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RADIOLOGICAL HEALTH, SAFETY, AND ENVIRONMENTAL CONSULTING

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March 14, 2003

VIA FEDERAL EXPRESS

Gail P. Wilson, Esq.
Assistant Regional Counsel
USEPA
Region III
1650 Arch Street
Philadelphia, PA 19103

Dennis Matlock
On-Scene Coordinator
USEPA
Removal Enforcement and Oil Section
(3HS32)
401 Methodist Building
Wheeling, WV 26003

Re: Safety Light Corporation Bloomsburg Site
Administrative Order No. 03-2002-0196DC

Dear Ms. Wilson and Mr. Matlock:

In accordance with Paragraph 8.4 of the subject administrative order, the enclosures with this letter together constitute the Response Action Work Plan (RAP) for the project and are hereby submitted for your approval. The enclosures are:

- "Work Plan for Safety Light Corporation Bloomsburg, PA, Radioactive Waste Repackaging, dated February 2002";
- "Health and Safety Plan for Radiological Activities of the Response Action for Radioactive Waste Repackaging at Safety Light Corporation Bloomsburg, PA, dated February 2003, with Attachment"; and
- "April 25, 2002 Responses to Comments from the U.S. Environmental Protection Agency – Region III, transmittal from Larry Harmon to Sheri Minnick, with Attachments".

These documents describe the specific tasks to be performed to accomplish the requirements of the subject administrative order, the manner in which the response actions will be performed, the schedule for expeditious performance of the response actions, and the health and safety practices to be followed during the project. The responses to comments from your agency on the February 2002 Work Plan are included as clarification of that Work Plan. Any commitments stated in those responses are considered to be binding for the response action and are part of the RAP. The work performed in accordance with the RAP will also be in compliance with the applicable radioactive materials license for the site issued by the U.S. Nuclear Regulatory Commission, and with all amendments to that license.

Please contact me if you have any questions regarding this submittal or if you need additional information regarding this matter.

Sincerely,

John R. Frazier, Ph.D., CHP
Project Coordinator

Enclosures

cc:

B. Fewell, US NRC Region I
D. Allard, PA DEP
D. Hogeman, PA DEP
S. Prewett, Solutient
K. McArdle, RFBC

RESPONSE ACTION WORK PLAN (RAP)

Safety Light Corporation Site
Bloomsburg, PA

Submitted by:
Safety Light Corporation

March 14, 2003

RESPONSE ACTION WORK PLAN (RAP)

- **Work Plan for Safety Light Corporation, Bloomsburg, PA, Radioactive Waste Repackaging, Prepared by Solutient Technologies, February 2002.**

- **Health and Safety Plan for Radiological Activities of the Response Action for Radioactive Waste Repackaging at Safety Light Corporation, Bloomsburg, PA, March 6, 2003.**

- **Responses to Comments from U.S. Environmental Protection Agency, Region III, on the February 2002 Work Plan, April 2002.**

Work Plan

For

Safety Light Corporation
Bloomsburg, PA

Radioactive Waste Repackaging

Prepared by:

Solutient Technologies
7857 Freedom Avenue, NW
North Canton, Ohio 44720

Phone: (330) 497-5905
Fax: (330) 497-2045

February 2002

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Introduction

The tasks outlined in this Work Plan are needed to assure proper segregation and packaging of wastes to meet disposal site waste acceptance criteria and to assure good health and safety practices during the segregation and packaging activities. Solutient will perform all on-site work in accordance with the approved Health and Safety Plan and the Quality Assurance Plan. These Plans are available for review upon request.

This Work Plan provides details of the onsite work to be performed at Safety Light Corp. in Bloomsburg, Pennsylvania. Procedures for specific tasks or a description of the work will be provided in the Solutient Technologies Radioactive Work Permit (RWP). A project RWP set will be provided upon approval of the Work Plan and prior to commencement of radiological activities at the site.

1.0 HEALTH AND SAFETY POLICY

Solutient Technologies (ST) provides every employee with a safe working environment. ST maintains a safe environment for all employees and establishes sound safety practices to eliminate conditions, which may cause injury or damage.

Maintaining safe working conditions and taking immediate steps to correct unsafe conditions and practices is the responsibility of all management and supervisory personnel. All employees are required to work in a safe manner and to bring any unsafe conditions or practices to the attention of their supervisors. Safety requirements are not reduced in order to achieve operational efficiencies.

ST instructs, trains and motivates its employees and subcontractors to recognize and to avoid unnecessary risks of illness or injury that may be encountered in the performance of their jobs or personal activities.

ST develops, operates, and maintains all of its facilities and equipment in a manner that protects the health and safety of ST employees, subcontractors and the public, minimizes the risks of accidental damage or loss, and prevents harmful environmental effects.

2.0 ORGANIZATIONAL STRUCTURE

Solutient's experienced professionals employing a project-oriented organization manage all remediation projects. The project team is dedicated to the project and is supported by matrix specialists. The project team aids the program manager in meeting all project requirements. The on-site project manager's focus is customer-oriented, whether the customer is one of the remediation workers in relationship to his individual exposure, or one of the regulatory agencies. The Sr. Scientist assists the on-site project manager in any areas of concern. The senior scientists will serve as the quality assurance manager for the project including, but not limited to measurements of radiation levels and the types and amounts of radioactive material encountered during each phase of the project. The Senior Scientist will also provide other assistance as requested by the on-site project manager. This team effort will provide the safest work environment possible, assure that the remediation site remains in compliance with all regulations and standards, and enable the project to be completed on time and within budget. Collectively, team members have a number of years of experience in project management. An organizational Chart for this project is shown as Appendix 1.

Mr. Steven M. Pocock, President of ST, is the primary contact for all project contractual issues.

The Project Manager/RSO is Mr. Stephen V. Prewett, Ph.D. Dr. Prewett is responsible for all site-specific license and regulatory items. Dr. Prewett has extensive experience in radiological remediation and has served as the project manager on several ST remediation projects. Mr. Brad Squibb, ST's Corporate Radiation Safety Officer (RSO), will assist Dr. Prewett with these mentioned activities.

Assisting Dr. Prewett in the roles of Technical/QC Director and Senior Scientist are Mr. Leslie Cole and Dr. Raymond Holmes respectively. Both are Certified Health Physicists with extensive experience in health physics, measurement and management of the radionuclides and chemicals of concern that are found at Safety Light Corporation. Both have over 30 years of experience and have published numerous technical papers. Mr. Cole serves as the Chair and Dr. Holmes serves as the Vice- Chair for the ALARA committee.

Mr. Dell Reuss, ST's Operations Manager, will support the project manager with any requests for materials and/or instrumentation. Dr. Prewett and Mr. Reuss will coordinate segregation and repackaging activities related to the project.

Mr. Dan Rossenhagen, on-site supervisor will supervise all daily activities with the assistance and direction from the Project Manager.

Mr. Scott Rose, ST's Lab Manager, will be responsible for all instrumentation and calibration activities for this project.

3.0 HEALTH AND SAFETY ISSUES

An organizational site visit was held during the week of November 12, 2001. Specific potential safety hazards identified for this project are:

- Working with Cs-137, Sr-90, Ra-226, and potential unknown sources with exposure rates > 200mrem/hr
- Material handling
- Heavy equipment operation
- Unstable walking and working surfaces (slip, trip, & fall hazards)
- Frost bite (Weather conditions)
- Broken glass
- Rusted metals
- Electrical hazards
- Air handling issues
- Potential unknown chemicals
- Heat /cold related illness or injuries to personnel

ST's Health and Safety Plan addresses each of these hazards and will be reviewed with all project related employees prior to the start of any on-site activities.

4.0 TRAINING & MONITORING

All personnel will receive site and job specific training in accordance with a training matrix indicating the general level of training shown as Appendix 2. Protective equipment for different levels of hazards will be established and identified in each RWP for specific tasks during segregation and repackaging activities. The requirements of the matrix can be modified by either the project manager or the ALARA committee as required to meet site conditions. All ST employees that will actually process the waste will possess current 40-hour HAZWOPER training for the project. All personnel involved in the project will receive site-specific training appropriate for their specific duties. Topics to be covered during worker training for this project are shown below. A training outline is shown as Appendix 2.

4.1 Occupational Health and Safety

- Emergency response procedure
- Working around heavy equipment (Forklift or similar unit)
- Lifting - individual
- Electric hand tools
- Heat/cold related illness/injury
- Personal protective equipment
- Reporting accidents
- Medical treatment/first aid
- Fire Control/Fire Extinguishers

4.2 Radiation Safety

- Working with Cs-137, Sr-90, Ra-226
- Radiation fundamentals
- Measurement/control of external and internal exposures
- Bioassay program
- Unknown material identification

4.3 Personal Protective Equipment

Personal Protective Equipment (PPE) will be selected based upon the potential hazards determined for the project (and as required by project specific RWP's). All PPE will be approved by the applicable agency (i.e., ANSI, NIOSH, etc.) and will include:

- Safety boots
- Gloves
- Safety glasses
- Coveralls, Tyvek, over garments

- Respiratory protection for workers performing tasks that require a respirator (RWP will specify each worker)
- Hearing protection (if required)

4.4 Medical Surveillance

All site personnel working in the controlled area that have the potential to be exposed to more than 25% of the DAC for the area will be required to have up-to-date medical surveillance that includes an assessment to wear respiratory protection, including a fit test.

4.5 Personnel Monitoring

Personnel monitoring will be performed for exposure to radiation/ radioactivity and where there may be a question of employee exposure to hazardous substances or concentrations of materials. All personnel will frisk hands, feet, and body when leaving any controlled areas.

4.6 Emergency Communication, Medical & Incident

- Major Spills / Incidents – Phone -
- Radioactive Spills / Phone –
- Medical Emergency / Phone (Nurse) Phone –
- Safety Issues / Phone -
- Health & Safety / Phone -
- Fire / Phone –

Note: These numbers will be presented during initial briefing and posted at various job locations

4.8 RWP Management

- RWP Development and approval
- Effective duration
- Daily sign in requirement
- Change notification
- ALARA review

4.9 Potential Project RWP's

A series of RWP will be generated for the management of radioactive materials for the project. They will cover all the activities from the initial evaluation of containers at their storage location to the final storage pending disposal. A draft set of these will be prepared for the initial training. The lack of detailed information about each container will not permit any RWP except the initial field assessment to become final. The rest of the RWP package will become final as site specific data is generated. ST fully expects these RWP's to be revised or replaced as new conditions are encountered.

Expected Site RWP List:

- Initial container survey
- Container transport
- Container assessment and sampling
- Container sorting
- Waste packaging
- Waste transport and storage

5.0 COMPREHENSIVE WORK PLAN

All open-container and material handling activities will be conducted in an environmentally-controlled area inside the existing process building originally constructed by a previous contractor. Currently, the structure does not meet the minimum requirements to perform the proposed work and will require major modifications prior to the commencement of work.

The following information describes the activities required to properly prepare the process building, implement the appropriate health and safety procedures involving work with radioactive and potentially hazardous materials, and insure the effective completion of all proposed work without any risk to personnel, property and the environment.

5.1 Process Area Set-up

The process area will have a 4-inch thick 30-foot by 40- foot concrete pad poured over a portion of the existing packed rock floor. On the concrete pad there will be a 20-foot by 30-foot containment area, where the actual segregation and repackaging of materials will take place. These areas are shown in Appendix 3, Process Area Layout. This segregation and repackaging project **will not** include taking up the concrete floor or anything beneath.

The containment will be constructed out of wood and 6 ml plastic. The containment area will have two portable HEPA ventilation systems. One system will draw on the general controlled area, and one system will be drawing air at the repackaging location within the controlled area. Both of the units will discharge outside of the containment area, to create a negative pressure within the containment area.

For transferring and sorting materials within the containment area, a drum-dumper or material-handling device such as a hoist will be utilized when emptying and sorting the contents of 55-gallon drums. B-25 boxes that need to be completely emptied will first have their lid removed and replaced with a multi-section lid. Each section will be held in place with an individual binder. The box will then be laid on its side and one section of the lid slowly removed to allow the contents to empty on the sort tray.

These contents will be manually segregated and placed in proper containers.

A number of floodlights will be utilized on the ceiling to provide lighting within the containment areas. Ground fault interrupters will be provided for all circuits that have a potential to contact water. Fire extinguishers will be provided in all areas where required. Selected work area floor will be covered with either 6 ml plastic or canvas whichever is more practical to facilitate project closure.

There will be a process area outside the containment area where materials with limited contamination and limited material handling requirements will be segregated and repackaged. Contamination Control boundaries will be established as well as a change line for the removal of first layer of PPE at the containment area boundary. An egress area leading to the control line will be used where the remaining PPE will be removed and personnel will perform final contamination surveys of the skin and clothing. All entrances to the containment area will be closed with curtains or similar systems except during personnel or equipment entry or egress. The overall structure will have six HEPA units running during the daily operation. All ventilation will be exhausted via a stack with appropriate air sampling.

5.2 Area Set-up

Set-up will consist of establishing daily requirements for health and safety and radiation safety operations which will also be covered in the site RWP. Work areas will be defined and monitoring requirements will be established (See Site Map Appendix 4 and Site Material Flow Diagram Appendix 5). The contamination control zones as described in Section 5.1 will be established.

5.3 Identification of Containers

Prior to containers being transported to the processing area, they will be identified with an identification number that will be cross-referenced to the container-tracking log provided by Safety Light Corp. The external exposure rate at contact with the surface of the container will be measured and recorded on the container tracking log prior to the containers being transported to the appropriate staging area for processing. As the containers are being repackaged, a new Waste Container Master Log (Appendix 6) will be generated for all containers along with a Waste Packaging Check Off List (Appendix 6) for each container. Each new container identification number will be will be cross-referenced to the original container number from the Safety Light Tracking log.

5.4 Transportation of Containers

All containers will be transported by the use of a yard truck or forklift. Drums will be transported on a skid. They will be banded to assure they do not fall or tip. Single drums may be transported with a drum lifter. All boxes will be carried on the forks of the lift trucks or similar unit. Forks will be opened as wide as possible and the load may be strapped to the carrier to prevent loss over uneven areas.

