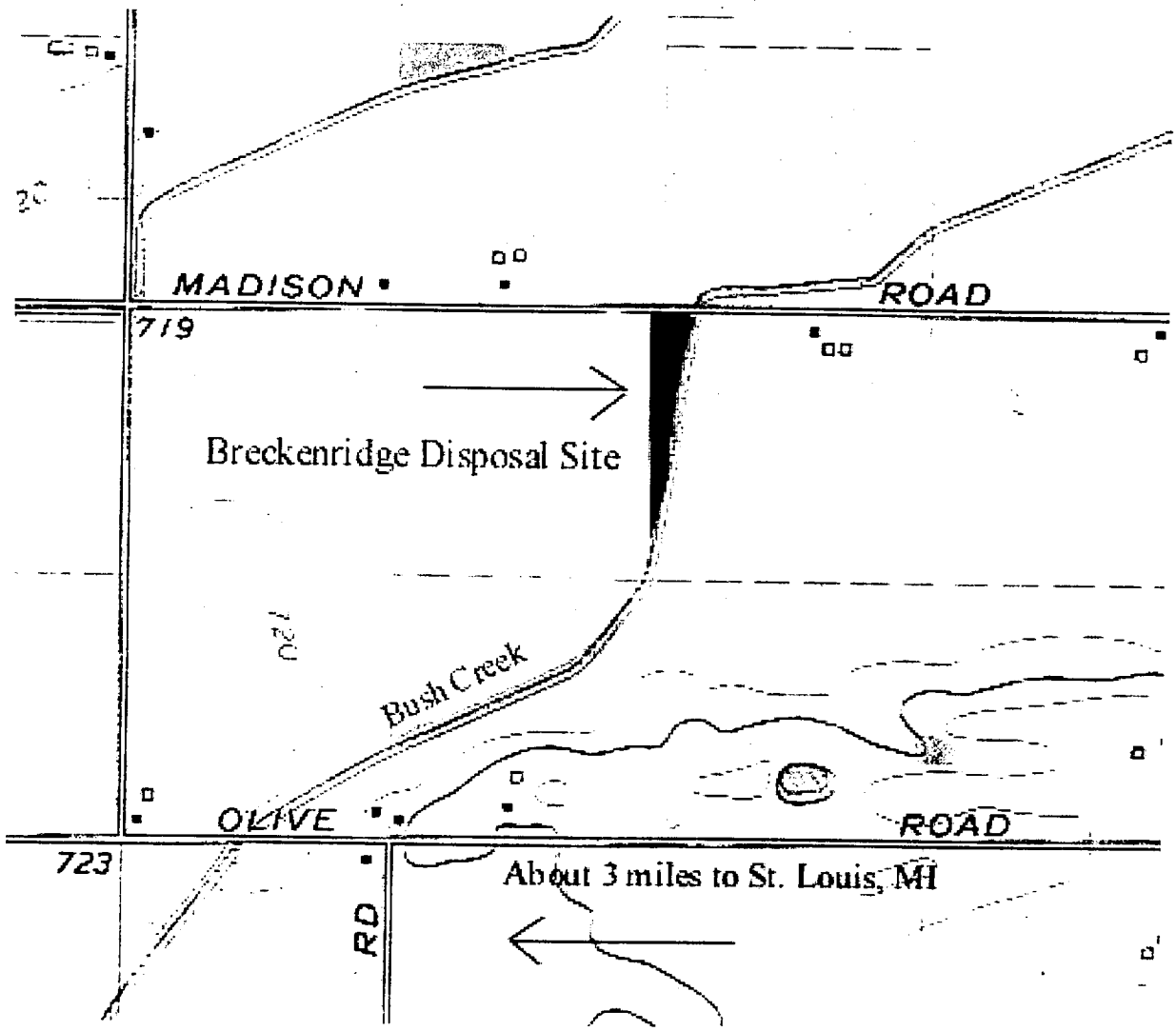

Figure 1. Breckenridge Site

In September 1996, an environmental consultant performed shallow trenching at the site to investigate reports of improperly buried material. In October 1996, the NRC was contacted by the Michigan Department of Environmental Quality (MDEQ) to investigate the Site since the buried waste may have been disturbed during the environmental investigation. The NRC, assisted by the MDEQ, performed a radiological scoping survey of the Site. The NRC report from the survey indicated that no significant risk was identified (NRC 1996). However, since the survey identified levels in excess of the NRC guidelines for unrestricted use, the NRC requested in a letter, dated December 10, 1996, that additional characterization activities be performed.

