DECOMMISSIONING PLAN

SHIELDALLOY METALLURGICAL CORPORATION
NEWFIELD, NEW JERSEY

Volume I

Text, Tables and Figures

Volume II

Appendices 19.1 through 19.8

Volume III

Appendix 19.9 Environmental Report

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Revision 1: October 2005

161152

19 APPENDICES

Appendix 19.1 - Acceptability Checklists

Shieldalloy Metallurgical Corporation Decommissioning Plan (Rev. 1)

Topic	Acceptance Criterion	Location (Section No.)	Comments
Chapter 1 - Executive Summary	The name and address of the licensee or owner of the site;	1.1	
	The location and address of the site;	1.1	
	A brief description of the site and immediate environs;	1.2	
	A summary of the licensed activities that occurred at the site, including the number and type of license(s); when the facility began and ceased using licensed material, and the types and activities of licensed material authorized and used under the license(s);	1.3	
	The nature and extent of contamination at the site;	1.4	
	The decommissioning objective proposed by the licensee (i.e., restricted or unrestricted use);	1.5	
	The DCGLs for the site, the corresponding doses from these DCGLs, and the method by which the DCGLs were determined;	1.6	
	A summary of the ALARA evaluations performed to support the decommissioning;	1.7	
	If the licensee requests license termination under restricted conditions, the restrictions the licensee intends to use to limit doses as required in 10 CFR 20.1403 or 20.1404, and a summary of institutional controls and financial assurance arrangements for the site;	1.8	Licensee is requesting license amendment
	If the licensee requests license termination under restricted conditions, or using alternate criteria, a summary of the public participation activities undertaken by the licensee to comply with 10 CFR 20.1403(d) or 20.1404(a)(4);	1.9	Licensee is requesting license amendment
	The proposed initiation and completion dates of decommissioning;	1.10	
	Any post-remediation activities (such as groundwater monitoring) that the licensee proposes to undertake prior to requesting license termination;	1.5	Licensee is requesting license amendment
	A statement that the licensee is requesting that its license be amended to incorporate the DP.	1.11	Licensee requests license be amended to authorize implementation of DP, including amendment of SMB-743 as a LTC license

Topic	Acceptance Criterion	Location (Section No.)	Comments
Chapter 2 - Facility Operating History			
Section 2.1 License Number/status/authorized Activities	The chemical forms of the radionuclides authorized and used under the current license;	2.1	
	Detailed description of how the radionuclides are currently being used at the site;	2.1	Section 2.2 also notes activities authorized by license have ceased
	The location(s) of use and storage of the various radionuclides authorized under current licenses;	2.1	
	A scale drawing or map of the building or site and environs showing the current locations of radionuclide use at the site; and	2.1	Aerial photo in Fig. 18.1, also Figs. 18.2 and 18.3
	A list of amendments to the license since the last license renewal.	2.1	
Section 2.2 License History	The radionuclides and maximum activities of radionuclides authorized and used under all previous licenses;	2.2	
	The chemical forms of the radionuclides authorized and used under all previous licenses;	2.2	
	A detailed description of how the radionuclides were used at the site;	2.2	
	The location(s) of use and storage of the various radionuclides authorized under all previous licenses as described in 10 CFR 30.35(g), 40.36(f), 70.25(g), 72.30(d); and	2.2	Figure 18.2
	A scale drawing or map of the site, facilities and environs showing previous locations of radionuclide use at the site as described in 10 CFR 30.35(g), 40.36(f), 70.25(g), 72.30(d).	2.2	Figure 18.2
Section 2.3 Previous Decommissioning Activities	A list or summary of areas at the site that were remediated in the past;	2.3	
	A summary of the types, forms, activities and concentrations of radionuclides that were present in previously remediated areas;	2.3	
	The activities that caused the areas to become contaminated;	2.3	
	The procedures used to remediate the areas and the disposition of radioactive material generated during the remediation;	2.3	
	A summary of the results of the final radiological evaluation of the previously remediated area, including the locations and average radionuclide concentrations in the previously remediated areas;	2.3	

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	A scale drawing or map of the site, facilities, and environs showing the locations of previous remedial activity.	2.3	
Section 2.4 Spills	A summary of areas at the site where spills (or uncontrolled releases) of radioactive material occurred in the past;	2.4	Not applicable (n.a..)
	The types, forms, activities and concentrations of radionuclides involved in the spill or uncontrolled release,		n.a.
	A scale drawing or map of the site, facilities, and environs showing the locations of spills.		n.a.
Section 2.5 Prior Onsite Burials	A summary of areas at the site where radioactive material has been buried in the past;	2.5	Reference to Sections 2.3 and 4.5
	The types, forms, activities and concentrations of waste and radionuclides in the former burial(s);	2.5	Reference to Sections 2.3 and 4.5
	A scale drawing or map of the site, facilities, and environs showing the locations of former burials.		n.a.
Chapter 3 - Facility Description			
Section .3.1 Site Location and Description	A description of the site and environs;	3.1	
	A description of the current population distribution;	3.2	
	A summary of current and potential future uses of land in and around the site;	3.3	
	Descriptions of the site meteorology, geology, seismology, climatology, surface and groundwater hydrology, geotechnical characteristics;	3.4	Continues through Section 3.7
	Descriptions of the natural and water resources at the site.	3.8	
	The size of the site in acres or square meters;	3.1	Also Section 1.2
	The State and county in which the site is located;	3.1	Also Section 3.2
	The names and distances to nearby communities, towns and cities;	3.1	Also Section 3.2
	A description of the contours and natural features of the site;	3.1	
	The elevation of the site;	3.1	
	A description of the man-made features of the site, such as buildings, roads, and settling ponds;	3.1	

Topic	Acceptance Criterion	Location (Section No.)	Comments
	A description of property surrounding the site, including the location of all offsite wells used by nearby communities or individuals;	3.1	
	The location of the site relative to prominent features such as rivers and lakes. To facilitate presentation of this information, U.S. Geological Survey (USGS) topographic maps may be provided;	3.1	
	A map that shows the detailed topography of the site using a contour interval (such as 2 feet or 1 meter) and including plot plans, the locations of characterization borings and monitoring wells, and the positions and types of geologic characterization activities;	3.1	Also Figure 18.5
	The location of the nearest residences and all significant facilities or activities near the site;	3.1	
	A description of the facilities (e.g., buildings, parking lots, and fixed equipment) at the site.	3.1	
Section 3.2 Population Distribution	A summary of the current population in and around the site, by compass vectors;	3.2	
	A summary of the projected population in and around the site, by compass vectors.	3.2	
Section 3.3 Current/future Land Use	The information supplied by the licensee should be sufficient to allow the staff to understand what current land uses are and what local, regional, or State planning boards or offices anticipate the future land uses will be at the site. The staff's review should verify that the licensee has used all available data on land use, plans and trends in land use, land use controls (such as zoning), potential for growth, or other factors likely to inhibit or stimulate growth in the area by comparing it with publicly available information from local, regional or State land use planning boards or offices. The DP should include a description of the current land uses in and around the site and a summary of anticipated land uses.	3.3	
Section 3.4 Meteorology and Climatology	A description of the general climate of the region with respect to types of air masses, synoptic features (high- and low-pressure systems and frontal systems), general air-flow patterns (wind direction and speed), temperature and humidity, precipitation, and relationships between synoptic-scale atmospheric processes and local meteorological conditions;	3.4	
	Seasonal and annual frequencies of severe weather phenomena, including tomadoes; water spouts, thunderstorms, lightning, hail, and high air pollution potential;	3.4	