5.5 Processing of Containers

All containers will be pre-surveyed prior to the container being moved or opened. Each container will be smeared, counted for gross alpha-beta contamination and recorded on a Smear Record Survey Form. ST will confirm the dose rates from the container and the physical condition of the external surfaces of the container. Container exterior surfaces will be smeared for removable contamination during the pre-survey. Initially, only containers having low external dose rates will be processed to verify the operational flow. When the container is placed in its proper processing area, the lid(s) will be prepared for removal. As the lids are initially opened there will be RCRA screening performed utilizing an HNu or similar device. Observations will be logged on the waste-processing sheet, Appendix ( ) in an area designated for survey data. Once it is deemed safe to remove the lids, radiological samples will be collected. The sampling retrieval are contingent on material composition inside each container, i.e.; material removal for lab analysis (soil, sources, liquids), and smears. External dose rates and removable contamination survey results will be reviewed to assure that the radiological concerns of the materials are known prior to handling and sorting/sampling and are within the limits set by the RWP.

Almost all of the containers are currently stored outside and are exposed to the elements. The presumption by Safety Light is there is no moisture within these wastes. Absent a more detailed waste inventory from the contractor thatpreviously filled the containers, it is possible there may be enough moisture present to allow soil-like materials to freeze into a solid mass. If this condition is encountered, ST has several options to manage this situation. The most straight-forward approach is to move a supply of containers into the gray zone and allow them to thaw. This could adversely impact exposure rates if the container contains material having high dose rates. More aggressive methods such as direct heating of the container may be used to reduce exposure durations provided that the RCRA sampling indicates there is no fire or explosion hazards.

55 Gallon drums:

Soils within containers will be sampled for waste characterization analysis outside the containment area in the process area. Samples collected will be

staged for later processing as a composite sample of like materials in accordance with applicable waste characterization criteria. Any 55-gallon drums containing materials requiring segregation will be staged in the containment controlled area. These drums will be surveyed for RCRA wastes and radiological contamination. The container will be emptied and the contents will be sorted by category; Dry Activated Waste (DAW)/concrete, soil-like materials, radionuclide and source types for proper packaging at designated disposal facilities. As containers are repackaged a unique identification number will be assigned to each container. These numbers will also be used to identify all samples for the sample packing sheet. Lids will be secured prior to movement of the containers from the area. The unique control/tracking number will be placed on the container using a paint pen or indelible marker. These markings will be placed on the lid and at least one location on the side of the container. A copy of the waste packaging sheet, Appendix ( ) will be attached to the container.

Boxes B-12/25

External dose rates will be measured in contact with each B-12/25 container and recorded prior to staging. Removable contamination surveys will be performed, and results of these surveys will be recorded on a Smear Survey Sheet. Based on the radiation measurement data collected (high dose vs. low dose) and the physical nature of the material inside the container, they will be staged in the controlled areas. Limited segregation of DAW and concrete will take place in the process area while the containers are being sampled for waste characterization analysis Plastic will be laid on the floor next to the container. DAW type material will be removed from the container and placed on the plastic to gain access to 100% of the materials for sampling for waste characterization analysis. The materials (DAW) will be sampled along with any limited soil or concrete type materials. All items placed into new containers for segregated wastes will be listed on a waste packaging sheet, which will be created for each new container. Containers will be marked with a unique identification number in the same manner as drums. All new packaging logs will refer to the containers original tracking log number. Containers that need to be handled in the containment area as indicated by elevated external dose rates in contact with the container or its contents, will be staged in the front of the area where each container will be surveyed and then sampled for RCRA materials. Once these concerns are addressed the container can be prepared for processing.

A general Process Material Flow Diagram is shown as Appendix 7.

High Activity Containers

There are several containers that have external dose rates greater than 200 milliroentgen/hour (mR/hr). These containers will present added difficulties in processing. Using the knowledge developed in processing containers having lower external dose rates, ST will develop a separate, detailed RWP containing step-by-step instructions for processing containers having higher external dose rates. The RWP will have specific exposure limits for processing of each container. In addition to the RSO approval, this RWP will have specific ALARA committee review and approval.

The step-by-step instructions in the RWP will be rehearsed by the processing team to assure that the exposure limits can be met and that the materials in each container can be safely repackaged. If the external dose rates due to the contents of the container exceed the dose rates upon which the RWP was based, the container will be closed and secured for additional evaluation. The process will be repeated as required to meet unexpected conditions.

5.6 Sampling Plan for Profiling of Waste

As the materials are processed there will be representative samples collected to characterize each waste stream. As containers are repackaged, representative samples of the contents will be collected and marked with unique identification numbers. There will be some pre samples, which will be collected and sent out for specific RCRA / radiological analysis. The remainder of the samples will be held for composite samples for the actual waste characterization analysis of each waste stream. All radiological analyses will be done on-site for sources, dials, and foil to determine the activity. The allowable activity will be packaged in each 2R container for disposal.

All project waste disposal sites with the exception of WCS maintain a list of laboratories for the purpose of sample analysis services approved for waste acceptance determination. Those labs are identified below, and are the intended labs to be utilized on this project:

General Engineering Laboratories
P.O. Box 30712
Savage Road – 29407
Charleston, SC 29417-2040
843-556-8171

Mountain States Analytical
1645 West 2200 South
Salt Lake City, UT 84119
800-973-6724

Eberline Services
P.O. Box 846001
Boston, MA 02284-6001
505-254-0955

Energy Laboratories
2393 Salt creek Highway
P.O. Box 3258
Casper, WY 82602
307-235-0515

Jordan laboratories
P.O. Box 2552
Corpus Christi, TX 78403
361-884-0371

Severn Trent Laboratories
P.O. Box 7777
W4305
Philadelphia, PA 19175-4305

Thermo Nutech
Drawer CS
Box 100581
Atlanta, GA 30384-0581
505-345-9931

Barringer Laboratories, Inc.
15000 West 6th Avenue
Suite 300
Golden, Colorado 80401-5047
800-654-0506

O'Brien & Gere Laboratories, Inc.
5000 Brittonfield Parkway
Suite 300, Box 4942
Syracuse, NY 13221
315-437-0200

WCS allows the customer to select a lab provided it is approved to perform the required analysis. A copy of this lab analysis is provided for the disposal sites review and acceptance as part of the disposal process. These labs are all certified and provide the typical QC reports. These reports note any lab QC deficiencies or failures and upon receipt of any such negative report, would remove any laboratory from our approved list immediately. Under routine circumstances, ST will provide a review function for any outside lab, although the final approval of laboratory results is obtained from the disposal site through their acceptance of the waste profile.

5.7 Packaging of waste

As each container is prepared to be repackaged, the container will be inspected to assure there are no holes and that the condition of the container meets strong tight and transportation requirements. Absorbent material will be added to each container at the bottom and top to assure that moisture from condensation is absorbed. A Waste Packaging Check Off List for each container will be prepared and the unique identification number will be recorded on the Waste Container Master Log. Materials will be packaged in five different categories as listed below.

WASTE STREAM	ST PACKAGE CONTAINER	EXPECTED WASTE DISPOSAL SITE
Ra-226	2R Container	Richland, WA
Sr-90	2R Container	Barnwell, SC
Cs-137	2R Container	Barnwell, SC
DAW/Concrete	B-25 Box	Envirocare, UT / WCS, TX
Soil-like Materials	55 gal / B-25 boxes	Envirocare, UT / WCS, TX

Note: (1) Exempt levels of material can be shipped to WCS as long as the material meets the disposal sites WAC. Materials exceeding exempt levels must go to Envirocare of Utah.
(2) Solutient is not required to obtain burial site permits as part of this contract. Permit issuance is considered part of the disposal phase and should be handled by SLC or their waste disposal contractor.

5.8 Labeling of the Waste Packages

All containers will be labeled with unique ID numbers and gross weight. Then, based on the actual materials and activities, labels will be marked in accordance with all applicable state and federal transportation requirements.

5.9 Final Package Staging

The B-25 boxes containing DAW/Concrete will be labeled with unique ID numbers, banded and staged for final disposition to WCS or Envirocare

based on exempt or non-exempt levels. All 55-gallon drums of soil-like materials will be labeled, placed on skids, banded, and then staged for disposal at WCS or Envirocare.

Since there are a number of potential concerns with 2R container waste, a different plan will be utilized. When a container is filled and the inventory and activity documents prepared, this information plus the waste profile will be presented to the QA contractor for review and approval. The container will be held without the 2R container sealed and the final layer of concrete placed pending approval. This will allow physical verification if desired and any addition or removal of material with out damage to the container and minimal exposure. When approval is granted, the cap will be sealed and the final layer of concrete placed. The completed container will be placed on a skid and banded for eventual shipment for disposal at Richland, WA or Barnwell, SC.

6.0 SPILL PREVENTION

While materials are being removed from their respective containers, personnel will work on one B12/B25 box or two drums at a time. This will reduce the potential for large spills occurring. In the event of a small contamination spill, the material will be picked up with the appropriate hand tools and safety equipment and placed in a container for further analysis as required.

During the removal and transport of material from one area to another precautions will be taken to ensure that loose contaminants will not be spilled or otherwise dispersed. Items coming from the container staging area will be secured so that they will not fall off the skid while being transported by yard truck or forklift. B-25 boxes will be transported with the forks spread as far apart as possible. Strapping the container to the transport device may provide additional protection and will be considered on a case-by-case basis. The RWP will outline proper controls for spill prevention and response.

7.0 SITE EMERGENCY RESPONSE

Medical emergency - For any medical emergency ST personnel will notify the Project Supervisor who will be on-site. The Project Supervisor will notify the designated Safety Light representatives as soon as practical. Care will be taken to ensure decontamination or containment of contaminants on an injured person. However, personnel involved shall understand that contamination on an injured person is secondary to serious physical injury. In the event an injury requires transport to a medical facility without the removal of PPE and frisking, ST will send appropriates employees and survey equipment to decontaminate the individual and prevent the spread of any radioactive material.

Non-medical emergency - This could include a spill, high radiation alert or fire not resulting in injury to personnel.

For an emergency on-site, ST personnel will contact the designated Safety Light Corp. on-site project manager. This individual will coordinate with other agencies upon arrival at the scene.

Evacuation plans, which include hospital routes and emergency procedures will be reviewed by all personnel prior to entering the work areas. Fire extinguishers will be provided at the work site. An air horn will be provided to signal an emergency evacuation.

8.0 RADIATION SAFETY PLAN

8.1 ALARA

All work will be undertaken with the As Low As Reasonably Achievable (ALARA) philosophy in the forefront. Each work task will be planned and carried out so that on-site personnel are not only protected from unnecessary exposure, but that the waste processing effort will result in the work area remaining clean so that future exposures are also ALARA. ST has a formal ALARA review committee that will review the project prior to the start of on-site operations. The committee will also review the initial RWP's and any significant modifications.

Whenever practicable, additional shielding of work areas will be installed to control external doses to workers. While it is not yet possible to determine the maximum exposures within the waste containers, this shielding will be used to minimize exposures during the project.

It is possible that the container may be shielding a very high activity source inside the waste that will be discovered during the sorting process. Shielded containers will be provided with immediate access to store any item that exceeds planned exposure rate limits. Should this occur, employees will exit the area after storing the item until appropriate review and planning can be completed. Most of the activity is expected to be contained in discrete objects. Various tools, such as tongs, will be used to maximize the distance from the operator and the object during handling.

8.2 Training

An initial training session will be conducted with all personnel involved with the project (see Section 4.0 for personnel training). Training will focus on radiation safety and use of RWP's, as well as, site-specific safety considerations. Additional on-the-job training is expected to continue as needed for technical personnel (See Appendix 2 for the outline to use during training). All training will be documented, including session content, attendance, and performance on any tests/quizzes.

8.3 Air Sampling

Daily air sampling will be conducted to determine airborne radiological conditions and potential worker intake. All activities involving metal cutting, breaking of concrete and other activities where airborne particulates could be generated will have representative monitoring performed with personal breathing zone (BZ) samplers. This data will determine the need for further control measures.

8.4 Bioassay

All personnel directly involved with handling radioactive material will submit to a urinalysis program for Ra226 and Sr90. Baseline bioassay samples will be collected from each employee prior to beginning on-site work. These samples will be sent to an accredited laboratory for analysis. Any in-process samples will be run for Ra226 only. Any positive results will be followed up with a sample for Sr90. All exit samples will be run for Ra226 and Sr90.

Ra226 is expected in discrete sources and soil, Sr90 is expected to be found in discrete sources only.

8.5 Thermoluminescent Dosimeters (TLD)

TLDs will be provided to each person working at site. Extremity TLD's will be issued to individuals with the potential to exceed 10% of the allowable extremity exposure and will include each individual trained and authorized for entry in to the Control Zone. Additional TLD's will be posted on-site along the property line as area monitors during the project's duration. If possible, the background exposure rate will be measured before any waste is processed. TLD's will be collected and shipped to an outside vendor quarterly and/or at the end of the project for measurement. Dosimetry records for exposures received during the project will be made available to workers at the end of the calendar year. A dose rate meter (Micro R) will also be used to establish existing exposure rate at the property boundary and in on-site work areas. . Also daily pocket ion chambers (picks) will be used to monitor daily doses so the ALARA philosophy will be followed for each worker. All external dosimeter data will be recorded and evaluated for trends.

8.6 RADIATION WORK PERMIT (RWP)

Radiation Work Permits (RWP's) will be used to identify radiological conditions, establish worker protection, monitoring requirements and contain specified approvals for radiological work activities. RWP's serve as an administrative process for planning and controlling radiological work and informing the worker of the radiological conditions.

Due to the activity levels expected, it will be necessary to designate a controlled area boundary. An RWP will be posted at the boundary to define the necessary precautions for entry and exit. These precautions may include the following:

- Shoe covers
- Outer protective clothing
- Tyvek clothing
- Respiratory protection
- Supplemental Dosimetry
- Safety glasses
- Gloves

Containers will be placed at the entry/exit point to collect contaminated garments. Survey meters will be available for personnel monitoring. The results of each frisk will be noted in the control point log. This log information will become part of the final report.

Site workers will be expected to monitor themselves or be monitored by health physics personnel prior to leaving the project site. This also applies to any materials or equipment they may be carrying.

9.0 DECONTAMINATION

Decontamination of equipment and materials will be conducted prior to any items leaving the controlled area. It is possible that the actual processing of the waste may generate surplus containers. The first use of these containers would be to dispose of PPE that will be generated during the project. Should there be containers above this requirement, they would be packaged for disposal as radioactive waste.