In July, 1997, NES, Inc. (later became SCIENTECH NES, Inc.) performed radiological measurements and sampling to further characterize the Site in accordance with characterization processes outlined in NUREG/CR-5849, "*Manual for Conducting Radiological Surveys in Support of License Termination.*" The characterization effort included surface activity measurements, surface dose rate measurements, down-hole activity measurements, and soil sampling at various depths. Due to some analytical irregularities, the site samples were reanalyzed in 1998. The NRC was provided with the revised analytical data in February 1999.

During March 1999, NWI met with the NRC to discuss the findings of the radiological characterization survey and to discuss the site's disposition. On April 14, 1999, the NRC issued a letter to NWI directing NWI to bring the site to an acceptable closure under the regulatory framework of 10 CFR 20, Subpart E, "*Radiological Criteria for License Termination.*" NWI submitted a proposal for site resolution on June 11, 1999. The June 11, 1999 submittal proposed phases of activities to be performed to bring this site to an acceptable closure. For the first phase, all historical data would be reviewed to supplement the existing Site characterization data in determining the nature and extent of radioactive materials at the site.

A report was submitted on August 24, 1999 which was prepared by SCIENTECH NES, Inc. (NES), entitled "*Radiological Evaluation of the Breckenridge Disposal Site,*" dated August, 1999 (Report). The Report compared the results of the historical site assessment and site characterization activities, and estimated the actual values of radioactive materials buried at the Breckenridge Disposal Site. The August 24, 1999 submittal also indicated that NWI believed that the next objective should be to conduct a dose assessment of the buried material as it is characterized in the Report.

A letter was received from the NRC, dated September 23, 1999, which indicated that the NRC had identified some generic issues in their review of the June 11 and August 24 submittals which necessitated consultation with the Headquarters Program Office. The letter further indicated that the NRC would contact NWI to discuss the findings on the generic issues once the discussions were completed. In addition, the letter requested that additional or revised information be submitted within 60 days of the letter regarding the

uranium characterization of previous samples and the applicability of the Time Rule at the Site.

A response to the September 23, 1999 correspondence from the NRC was submitted on November 22, 1999 which addressed each of the requested items. To better understand the NRC's comments regarding the uranium characterization, NWI also requested a meeting with the NRC. In addition, information was included with the November progress report (dated December 14, 1999) which may have addressed some of the NRC's comments. The information included revised data for uranium 238 for 19 of the 229 samples. Of the 19 revised results, only a limited number of these changed significantly. The revised data did not alter the affected area identified in the Report. In fact, the revised uranium data was more consistent with the thorium results. After this Work Plan is implemented, NWI will generate a revised Report that will, among other topics, address uranium activity.

A meeting occurred on January 21, 2000 between the NRC, NWI and NES to discuss the information that had been obtained by the NRC from the Headquarters Program Office. The items discussed at the meeting were generally summarized in a Conversation Record prepared by the NRC and provided to NWI. During the January 21, 2000 meeting, options were also discussed for the acceptable closure of the Breckenridge Disposal Site. The NRC indicated that applicable formal NRC positions regarding radiological criteria were not yet finalized. However, the NRC noted that the site may be acceptable for closure if the current and future public risk is no more than 100 millirem per year, and the specific activity of the exhumed material would not be licensable under a probable end use scenario. Based on the discussions at the meeting, NWI indicated that the proposed schedule and phases of activities to be performed to bring this site to an acceptable closure contained in the June 11, 1999 submittal would need to be revised. The revised schedule and phases of activities were submitted on February 22, 2000 and included the development of a preliminary dose assessment, the acquisition of additional characterization data followed by the development of a revised dose assessment (considering the additional characterization data).