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	Weather-related radionuclide transmission parameters, including average and extreme wind vectors, and average and extreme duration and intensity of precipitation events;	3.4	
	Routine weather-related site deterioration parameters, including precipitation intensity and duration, wind vectors, and temperature and pressure gradients;	3.4	
	extreme weather-related site deterioration parameters, including tomadoes, water spouts, thunderstorms, hail, and extreme air pollution (from offsite sources);	3.4	
	a description of the local (site) meteorology in temperature, atmospheric water vapor, precipitation, fog, atmospheric stability and air quality;	3.4	
	the National Ambient Air Quality Standards Category of the area in which the facility is located, and, if the facility is not in a Category 1 zone, the closest and first downwind Category 1 Zone.	3.4	
Section 3.5 Geology and Seismology	A detailed description of the geologic characteristics of the site and the region around the site.	3.5.1	
	A discussion of the tectonic history of the region, regional geomorphology, physiography, stratigraphy, and geochronology. All tectonic structures should be identified, in particular folds and faults in the region around the site, and their geologic and structural history should be discussed. The relationship between seismicity and tectonic structures and the earthquake-generating potential of any active structures should be discussed.	3.5.2	
	A regional tectonic map showing the site location and its proximity to tectonic structures should be provided. Appropriate references or supporting documents should be provided with regional physiographic and topographic maps, geologic and structure maps, fault maps, stratigraphic sections, boring logs, and aerial photographs.	3.5.3	
	A description of the structural geology of the region and its relationship to the site geologic structure should be discussed. Ahy faults, folds, open jointing, fractures, and shear zones in the region must be identified, and their significance to the facility shoiild be discussed.	3.5.4	
	A description of any crustal tilting, subsidence, karst terrain, landsliding, and erosion.	3.5.5	

Topic	Acceptance Criterion	Location (Section No.)	Comments
	A description of the surface and subsurface geologic characteristics of the site and its vicinity. The description should include local stratigraphic units and their accepted names, ages, genetic relationships, and lithologies. To facilitate the presentation, these descriptions should be accompanied by appropriately scaled geologic maps. Descriptions of mineralogy, particle size, organic materials, degree of cementation, zones of alteration, and depositional environment of unconsolidated strata should be included.	3.5.6	
	A description of the geomorphology of the site, including USGS topographic maps that emphasize local geomorphic features pertinent to the site. A description of the geomorphic processes affecting the present-day topography of the disposal site and vicinity should be included. Information should include descriptions of processes such as mass wasting, erosion, slumping, landsliding, and weathering where appropriate. The discussion of relevant geomorphic processes should include their rates, frequencies of occurrence, and controlling mechanisms or factors.	3.5.7	
	A description of the location, attitude, and geometry of all known or inferred faults in the site and vicinity. Fault displacements should be identified and potential recurrence intervals addressed.	3.5.8	
	A discussion of the nature and rates of deformation such as folding within the site and their relation to the local stress regime. Any joint sets within the site, including their densities and orientations, should be described, and their relative ages discussed. Remineralization and mineralization history of the various joint sets should also be discussed. Solution cavities and crevices in the bedrock should be described and discussed, if applicable.	3.5.9	
	A description of any man-made geologic features, such as mines or quarries.	3.5.10	
	A description of the seismicity, tectonic characteristics of the site and region, correlation of earthquake activity with geologic structures and tectonic provinces, maximum earthquake potential, seismic wave transmission characteristics of the site, design earthquake, settlement and liquefaction, and geophysical methods for site characterization.	3.5.11	

Topic	Acceptance Criterion	Location (Section No.)	Comment
	A complete list of all historical earthquakes that have a magnitude of 3 or more or a modified Mercalli intensity of IV or more within 320 kilometers (200 miles) of the site. The listing should include all available information about the earthquakes such as epicenter coordinates, depth of focus, origin time, intensity, and magnitude, augmented by a map showing the locations of these earthquakes. The references from which the information was obtained should be indicated. In addition, any earthquake that induced geologic hazard (e.g., landsliding or liquefaction) should be identified, and the acceleration that caused the hazard should be provided.	3.5.11	
Section 3.6 Surface Water Hydrology	a description of site drainage and surrounding watershed fluvial features, including important water users;	3.6.1	
	water resource data, including maps, hydrographs, and stream records from other agencies (e.g., USGS and USACE);	3.6.2	
	topographic maps of the site that show natural drainage and man-made features;	3.6.3	Also Figure 18.5
	a description of the surface water bodies at the site and surrounding areas, including the location, size, shape, and other hydrologic characteristics of all streams, lakes, or coastal areas;	3.6.4	
	a description of existing and proposed water control structures and diversions (both upstream and downstream) that may influence the site;	3.6.5	
	flow-duration data that indicate minimum, maximum, and average historical observations for surface water bodies in the site areas;	3.6.6	
	aerial photography and maps of the site and adjacent drainage areas identifying features such as drainage areas, surface gradients, and areas of flooding;	3.6.7	
	an inventory of all existing and planned surface water users, whose intakes could be adversely affected by migration of radionuclides from the site (the inventory should include the owner, location, type, and amount of use; source of supply; type of intake; and surface water quality data);	3.6.8	
	topographic and/or aerial photographs that delineate the 100-year floodplain at the site;	3.6.9	

Topic	Acceptance Criterion	Location (Section No.)	Comments
	a description of any man-made changes to the surface water hydrologic system that may influence the potential for flooding at the site (such changes may include construction of reservoirs, urban development, strip mining, and lumbering) (the description of these changes should include the proximity of the affected area to the site, the surface water bodies affected, the size of the area affected, and the potential effects at the site).	3.6.10	
Section 3.7 Ground Water Hydrology Acceptance Criteria	A description of the saturated zone including all potentially affected aquifers, the lateral extent, thickness, water-transmitting properties, recharge and discharge zones, groundwater flow directions and velocities, and other information that can be used to create an adequate conceptual model of the saturated zone.	3.7.1	
	Descriptions for monitor wells, including location, elevation, screened intervals, depths, construction and completion details, and hydrogeologic units monitored. The description should include domestic, industrial and/or municipal wells or other monitoring devices, if applicable, and any construction and completion details for these devices, when available. Descriptions of all aquifer tests should also be provided, including test data and a discussion of the assumptions, analysis, and test procedures used.	3.7.2	
	Physical parameters such as storage coefficients, transmissivities, hydraulic conductivities, porosities, and intrinsic permeabilities should be included.	3.7.3	
	A description, to the extent practicable, of groundwater flow directions and velocities (horizontal and vertical) for each potentially affected aquifer. When applicable, the groundwater hydrology should be described by making use of hydrogeologic columns, cross-sections, and water table and/or potentiometric maps.	3.7.3	
	A description of the unsaturated zone including descriptions of the lateral extent and thickness of permeable and impermeable zones, potential conduits of anomalously high flux, and direction and velocity of unsaturated flow.	3.7.4	
	Information on all monitor stations, including location and depth.	3.7.2	
	A description of physical parameters including the spatial and stratigraphic distribution of the total and effective porosity; water content variations with time; saturated hydraulic conductivity; characteristic relationships between water content, pressure head, and hydraulic conductivity; and hysteretic behavior during wetting and drying cycles, especially during extreme conditions.	3.7.6	

Topic	Acceptance Criterion	Location (Section No.)	Commeu.
	A description of the numerical analysis techniques used to characterize the unsaturated and saturated zones including, the model type, justification, documentation, verification, calibration and other associated information. In addition, the description should include the input data, data generation or reduction techniques, and any modifications to these data.	3.7.7	
	The distribution coefficients of the radionuclides of interest at the site.	3.7.8	
Section 3.8 Natural Resources	a description of the natural resources occurring at or near the site, including metallic and nonmetallic minerals and ores; fuels, such as peat, lignite, and coal; hydrocarbons, including gas, oil, tar sands, and asphalt; geothermal resources; industrial mineral deposits, such as sand and gravel, clays, aggregate sources, shales, and building stone; timber; agricultural lands; and waters in the form of brines;	3.8	
	a description of potable, agricultural, or industrial ground or surface waters including information on resource type, occurrence, location, extent, net worth, recoverability, and current and projected use;	3.8.1	
	a description of economic, marginally economic, or subeconomic known or identified natural resources as defined in U.S. Geological Survey Circular 831;	3.8.2	
	mineral, fuel, and hydrocarbon resources near and surrounding the site which, if exploited, would affect the licensee's dose estimates.	3.8.3	
Chapter 4 - Radiological Status of Facility			
Section 4.1 Contaminated Structures	a list or description of all structures at the facility where licensed activities occurred that contain residual radioactive material in excess of site background levels;	4.1	
	a summary of the structures and locations at the facility that the licensee has concluded have not been impacted by licensed operations and the rationale for the conclusion;	4.1	
	a list or description of each room or work area within each of these structures;	4.1	Entire buildings are affected; individual rooms are not addressed.
	a summary of the background levels used during scoping or characterization surveys;	4.2	
	a summary of the locations of contamination (e.g., walls, floors, wall/floor joints, structural steel surfaces, and ceilings) in each room or work area;	n.a.	