9.1 Decontamination Criteria

The criteria for release are taken from 10 CFR 835, see Appendix 8, for surface contamination values.

Fixed and removable surveys of equipment and materials will include a 100 percent scan for fixed contamination and a representative number of smears.

Portable survey instruments equipped with pancake GM detectors and/or Ludlum 43-90 or equivalent detectors will be used to survey objects and those items with uneven surfaces.

All materials surveyed will be held on site for release until the appropriate documentation has been completed.

9.2 Material, Tools and Equipment Decontamination

Each item will have an initial survey performed. If gross amounts of contaminants are found, they will be removed and placed in a radiological waste container. Light residual materials will be dry vacuumed off with a HEPA filtered vacuum. These items will be wiped or scrubbed clean, and resurveyed. Any item not practical to decontaminate or survey will be disposed of as radioactive waste.

10.0 WASTE STAGING and PROFILE ACCEPTANCE

All contaminated materials will be packaged as radioactive waste, per instructions from ST personnel. All waste will be labeled, marked, and staged on site until all waste profiling is complete.

The WAC Matrix (Appendix 9) will assist ST personnel in determining the appropriate disposal packaging and labeling for final disposition of each container.

11.0 WASTE MATERIAL SCREENING / SURVEY AND SAMPLING

ST will conduct surveys and sampling of all materials.

11.1 Waste Material Screening

Initial screening of the waste containers will be done using a beta/gamma survey instrument to determine that radiation levels near each container are within acceptable limits. Initially, each item will be treated as an unknown. When the first of a kind for any item is discovered, it will be screened for beta radiation as well as have an isotopic analysis performed by an on-site NaI MCA. Both Ra-226 (its decay products) and Cs-137 have unique and easy to identify spectra. The MCA evaluation will be used to determine whether there are unidentified gamma emitters present.

Each unique item will be given a specific number and name. For example, item 17 might be listed as a 3-inch radium painted dial. A digital photograph of the item with its description will be made and supplied to the sort station and various other locations as required. The inventory sheet will contain a list of all these items as part of a standard format. All the person doing the sorting has to do is put a mark beside the item description as he places it in the container. This will speed the process and minimize exposure. The use of this system will insure that there is only one unique identification for each item and that every one uses the same identification.

After the initial identification is made, additional confirming items will be analyzed to insure there is not another item with the same physical appearance but different radiological conditions.

A conversion will be made from either dose rate or cpm to determine the activity. For Sr-90 sources, the net counts will be divided by the instrument efficiency to determine the dpm and the total activity. This is reasonable since the instruments are calibrated using an Sr-90 source. For Ra-226, the following dose vs. distance conversion will be used. If Cs-137 is present, a similar conversion will be developed.

11.2 Soil and Soil Like Material Sampling

Soil samples will be collected from individual containers. Sample size will be determined by the RSO. A trowel will be used to collect samples. The trowel will be cleaned of any visible material between uses. Samples will be collected in plastic bags and identified by container numbers and sample number. Sampling information will be entered into a sample logbook. Samples will be submitted at natural moisture content. Any samples sent off-site for analytical will have the appropriate chain-of-custody documentation.

A significant amount of information has already been provided on the chemical conditions of the material. What cannot be determined at this time is how consistent is the waste and how representative are the samples. Significantly less is known about the radiological conditions of the waste. Gamma emitters are fairly easy to identify and quantify with simple systems such as a NaI MCA system. Sr-90 in soil is a more difficult problem but is manageable. The first assessment is to assign all activity above background to Sr-90 and calculate the concentration. Providing the calculated concentration is well below the proposed disposal site WAC, this is acceptable. As the WAC is approached, then a more sophisticated analysis is required.

Any gamma spectroscopy analysis provided by ST will be performed utilizing a Canberra system using their standard software package. The system will be calibrated using a NIST mixed isotope source in the ST standard geometry container. The MCA system and associated algorithims will be managed by Mr. Cole, CHP. Mr. Cole will also review and approve all data prior to its use. The ST lab will perform quality checks such as standards, blanks and duplicates for each lot of samples.

11.3 Site Surveys

Periodic radiation surveys will be made to confirm that the controlled area is acceptable for the radioactive material present. Area contamination

surveys (smear surveys) will be performed to assure that controls are maintained on loose radioactive material within controlled areas and on containers leaving controlled areas. The results of these surveys will be documented and maintained in the project file.

11.4 Air Sampling

The material may be damp and airborne activity is expected to be minimal. To confirm this, area samplers and breathing zone air samplers will be used. Air sampling will be performed in the two main work areas using a RAS pump and breathing zone air sampler. One sampler will be used to monitor each process area. One additional sampler will be used as a fixed position unit located next to the stack discharge and will be sampling discharge. All results will be documented and maintained in the project file.

11.5 Smear Samples

Smears will be taken to document that the outside of the shipping containers meet transportation requirements and that material being released, meets the release criteria. Smears will be counted on-site using a Ludlum 2241-2 or equivalent rate meter to determine alpha and beta/gamma activities on the smears. Smears will also be used to demonstrate whether radioactive material control procedures are effective in limiting the spread of radioactive material. The off-site lab instrument will be a Ludlum 2929 smear counter or equivalent to check results of some smears counted in the field. The results of all smear sample measurements will be documented and maintained in the project file.

12.0 QUALITY CONTROL

12.1 Quality Commitment

ST is committed to the highest level of quality in its environmental remediation work. This commitment extends to the entire work force. Every effort will be made to assure that all applicable standards, processes, procedures and regulations are followed to the completion of the project.

Mr. Cole, CHP will serve as the QC Manager for this project. He will independently review measurement systems and their implementation by project employees.

12.2 Survey and Sampling Quality Control

ST will conduct quality assessment by spot checking waste material using duplicate materials to compare results.

Survey instruments will be calibrated using manufacturer's procedures. Daily checks will be conducted using a known source to verify instrument response.

12.3 Record Keeping

All records, including field logbooks, will be checked by the Project Manager or his designee for completeness and legibility. All records generated during the project will be retained and will be consolidated and made part of the final report to Safety Light. The QC manager will verify the sample analysis records.

13.0 SCHEDULE

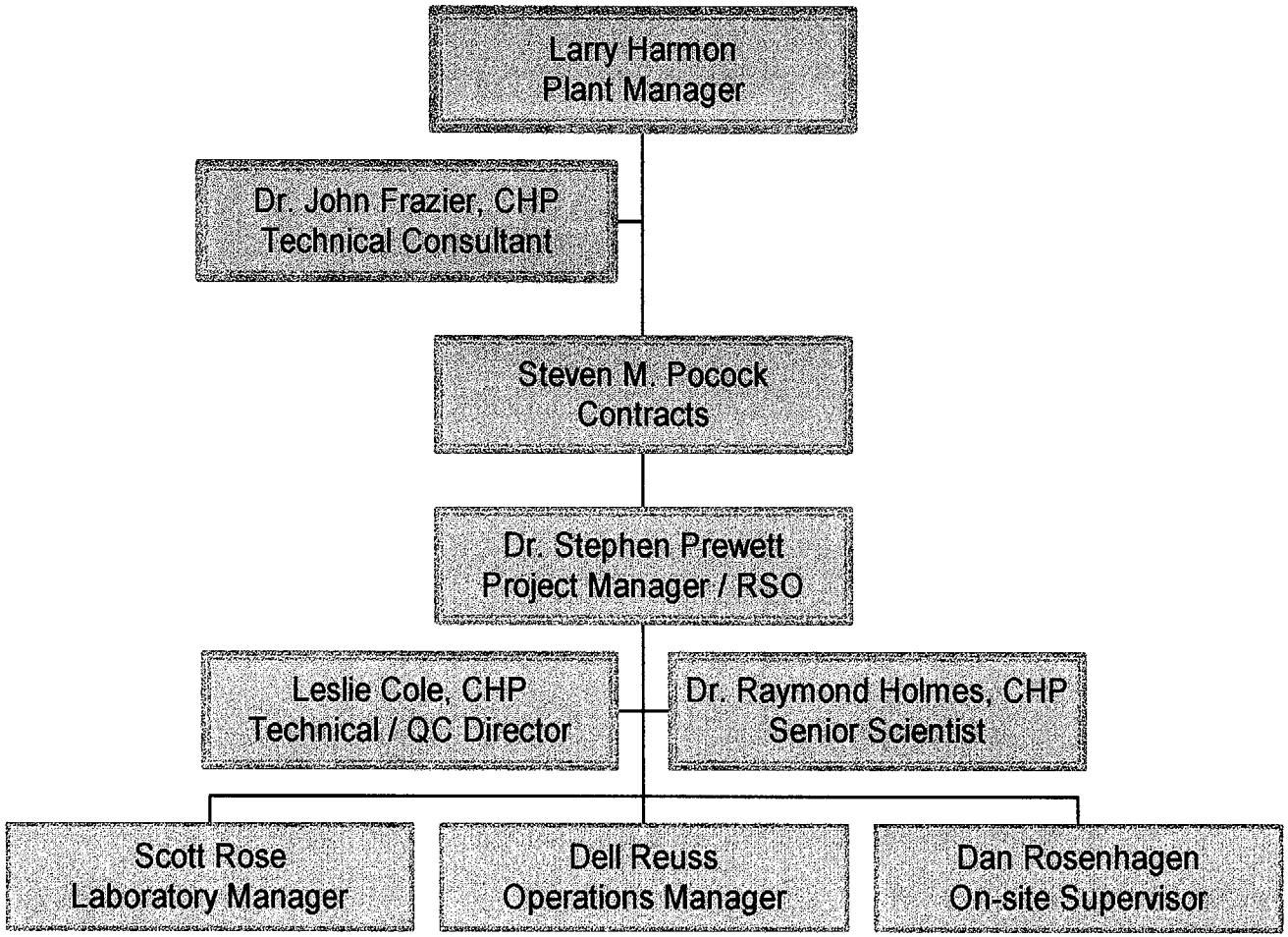
Personnel will work Monday through Friday on schedule of a ten (10) hour per day, five (5) days per week. Additional work periods may be scheduled with the approval of the Project Manager and RSO. It is possible that work involving high activity material may be scheduled during off shift hours to minimize the potential exposures.

Appendix 10 shows the Work Schedule by activity.

Appendix 1

ORGANIZATIONAL CHART

SAFETY LIGHT PROJECT



Appendix 2

TRAINING OUTLINE

Employee Safety Training Outline

I. Radiation Safety

- A. Inhalation Problems
  - 1. Sources
  - 2. Safety Measures
- B. Skin/Whole Body Exposures
  - 1. Sources
  - 2. Safety Measures
- C. Forms of Radiation
  - 1. Alpha
  - 2. Beta
  - 1. Gamma
- D. Radiation Work Permit (RWP)
  - 1. Use
  - 2. Employee Knowledge
  - 3. Changes

II. Radiation Monitoring

- A. TLD Badges
- B. Urinalysis
- C. Beta, Gamma Survey
- D. Instruments
- E. Air Sampling
- F. Releasing Materials and personnel
- G. Change Line Procedures
- H. Personal Hygiene

III. Site Safety

- A. Working around heavy equipment
- B. Heat-related stress to personnel
- C. Site Hazards

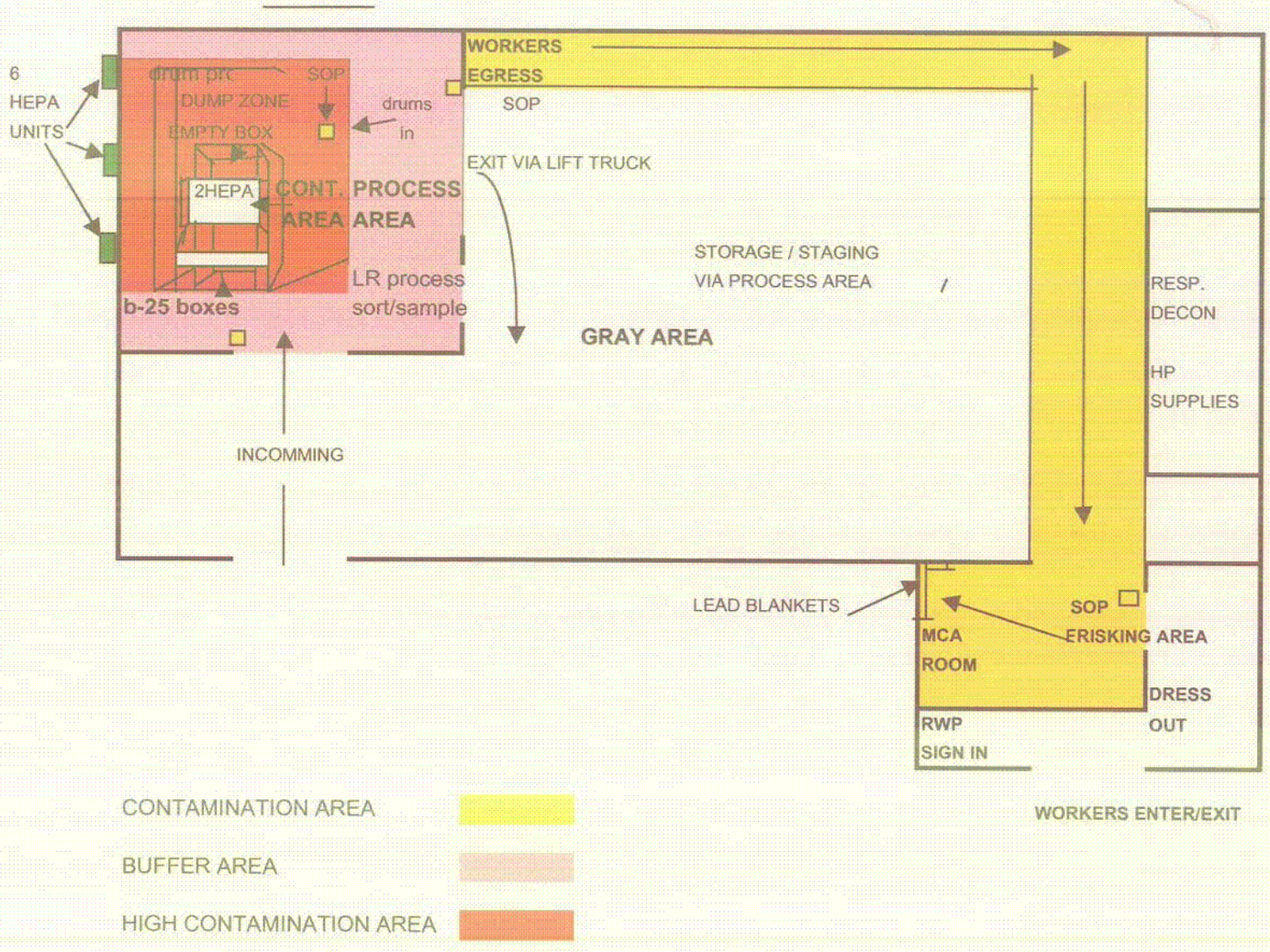
IV. Emergency Response

- A. On site Emergency number (See Section 4.6)
- B. Evacuation Routes
- C. Staging areas (head count)
- D. Emergency Alarms
- E. Site Security