1.4 PRELIMINARY DOSE ASSESSMENT

NES completed the Preliminary Dose Assessment (PDA) for the Breckenridge Disposal Site during June 2000. A copy of the PDA is attached. The dose assessment generally consisted of exposure simulations of a resident farmer using the RESRAD computer code with available site-specific data, as it was available, coupled with default RESRAD data. During the first RESRAD simulation, dose was assessed from a waste volume that is brought to the surface and spread out over an area, as a result of excavating a basement for a residence. The second, or subsurface, simulation assessed the dose from the remaining underground waste. The total dose that an individual could receive was obtained by integrating and summing the doses from the two scenarios. The dose assessment showed that the total dose for the Breckenridge Disposal Site using the dual simulation model was less than 100 millirem per year. The mean concentration of the exhumed material also would be less than 0.05% by weight, combined thorium and uranium.

Significant assumptions and sensitive parameters, which will be confirmed as part of this Work Plan, are discussed in the PDA and include the following

- Contaminated Zone Thickness
- Radionuclide Concentrations
- Soil Densities & Hydraulic Conductivities
- Precipitation and Wind Speed
- Well Pump Intake Depth

1.5 PURPOSE

The primary purpose of this Work Plan is to collect additional data for sensitive parameters of the dose assessment model. The dose assessment process is currently directing its effort towards determining whether the Site meets the following two criteria (as discussed previously):

a) The Site poses a total effective dose equivalent of no greater than 100 millirem per year to the average member of the critical exposure group through all exposure pathways.

b) If the radioactive material at the Site were accessed, the mean concentrations of the material would be less than 0.05% by weight.

Site characterization and preliminary dose modeling have been performed and indicate that these two criteria can likely be satisfied without performing significant Site remediation. The dose assessment process, thus far, has assumed that the quantity of near-surface radioactivity is limited and that the radioactivity, which is currently at the surface, will be remediated. If the amount of radioactivity near the surface and in the earthen cover over the buried filtercake is found to be substantial, the dose model will have to be altered accordingly.

By implementing this Work Plan, NWI will be able to validate assumptions or refine data used in the PDA. Two reports will be developed and submitted to the NRC based on the data obtained from the implementation of this Work Plan. The first report will be the "Radiological Evaluation of the Breckenridge Disposal Site, Revision 1" (Revised Report). The Revised Report will build off of the existing August 1999 Report and will integrate the new data. The Revised Report will also address uranium concentrations and revise the estimate of the actual volumes of radioactive materials buried at the Site. The second report will be the refined dose assessment report. The refined dose assessment will evaluate the Site against the two previously-noted criteria.

This Work Plan outlines the specific tasks NWI will perform to collect additional data for sensitive parameters of the dose assessment model. These tasks include the following:

a) Surface characterization of the Site to identify areas of elevated activity requiring remediation.

b) Subsurface characterization of the Site to accurately establish the depths and specific-activity of the buried radioactive filtercake material.
c) Limited near-surface radiological remediation
d) Obtaining additional site-specific non-radiological environmental data to facilitate refinement of the dose assessment model.
e) Preparing a Revised Radiological Evaluation Report. This report will be submitted to the NRC independent of a refined dose assessment.

NES has been contracted by NWI to provide engineering and consulting services to NWI and to perform the characterization work described herein.

2.0 PROJECT ORGANIZATION AND RESPONSIBILITIES

The project organization for activities defined in this Work Plan is illustrated in Figure 2. Each component of the project organization is described as follows:

2.1 PROJECT MANAGEMENT PERSONNEL

- NWI Project Manager, **Mr. John Hock, PE.** Shall be responsible for NWI's oversight of the project and will be the primary contact for the NRC.
- NES Project Manager, **Mr. Lee Penney**. Shall be responsible for the overall management of the project and will serve as the primary point of contact for NES on this project. Mr. Penney's duties will include:
  - interacting with NWI's representative;
  - coordinating office and field personnel;
  - managing administrative requirements;
  - ensuring that quality assurance and contractual requirements are fulfilled;
  - managing the preparation and implementation of the technical approach;
  - overseeing preparation and submittal of the Revised Radiological Evaluation Report; and
  - ensuring that the project is completed within schedule and budget.
- NES Site Supervisor, Mr. Eric Nielsen. Shall work closely with the NES Project Manger to ensure that on-site activities are performed in a manner that is consistent with the objectives and scope of the Work Plan. Duties will include:
  - the direct oversight and implementation of all pertinent NES corporate and site specific procedures and work plans;
  - conducting personnel training;
  - coordinating the activities of field personnel and subcontractors;
  - preparing and maintaining all required records. The NES Site Supervisor will have training equivalent to requirements specified in ANSI 3.1. The NES Site Supervisor will also assume the responsibilities of Site Health and Safety Officer. In this capacity, the NES Site Supervisor will be responsible for the administration of the Health and Safety Plan; and
  - preparing the project Quality Assurance Program Plan (QAPP).