Topic	Acceptance Criterion	Location (Section No.)	Comments
	a summary of the radionuclides present at each location, the maximum and average radionuclide activities in disintegrations per minute per 100 square centimeters (dpm/100cm2), the chemical form of the radionuclide, and, if multiple radionuclides are present, the radionuclide ratios;	4.4.2	Demolition concrete only
	the mode of contamination for each surface (i.e., whether the radioactive material is present only on the surface of the material or if it has penetrated the material);	4.4.2	Also Section 4.1, footnote
	the maximum and average radiation levels in millisievert per hour (mSv/hr) or microsievert per hour (μSv) (millirem per hour (mrem/hr) or microrem per hour (μrem/hr)), as appropriate, in each room or work area; and	4.4.2	
	a scale drawing or map of the rooms or work areas showing the locations of radionuclide material contamination and radiation levels. All maps should include compass direction indicators.		Entire buildings are affected; individual rooms are not addressed..
Section 4.2 Contaminated Systems and Equipment	a list or description and the location of all systems or equipment at the facility that contain residual radioactive material in excess of site background levels;		n.a.
	a summary of the radionuclides present in each system or on the equipment at each location, the maximum and average radionuclide activities in dpm/100cm2, the chemical form of the radionuclide, and, if multiple radionuclides are present, the radionuclide ratios;		n.a.
	the maximum and average radiation leyels in mSv/hr or p Sv/hr(mrem/hr or p rem/hr), as appropriate, at the surface of each piece of equipment;		n.a.
	a summary of the background levels used during scoping or characterization surveys;		n.a.
	a scale drawing or map of the rooms or work areas showing the locations of the contaminated systems or equipment. All maps should include compass direction indicators.		n.a.
Section 4.3 Surface Soil Contamination	a list or description of all locations at the facility where surface soil contains residual radioactive material in excess of site background levels;	4.4	
	a summary of the background levels used during scoping or characterization surveys;	4.2	
	a summary of the radionuclides present at each location, the maximum and average radionuclide activities in becquerel per gram (Bq/gm) (picocuries per gram (pCi/gm)), the chemical form of the radionuclide, and, if multiple radionuclides are present, the radionuclide rat	4.4	Table 17.2

Topic	Acceptance Criterion	Location (Section No.)	Comment
	the maximum and average radiation levels in mSv/hr (mrem/hr) at each location;	4.4	
	a scale drawing or map of the site showing the locations of radionuclide material contamination in surface soil. All maps should include compass direction indicators.	4.4	Figures 18.1 and 18.2
Section 4.4 Subsurface Soil Contamination	a list or description of all locations at the facility where subsurface soil contains residual radioactive material in excess of site background levels;	4.5	
	a summary of the background levels used during scoping or characterization surveys;	4.5	Also Section 4.2.3 and Table 17.2
	a summary of the radionuclides present at each location, the maximum and average radionuclide activities in Bq/gm (pCi/gm), the chemical form of the radionuclide, and, if multiple radionuclides are present, the radionuclide ratios;	4.5	
	the depth of the subsurface soil contamination at each location;	4.5	
	a scale drawing or map of the site showing the locations of subsurface soil contamination. All maps should include compass direction indicators.	4.5	Figures 18.1 and 18.2
Section 4.5 Surface Water	a list or description and map of all surface water bodies at the facility that contain residual radioactive material in excess of site background levels;	4.6	n.a.
	a summary of the background levels used during scoping or characterization surveys;		n.a.
	a summary of the radionuclides present in each surface water body and the maximum and average radionuclide activities in becquerel per liter (Bq/L) (picocuries per liter (pCi/L)).		n.a.
Section 4.6 Ground Water	a summary of the aquifer(s) at the facility that contain residual radioactive material in excess of site background levels;	4.7	No leaching into aquifer.
	a summary of the background levels used during scoping or characterization surveys;	4.7	n.a.
	a summary of the radionuclides present in each aquifer and the maximum and average radionuclide activities in becquerel per liter (Bq/L) (picocuries per liter (pCi/L		n.a.
Chapter 5 - Dose Modeling			

Topic	Acceptance Criterion	Location (Section No.)	Comments
	The licensee should identify realistic exposure scenarios assuming past, present and reasonably foreseeable (i.e., a few decades and possibly up to 100 years) land uses.	5.2, 5.3	RESRAD parameters
	Included in the assumption that the institutional controls are no longer in place, the licensee should assume that there is no maintenance and no repair of engineered barriers (if used), and as a result, should analyze how the engineered barrier might degrade over time, for example, due to erosion or biointrusion.	5.3	Section 17tables
	If a portion of the site is released for unrestricted use, the total dose from all portions of the site must meet the applicable dose criteria. Therefore, dose assessments for both restricted and unrestricted use portions of the site are needed and also take into consideration the impact of the other portion of the site.	5.3	Section 17 Tables
Chapter 6 - Environmental Information			
Chapter 7 - ALARA Analysis			
Chapter 8 - Planned Decommissioning Activities			
Section 8.1 Contaminated Structures	A summary of the remediation tasks planned for each room or area in the contaminated structure in the order in which they will occur, including which activities will be conducted by licensee staff and which will be performed by a contractor	8.1	n.a.
	A description of the remediation techniques (such as scabbling, hydrolazing or grit blasting) that will be employed in each room or area of the contaminated structure. Licensees may generically describe these techniques once at the beginning of the "Contaminated Structures" section and refer to them in the descriptions of the remediation of the individual rooms or areas.		n.a.
	A summary of the radiation protection methods (such as PPE, step-off pads and exit monitoring) and control procedures (such as scabbier shrouds, HEPA vented enclosures or superfine water misting) that will be employed in each room or area. (The staff's technical review of the adequacy of the licensee's radiation safety procedures should be performed pursuant to the criteria in Section 17.3 of this NUREG. In this section, the staff should make a qualitative assessment of the adequacy of the radiation protection and control methods proposed by the licensee to determine if the procedures described in the "Radiation Safety and Health" section of the DP have been followed.)		n.a.