Appendix 3

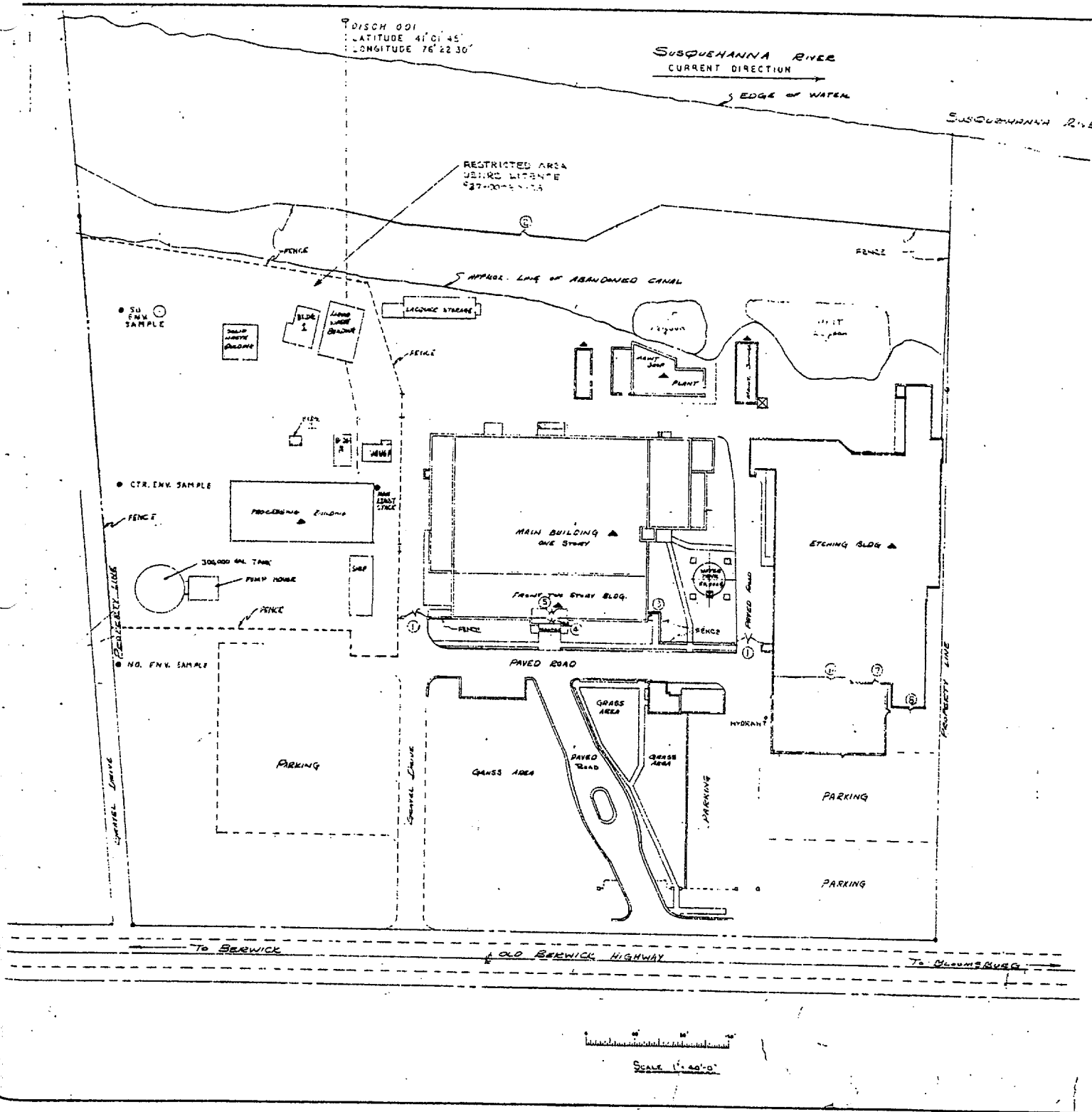
PROCESS AREA LAYOUT

FLOOR PLAN


6
HEPA
UNITS
drum prc
SOP
DUMP ZONE
EMPTY BOX
drums
in
2HEPA
CONT. AREA
PROCESS AREA
LR process
sort/sample
b-25 boxes
INCOMMING
WORKERS
EGRESS
SOP
EXIT VIA LIFT TRUCK
STORAGE / STAGING
VIA PROCESS AREA
GRAY AREA
RESP.
DECON
HP
SUPPLIES
LEAD BLANKETS
SOP
MCA
ROOM
ERISKING AREA
DRESS
OUT
RWP
SIGN IN
WORKERS ENTER/EXIT
CONTAMINATION AREA
BUFFER AREA
HIGH CONTAMINATION AREA

Appendix 4

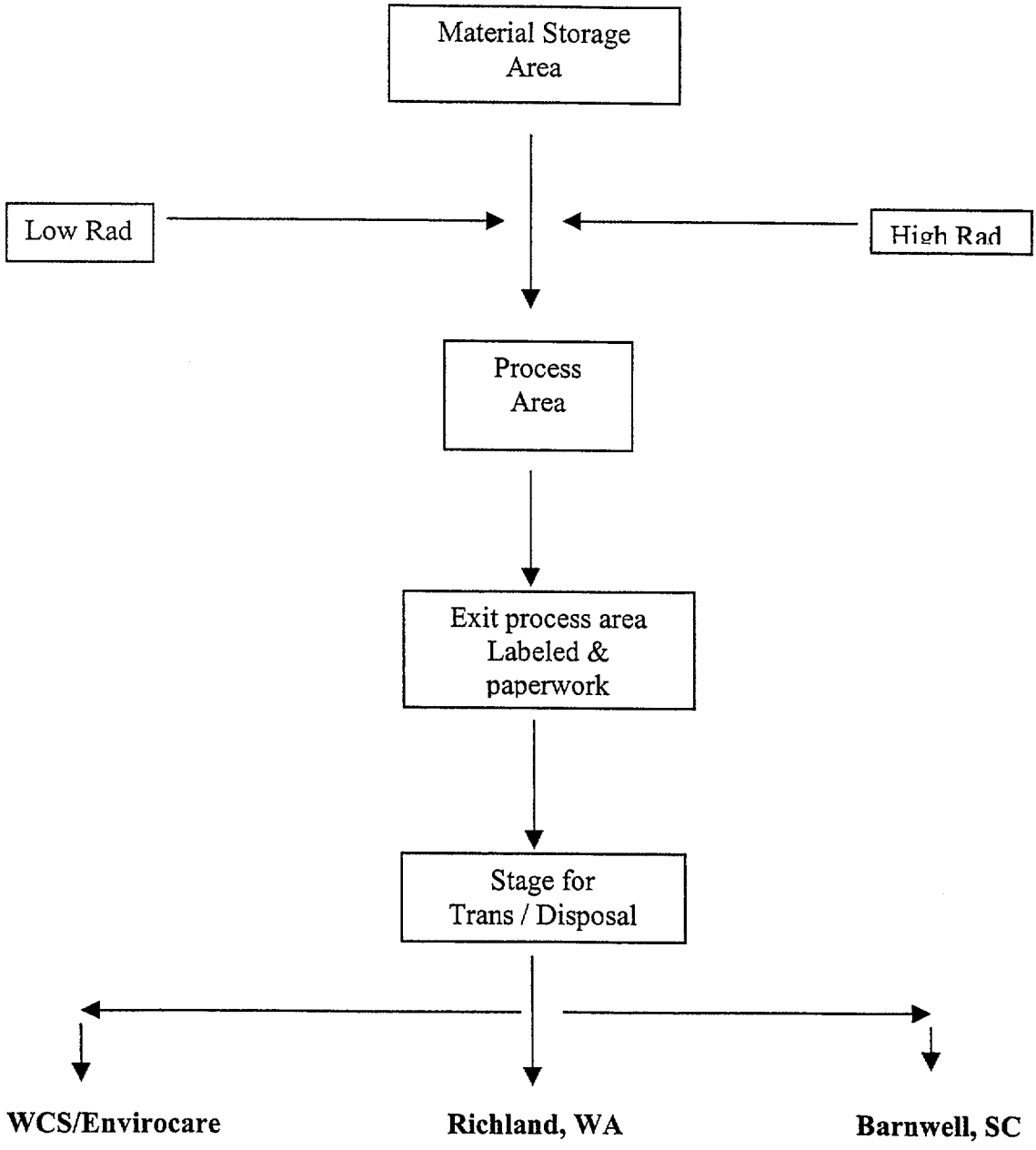
SITE MAP


DISCH 001
LATITUDE 41° 01' 45"
LONGITUDE 76° 22' 30"
SUSQUEHANNA RIVER
CURRENT DIRECTION
EDGE OF WATER
SUSQUEHANNA RIVER
RESTRICTED AREA
USERS LICENCE
FENCE
APPROX. LINE OF ABANDONED CANAL
SU ENV. SAMPLE
LACQUER STREAMS
PLANT
CTR. ENV. SAMPLE
PROCESSING BUILDING
MAIN EXHAUST STACK
FENCE
300,000 GAL. TANK
PUMP HOUSE
SHED
NO. ENV. SAMPLE
MAIN BUILDING ONE STORY
FRONT TWO STORY BLDG.
ETCHING BLDG.
PAVED ROAD
PARKING
GRASS AREA
HYDRANT
PROPERTY LINE
BOULEVARD DRIVE
SCHOOL DRIVE
To BERWICK
OLD BERWICK HIGHWAY
To BLOOMSBURG
SCALE 1" = 60'-0"

Appendix 5

SITE MATERIAL FLOW DIAGRAM

Site Material Flow Diagram



Appendix 6

WASTE PACKAGING SHEET / MASTER CONTROL LOG

SOLUTIENT TECHNOLOGIES

			WASTE CONTAINER MASTER LOG						
CONTAINER ID	TYPE of CONTAINER	DATE PACKAGED	CONTENTS	NET WT.	GROSS WT.	RAD LEVEL CONTACT	RAD LEVEL 1 METER	RAD LEVEL SMEARABLE	ACTIVITY

SOLUTIENT TECHNOLOGIES

Container I.D. #_____

Type Container_____ Date Packed_____

Weight of Container_____

	Supervisor Waste	Quality Control
1. Container Inspected Prior to Use		
2. Plastic Liner installed		
3. At least 2" of Cushioning Material added to bottom		
4. All Waste Inspected prior to Packing		
5. Container Inspected prior to Closure		
6. Tape or Sealant Applied to Lid and Secured		
7. Marking and Labeling Applied		
8. Verification of Packing (Quality Control)		

Contents of Package:	Container No.
_____	_____ 1
_____	_____ 2
_____	_____ 3
_____	_____ 4
_____	_____ 5
_____	_____ 6
_____	_____ 7
_____	_____ 8
_____	_____ 9
_____	_____ 10
_____	_____ 11
_____	_____ 12
	_____ 13

_____

Foreman or Deputy Date

Radiation Checks:	Beta/Gamma	Level	Initial
Radiation Checks:	Alpha		
Highest Radiation Level on Contact	mR/Hr		
Highest Radiation Level at 1 Meter	mR/Hr		

_____

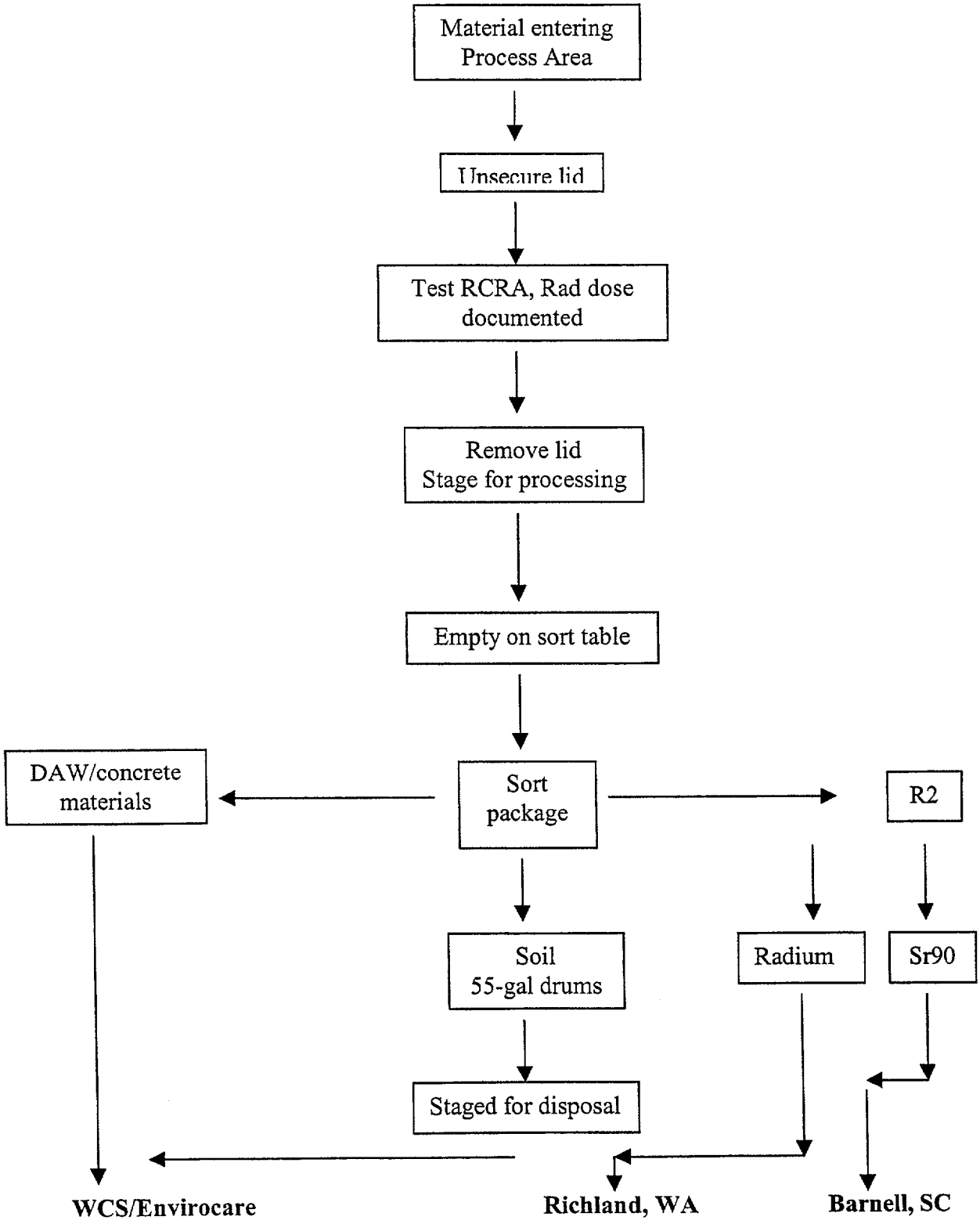
Waste Process Manager or Deputy

WASTE PACKAGING CHECK OFF LIST

Appendix 7

PROCESS MATERIAL FLOW DIAGRAM

Process Material Flow Diagram



Appendix 8

SURFACE CONTAMINATION VALUES (PART 835)