The NES Site Supervisor will be an engineering level professional, who may provide technical support to NWI in dealings with local stakeholders, if requested.

2.2 SITE TECHNICAL PERSONNEL

- NES Health Physics Technicians. Will report directly to the NES Site Supervisor and perform surveys, sample collection and monitor the activities of subcontractor personnel. They will satisfy qualification requirements specified in ANSI 3.1.

- Geological Engineers/Technicians. Will perform geophysical surveys, groundwater sampling and other related activities. They will be supervised on-site by the NES Site Supervisor and will receive technical direction and support from the NES off-site support staff, as necessary.
- Other Subcontractor personnel that may provide on-site services in support of Work Plan activities include Equipment Operators. Prior to being permitted to work on-site, these personnel will be provided appropriate radiological worker training.

2.3 OFF-SITE PROJECT SUPPORT PERSONNEL

NES staff personnel will provide project support as necessary. NES staff members assigned to support the Breckenridge project include:

- Project Health Physicist. **Ken Kasper, CHP.**
- Project Dose Assessment Specialist. **Roy Racino.**
- Project Geology Specialist. **Kerry Hanlon, PG.**
- Project H&S Specialist. **Richard Moss.**
- Project Administrative Support. **Lori Peck.**
- Project Radiological Engineer. **Dwight Vann, PE.**
- Project QA Manager. **Mary-Ellen Alling.**

3.0 CHARACTERIZATION WORK PLAN

3.1 CHARACTERIZATION WORK PLAN

This Characterization Work Plan, which also includes limited remediation, is prepared in support of the Breckenridge site characterization project. This Characterization Work Plan specifies a detailed approach to performing each activity and serves as a key project guidance document. This Characterization Work Plan addresses each primary activity as follows:

3.2 MOBILIZATION AND SITE PREPARATION

Mobilization is intended to occur subsequent to the NRC review of this Work Plan. During the project mobilization phase, equipment and supplies will be prepared and shipped to the site. Immediately upon mobilization of site project personnel and equipment, site preparation activities will be performed. The Site Supervisor will oversee site preparation, which will at a minimum include the following:

- Coordination of the receipt and placement of temporary Site facilities.
- Coordination of the feed and connections of temporary Site utilities, if necessary.
- Finalize and coordinate access and support arrangements with NWI.
- Receive, unpack, and test project instruments and equipment.
- Clear the Site surface as necessary; mowing is anticipated to be performed prior to mobilization.
- Completion of any additional preparatory tasks necessary for the arrival of additional task personnel and/or the commencement of work activities.

Additionally, prior to beginning work on site, project personnel will be provided training in accordance with the requirements of NES and site specific plans and procedures. This training will include, as a minimum, the following topics:

- Personal Responsibilities
- Site Access and Control
- Work Scope, including any special Equipment or Conditions
- Protective Clothing and Equipment
- Radiological, Chemical, Physical, and Biological Hazards
- Emergency Procedures
- Decontamination

3.3 ESTABLISH SITE BACKGROUND LEVELS

Background levels will be determined using the guidance provided in USNRC NUREG/CR-5849, *"Manual for Conducting Radiological Surveys in Support of License Termination"* (Reference 6). Laboratory analysis and evaluation of the resulting data will establish the background level.

3.4 RE-ESTABLISHING THE GRID SYSTEM

Original reference markers still exist in-place and will be used to re-mark the grid system as it was marked for survey work performed by NES in 1997. The original (1997) grid was subsequently referenced to perform the recent preliminary dose assessment. Surveyor flags, stakes, spray paint and chalk lines will be used to physically re-mark the grid system as necessary to facilitate sample collection, remediation, and data logging.