Topic	Acceptance Criterion	Location (Section No.)	Commei
	A summary of the procedures already authorized under the existing license and those for which approval is being requested in the DP.		n.a.
	A commitment to conduct decommissioning activities in accordance with written, approved procedures.		n.a.
	A summary of any unique safety or remediation issues associated with remediating the room or area.		n.a.
	For Part 70 licensees, a summary of how the licensee will ensure that the risks addressed in the facility's Integrated Safety Analysis will be addressed during decommissioning.		n.a.
Section 8.2 Contaminated Systems and Equipment	A summary of the remediation tasks planned for each system in the order in which they will occur, including which activities will be conducted by licensee staff and which will be performed by a contractor.	8.2	n.a.
	A description of the techniques (such as scabbling, hydrolazing or grit blasting) that will be employed to remediate each system in the facility or site. Licensees may generically describe these techniques once at the beginning of the "Contaminated Systems" section and refer to them in the descriptions of the remediation of the individual systems.		n.a.
	A description of the radiation protection methods (such as personal protective equipment (PPE), step-off pads and exit monitoring) and control procedures (such as scabbier shrouds, HEPA vented enclosures or superfine water misting) that will be employed while remediating each system. (The staff's technical review of the adequacy of the licensee's radiation safety procedures should be performed pursuant to the criteria in Section 17.3 of this NUREG. In this section, the staff should make a qualitative assessment of the adequacy of the radiation protection and control methods proposed by the licensee to determine if the procedures described in the Radiation Safety and Health section of the DP have been followed.)		n.a.
	A summary of the equipment that will be removed or decontaminated and how the decontamination will be accomplished.		n.a.
	A summary of the procedures already authorized under the existing license and those for which approval is being requested in the DP.		n.a.
	A commitment to conduct decommissioning activities in accordance with written, approved procedures.		n.a.
	A summary of any unique safety or remediation issues associated with remediating any system or piece of equipment.		n.a.

Topic	Acceptance Criterion	Location (Section No.)	Comments
	For Part 70 licensees, a summary of how the licensee will ensure that the risks addressed in the facility's Integrated Safety Analysis will be addressed during decommissioning.		n.a.
Section 8.3 Soil	a summary of the removal/remediation tasks planned for surface and subsurface soil at the site in the order in which they will occur, including which activities will be conducted by licensee staff and which will be performed by a contractor;	8.3	
	a description of the techniques that will be employed to remove or remediate surface and subsurface soil at the site;	8.3	
	a description of the radiation protection methods (such as PPE, or area exit monitoring) and control procedures (such as the use of HEPA vented enclosures during excavation or covering soil piles to prevent wind dispersion) that will be employed during soil removal/remediation (The staff's technical review of the adequacy of the licensee's radiation safety procedures should be performed pursuant to the criteria in Section 17.3 of this NUREG. In this section, the staff should make a qualitative assessment of the adequacy of the radiation protection and control methods proposed by the licensee to determine if the procedures described in the Radiation Safety and Health section of the DP have been followed.);	8.3	
	a summary of the procedures already authorized under the existing license and those for which approval is being requested in the DP;	8.3	
	a commitment to conduct decommissioning activities in accordance with written, approved procedures;	8.3	Describes development of final design and specifications for construction
	a summary of any unique safety or removal/remediation issues associated with remediating the soil; and	8.3	
	for Part 70 licensees, a summary of how the licensee will ensure that the risks addressed in the facility's Integrated Safety Analysis will be addressed during decommissioning.		n.a.
Section 8.4 Surface and Ground Water	a sununary of the remediation tasks planned for ground and surface water in the order in which they will occur, including which activities will be conducted by licensee staff and which will be performed by a contractor;	8.4	n.a.
	a description the remediation techniques that will be employed to remediate the ground or surface water;		n.a.
	a description of the radiation protection methods and control procedures that will be employed during ground or surface water remediation;		n.a.

Topic	Acceptance Criterion	Location (Section No.)	Commem
	a summary of the procedures already authorized under the existing license and those for which approval is being requested in the DP;		n.a.
	a commitment to conduct decommissioning activities in accordance with written, approved procedures; and		n.a.
	a summary of any unique safety or remediation issues associated with remediating the ground or surface water.		n.a.
Section 8.5 Schedules	A Gantt or PERT chart is included that details the proposed remediation tasks in the order in which they will occur and including the amount of time required to perform each decommissioning activity and the initiation and completion dates for the activities.	8.5	Figure 18.9
	A statement is included that acknowledges that the dates in the schedule are contingent on NRC approval of the DP.	8.5	
	A statement is included that acknowledges that circumstances can change during decommissioning, and, if the licensee determines that the decommissioning cannot be completed as outlined in the schedule, the licensee will provide an updated schedule to NRC.	8.5	
	If the decommissioning is not expected to be completed within the time frames outlined in NRC regulations at 10 CFR 30.36(h)(1), 10 CFR 40.42(h)(1), 70.38(h)(1), or 72.54(j)(1), the staff should verify that the licensee has requested an alternative schedule for completing the decommissioning and has addressed the criteria in NRC regulations at 10 CFR 30.36(h)(2)(i)(1–5), 10 CFR 40.42(h)(2)(i) (1–5), 70.38(h)(2)(i)(1–5), or 72.54(k)(1–5).		n.a.
Chapter 9 - Project Management and Organization			
Section 9.1 Decommissioning Management Organization	a description of the decommissioning organization, including descriptions of the individual decommissioning project units within the decommissioning project; organization, such as project management, health and safety, and remedial activities;	9.1	
	a description of the responsibilities of each of these decommissioning project units;		n.a. - streamlined organization
	a description of the reporting hierarchy within the decommissioning project management organization, including a chart or diagram showing the relationship of each decommissioning project unit to other project units and decommissioning project management;	9.1	Figure 18.10

Topic	Acceptance Criterion	Location (Section No.)	Conunents
	a description of the responsibility and authority of each unit to ensure that decommissioning activities are conducted in a safe manner and in accordance with approved written procedures, including both stop-work authority of each unit and the manner in which concems about safety issues are managed within the overall decommissioning project.		n.a. - Streamlined organization
Section 9.2 Decommissioning Task Management	A description of the manner in which the decommissioning tasks are managed, such as through the use of Radiation Work Permits (RWPs). The term "RWP" will be used throughout this section to refer to the written procedure used to manage individual decommissioning tasks.	9.2	
	A description of how individual decommissioning tasks are evaluated and how the RWPs are developed for each task.	9.2	
	A description of how the RWPs are reviewed and approved by the decommissioning project management organization.	9.2	
	A description of how RWPs are managed throughout the decommissioning project (i.e., how they are issued, maintained, revised, and terminated).	9.2	
	A description of how individuals performing the decommissioning tasks are informed of the procedures in the RWP, including how they are initially informed and how they are informed when an RWP is revised or terminated.	9.2	
Section 9.3 Decommissioning Management Positions and Qualifications	a description of the duties and responsibilities of each management position in the decommissioning organization and the reporting responsibility of the position;	9.3	
	a description of the duties and responsibilities of each chemical, radiological, physical and occupational safety-related position in the decommissioning organization, and the reporting responsibility of the position;	9.3	
	a description of the duties and responsibilities of each engineering, quality assurance, and waste management position in the decommissioning organization and the reporting responsibilities of their respective positions;	9.3	
	the minimum qualifications for each of the positions described above, and the qualifications of the individuals currently occupying the positions (the licensee should also commit to providing the staff with the qualifications of any newly hired employees or replacements for these positions); and	9.3	
	a description of all decommissioning and safety committees, including the membership of the committees, the duties and responsibilities of each committee, and the authority of each committe		n.a.