Appendix D to Part 835

Surface Contamination Values

The data presented in Appendix D are to be used in identifying the need for posting of contamination and high contamination areas in accordance with Sec. 835.603(e) and (f) and identifying the need for surface contamination monitoring and control in accordance with Secs. 835.1101 and 835.1102.

Surface Contamination Values \1\ in dpm /100 cm \2\

Radionuclide	Removable \2\, \4\	Total (Fixed + Removable) \2\, \3\
U-nat, U-235, U-238, and associated decay products.	\7\ 1,000	\7\ 5,000
Transuranics, Ra-226, Ra-228, Th-230, Th-228, Pa-231, Ac-227, I-125, I-129.	20	500
Th-nat, Th-232, Sr-90, Ra-223, Ra-224, U-232, I-126, I-131, I-133.	200	1,000
Beta-gamma emitters (nuclides with decay Modes other than alpha emission or spontaneaous fission) except Sr-90 and others noted above \5\.	1,000	5,000
Tritium and tritiated compounds \6\	10,000	N/A

\1\ The values in this appendix, with the exception noted in footnote 5, apply to radioactive contamination deposited on, but not incorporated into the interior or matrix of, the contaminated item. Where surface contamination by both alpha-gamma-emitting nuclides apply independently.

\2\ 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.

\3\ The levels may be averaged over one square meter provided the maximum surface activity in any area of 100 cm \2\ is less than three times the value specified. For purposes of averaging, any square meter of surface shall be considered to be above the surface contamination value if: (1) From measurements of a representative number of sections it is determined that the average contamination level exceeds the applicable value; or (2) It is determined that the sum of the activity of all isolated spots or particles in any 100 cm \2\ area exceeds three times the applicable value.

\4\ The amount of removable radioactive material per 100 cm^2 of surface area should be determined by swiping the area with dry filter or soft absorbent paper, applying moderate pressure, and then assessing the amount of radioactive material on the swipe with an appropriate instrument of known efficiency. (Note-The use of dry material may not be appropriate for tritium.) When removable contamination on objects of surface area less than 100 cm^2 the activity per unit area shall be based on the actual area and the entire surface shall be wiped. It is not necessary to use swiping techniques to measure removable contamination levels if direct scan surveys indicate that the total residual surface contamination levels are within the limits for removable contamination.

\5\ This category of radionuclides includes mixed fission products, including the Sr-90 which is present in them. It does not apply to Sr-90 which has been separated from the other fission products or mixtures where the Sr-90 has been enriched.

\6\ Tritium contamination may diffuse into the volume or matrix of materials. Evaluation of surface contamination shall consider the extent to which such contamination may migrate to the surface in order to ensure the surface contamination value provided in this appendix is not exceeded. Once this contamination migrates to the surface, it may be removable, not fixed: therefore, a "Total" value does not apply.

Appendix 9

WAC MATRIX

WASTE ACCEPTANCE CRITERIA (WAC)

MATRIX

1.0 RICHLAND, Washington

1.1 Certify that there is a valid unencumbered site license at location of origin of waste.

1.2 Generate and action radioactive waste shipment certification (Form RHE-31).

1.3 Classify waste for near surface disposal for Ra-226. If Ra-226 concentration is <10nCi/g it meets the specific activity limit for Class A; if Ra-226 concentration is <100 nCi/g then it meets Class C specific activity limits. If Ra-226 is greater than 100nCi/g the waste is not acceptable for near surface disposal.

1.4 WAC allows acceptance of bulk or containerized wastes of wide range. Bulk at 200mr/hr at surface: containerized at >200 mr/hr at surface. DOT 200 mr/hr transport index for exclusive use vehicles.

Note: Type A Limits >0.001A (one or two) for solids. Cs-137 A1 is 54.1 and A2 is 13.5: Ra-226 A1 is 8.11 and A2 is 0.541Ci.

1.5 Check for presence of following isotopes (Table 1) C-14: Ni-59, Nb-94 Tc-99, Pu-241 Cm-242 and any other long lived (T1/2 >5 years) alpha emitter. May be possible to eliminate some as not relevant although most likely require full alpha, beta and gamma spectrographic analyses (Limits in Table 1 WAC 246-249-040)

1.6 Check for presence of Table 2 isotopes H-3; Co-60; Ni-63; Sr-90; Cs-137 and all radionuclides with half-life of less than 5 years. In this case the probability of Sr-90 and Cs-137 is possible. The following limits for these isotopes apply.

Isotope **Curies/cubic meter**	**Class A**	**Class B**	**ClassC**	**Not acceptable**
Sr- 90	**Zero**	**>0.04<150**	**>150<7000**	**>7000**
Cs-137	**Zero**	**>1<44**	**<4600**	**>4600**

Note: If Ra-226 and Sr-90 and or Cs-137 coexist then if Ra-226<10Ci/cubic meter then limits set as above by Sr-90 and Cs-137; If Ra-226 between 10 and 100 Ci/cubic meter then Class C.

1.7 Acceptable Form of Waste:

1. Metal containers, no significant deformation, or corrosion
2. Liquid less than 1% volume
3. No reactive at normal pressures and temperatures
4. No explosive reaction with water
5. No fumes
6. Not pyrophoric
7. Not RCRA Hazardous Wastes
8. Not more than 15% voids

1.8 Labeling and Certification including NRC Form 540 (and NRC 540A if required)

1.9 Detailed conformance in WAC 246 –249

2.0 BARNWELL, South Carolina

2.1 Dry Active Waste containing isotopes with half-lives greater than 5 years with a total specific activity greater than 1 uCi/cc require stabilization(DHEC approval).

2.2 Petroleum based oils not acceptable. Limit trace incidental at<1%by volume.

2.3 Not Pyrophoric.

2.4 No violent reaction with water.

2.5 No hazardous chemicals unless radiological hazard shown independently to exceed chemical. Need to define the most prevalent chemical, form of the waste.

2.6 No Mixed Wastes accepted unless treated to no longer exhibit waste characteristics. TCLP testing required.

2.7 No asbestos more than 0.1% by weight.

2.8 Ra-226 only as solid homogeneous where Radium is incidental and less than 1% of total activity.

2.9 Non regulated <0.002uCi/g.

1. **Limited>0.002uCi/g with A1 <0.001 and A2<0.001A2**
2. **Type A>0.001A1>0.001A2**
3. **Type B >A1 or>A2 and <3000A1 or 3000A2**

Note: A1 is Special Form A2 is Normal Form. A2 likely in this case;

Isotope	A1 (Ci)	A2 (Ci)
Cs-137	54.1	13.5
Ra-226	8.11	0.541
Sr-90	5.41	2.70

Recommend use on site of General case allowed for Beta and gamma emitters of A1 of 5 and A2 of 0.5.

2.10 Sealed sources may be acceptable by prior arrangement. Specification requires a DOT certified shipping container, surrounded with a minimum of 4 inches of concrete of compressive strength 2500 psi.

2.11 Transport to the Barnwell site requires that the waste generator shall have a valid Radioactive Waste Transport Certificate from the State of South Carolina.

3.0 ENIVIROCARE, Utah

3.1 WAC is specific for radionuclide analyses. Gamma spectral analyses at 1Pci.g normally required. Waste origin needs to be reviewed and the known presence of Sr-90 will require specific Sr-90 determination. Low, average and high limits required

3.2 Not suitable for TOSCA. Need a minimum of a definitive statement that these are not present. May be desirable to allow for PCB sampling

3.3 If waste is not a Mixed Waste need to demonstrate that it is not RCRA by:

1) TCLP

2) Reactivity Cn and sulfide

3) Soil pH

4) Paint Filter Test

3.4 If the waste is a mixed waste then add:

1) Full analytical to support treatment standard

2) TOX

3) Physical

a) Moisture (high low and average)

b) Optimum moisture ASTM D-698

3.5 Two stage pre-approval process

4.0 WASTE CONTROL SPECIALIST (WCS), Texas

4.1 Accept low level and mixed waste for interim storage and burial.

4.2 License allows storage for up to 20,000 Ci of Cs-137; 2,000 Ci of Sr-90 and 200 Ci of Ra-226.

4.3 Class A, B, C or more than C can be accepted subject to regulatory appropriate containers and license limits. No cardboard containers.

4.4 No pathogens, infectious wastes, biological material, explosives, organic peroxides or other etiological agents defined by 49 CFR 173.134.

4.5 Packaged to minimize voids.

4.6 No free standing or corrosive liquids.

4.7 No chelating or complexing agents greater than 8% by weight.

4.8 Non pyrophoric.

4.9 Not capable of explosive or violent reaction at normal pressures and temperatures of mixed with water.

4.10 No toxic gases or fumes.

4.11 Technologically enhanced Ra-226 in soil averaging <30Pci/g provided radon emanation <20 pCi/ square meter/second. Discrete Ra-226 >2nCi/g acceptable as sealed sources in 2R container which is immobilized and over packed in a second DOT approved container

4.12 Radiologically contaminated asbestos accepted with conditions.

REVIEW AND CONCLUSIONS

Introduction

The Waste Acceptance Criteria for the selected disposal options are not sufficiently different for extent of effort of ancillary cost of analysis for conformance to be a major factor in the selection of a disposal option. Selection should be based upon the likelihood of acceptance and overall cost.

1. Radium in Drums

Drums require sampling and/or a review of existing samples to establish the optimum routing. Preferred option for these drums is Richland WA as they have an established record for acceptance of Ra-226 wastes.

Step 1 Radiological sampling/analyses needs to establish that average Ra-226 level is less than 100 nCi/g i.e. in conformance with Table 1 for near surface disposal with no Sr-90 and Cs-137 present. Establish if Ra-226 samples less than 10nCi/g for interpretation if Sr-90 and/or Cs 137 present. If greater than an average of 100 nCi/g establish if repackaging to meet the 100nCi/g average if feasible. If not consider repackaging as sealed over-pack to WCS. Note in this need to meet surface, and 1 meter dose rate limit for transport.

Step 2 Analyze samples for Sr-90 and Cs-137. If Concentration of Ra-226 is less than 10nCi/g then waste classification is class C, if concentration of Sr-90 at 7,000 Ci/M3 plus Cs-137 at 4,500 Ci/M3 (on fractions rule). Note that Gamma spectrographic analyses and beta analyses should identify any unknown contaminants which can be evaluated in the same way as Cs-137 and Sr-90.

Step 3 Chemical analyses and tests for RCRA Hazardous status i.e.
TCLP
Reactivity
Determine either mixed waste or no RCRA impediment.
If mixed add TOX and support for treatment of chemical hazards.

Step 4 Other physical limits:
PH
Paint Filter test
Pyrophoricity
Water reactivity
Moisture content
Air /Ambient temperature reactivity
Excessive voids
Container corrosion
Physical condition to withstand external pressure
Determine if repackaging and/or processing required.

2. Drums Containing Primarily Sr-90 and Cs-137 Contaminants

Preferred disposal for these drums is Chem-Nuclear at Barnwell, South Carolina with Envirocare of Utah as an alternate. Follow the same procedure for establishing likely conformance with WAC.

Step 1 Sampling and radiological analyses to establish specific activity of average contents for Cs-137 and Sr-90 for total radioactivity and incidental contamination of Ra-226. Ra-226 can only be an incidental contaminant at less than 1% of total activity for acceptance at Barnwell. If greater than 1%, consider Envirocare and/or Richland, Washington as Ra-226 waste above.

Step 2 If less than 0.002 pCi/g treat as radiologically unregulated.

Step 3 Sample and analyze for beta and gamma emitting isotopes. Confirm absence of alpha emitters. Assume general case for A1 and A2 limits for isotopes of interest of A1 of 5 Ci and A2 of 0.5Ci. Check individual isotopes identified with 49 CFR 173.435. It is likely that in this case that the general A2 of 0.5 Ci for all beta and gamma isotopes will be relevant, and will speed decisions on waste classification. Classify and package as Type B or Type C waste.

Step 4 Check if total activity of waste isotopes with half lives greater than 5 years sums to more than 1 uCi/cc. If so, either negotiate stabilization for Barnwell (DHEC approval) or reroute to Envirocare or WCS.

Step 5 Check status of waste under RCRA (as above) for TCLP and reactivity. Establish if mixed waste. If mixed waste not acceptable at Barnwell or Envirocare, reroute to WCS Texas.

Step 6 Check for petroleum Based oil contamination. If incidental and greater than 1% by volume, waste not acceptable at Barnwell. Check Envirocare or re-route to WCS.