3.5 SURVEYING AND REMEDIATING THE EXISTING COVER

The existing cover will be further evaluated and remediated to validate the dose assessment assumption that approximately 4 feet of non-contaminated soil is present over the buried filtercake material at the Site. Since adequate data was previously obtained regarding the depth of the contaminated zone, additional data on the existing cover will provide corresponding data on the thickness of the contaminated zone.

The affected area of the Site, as noted in Reference 2, will be 100% scan surveyed initially to determine the areal extent of elevated areas of surface activity. These areas will be suitably marked and recorded.

Based on the previous characterization activities at the Site, the elevated areas of surface activity are presumed to "spillage" of filter cake material that was incidental to burial operations. The near surface soils in these areas will be scanned, sampled and surveyed at varying depths to determine the extent of near-surface contamination.

Once the extent of near-surface contamination is estimated, near-surface soils which are determined to contain elevated radioactivity will be remediated using hand tools or machinery, as appropriate. Remediated near-surface soils will be temporarily containerized or placed in a staging area and covered for later disposal in accordance with Section 3.7. After the surface activity is remediated, sampling will be performed using hand sampling tools or auger drilling to obtain composite samples of the cover material which will be analyzed to determine the presence or absence of contamination.

If elevated surface activity is still present in an area after remediation of the near surface soils is completed, the underlying material in that area will be evaluated. Sufficient borings will be performed in that area to determine the integrity of the subsurface cover soils. If borings are determined to be unable to satisfactorily characterize the subsurface cover soils

in an area (e.g. elevated surface activity is not reasonably attributed to the material sampled in the borings), a backhoe may be used to dig a test pit/trench in that area. All boring and test pit/trench locations will be suitably marked and recorded. Below surface cover soils which are determined to be contaminated may be remediated at that time or at a later date.

3.6 SAMPLING OF THE BURIED FILTERCAKE MATERIAL

The filtercake sampling protocol is designed to gain additional knowledge regarding the specific activity of the buried filtercake material. The specific-activity information will be combined with known quantity data identified during the historical site assessment to determine the radionuclide source inventory. Because the quantity of the buried filtercake is known with a relatively high degree of confidence, finding the exact location of the burial trenches is not part of this characterization effort.

To gain a better understanding of the specific activity of the buried filtercake material, the filtercake will be located and sampled. Once the existing cover surveying/ remediation has been completed, direct measurements will be taken on the surface in order to attempt to locate the buried filtercake material. In addition, previous characterization data and aerial photographs may be used to help determine the location of the filtercake-containing burial trenches. Previous sampling and analysis appears to indicate the presence of buried filtercake material in and around grids A-12 and B-17. These areas will be carefully evaluated for the presence of the buried filtercake. Other areas that clearly indicate elevated activity out of the general proximity of these two grids may also be evaluated.

Subsurface samples will be taken in suspected areas in order to locate the buried filtercake material for additional sampling and analysis. Field analytical techniques will be developed to determine the presence of filtercake material, which has previously exhibited relatively high specific activity. Once the filter cake material has been located, approximately six samples of the buried filter cake material will be collected then analyzed off-site for radionuclide content, using gamma spectroscopic analysis. Samples will be collected from at least two distinct burial trenches to assess the radioactivity variability in the filtercake material.

Field analytical measurements will also be used to estimate the vertical distribution of the filtercake and to assess the level of radioactivity in the material that was used to backfill the trenches after the filtercake was placed.

3.7 DISPOSAL OF REMEDIATED FILTERCAKE

Remediated surface activity and sample borings will be buried within the site's affected area at a depth between 4 and 6 feet below grade. The exact location and quantity of this material will be noted in the project log. In addition, at least two composite samples of this material will be taken and analyzed using gamma spectroscopic analysis. Excavation required to rebury this material will be kept to a practical minimum.

When elevated areas of surface radioactivity have been removed, filtercake profiling and sampling is completed and contaminated soil has been reburied, spoils from the recent creek cleaning may be spread over the radiologically affected area of the site. Following the completion of all Site work defined in this Characterization Work Plan, reseeding may be performed at NWI's discretion.