Topic	Acceptance Criterion	Location (Section No.)	Commen.
Section 9.3.1 Radiation Safety Officer	a description of the health physics and radiation safety education and experience required for individuals acting as the licensee's RSO;	9.3.1	
	a description of the responsibilities and duties of the RSO;	9.3.1	
	a description of the specific authority of the RSO to implement and manage the licensee's radiation protection program, including the RSO's access and "stop-work" aiithority for all activities involving radioactive material at the site.	9.3.1	
Section 9.4 Training	a description of the radiation safety training that the licensee will provide to each employee including pre-employment, annual/periodic training and specialized training to comply with 10 CFR Part 19;	9.4.2	Training for RSO is described in Section 9.3.1
	a description of any daily worker "job site" or "tailgate" training that will be provided at the beginning of each workday or job task to familiarize workers with job-specific procedures or safety requirements;	9.4.4	
	a description of the documentation that will be maintained to demonstrate that training conunitments are being met.	9.4.5	
Section 9.5 Contractor Support	a summary of decommissioning tasks that will be performed by contractors, including the areas at the site where they will perform these tasks	9.5	
	a description of the management interfaces that will be in place between the licensee's management and onsite supervisors, and contractor management and onsite supervisors;	9.3.2.1	Decommissioning contractor subject to SMC's control; per Section 9.5, decommissioning contractor responsible for all subcontractors
	a description of the oversight responsibilities and authority that the licensee will exercise over contractor personnel;	9.3.2.1	Decommissioning contractor subject to SMC's control; per Section 9.5, decommissioning contractor responsible for all subcontractors
	a description of the training that will be provided to contractor personnel by the licensee, and the training that will be provided by the contractor;	9.5	
	a commitment that the contractor will comply with all radiation safety and license requirements at the facility.	9.5	
Chapter 10 - Health and Safety Program			
Section 10.1 Radiation Safety Controls and Monitoring for Workers			

Topic	Acceptance Criterion	Location (Section No.)	Comments
Section 10.1.1 Workplace Air Sampling Program	a demonstration that the air sampling program is representative of the workers' breathing zones and will be initiated whenever a worker's intake is likely to exceed the criteria in 20.1502(b)	10.1.1	Maximum individual exposures below monitoring reqmts of 10 CFR 20.1502(b)
	a description of the criteria used for selection of the placement of air samplers in work areas where potential for airborne hazards exists;	10.1.1	
	a description of the criteria demonstrating that air samplers with appropriate sensitivities will be used; and that samples will be collected at appropriate frequencies;	10.1.1	
	a description of the conditions under which constant air monitors (CAMs) (or similar equipment), general air and breathing zone samplers will be used, including a description of their readouts, annunciators, and alarm setpoints;	10.1.1	
	a description of the criteria used to determine the frequency of calibration of the flow meters on the air samplers;	10.1.1	
	a description of the action levels for air sampling results, including the actions to be taken when they are exceeded; and	10.1.1	
	a description of how minimum detectable activities (MDAs) for each specific radionuclide that may be collected in air samples are determined.	10.1.1, 10.2	
Section 10.1.2 Respiratory Protection Program	a description of the process controls, engineering controls, or procedures to control concentrations of radioactive materials in air;	10.1.2	
	a description of the evaluation that will be performed when it is not practical to apply engineering controls or procedures, that demonstrates that the use of respiratory protection equipment is ALARA;	10.1.2	Respirator usage not expected to be necessary
	a description of the considerations used to demonstrate that respiratory protection equipment is appropriate for a specific task, based on the guidance on assigned protection factors (APF);	10.1.2	Respirator usage not expected to be necessary
	a description of the medical screening and fit testing required before workers will use any respirator that is assigned a protection factor;	10.1.2	
	a description of the written procedures maintained to address all the elements of the respiratory protection program;	10.1.2	
	a description of the use, maintenance, and storage of respiratory protection devices in such a manner that they are not modified and are in like-new condition at the time of issue;	10.1.2	

Topic	Acceptance Criterion	Location (Section No.)	Comment
	a description of the respiratory equipment users' training program;	10.1.2	Commitment to incorporate into respiratory protection procedures
	a description of the considerations made when selecting respiratory protection equipment to mitigate existing chemical or other respiratory hazards instead of (or in addition to) radioactive hazards.	10.1.2	
Section 10.1.3 Internal Exposure Determination	A description of the monitoring to be performed to determine worker exposure during routine operations, special operations, maintenance, and clean-up activities.	10.1.3	
	A description of how worker intakes are determined using measurements of quantities of radionuclides excreted from, or retained in the human body. The licensee should include in its description the following: — how frequencies for bioassay measurements for baseline, periodic, special, and termination assays are assigned; — how radioactivity measured in the human body by bioassay techniques are converted into worker intake; and — action levels for bioassay samples, actions to be taken when they are exceeded, and their technical bases.	10.1.3	
	A description of how worker intakes are determined by measurements of the concentrations of airborne radioactive materials in the workplace. To determine worker intake by measurements of the concentrations of airborne radioactive materials in the workplace, the licensee should include the following: — how airborne concentrations of radioactivity are measured; — how airborne concentrations are converted to determine intakes; — action levels for a worker's intake based on dose, and actions to be taken when they are exceeded; and — action levels for a worker's intake based on chemical toxicity if soluble uranium is present in the work area.	10.1.3	
	A description of how worker intakes, for an adult, a minor, and a declared-pregnant woman (DPW) are determined using any combination of the measurements above.	10.1.3	
	A description of how worker intakes are converted into committed effective dose equivalent (and organ-specific committed dose equivalent), including how the intake of radioactivity by a DPW will be converted into a dose to the embryo/fetus.	10.1.3	
Section 10.1.4 External Exposure Determination	a description of the individual-monitoring devices that will be provided to workers who meet the criteria in 10 CFR 20.1502(a) and 20.1601 for external exposures;	10.1.4	
	a description of the type, range, sensitivity, and accuracy of each individual-monitoring device;	10.1.4	

Topic	Acceptance Criterion	Location (Section No.)	Comments
	a description of the use of extremity and whole body monitors when the external radiation field is non-uniform;	10.1.4	n.a. - see footnote to text
	a description of when audible-alarm dosimeters and pocket dosimeters will be provided, and a description of their performance specifications;	10.1. 4	n.a.
	a description of how external dose from airborne radioactive material is determined;	10.1.4	
	a description of the procedure to insure that surveys necessary to supplement personnel monitoring are performed; and	10.1.4	
	a description of the action levels for workers' external exposure, including the technical bases and actions to be taken when they are exceeded.	10.1.4	
Section 10.1.5 Summation of internal and External Exposures	a description of how the internal and external monitoring results are used to calculate Total Organ Dose Equivalent (TODE) and TEDE doses to occupational workers;	10.1.5	
	a description of how internal doses to the embryo/fetus, which is based on the intake of an occupationally-exposed, declared-pregnant woman, will be determined;	10.1.3, 10.1.5	
	a description of the monitoring of the intake of a declared-pregnant woman if determined to be necessary; and	10.1.3, 10.1.5	
	a description of the program for the preparation, retention and reporting of records for occupational radiation exposures.	10.1.5, 10.3	
Section 10.1.6 Contamination Control Program	a description of the written procedures to control both access to and stay time in contaminated areas by workers, if they are needed;	10.1.6	
	a description of surveys to supplement personnel monitoring for workers during routine operations, maintenance, clean-up activities, and special operations;	10.1.6	
	a description of the surveys that will be performed to determine the baseline of background radiation levels and radioactivity from natural sources for areas where decommissioning activities will take place;	10.1.6	
	a description in matrix or tabular form that describes contamination action limits (i.e., actions taken either to decontaminate a person, place or area, or to restrict access, or to modify the type or frequency of radiological monitoring);	10.1.6	Table 17.10

Topic	Acceptance Criterion	Location (Section No.)	Comments
	a description (included in the matrix or table mentioned above) of proposed radiological contamination guidelines for specifying and modifying the frequency for each type of survey used to assess the reduction of total contamination;	10.1.6	
	a description of the procedures used to test sealed sources and to insure that sealed sources are leak tested at appropriate intervals.		n.a.
Section 10.1.7 Instrumentation Program	a description of the instruments to be used to support the health and safety program including the manufacturer's name, the intended use of the instrument, the number of units available for the intended use, the ranges on each scale, the counting mode and the alarm set-points;	10.1.7	Describes method for selecting instrumentation to be used
	a description of instrumentation storage, calibration and maintenance facilities for instruments used in field surveys, including onsite facilities used for laboratory analyses of samples collected during surveys;	10.1.7	
	a description of the method used to estimate the Minimum Detectable Concentration (MDC) or Minimum Detectable Activity (MDA) (at the 95 percent confidence level) for each type of radiation to be detected;	10.1.7	Section 10.1.1
	description of the instrument calibration and quality assurance procedures;	10.1.7	
	a description of the methods used to estimate uncertainty bounds for each type of instrumental measurement; and	10.1.7	
	a description of air sampling calibration procedures or a statement that the instruments will be calibrated by an accredited laboratory.	10.L7	
Section 10.2 Nuclear Criticality Safety	A description of how the NCS functions, including management responsibilities and technical qualifications of safety personnel, will be maintained when needed throughout the decommissioning process.	10.2	n.a.
	A description of how an awareness of procedures and other items relied on for safety will be maintained throughout decommissioning among all personnel with access to systems that may contain fissionable material in sufficient amounts for criticality.		n.a.
	A summary of the review of NCSAs or the ISA indicating either that the process needs no new safety procedures or requirements, or that new requirements or analysis have been performed.		n.a.
	A summary of any generic NCS requirements to be applied to general decommissioning, decontamination, or dismantlement operations, including those dealing with systems that may unexpectedly contain fissionable material.		n.a.