Step 7 Check for asbestos greater than 0.1% by weight. If in excess, reroute to WCS.

Step 8 Check physical /chemical properties i.e.

Pyrophoricity	Moisture Content
Water reactivity	Excessive Voids
Air /Ambient temperature reactivity	Container corrosion
Physical condition to withstand external pressure	

Determine if repackaging and/or processing required for disposal at any of the locations.

3. Bulked Waste as DAW/concrete (B25 Boxes) and Soil Like Materials (B 25 boxes and 55 gallon drums)

Preferred disposal at WCS with alternate of Envirocare

Step 1 Sampling and radiological analyses to establish specific activity of average contents for Cs-137 and Sr-90 for total radioactivity and incidental contamination of Ra-226.

Step 2 If Ra-226 is present at concentrations greater than 30 pCi/g not acceptable except in over-packed DOT approved container. Reroute to Richland, Washington. If Ra-226 is present up to 30 pCi/g, establish radon emanation rate. If less than 20 pCi/square meter exposed surface/second submit to WCS. If greater than this radon emanation rate reroute to Richland, Washington.

Step 3 Chemical analyses and tests for RCRA Hazardous status i.e.
TCLP
Reactivity
Determine either mixed waste or no RCRA impediment.
If mixed waste, add TOX and support for treatment of chemical hazards.

Step 4 Check waste for asbestos. If present, consult WCS for conditions of acceptance.

Step 5 Check waste physical /chemical properties i.e.
Pyrophoricity
Water reactivity
No free standing liquids or corrosive agents
Absence of chelating or complexing agents at more than 8% by weight
Air /Ambient temperature reactivity
No toxic fumes, vapors or gases
Excessive voids
Container corrosion
Physical condition to withstand external pressure

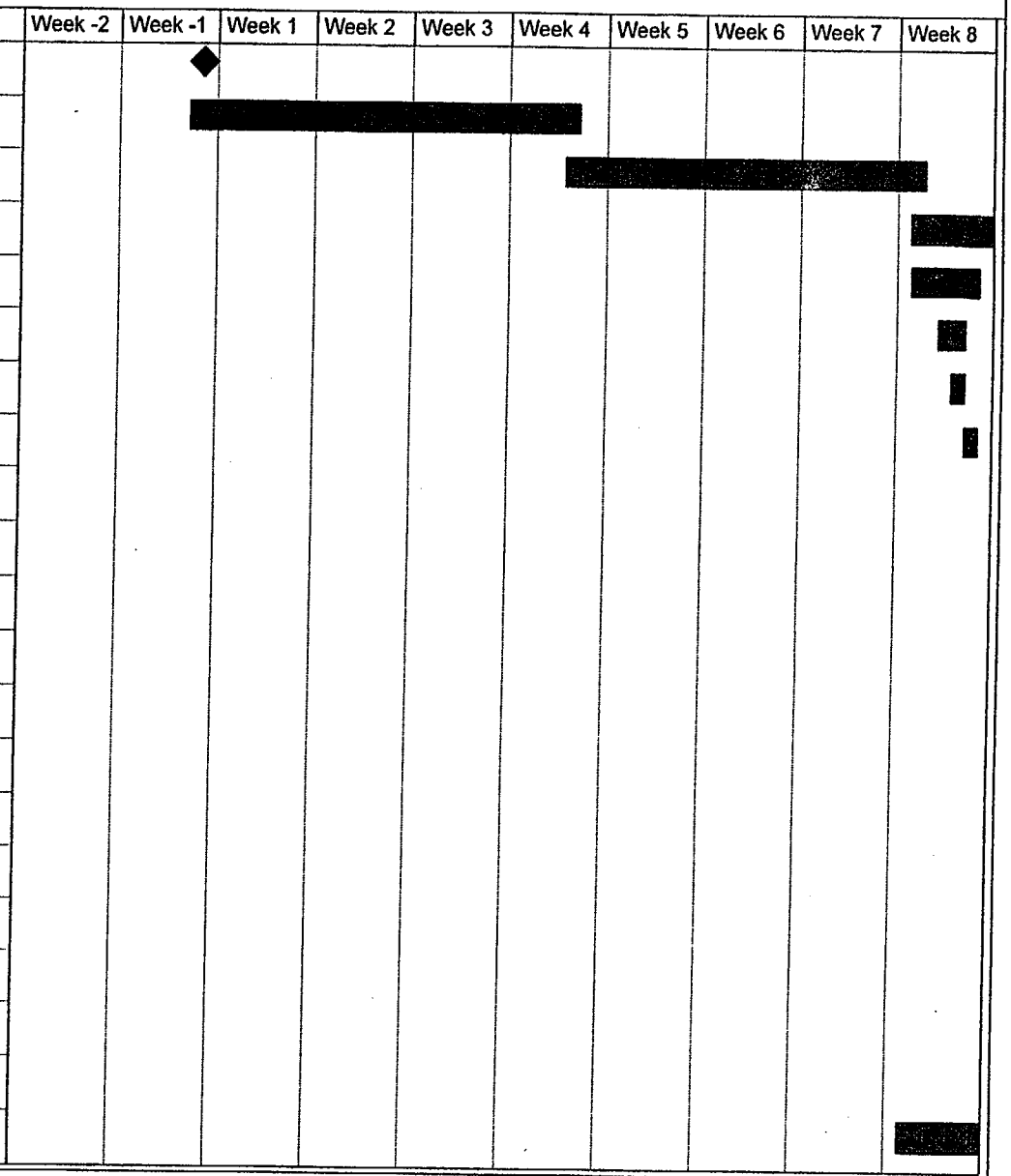
Determine if repackaging and/or processing required for disposal.

Appendix 10

SCHEDULE

Safety Light Remediation Schedule

ID	Task Name
1	RECIEPT OF AWARD
2	PREPARE WORK PLAN APPROVAL OF SLC & NRC
3	APPROVAL OF SLC & NRC
4	MOBILZE ON SITE
5	PREPARE PROCESS BUILDING
6	INSTALL SOLID FLOOR
7	INSTALL BOX SCREEN-CONTAINMENT
8	INSTALL HEPA FILTER SYSTEM
9	RELOCATE CONTAINERS TO PROCESS
10	BENCH STUDY METALS/ORGANICS
11	PROCESS B-25 BOXES-DRUMS PPE, CONCRETE
12	PROCESS B-25 BOXES, DRUMS, DIALS, SOIL
13	ALARA COMMITTEE REVIEW 6R SOURCE PROCESSING
14	PROCESS HOT SOURCE >6R
15	SAMPLE EACH CONTAINER FOR PROFILING
16	SHIP OUT SAMPLES TO LAB FOR PROFILE ANALITICAL
17	REMOVE PROCESS BUILDING
18	COMPLETE PACKAGING OF ALL WASTE DEMOB ACT.
19	PREPARE SHIPPING DOCUMENTS
20	DEMOBILIZATION
21	PREPARE REPORT OF REMEDIATION ACTIVITIES

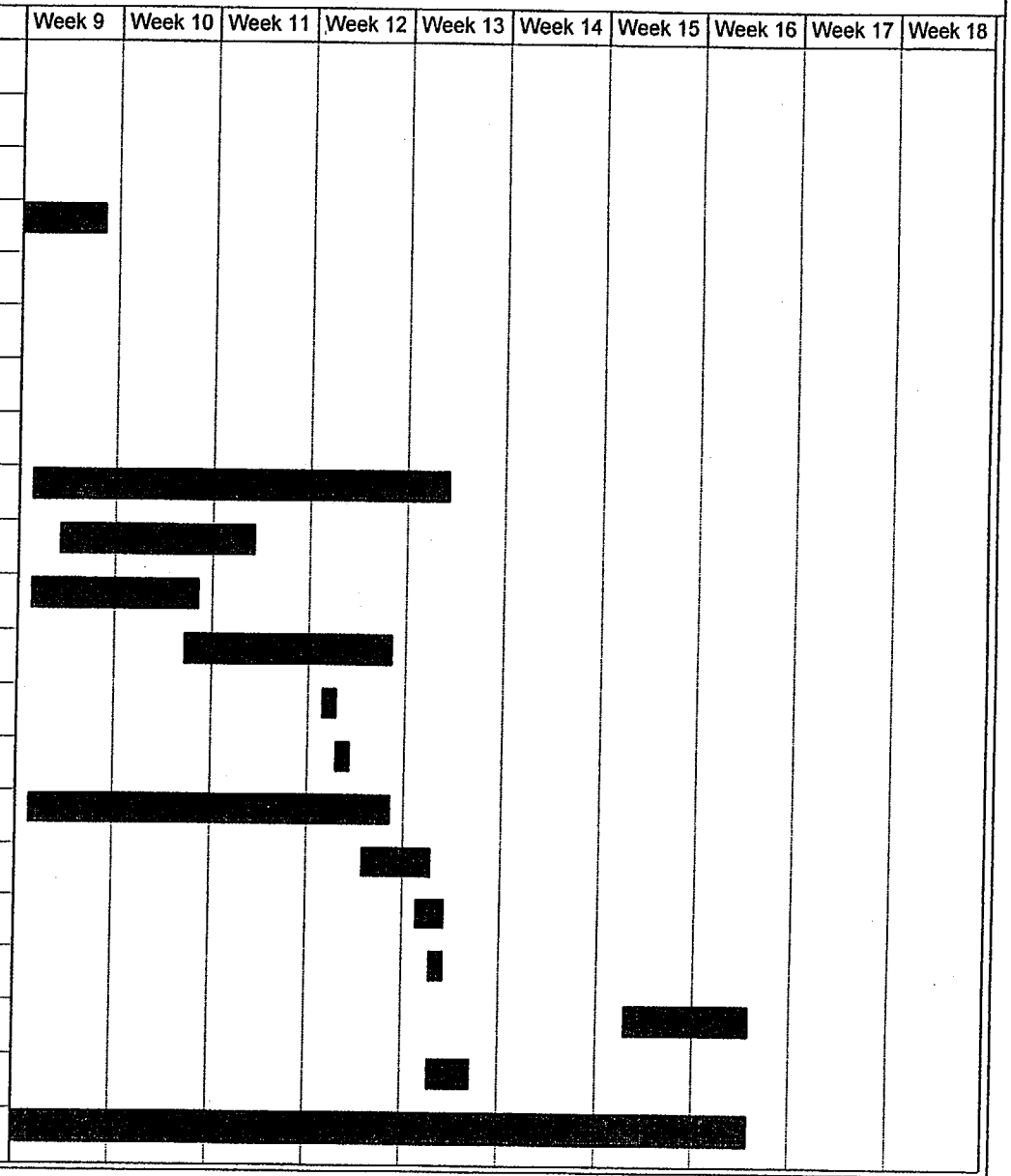


Project: SL REMEDIATION SCHEDU
Date: Mon 2/4/02

Task
Split
Progress
Milestone
Summary
Project Summary
External Tasks
External Milestone
Deadline

Safety Light Remediation Schedule

ID	Task Name
1	RECIEPT OF AWARD
2	PREPARE WORK PLAN APPROVAL OF SLC & NRC
3	APPROVAL OF SLC & NRC
4	MOBILZE ON SITE
5	PREPARE PROCESS BUILDING
6	INSTALL SOLID FLOOR
7	INSTALL BOX SCREEN-CONTAINMENT
8	INSTALL HEPA FILTER SYSTEM
9	RELOCATE CONTAINERS TO PROCESS
10	BENCH STUDY METALS/ORGANICS
11	PROCESS B-25 BOXES-DRUMS PPE, CONCRETE
12	PROCESS B-25 BOXES, DRUMS, DIALS, SOIL
13	ALARA COMMITTEE REVIEW 6R SOURCE PROCESSING
14	PROCESS HOT SOURCE >6R
15	SAMPLE EACH CONTAINER FOR PROFILING
16	SHIP OUT SAMPLES TO LAB FOR PROFILE ANALITICAL
17	REMOVE PROCESS BUILDING
18	COMPLETE PACKAGING OF ALL WASTE DEMOB ACT.
19	PREPARE SHIPPING DOCUMENTS
20	DEMOBILIZATION
21	PREPARE REPORT OF REMEDIATION ACTIVITIES



Project: SL REMEDIATION SCHEDU
Date: Mon 2/4/02

Task
Split
Progress
Milestone
Summary
Project Summary
External Tasks
External Milestone
Deadline

HEALTH AND SAFETY PLAN
FOR RADIOLOGICAL ACTIVITIES
OF THE RESPONSE ACTION
FOR RADIOACTIVE WASTE REPACKAGING
AT SAFETY LIGHT CORPORATION
Bloomsburg, PA

It is the policy of Solutient Technologies (Solutient) to provide a safe and healthful work environment for all its employees and to satisfy applicable environmental, safety, and health regulations. Solutient maintains a safe environment for all employees and establishes sound safety practices to eliminate conditions that may cause injury or damage. Maintaining safe working conditions and taking immediate steps to correct unsafe conditions and practices is the responsibility of all management personnel, supervisory personnel, and each individual worker. All employees are required to work in a safe manner and to bring any unsafe conditions or practices to the attention of their supervisors. Safety requirements are not reduced in order to achieve operational efficiencies.

Solutient instructs, trains, and motivates its employees and subcontractors to recognize and to avoid unnecessary risks of illness or injury that may be encountered in the performance of their jobs or personal activities. Solutient develops, operates, and maintains all of its facilities and equipment in a manner that protects the health and safety of Solutient employees, subcontractors and the public, minimizes the risks of accidental damage or loss, and prevents harmful environmental effects.

Solutient follows a graded approach to health and safety; the level of effort and requirements for a specific project should be commensurate with the potential hazards associated with that project. The purpose of this Plan is to establish the basic policies, organizational structure, and general procedures related to health and safety aspects of Solutient radiological operations at the Bloomsburg, PA site. The provisions of this Plan are applicable to Solutient employees engaged in field radiological activities, including site visits and project operations.

The onsite scope of work for Solutient is to segregate and characterize containerized radiological waste and repackage it in a manner that is acceptable for disposal at appropriate radiological waste disposal sites. The potential health and safety concerns associated with radiological activities to be conducted at the Bloomsburg site have been evaluated on the basis of previous Solutient experience and reported site history. The potential concerns are significant and Solutient personnel are expected to abide by the requirements of the Plan and cooperate with site supervision in ensuring a safe and healthful work environment.