3.8 EVALUATION OF ADDITIONAL SITE DATA NECESSARY TO VERIFY THE DOSE ASSESSMENT

To refine certain parameters in the dose assessment model, additional soil samples will be collected and evaluated, and additional local data will be acquired from publicly available sources. Specifically, on-site soil samples will be collected and evaluated for soil density and soil chemistry. This data will also be used to calculate site specific values for other parameters such as soil porosity and distribution coefficient. Additional local data will be sought regarding the depth of water wells, evapotranspiration, runoff and irrigation. Each of the these parameters and associated determination methods are discussed further below.

Soil Density: Project personnel will collect soil samples and will send away for laboratory analysis or will perform in-situ analyses. Either method will utilize methods such as ASTM 1992, a-o; Department of the Army (DOA) 1970, Appendix II; or equivalent. NWI will also conduct soil "naming" using USDA methodology for sand/loam/silt/clay ratios.

Soil Porosities: Soil porosity values will most likely be calculated, using the information obtained in the soil density determinations, using formulas from RESRAD Data Collection Handbook, Sections 3 and 4. These formulas are consistent with DOA (1970), Appendix II.

Soil Chemistry: Project personnel will conduct laboratory analyses "IC" and "ICPM" scans primarily using EPA SW846 methods for elemental constituents, bromides, chlorides, fluorides, sulfates, nitrates, nitrites, PH, etc.

Distribution Coefficient: Project personnel will determine distribution coefficients using RESRAD Data Collection Handbook, Tables 32.1 and 32.2; RESRAD Manual, Appendix E, Table E.5; using information obtained regarding soil type and chemistry.

Well Depths: Well depths will be determined by collecting data on local wells.

Evapotranspiration: Evapotranspiration values will be determined using area-specific National Weather Service and USGS literature.

Runoff: Runoff values will be determined using area-specific USGS literature.

Irrigation: Irrigation parameters will be based on data collected from nearby farms.

3.9 DEMOBILIZATION AND SITE RESTORATION

When it is determined by the NWI and NES Project Managers that Work Plan activities have been satisfactorily completed, Site personnel will be demobilized. Demobilization will serve to terminate on-site operations in an efficient and safe manner and will be managed by the NES Site Supervisor. These activities will include:

- Debriefing of personnel,
- Packing and shipping instrumentation and equipment off site,
- Proper notification and oversight for the termination of site services,
- Oversight for the break down and removal of temporary site facilities,
- Final arrangements with NWI,
- Verification of the safe and secure condition of the site, and
- Return travel.

4.0 QUALITY ASSURANCE

NES Document No. 80A9086, "*Quality Assurance Manual*" (Reference 3) and a project-specific Quality Assurance Program Plan (QAPP) will be implemented during the performance of activities defined in this Work Plan. Also, work will be performed in accordance NES corporate and site-specific plans, procedures, and policies. Project-specific Quality Assurance (QA) considerations will be specified in the QAPP and, for example, may address the following:

- The availability of controlled copies of all pertinent plans and procedures on-site for the duration of the project.
- The maintenance of field logs in accordance with NES procedures. The information contained in these logs normally includes dates, times, training, meetings, work activities, weather conditions, sample data and other information relevant to site activities.
- Sample collection, handling, chain of custody preparation and packaging & shipping in accordance with established NES procedures.
- Documentation maintenance requirements in accordance with the NES procedures on record keeping and retention.

5.0 HEALTH AND SAFETY

5.1 INDUSTRIAL HEALTH AND SAFETY

The NES *Health and Safety Plan* (Reference 4) will be implemented during activities defined in this Work Plan. Health and safety concerns specific to this work will be addressed and acknowledged by all personnel that are to be permitted access on-site. Project specific considerations, for example, may consist of:

- The level of protection for personal protective equipment (PPE). This may consist of long pants, steel-toed shoes, safety glasses, a hard hat, leather gloves and any additional PPE required or recommended by a Health Physics Technician.
- An investigation into the existence of underground utilities, services, or other type of subsurface interference or hazard prior to the commencement of any subsurface drilling activities.
- Particular attention to the hazards associated with the operation of heavy equipment, such as drilling mechanisms and excavators.
- Site Safety (Daily Tailgate) Briefings, conducted to review completed work, scheduled work, any past or potential problem areas and to ensure that personnel are continually cognizant of the safety of all involved. Such briefings may be held more frequently at the discretion of the NES Site Supervisor.