Topic	Acceptance Criterion	Location (Section No.)	Comments
Section 10.3 Health Physics Audits, Inspections, and Recordkeeping Program	A general description of the annual program review conducted by executive management is included.	10.3	
	A description of the records to be maintained of the annual program review and executive audits is included.	10.3	
	A description of the types and frequencies of surveys and audits to be performed by the RSO and RSO staff is included. These surveys and audits should be frequent enough to ensure close communications and proper surveillance of individual radiation workers. Applicants should consider developing survey and audit schedules based on activity and use (e.g., highly contaminated areas or facilities involving volatile radioactive materials may be audited weekly or biweekly, moderately contaminated areas or facilities may be audited monthly, and slightly contaminated facilities may be audited quarterly). The audit program should include routine unannounced inspections).	10.3	
	A description of the process used in evaluating and dealing with violations of NRC requirements or license commitments identified during audits is included.	10.3	Corrective actions described in more detail in Section 13.5
	A description of the records maintained of RSO audits is included (e.g., the date of each audit, name of person(s) who conducted the audit, persons contacted by the auditor(s), areas audited, audit findings, corrective actions, and follow-up).	10.3	
Chapter 11 - Environmental Monitoring and Control Program			
Section 11.1 Environmental ALARA Evaluation Program	a description of ALARA goals for effluent control;	11.I	
	a description of the procedures, engineering controls, and process controls to maintain doses ALARA (see Section 17.4);	11.1	
	a description of the ALARA reviews and reports to management.	11.1	
Section 11.2 Effluent Monitoring Program	a demonstration that background and baseline concentrations of radionuclides in environmental media have been established through appropriate sampling and analysis;	11.2	Describes baseline sampiing to be conducted
	a description of the known or expected concentrations of radionuclides in effluents;	11.2	
	a description of the physical and chemical characteristics of radionuclides in effluents;	11.2	
	a summary or diagram of all effluent discharg tions;	11.2	

Topic	Acceptance Criterion	Location (Section No.)	Comment
	a demonstration that samples will be representative of actual releases;	11.2	
	a summary of the sample collection and analysis procedures, including the minimum detectable concentrations of radionuclides (if this information is not already described pursuant to Section 17.4 of this volume);	11.2	
	a summary of the sample collection frequencies;	11.2	
	a description of the environmental monitoring recording and reporting procedures;	11.2	
	a description of the quality assurance program to be established and implemented for the effluent monitoring program (if this is not already described under Section 17.6 of this volume).	13.2	
Section 11.3 Effluent Control Program	a description of the controls that will be used to minimize releases of radioactive material to the environment;	11.3	
	a summary of the action levels and description of the actions to be taken; should a limit be exceeded;	11.3	
	a description of the leak detection systems for ponds, lagoons, and tanks;		n.a.
	a description of the procedures to ensure that releases to sewer systems are controlled and maintained to meet the requirements of 10 CFR 20.2003;		n.a.
	a summary of the estimates of doses to the public from effluents and a description of the method used to estimate public dose.	11.3	Provides for evaluation of doses if action levels are exceeded
Chapter 12 - Radioactive Waste Management Program			
Section 12.1 Solid Radioactive Waste	a summary of the types of solid radioactive waste that are expected to be generated during decommissioning operations, including (but not limited to) soil, structural and component metal, concrete, activated components, contaminated piping, wood, and plastic;	12.1	
	a sununary of the estimated volume, in cubic feet, of each solid radioactive waste type summarized under bullet 1, above;	12.1	Table 17.1
	a summary of the radionuclides (including the estimated activity of each radionuclide) in each estimated solid radioactive waste type summarized under bullet 1, above;	4.4.1	
	a summary of the volumes of Classes A, B, C, and Greater-than-Class-C solid radioactive waste that will be generated by decommissioning operations;		n.a.

Topic	Acceptance Criterion	Location (Section No.)	Comments
	a description of how and where each of the solid radioactive wastes summarized under bullet 1, above, will be stored onsite prior to shipment for disposal;	12.1	n.a.
	a description of how the each of the solid radioactive wastes summarized under the first bullet above, will be treated and packaged to meet disposal site acceptance criteria prior to shipment for disposal;		n.a.
	if appropriate, a description of how the licensee intends to manage volumetrically contaminated material;	12.1	
	a description of how the licensee will prevent contaminated soil, or other loose solid radioactive waste, from being re-disbursed after exhumation and collection;	12.1	Section 11.3/Chapter 8
	the name and location of the disposal facility that the licensee intends to use for each solid radioactive waste type summarized under the first bullet, above.		n.a.
Section 12.2 Liquid Radioactive Waste	a summary of the types of liquid radioactive waste that are expected to be generated during decommissioning operations;	12.2	n.a.
	a summary of the estimated volume, in liters, of each liquid radioactive waste type summarized under the first bullet above;		n.a.
	a summary of the radionuclides (including the estimated activity of each radionuclide) in each liquid radioactive waste type summarized under the first bullet above;		n.a.
	a summary of the estimated volumes of Class A, B, C and Greater-than-Class-C liquid radioactive waste that will be generated by decommissioning operations;		n.a.
	a description of how and where each of the liquid radioactive wastes summarized under the first bullet above, will be stored onsite prior to shipment for disposal;		n.a.
	a description of how the each of the liquid radioactive wastes summarized under the first bullet above, will be treated and packaged to meet disposal site acceptance criteria prior to shipment for disposal;		n.a.
	the name and location of the disposal facility that the licensee intends to use for each liquid radioactive waste type summarized under the first bullet, above.		n.a.

Topic	Acceptance Criterion	Location (Section No.)	Commen
Section 12.3 Mixed Waste	a summary of the types of solid and liquid mixed waste that are expected to be generated during decommissioning operations;		n.a.
	a summary of the estimated volumes, in cubic feet, of each solid mixed waste type sununarized under bullet 1 above and in liters for each liquid mixed waste;		n.a.
	a summary of the radionuclides (including the estimated activity of each radionuclide) in each type of mixed waste type summarized under bullet 1 above;		n.a.
	a summary of the estimated volumes of Class A, B, C and Greater-than-Class-C mixed waste that will be generated by decommissioning operations;		n.a.
	a description of how and where each of the mixed wastes summarized under bullet 1 above, will be stored onsite prior to shipment for disposal;		n.a.
	a description of how the each of the mixed wastes summarized under bullet 1 above, will be treated and packaged to meet disposal site acceptance criteria prior to shipment for disposal;		n.a.
	the name and location of the disposal facility that the licensee intends to use for each mixed waste type summarized under bullet 1 above;		n.a.
	a discussion of the requirements of all other regulatory agencies having jurisdiction over the mixed waste; and		n.a.
	a demonstration that the licensee possesses the appropriate EPA or State permits to generate, store and/or treat the mixed wastes.		n.a.
Chapter 13 - Quality Assurance Program			
Section 13.1 Organization	a description of the QA program management organization;	13.1	
	a description of the duties and responsibilities of each unit within the organization and how delegation of responsibilities is managed within the decommissioning program;	13.1	
	a description of how work performance is evaluated;	13.1	Also Section 13.2
	a description of the authority of each unit within the QA program;	13.1	
	an organization chart of the QA program organization.	13.1	Supplemented by Figure 18.10