I. HAZARD EVALUATION

Potential hazards that may be encountered while performing the scope of work on the Safety Light property include:

- Radioactive materials (containerized and airborne) including Cs-137, Sr-90, C-14, H-3, and Ra-226
- Radiation fields (potential sources with dose rates greater than 200 mrem/hr)
- Physical hazards (e.g., container handling, toxic or hazardous atmospheres, material handling, unstable walking and working surfaces (slip/trip/fall hazards), sharp surfaces (glass, metal), potential for strains, electric shock, noise)
- Vehicle/heavy equipment operations
- Temperature extremes (heat/cold stress) and meteorological factors (severe weather conditions)
- Biological hazards (e.g., poisonous plants, snakes, insects)

Solutient personnel should be alert to the presence of additional health and safety hazards, take appropriate precautions to reduce the potential impact during their activities, and bring them to the attention of the project management for consideration in health and safety planning.

Radioactive Materials and Radiation Fields

The potentially most hazardous category of safety concerns at the site is radiological. The wastes in the existing containers are uncharacterized but are expected to include radium dials and foils, Sr-90 sources and Cs-137 sources, dry radioactive waste, impacted soil and soil-like material, and impacted concrete rubble. The concentrations of radioactive material in the waste media in the containers vary considerably. The waste media are not segregated nor characterized in their existing containers. Therefore, precautions will be taken to address potentially high concentrations of radioactive material in the waste, potential air resuspension /air dispersion concerns, and toxic or hazardous material (non-radiological) concerns associated with the existing containers of waste. Direct radiation levels from the wastes are expected to vary widely (from near the range of background to mR/hr levels). These levels have not been characterized; therefore, precautions will be taken to address high radiation dose rate concerns. Solutient personnel will avoid unnecessary exposure to high direct radiation fields and will survey waste containers prior to handling and during sorting/segregation operations. Dosimeters and/or direct reading devices will be assigned to workers and used in accordance with the requirements of RWPs. The Response Action Work Plan (RAP) prepared by Solutient presents more specific information on the subject of the precautions that will be taken to address these concerns (see Section 4.0 regarding training and Section 8.0 regarding radiation safety).

There is a potential for surface contamination of waste containers, equipment, waste sorting and packaging areas, work tools, and workers. It will be necessary to monitor shoes, exposed skin, and other surfaces that contact wastes for contamination before leaving the controlled work area. Eating, drinking, or use of tobacco is prohibited in controlled areas.

Work with the wastes in the controlled area and waste storage areas will be governed by specific written RWPs, prepared by Solutient for this work. The work will be performed in accordance with the Safety Light radioactive materials license, as amended. The RWPs will be approved by the Project Manager/RSO Dr. Stephen V. Prewett, or his appointed alternate. All personnel will review and understand each RWP under which they will work and will be expected to comply with the requirements of each RWP. The RWP sign in requirement is specified in the RAP.

Physical Hazards

Potential physical hazards are involved in the handling, moving, and opening of waste containers. These activities can cause pinch points, crush hazards, or unexpected venting of hazardous materials or radioactive materials from waste containers. Uneven and slippery or unstable terrain, grades, working at heights, and lifting and tipping heavy waste containers present a potential for injury from slips and falls. Objects in the waste material such as nails, broken glass, and sharp or pointed metal surfaces may cause lacerations and puncture wounds. Stacked containers and unstable surfaces may pose a hazard of falling objects.

High dust levels may cause respiratory difficulties and pose airborne radiological inhalation and dispersion hazards. Measures will be taken to reduce the potential for suspension of particulate material. Operations involving emptying of containers, sorting and segregating waste, and repackaging segregated waste will be conducted within an enclosed work area equipped to control ventilation and provide filtration of air exiting the work area.

Exposed energized surfaces and overhead transmission lines can result in life threatening electrical hazards, depending on the activities being conducted.

Moving container-handling vehicles are a potential safety concern at this site. Operating equipment will be present in the vicinity retrieving staged waste containers for processing and re-staging containers of re-packaged waste. Workers should be aware of vehicles moving loaded containers in their vicinity. Vehicle operators will be particularly cautious when operating in the vicinity of other workers because of the potential for injury by moving vehicle. Vehicles/equipment equipped with an audible device when operated in reverse provide an added measure of safety.

Back injuries may result from working on uneven surfaces and handling or lifting materials in an improper manner. The physical demands of the project and the fitness of the involved employees should be evaluated in identifying the potential for injuries to the back.

Vehicle Operation

Use of vehicles for transport of Solutient employees to, from, and on the site presents a potential safety concern. Such vehicles should be in good operating condition, and employees should be familiar with, and experienced in the operation of, such vehicles. Vehicle/equipment operators will adhere to federal, state, and local regulations regarding the operation of their motor

vehicle/equipment. The number of passengers in a vehicle will not exceed the number of functional passenger restraint devices available. Seat belts will be used at all times by all persons riding in vehicles. All drivers will adhere to the speed limits, warning signs, and road markings. Any employee who operates a company-leased vehicle must have a valid state vehicle operator's license.

Temperature Extremes and Meteorological Conditions

Heat stress is a common and serious safety concern when working in hot, humid climates. In any climate the potential for such effects may be increased when personal protective clothing is required for site work. Physical conditioning and acclimation are also factors in evaluating the potential for such effects. Heat stress may also lead to other heat-related illnesses such as heat exhaustion and heat stroke.

Heat-Related Problems
If the body's physiological processes fail to maintain a normal body temperature because of excessive heat, a number of physical reactions can occur. They can range from mild symptoms such as fatigue, irritability, anxiety, and decreased concentration, dexterity, or movement, to death. Medical help must be obtained for the more serious cases of heat stress.

- Heat rash: Caused by continuous exposure to heat and humid air and aggravated by chafing clothes. This condition decreases ones ability to tolerate heat.
- Heat cramps are caused by profuse perspiration with inadequate fluid intake and chemical replacement, especially salts. Signs include muscle spasms and pain in the extremities and abdomen.
- Heat exhaustion is caused by the increased stress placed on various organs to meet increased demands to cool the body. Signs include shortness of breath, increased pulse rate (120-200 beats per minute), pale, cool, moist skin, profuse sweating, dizziness, and lassitude.
- Heat stroke is the most severe form of heat stress. Signs of heat stroke include red, hot and dry skin, no perspiration, nausea, dizziness and confusion, strong, rapid pulse, and possible unconsciousness. Body must be cooled immediately to prevent severe injury and/or death. Professional medical assistance must be obtained immediately.

Prevention of Heat Stress
One or more of the following recommendations will help reduce heat stress:

- Provide plenty of liquids. To replace body fluids (water and electrolytes) lost due to sweating, use a 0.1 percent salt-water solution, more heavily salted foods, or commercial mixes. The commercial mixes may be preferable for those employees on a low-sodium diet.
- Schedule tasks with heat stress in mind. For example, the early afternoon hours may be used for paperwork and/or equipment maintenance in a sheltered environment.

- Maintain good hygienic standards; frequent clothing changes and daily off site showering. Clothing should be permitted to dry during rest periods. Workers who notice skin problems should inform the Site Safety Officer and take corrective action.

It is strongly recommended that the "buddy system" be employed so that each worker can monitor and observe other team member(s) physical conditions and take breaks as frequently as needed. The Site Safety Officer or his/her designee will also monitor the ambient conditions and recommend change in schedules or increase the number of breaks to minimize the chances of heat stress.

Meteorological Conditions
Survey personnel should be alert to the possibility of severe or extreme weather conditions, which may pose dangers to personnel performing field activities, either directly or from related effects. Examples of such conditions include high winds, torrential rains with associated flooding, severe cold or heat.

Biological Hazards

Work in outdoor environments involves potential exposure to insects (bees, wasps), possibly poisonous plants (poison ivy, oak, and sumac), and animals (stray dogs, raccoons, snakes). Workers should be aware of these potential outdoor hazards and avoid them accordingly. An associated concern in evaluating biological hazards is personal sensitivity, such as allergies and systemic reactions, of employees.

In the northern U.S., insects and poisonous plants are generally not present throughout the year. Personnel should be alert to the potential for such hazards, particularly on bright, warm days. Personnel should watch where they step and avoid contact with poison ivy and oak. If contact may have occurred, exposed skin should be washed. Insect bites should be treated accordingly, depending on personal sensitivity to such bites. Extra precaution to avoid mosquito bites is warranted due to the rise in West Nile virus cases in the U.S. The virus can cause high fever, headache, neck stiffness, coma, and death. Insect repellent containing a minimum of 25% N,N-diethly-meta-toluamide (DEET) may be used on clothing and skin. The lotion is recommended for the skin while the clothing can be sprayed. Physical contact with any bird carcasses should be avoided as they are particularly susceptible to infection by this virus. Birds have also roosted in the process building, so the droppings and nesting material will have to be sprayed to eliminate the risk of toxoplasmosis.

II. PERSONAL PROTECTIVE EQUIPMENT (PPE)

Inside the enclosed, controlled atmosphere work area for emptying, sorting/segregating, and repackaging waste the radiological conditions will likely require Level C PPE. Retrieval of existing containers and staging of repackaged waste containers will likely require Level D with tyvek suit and disposable gloves. Specific RWPs prepared for project tasks will specify PPE requirements. Revision of those requirements may be warranted based on experience gained during the progress of the work with the wastes.

Level C protective equipment provides respiratory protection and an appropriate level of skin protection. This level of equipment is worn when working in atmosphere potentially containing airborne radioactive materials. Seams where pieces of PPE meet will be taped closed to prevent skin contamination at these locations. Chemical Protective Clothing will be selected based on potential hazardous materials that may be inside waste containers and may be modified based on experience opening containers and sorting waste as appropriate.

Level C protective equipment includes:

- Chemical Protective Clothing and tyvek inner suit
- Air Purifying Respirator
- Shoe covers
- Heavy work gloves with inner chemical protective gloves

Level D protective equipment provides minimal protection from chemical or radioactive material. It is worn to prevent contamination only when the atmosphere contains no known hazards and work functions preclude splashes, immersion, or potential for inhalation of or contact with hazardous levels of chemicals or radioactive materials.

Level D protective equipment includes:

- Coveralls or tyvek suits
- Sturdy boots or shoes (with steel toe and shank, as necessary)
- Eye protection, as necessary
- Gloves (heavy for drum handling)

Such PPE provides protection from the physical hazards that may be encountered, more than potentially hazardous substances.

III. PERSONNEL AND EQUIPMENT MONITORING

Equipment and materials used in areas where contamination is possible will be monitored for contamination, prior to release for unrestricted use. Upon exiting potential contamination areas, shoes and clothing will be monitored. Results of monitoring that indicate contamination and any actions taken will be recorded on field documentation for preservation in the project files. Instances of personnel contamination will be reported immediately to the Solutient Health and Safety Officer.

In the event of contamination of personnel skin or clothing, gross loose material should be removed by gently wiping the skin or clothing with a damp cloth (if clothing is highly contaminated, it should be removed and secured in a container). Skin may be washed and rinsed with a mild soap and tepid water. Any type of cleaning action that may abrade or otherwise damage the skin should be avoided. The affected areas should be monitored after each cleaning step to determine if decontamination has been effective.

Monitoring at a sampling location will often provide an indication of the need for special handling of the sample. Samples will be screened to identify levels of radioactive material requiring special packaging and labeling for transportation purposes. To avoid cross contamination, the presence of contamination on sampling equipment will be identified and potential contamination removed before reuse for sampling.

For decontamination of equipment and materials, visible loose material should be removed by wiping the surface with a damp cloth. Equipment should be washed with warm water and detergent, and then be rinsed. Monitoring is performed to determine the effectiveness of decontamination. Decontamination steps should be repeated, as necessary. Persistent contamination may be removed using a stiff bristled brush. If decontamination is not effective, the equipment should be removed from service.

IV. MEDICAL AND EMERGENCY RESPONSE

All employee injuries must be promptly reported to the Project Manager and the Health and safety (H&S) Officer.

The designated emergency agencies and personnel for this project are as follows:

Emergency-Police, Fire Department, Ambulance	911
Non-Emergency-Police/Fire Department, Ambulance	((570)-784-4155/(570)-784-1357)
Solutient Site Safety Officer	(Solutient insert cell phone)
Solutient Onsite Supervisor	(Solutient radio, cell phone)
Solutient Project Manager – Dr. Stephen V. Prewett	(office (330)-497-5905) (cell (330)-353-3346)
Solutient H&S Committee Chairperson – Les Cole	(Solutient (863)-424-3222)

Directions to local medical care facilities (the Bloomsburg Hospital, 549 East Fair Street, Bloomsburg, PA (570-387-2100):

From Safety Light site on Old Berwick Road:

Proceed southwest on Old Berwick Road toward Bloomsburg
In Bloomsburg, merge with 7th Street proceeding west
Turn right onto route 487, cross railroad tracks and continue on routes 487/U.S. 11
Turn right to continue on route 487
Turn left onto South Hospital Drive
Turn right onto Fair Street
Proceed on Fair Street to the Bloomsburg Hospital

From Interstate-80:

Exit onto route 487 and proceed southwest toward Bloomsburg
Turn right onto South Hospital Drive
Turn right onto Fair Street
Proceed on Fair Street to the Bloomsburg Hospital

First aid supplies will be available at the field site for treatment of minor injuries. First aid is an interim treatment and should not be considered a substitute for professional medical attention.

V. GENERAL SAFE WORK PRACTICES

Solutient personnel working on the site will receive training in required health and safety issues prior to beginning work on the site. Visitors/observers will be trained to a level appropriate to the access granted.

Designated personal protective equipment and safety equipment will be worn or used at all times while on the site as required by the RWP for that area.

Eating, drinking, smoking, or chewing gum or tobacco are prohibited in controlled areas on the site.

Only approved containers for storage and handling of flammables should be used. There will be no smoking or sources of ignition in the vicinity of flammables.

Enclosed areas where low oxygen levels, toxic gases, or explosive atmospheres may be present should not be entered until the area has been monitored and determined safe for entry.

Any unsafe conditions or practices should be brought to the attention of the Site Supervisor.

Hands, face, and other potentially contaminated areas will be monitored before eating, smoking, drinking, or leaving the site.