5.2 RADIATION PROTECTION

Work will be performed in accordance with the requirements of NES and site specific plans and procedures that address radiological control and safety. Project specific considerations, for example, will include the following:

- **Personnel Dosimetry**. Based on available characterization data, radiological conditions at the Site do not necessitate the monitoring requirements of 10CFR20.1502, "*Conditions Requiring Individual Monitoring of External and Internal Occupational Dose.*" However, radiological conditions will be monitored on an on-going basis throughout the duration of the project for dosimetry considerations.
- **Radiation Work Permits (RWPs)**. The RWP work control system will be utilized as the means for providing administrative control under which work at the Site will be performed. RWPs are prepared and approved by the NES Site Supervisor prior to the start of work activities. RWPs will be updated or re-issued as project conditions warrant.
- **Air Sampling.** Air sampling will be performed during drilling, excavation or grading activities if conditions create a potential for airborne radioactivity. In addition, NES will employ available methods during these evolutions to keep airborne levels of dust down to a minimum. Typically, if measured air concentration meets or exceeds 10CFR20, Appendix B, Table 1, Column 3 concentrations for unknown alpha emitters (2E-13 µCi/ml), work activities will cease and personnel will leave the immediate area. Suspension of the activity that is suspected of causing the increase in airborne

concentrations remains in effect until the cause is determined and corrective actions are instituted.

- Examples of corrective actions may range from the moistening of materials that are being disturbed, to modifying the plan to relocate the sampling activity. The NES Site Supervisor will authorize and verify the effectiveness of corrective actions prior to the resumption of activities. The NES Site Supervisor will notify the NES Project Manager and NES Corporate RSO of any situation involving elevated airborne concentrations.
- **Personnel Monitoring.** Project personnel exiting the Site are surveyed with a Ludlum Model 2220/44-9, or equivalent, for beta/gamma contamination. Any detectable activity above background levels are surveyed with a Ludlum Model 2220/43-5, or equivalent, for alpha contamination. Affected areas of clothing or skin are decontaminated until levels are indistinguishable from background levels. Any personnel contamination will be documented in the field log and immediately investigated to determine if corrective actions are warranted. These actions may involve utilization of engineering controls, increasing PPE requirements, performing additional personnel training, instituting additional radiological controls or invoking procedural modifications. In addition, the NES Corporate RSO will be notified in the event of any skin contamination incident.
- **Bioassay Program.** Air quality will be monitored routinely during excavation or other soil-disturbing activities. If air sample analyses indicate airborne radionuclide concentrations in excess of the appropriate Derived Air Concentration value(s) specified in 10CFR20, the Project Health Physicist will initiate an investigation. The Project Health Physicist will require the collection and analysis of urine and or fecal samples as part of the investigation if a committed effective dose equivalent (CEDE) of 10 millirem is suspected for any individual.
- **Material and Equipment Monitoring.** Material and equipment exiting the Site will be swipe surveyed for removable contamination and directly frisked with a Ludlum Model 2220/44-9, or equivalent, for total beta/gamma contamination. Any material with detectable activity above background levels is surveyed with a Ludlum Model 2220/43-5, or equivalent, for alpha contamination. No material or equipment will be released if contamination levels exceed the limits specified in NRC Policy and Guidance Directive FC 83-23 , *"Guidelines for Decontamination of Facilities and Equipment Prior to Release for Unrestricted Use or Termination of Licenses for Byproduct, Source, or Special Nuclear Material"* (Reference 5). These limits are presented in Table 5-1, below. It is anticipated that any items requiring decontamination may be decontaminated as necessary using conventional methods such as wiping or light abrasive cleaning with industrial grade cleaning agents. Items that cannot be decontaminated to meet the stated release criteria will be packaged appropriately and disposed of as radioactive waste at a licensed waste disposal facility.