Topic	Acceptance Criterion	Location (Section No.)	Comments
Section 13.2 Quality Assurance Program	a commitment that activities affecting the quality of site decommissioning will be subject to the applicable controls of the QA program and activities covered by the QA program are identified on program defining documents;	13.2	
	a brief summary of the company's corporate QA policies;	13.2	Also Section 13.1
	a description of provisions to ensure that technical and quality assurance procedures required to implement the QA program are consistent with regulatory, licensing, and QA program requirements and are properiy documented and controlled;	13.2	
	a description of the management reviews, including the documentation of concurrence in these quality-affecting procedures;	13.2	
	a description of the quality-affecting procedural controls of the principal contractors, including documentation of the acceptance of the controls before the initiation of activities affected by the program;	13.2	
	a description of how NRC will be notified of changes (a) for review and acceptance in the accepted description of the QA program as presented or referenced in the DP before implementation and (b) in organizational elements within 30 days after the announcement of the changes (note that editorial changes or personnel reassignments of a nonsubstantive nature do not require NRC notification);	13.2	
	a description is proyided of how management (above or outside the QA organization) regulariy assesses the scope, status, adequacy, and compliance of the QA program;	13.2	
	a description of the instruction provided to personnel responsible for performing activities affecting quality pertaining to the purpose, scope, and implementation of the quality-related manuals, instmctions, and procedures;	13.2	
	a description of the training and qualifications of personnel verifying activities affecting quality in the principles, techniques, and requirements of the activity being performed;	13.2	
	for formal training and qualification programs, documentation includes attendees, date of attendance, and the objectives and content of the program;	13.2	
	a description of the self-assessment program to confirm that activities affecting quality comply with the QA program;	13.2	

Topic	Acceptance Criterion	Location (Section No.)	Comments
	a commitment that persons performing self-assessment activities are not to have direct responsibilities in the area they are assessing;	13.2	
	a description of the organizational responsibilities for ensuring that activities affecting quality are (a) prescribed by documented instmctions, procedures, and drawings; and (b) accomplished through implementation of these documents;	13.2.1	
	a description of the procedures to ensure that instructions, procedures, and drawings include quantitative acceptance criteria (such as those pertaining to dimensions, tolerances, and operating limits) and qualitative acceptance criteria (such as workmanship samples) for determining that important activities have been satisfactorily performed.	13.2	Section 13.7
Section 13.3 Document Control	a summary of the types of QA documents included in the program;	13.3	
	a description of how the licensee develops, issues, revises and retires QA documents.	13.3	Section 13.2
Section 13.4 Control of Measuring and Test Equipment	a summary of the test and measurement equipment used in the program;	13.4	
	a description of how and at what frequency the equipment will be calibrated;	13.4	
	a description of the daily calibration checks that will be performed on each piece of test or measurement equipment;	13.4	
	a description of the documentation that will be maintained to demonstrate that only properly calibrated and maintained equipment was used during the decommissioning.	13.4	
Section 13.5 Corrective Action	a description of the corrective action procedures for the facility, including a description of how the corrective action is determined to be adequate;	13.5	
	a description of the documentation maintained for each corrective action and any follow-up activities by the QA organization, after the corrective action is implemented.	13.5	
Section 13.6 Quality Assurance Records	a description of the manner in which the QA records will be managed;	13.6	
	a description of the responsibilities of the QA organization as well as all other units involved in the decommissioning to implement and maintain QA records;	13.6	
	a description of the QA records storage facility.	13.6	

Topic	Acceptance Criterion	Location (Section No.)	Comments
Section 13.7 Audits and Surveillance	a description of the audit program, including the procedures for conducting the audits or surveillance;	13.7	
	a description of the records and documentation generated during the audits and the manner in which the documents are managed;	13.7	
	a description of all followup activities associated with audits or surveillances;	13.7	
	a description of the trending/tracking that will be performed on the results of audits and surveillance.	13.7	
Chapter 14 - Facility Radiation Surveys			
Section 14.1 Release Criteria	a sununary table or list of the DCGLW for each radionuclide and impacted media of concem	14.3.2	Table 17.6
	if Class 1 survey units are present, a summary table or list of area factors that will be used to for determining a DCGLEMC for eaeh radionuclide and media of concem	14.3.14.2	Table 17.3
	If Class 1 survey units are present, the DCGL EMC values for each radionuclide and medium of concem	14.3.14.2	Table 17.3
	If multiple radionuclides are present, the appropriate DCGLW for the survey method to be used.	14.3.14.2	14.3.2, Table 17.6
Section 14.2 Characterization Surveys	a description of the survey measurements for impacted media	14.1	
	a description of the field instruments and methods that were used for measuring concentrations and the sensitivities of those instruments and methods	14.1.2	
	A description of the laboratory instruments and methods that were used for measuring concentrations and the sensitivities of those instruments and methods	14.1.3	
	The survey results, including tables or charts of the concentrations of residual radioactivity measured	14.1.4	Appendix 19.6
	maps or drawings of the site, area or building, showing areas classified as non-impacted or impacted	14.1.5	Appendix 19.6
	justification for considering areas to be non-impacted	14.1.5	

Topic	Acceptance Criterion	Location (Section No.)	Commem.
	a discussion of why the licensee considers the characterization survey to be adequate to demonstrate that it is unlikely that significant quantities of residual radioactivity have gone undetected.	14.1.6	
	for areas and surfaces that are inaccessible or not readily accessible, a discussion of how they were surveyed or why they did not need to be surveyed.	14.1.6	
	for sites, areas or buildings with multiple radionuclides, a discussion justifying the ratios of radionuclides that will be assumed in the final status survey or an indication that no fixed ratio exists and each radionuclide will be measured separately.	14.1, 14.2.1	
Section 14.3 In-process Surveys	A description of field screening methods and instrumentation	14.2.2	
	A demonstration that field screening should be capable of detecting residual radioactivity at the DCGL	14.2.2	
Section 14.4 Final Status Survey Design	a brief overview describing the final status survey design	14.3.1	
	a description and map or drawing of impacted areas of the site, area or building classified by residual radioactivity leyels (Class 1, 2, or 3) and divided into survey units with an explanation of the basis for division into survey units	14.3.4	Figure 18.11
	A description of the background reference areas and materials, if they will be used, and a justification for their selection	14.3.5	
	a summary of the statistical tests that will be used to evaluate the survey results	14.3.14.1	
	a description of scanning instruments, methods, calibration, operational checks, coverage and sensitivity for each media and radionuclide	14.3.8	
	For in-situ sample measurements made by field instruments, a description of the instruments, calibration, operational hecks, sensitivity and sampling methods, with a demonstration that the instruments and methods have adequate sensitivity.	14.3.9	
	a description of the analytical instruments for measuring samples in the laboratory, as well as calibration, sensitivity and methods with a demonstration that the instruments and methods have adequate sensitivity	14.3.10	
	A description of how the samples to be analyzed in the laboratory will be collected, controlled and handled	14.3.11.2	