All accidents and/or injuries shall be reported to the Site Survey Supervisor and the Chairperson of the Health and Safety Committee.

Contact with potentially hazardous substances should be avoided. Kneeling, sitting, or placing equipment on potentially contaminated surfaces should be avoided.

Personnel should be continuously alert to potentially dangerous situations, such as the presence of radiation dose rates or irritating or nauseating fumes or vapors, and take immediate precautionary measures, including stay time limitation or evacuation of the area.

The number of personnel and the amount of equipment entering potentially contaminated areas should be minimized. However, personnel should not work alone in potentially hazardous conditions – the buddy system should be used.

Concerns and actions for physical safety override concerns of minor spread of contamination, minor exposure to toxic materials, and work schedules. Immediate action should be taken to respond to life-threatening injuries and indications of sickness.

"Tailgate" Safety meetings will be held on a daily basis. All Solutient personnel, individuals entering the work area, and subcontractors will attend these meetings and shall sign or initial the attendance form.

A first aid kit will be available at the site.

APPROVED BY:

Dell Reuss — Date
Solutient Operations Manager

Dr. Stephen Prewett — Date
Solutient Project Manager

United States Environmental Protection Agency
Region III
1650 Arch Street
Philadelphia, Pa. 19103-2029
Attention: Sheri Minnick

April 25, 2002

Dear Ms. Minnick:

Enclosed are the answers to your concerns expressed in attachment A of your letter that was received on April 2, 2002. I have also enclosed Solutient Technologies qualifications.

If you have any further questions, please do not hesitate to call.

Very Truly Yours,

Larry Harmon,
Plant Manager

Request for qualifications:

Review the attached "Solutient Qualification Package"

Section 4.5

1. **The plan does not state what type of personnel monitoring will be used by the remediation workers.**
   Please review SLC Work plan section 8.5 for more detailed information. Solutient receives all personnel monitoring services from Landauer.

   The device types are discussed in the NRC response to air sampling question. Each employee will receive a standard Thermoluminescent Dosimeter (TLD) for the project. Employees who will be performing actual 'hands on' segregation of radium and strontium sources and final packaging of higher activity sources/material will also receive extremity TLD badges.

   Visitors who do not have a TLD issued by their organization and have in the judgment of the Radiation Safety Officer or project manager, a reasonable expectation of an exposure of greater than 75 mRem during their visit, will be issued a TLD. Pocket ion Chambers (PIC's) will be issued to employees as determined by the RWP for that task.

2. **Also there is no discussion of the types of personnel monitoring device controls and how/where these controls will be stored.**

   Solutient is unclear regarding your request for device types and controls. All project TLD's will have at least one control badge with the set. The current plans are to store the TLD's in the 'house' in the north end of the property that is being supplied for ST use. Although not previously surveyed by Solutient personnel, this area is expected to be a low background area.

Section 4.6

1. **There is no indication that the local emergency medical teams and/or local hospitals have been notified of the proposed clean up. These groups should be informed and trained to deal with potential radiation accidents, radiation exposures and treatments, decontamination protocols, and other sources of expert assistance that would be available in case of a radiological emergency.**

   The Susquehanna nuclear power plant is approximately 10 miles East of Safety Light Corporation. The Berwick Hospital is situated half way in between us. I am sure that the groups mentioned above are fully trained in handling radiation accidents. It should be noted however, that Solutient is a licensed decontamination service organization with the infrastructure and personnel to handle most emergencies involving radiation accidents/incidents. Emergency response capabilities involving radioactive material mishaps are part of Solutient's day-to-day capabilities and should be considered during the planning

and implementation of radiation accidents, exposures, treatments and decontamination protocols. The proper emergency authorities will be notified as part of the mobilization with the approval of SLC

Section 5.1

1. **The HEPA vent stacks should be monitored to ensure no break through and release of radiological materials into the environment at the beginning of this section where the HEPA equipment is first discussed. Monitoring of the stacks seems to be added as an afterthought at the end of this section.**

   When a new HEPA filter is placed into service, the efficiency of the unit is always tested and documented to ensure that it is 99.97% efficient. Aside from the air quality monitoring inside the process tent, all effluent at the exhaust end of the stacks are also monitored. Each sample is retrieved and analyzed on site each day, and the combination of sampling media collected from each location aid in the determination of PPE as well as the identification of potential airborne problems routinely experienced with these activities.

   Stack monitoring is part of Solutient's standard operating procedures and was not considered an afterthought in our work plan. Solutient always monitors process discharge air to document compliance with the appropriate Derived Air Concentrations (DAC) as described in Title 10 Part 20.

2. **In those cases where the lids are to be removed from the B-25 boxes, there is no indication if the lids will be monitored for contamination and if contaminated, where will the lids be placed prior to disposal.**

   Please review Work Plan section 5.5. It describes how the containers will be surveyed and smears taken. All lids that are removed will be removed in controlled areas and will be placed back on the boxes for disposal.

   B-25 Box lids. All B-25 box lids will be removed to allow management of the waste. These lids will be reused to seal the boxes for disposal. All interior surfaces of any waste container are assumed to be impacted. At no time will any open container components be removed from the process location unless the container has been closed and surveyed for surface contamination.

3. **Also if some of the B-25 boxes contained unconfined liquids, placing the boxes on their side could result in the spread of contamination in the confinement area. There should be some method to check the box for liquid prior to its being placed on its side.**

   Section 5.5 of the work plan states that "all containers will be staged based on the radiation measurements collected and the physical nature of the material inside the container". If physical liquids are present (free standing liquids) Solutient will not tip the containers on their side until the inspection of contents are complete. Any drain plugs on the existing containers will be removed, and any liquids will be collected prior to segregation activities and material processing.

   Regarding liquid in B-25 containers, please note that the first step in the process is the 'inspection station'. At this point any identified free liquids will be removed for storage and

treatment. The actual sorting area will be contained, i.e.; dikes, absorbent tubes, etc., should any liquid remain after this point.

4. **Current radiological measurements of some of these boxes suggest that the exposure rates are in excess of several millirem per hour at several meters. If this is the case, then hand sorting of the wastes may not be possible due in part to the high exposure rates or, that the amount of time the workers have to perform their tasks would be limited. There should be some alternate plan for sorting if the exposure rates are found to be in excess of the OSHA limits as expressed in 29 CFR 1910.1096.**

   Exposure rates. Our measurements indicate rates from a few millirem to a few hundred millirem on exterior box surfaces. These rates are well within the ALARA planning for the project and should not result in any unacceptable exposures. Solutient includes control measures including time in the RWP development process. These control measures will be detailed in the RWP for that process.

Section 5.5

1. **Because the wastes in the drums and B-25 boxes is not uniform, it is not clear how sampling of the wastes will be performed. A discussion of how to ensure that an adequate number samples are collected to indicate the degree and extent of radiological materials in the containers is characterized sufficiently to determine how the wastes are to be segregated should be included.**

   A detailed sampling protocol has been submitted to the USNRC in response to their interrogatives regarding this project. As all sampling should be accomplished in accordance with the waste acceptance parameters of the proposed disposal facilities, any sampling should model the waste acceptance criteria of those facilities. Solutient's sampling procedures are designed around those requirements.

Section 8.3

1. **Up to this point, there has been no discussion of an on-site radiological laboratory. Please add and discuss its equipment and quality assurance/control program.**

   The following equipment is to be part of Solutient's on-site laboratory and analysis capability:

   Lab Equipment List:
   Protean Low Background Counter or Equivalent
   Canberra MCA Gamma Spectrometer or Portable Bubble MCA or equivalent items.
   Ludlum handheld instruments models 2221, 2241, 12, 19, 9, Eberline E-530 or equivalent
   Detectors Ludlum model 43-68, 44-9, 44-1, 44-10, or equivalent

   Equipment.
   The equipment to be used may include a High Purity GeLi MCA and a low background alpha beta counter. Both systems have a NIST traceable primary calibration source and will undergo routine system performance checks.

2. **Also there should be some discussion of its capabilities and detection limits for air samples**

   Capabilities. The MCA has a normal detection limit of 1 pCi/g of Ra-226 with reasonable counting times and sample size. The MDA for the counter is a function of sample size and count time but is typically less than 10% of the appropriate limit.

3. **And for any bioassay samples that might be collected as discussed in Section 8.4.**

   Bioassay. The laboratory determines its MDC.

Section 8.4

1. **Discuss why cesium-137 and/or tritium is excluded from the bioassay program.**

   Tritium. Tritium sampling of the employees on site indicate very minimal uptake for a whole year. Solutient is only going to be here for a few months and the uptake that comes from tritium will be even more miniscule compared to the other isotopes of concern.

   Cesium-137. The review of the analytical data supplied to Solutient did indicate the presence of measurable levels of Cs-137. These levels are well below the radium levels so radium will be used as the primary marker in the bioassay program. If a positive reading is obtained for radium, then Cs-137 will be analyzed. Cs-137 will not be analyzed independently unless additional information is presented or discovered that warrants it.

Section 8.5

1. **The collection of thermo luminescent dosimeters for shipment at the end of the project defeats the purpose of personnel monitoring. There should be some arrangement for collection of dosimeters on a monthly basis to estimate the typical exposures one might receive during the remediation.**

   According to the original schedule if Solutient processes 10 packages per day the duration of the project should be about 5-6 weeks. If they are collected every 2 weeks the results will not be received prior to project completion. The most efficient method would be to utilize the pocket dosimeters along with the daily dose surveys to estimate the expected exposure to the personnel and rotate personnel as needed.

   TLD evaluation: The collection and reading of the TLDs will be determined by the project manager in conjunction with the ALARA committee. The normal Solutient practice for higher potential exposure projects is to evaluate a TLD when the user has the potential to have 25 to 50 % of the allowable exposure for that interval based on other measurements whenever that may occur.

2. **Furthermore, the use of pocket reading dosimeters, depending on the type used may not be sensitive enough to register any exposure. Please review and adjust as necessary.**

Pocket reading Dosimeters: The PICs Solutient will use are sensitive to the energy spectrum from cesium, radium and its daughters. No review or adjustment is required.

Section 8.6

1. **The radiation work permit section is too brief to evaluate especially given the nature and possible extent of the contamination present at this site. The presence of radium and cesium wastes indicate a potentially serious health threat exists at this site and this section does not adequately assess theses threats.**

Radiation Work Permits: The available information for the site and waste is very limited at this point. Solutient has defined the methodology in NRC question #2 but cannot develop a detailed RWP program until additional data is collected.

Presence of radium and cesium: The presence of these items does not necessarily constitute a hazard but the concentration, location, and chemical forms may. Due to the lack of information, Solutient will use very senior technical staff during the project to quantify and manage the actual hazard from these materials. The program and associated risks cannot be further quantified until additional data is developed. At that time, the adequacy of the program will be actively reviewed and updated accordingly.

Section 9.1

1. **The citation 10 CFR 835 pertains to Department of Energy facilities. Since Safety Light holds a Nuclear Regulatory Commission (NRC) license, please correct using the appropriate NRC citation.**

The rationale for the utilization of this citation has been presented to the USNRC and PADEP in our initial submittals to them. Their approval of this has been apparent during recent communications with them.

Section 11.1

1. **Explain how the unique number/ID system will speed processing and reduce exposure, especially if the workers have to sort through several pages locating the correct ID.**

Numbering System: The unique number system refers to a particular artifact such as a dial or marker. Photographs will be taken of each item and posted at the sort station. Each item (or group of items) will be assigned a unique part number so the worker only has to note how

many of what type are recovered in the receiving container inventory. This will reduce the potential to have to re-inventory a container due to contents confusion.

2. **Also how will multiple items be encoded, for example, if there are 14 identical dials pulled from one container. Although the plans states that other confirming items will be analyzed, etc., this can increase the amount of exposure to the workers.**

   Yes there will be a certain number of each type run on the MCA to get a known average of activity per unit.

   We only need to know that we have compatible isotopic materials packaged together and that means we only need to keep count of how many of each type are in each container, as long as we know the estimated activity of each type, so we don't exceed the total activity of any one certain type of container, for example radium container to Richland, WA. .

   Multiple item encoding: It is not a requirement to assign a unique number to each dial but to carefully measure a reasonable number of the same type dials and assign a unique activity to that part number. This activity will be used to calculate the container activity based on the number of these items present. Each unique artifact will have an associated part number and activity. Records will be kept of the number and location of these parts.

   Exposure: By developing a standard identification and activity, the actual handling and exposure will be significantly reduced. The analysis of confirming items is required for waste quality assurance to confirm the parts have not changed significantly. Visual inspection cannot provide this assurance.

   Also, depending upon the instrument used to confirm the radiological characteristics, will the sensitivity and precision be sufficient to uniquely identify those items with similar or identical appearances?

   Sensitivity and Precision: If the precision is not sufficient to differentiate radiologically among items, they will be considered identical and assigned one activity. The system we will use has less than 10% error on standards and typically less than 30% on field samples. This is much better than typically accepted for RCRA analysis and normal industry practice.

Section 11.4

1. **Depending on the airflow of the samplers and the concentrations of radiological materials in the air, explain whether the lower limit of detection will be sufficient to ensure a true non-detect or will this be a potential false reading.**

   Lower Limit of Detection(LLD): The lower level of detection for the system is not dependent on concentration present but the sample flow rate, collection time, background concentrations of the contaminate and quality of the detection system. Solutient typically designs their collection and analysis systems so the LLD is less than 25% of the level of concern. Item below the LLD are reported at the LLD rather than zero.

Section 11.5

1. **The use of a Ludlum 2241-2 to count smears may be inappropriate as this particular model is a hand-held unit.**

   This a field survey instrument to assure there are no gross amount of smearable contamination. For waste shipments and release of equipment or final staging of waste containers the smears will be run on a low background counter in the on site radiological lab.

2. **Explain how the counting parameters will be kept uniform, e.g., will the counting geometry be uniform.**

   The system will use a Ludlum smear holder for consistent geometry.

Appendix 2

Worker safety should address cold stress, if portions of the remediation, as scheduled, will take place during the winter months.

Solutient had originally intended on starting the project in the late winter of this past season. Due to regulatory reviews and approvals of a required work plan yet to be received, it is now anticipated that the work to be done at Safety Light should be done through the summer months.