Table 5-1
CONTAMINATION GUIDELINES

NUCLIDE	AVERAGE [b c]	MAXIMUM [b d]	REMOVABLE [b e]
U-nat, U-235, U-238, and associated decay products	5,000 dpm/100 cm²	15,000 dpm/100 cm²	1,000 dpm/100 cm²
Th-nat, Th-232, Sr-90, Ra-223, Ra-224, U-232, I-126, I-131, I-133	1,000 dpm/100 cm²	3,000 dpm/100 cm²	200 dpm/100 cm²

[a] Where surface contamination by both alpha-and beta-gamma-emitting nuclides exists, the limits established for alpha-and-beta-gamma-emitting nuclides should apply independently.

[b] As used in this table, dpm (disintegrations per minute) means the rate of emission by radioactive material as determined by correcting the counts per minute observed by an appropriate detector for background, efficiency, and geometric factors associated with the instrumentation.

[c] Measurements of average contaminant should not be averaged over more than 1 square meter. For objects of less surface area, the average should be derived for each such object.

[d] The maximum contamination level applies to an area of not more than 100 cm².

[e] The amount of removable radioactive material per 100 cm² of surface area should be determined by wiping that area with dry filter or soft absorbent paper, applying moderate pressure, and assessing the amount of radioactive material on the wipe with an appropriate instrument of known efficiency. When removable contamination on objects of less surface area is determined, the pertinent levels should be reduced proportionally and the entire surface should be wiped.

6.0 RADIOLOGICAL INSTRUMENTATION

6.1 ON-SITE RADIOLOGICAL INSTRUMENTATION

The radiological instrumentation and related equipment, or their equivalents, that will be utilized on-site during activities defined in this Work Plan are listed below in Table 6-1:

Table 6-1
RADIOLOGICAL INSTRUMENTATION

INSTRUMENT	APPLICATION
Eberline RAS-1 High Volume Air Sampler	Routine air sampling during site activities
Bicron MicroRem meter	Area dose rate measurements
Ludlum Model 19 Micro R meter	Area exposure rate measurements
Ludlum 2220 or 2221 scaler/ratemeter with Ludlum 44-9 beta/gamma probe	Beta/Gamma surveys, swipe and air sample counting
Ludlum 2220 or 2221 scaler/ratemeter with Ludlum 43-5 or 43-65 alpha probe	Alpha surveys, swipe and air sample counting
Ludlum 2221 scaler/ratemeter with Eberline SPA-3 2x2 NaI gamma scintillation probe	Area Gamma scans, sample counting, and downhole gamma logging

6.2 ON-SITE INSTRUMENT PROCEDURES

Instrumentation will be calibrated, maintained, operationally checked, utilized and have records maintained in accordance with established NES procedures. Records will include frequencies, methods, dates and source traceability. The following NES instrumentation and survey procedures will apply:

- NES Document No. 82A8008, "*General Radiological Survey Procedure*"
- NES Document No. 82A8030, "*Radioactive Source Accountability Procedure*"
- NES Document No. 82A8034, "*Calibration and Maintenance of Survey Instrumentation Procedure*"

7.0 REVISED RADIOLOGICAL EVALUATION OF THE BRECKENRIDGE DISPOSAL SITE

When all characterization, data collection, data evaluation and field activities have been completed, NES will prepare and submit a Revised Version of the "Radiological Evaluation Of The Breckenridge Disposal Site." This report will integrate the findings of this and previous characterization efforts along with historical site information. This revised report will be used as the basis for a refined Site dose assessment.

8.0 REFERENCES

1. NES, *Breckenridge Site Preliminary Dose Assessment*, 5/12/00
2 NES, *Radiological Evaluation of the Breckenridge Disposal Site*, 8/99
3. NES Document No. 80A9086, "*Quality Assurance Manual*"
4. NES Documents No. 82A8126, "*NES Health and Safety Plan*"
5. USNRC Policy and Guidance Directive FC 83-23, "*Guidelines for Decontamination of Facilities and Equipment Prior to Release for Unrestricted Use or Termination of Licenses for Byproduct, Source, or Special Nuclear Material*"
6. USNRC NUREG/CR-5849, "*Manual for Conducting Radiological Surveys in Support of License Termination*"