Topic	Acceptance Criterion	Location (Section No.)	Comments
	a description of the final status survey investigation levels and how they were determined	14.3.14	
	a summary of any significant additional residual radioactivity that was not accounted for during site characterization		n.a.
	A summary of direct measurement results and/or soil concentration levels in units that are comparable to the DCGL, and if data is used to estimate or update the survey unit	14.3.14	n.a.
	A summary of the direct measurements or sample data used to both evaluate the success of remediation and to estimate the survey unit variance	14.3.14	
Section 14.5 Final Status Survey Report	An overview of the results of the final status survey	14.3.15	
	A discussion of any changes that were made in the final status survey from what was proposed in the DP or other prior submittals	14.3.15	
	A description of the method by which the number of samples was determined for each survey unit	14.3.15	
	A summary of the values used to determine the number of samples and a justification for these values	14.3.15	
	The survey results for each survey unit include: 1. The number of samples taken for the survey unit; 2. A description of the survey unit, including (a) a map or drawing of the survey unit showing the reference system and random start systematic sample locations for Class 1 and 2 survey units and random locations shown for Class 3 survey units and reference areas, and (b) a discussion of remedial actions and unique features; 3. The measured sample concentrations in units that are comparable to the DCGL; 4. The statistical evaluation of the measured concentrations; 5. Judgmental and miscellaneous sample data sets reported separately from those samples collected for performing the statistical evaluation; 6. A discussion of anomalous data, including any areas of elevated direct radiation detected during scanning that exceeded the investigation level or measurement locations in excess of DCGLW ; and 7. A statement that a given survey unit satisfied the DCGLW and the elevated measurement comparison if any sample points exceeded the DCGLW.	14.3.15	

Topic	Acceptance Criterion	Location (Section No.)	Commen.
	A description of any changes in initial survey unit assumptions relative to the extent of residual radioactivity (e.g., material not accounted for during site characterization)	14.3.15	
	A description of how ALARA practices were employed to achieve final activity levels	14.3.15, 16.6	
	If a survey unit fails, a description of the investigation conducted to ascertain the reason for the failure and a discussion of the impact that the failure has on the conclusion that the facility is ready for final radiological surveys and that it satisfies the release criteria	14.3.15	
	If a survey unit fails, a discussion of the impact that the reason for the failure has on other survey unit information	14.3.15	
Chapter 15 - Financial Assurance			
Section 15.1 Cost Estimate	A cost estimate that appears to be based on documented and reasonable assumptions	15.1	
Section 15.2 Certification Statement	The certification statement is based on the licensed possession limits and the applicable quantities specified in 10 CFR 30.35, 40.36, or 70.25	15.2	n.a.
	The licensee is eligible to use a certification of financial assurance and, if eligible, that the certification amount is appropriate	15.2	n.a.
Section 15.3 Financial Mechanism	The financial assurance mechanism supplied by the licensee consists of one or more of the following instruments: 1. Trust fund; 2. Escrow account; 3. Govemment fund; 4. Certificate of deposit; 5. Deposit of govemment securities; 6. Surety bond; 7. er of credit; 8. of credit; 9. Insurance policy; 10. Parent company guarantee; 11. Self guarantee; 12. Extemal sinking fund; 13. Statement of intent; or 14. By special arrangements with a govemment entity assuming custody or ownership of the site.	15.3	
	The financial assurance mechanism is an original signed duplicate		n.a.

Topic	Acceptance Criterion	Location (Section No.)	Comments
	The wording of the financial assurance mechanism is identical to the recommended wording provided in Appendix F of this document		n.a.
	For a licensee regulated under 10 CFR Part 72, a means is identified in the DP for adjusting the financial assurance funding level over any storage and surveillance period		n.a.
	The basis for financial assurance for a LTC license should be a combination of methods from 10 CFR 40.36, 10 CFR 20.1403 and NUREG-1757, Vol. 3.	15.1, 15.3	
	The cost estimate should include funds for at least the following licensee activities: site surveillance of access and land use restrictions; routine maintenance; radiological monitoring of surface and groundwater, if needed; reporting; and records retention.	15.1, 15.3	
	The cost estimate should assume the following USNRC oversight fees: A fee of $10,000 for one inspection and one report each year; $20,000 every five years for five year license renewal, inspection and report.	15.1	Table 17.14
	The cost estimate should include reasonable trustee fees and expenses.	15.1, 15.3	
	There should be a contingency factor of 25% added to the cost estimate to buffer against potential market losses and to provide for unexpected costs. (If the contingency proves insufficient, the licensee should be required to add funds to the trust. As a matter of faimess, particularly in light of the long term existence of the fund, if the balance substantially exceeds the amount needed to produce sufficient annual income, a provision to return excess funds to the licensee with USNRC's approval should be included in the trust.)	15.1	Table 17.14
Chapter 16 - Restricted Use and Alternate Criteria			
Section 16.1 Overview	a description of the institutional controls the licensee has instituted or plans to institute at the site; a demonstration that doses from residual radioactive material at the site will not exceed the limits in 10 CFR 20.1404(a)(1); a description of the restrictions on site use the licensee has provided to comply with 10 CFR 20.1404(a)(2); a demonstration that the potential doses are ALARA; a description of the activities undertaken by licensee tb obtain advice from the public and the results of these activities 10 CFR 20.1403requires that licensees obtain advice from institutions and individuals that may be affected by the deconunissioning on specific issues related to institutional controls and financial assurance.	16.1, 16.3	
Section 16.2 Eligibility Demonstration	A demonstration that the benefits of dose reduction are less than the cost of doses, injuries, and fatalities (see Volume 3 of NUREG series);	16.2	

Topic	Acceptance Criterion	Location (Section No.)	Commen
	A demonstration that the proposed residual radioactivity levels at the site are ALARA.	16.2	
	To be eligible, the licensee must demonstrate that further reductions in residual radioactivity necessary to release the site for unrestricted use: (1) would result in net public or environmental harm; or, (2) were not being made because the residual levels are ALARA (10 CFR 20.1403(a)). 2. The licensee has made provisions for legally enforceable institutional controls that would limit dose to the average member of the critical group to 0.25 millisieverts per year (0.25 mSv/yr)(25 millirem/year (25 mrem/yr)(10 CFR 20.1403(b)). The licensee has provided sufficient financial assurance to enable an independent third party to assume and carry out responsibilities for any necessary control and maintenance of the site (10 CFR 20.1403©). 4. The licensee has submitted a decommissioning plan or a license tennination plan to the NRC that indicates the licensee's intent to release the site under restricted conditions and describes how advice from individuals and institutions in the conununity who may be affected by the decommissioning has been sought and incorporated, as appropriate, following analysis of that advice (10 CFR 20.1403(d)). In seeking this advice, thc licensee would have conducted the actiyities for seeking advice required by 10 CFR 20.1403(d)(2), including providing for participation by a broad cross-section of community interests who may be affected by decommissioning; providing an opportunity for a comprehensive collective discussion of the institutional controls and financial assurance specified in 10 CFR 20.1403(d)(1) by the affected parties; and providing a publicly available summary of all such discussions. 5. The residual radioactivity levels have been reduced so that, if the institutional controls were no longer in effect, the annual dose to the average member of the critical group would not exceed either 1 mSv/yr (100 mrem/yr) or, under certain conditions, 5mSv/yr (500 mrem/yr). If the 5 mSv/yr value is used, the licensee must: (1) demonstrate that achieving 1 mSv/yr is prohibitively expensive, not technically achievable, or would result in net harm, (2) make provisions for durable institutional controls, and (3) provide sufficient financial assurance to allow an independent third party to carry out rechecks of the controls and maintenance at least every 5 years and carry out any necessary controls and maintenance (10 CFR 20.1403(e)).	16.2	

Topic	Acceptance Criterion	Location (Section No.)	Comments
Section 16.3Institutional Controls and Engineered Barriers	The system of controls to sustain protection should include the following six elements: (1) legally enforceable institutional controls; (2) engineered barriers (as used to mitigate adverse processes (e.g., infiltration or erosion) so the dose criteria are met; (3) monitoring and maintenance; (4) independent third party oversight; (5) sufficient funding; and (6) maximum limits on dose (i.e., dose caps") if institutional controls fail. The licensee should describe how it proposes to apply the total system approach to its specific site. This total system description should be summarized.	16.3	
	Location and description of the general type of institutional controls and the basis for selection using USNRC's risk-informed graded approach in Attachment 1 of the LTR Analysis in SECY-03-0069. Using this approach, determine if the restricted area of the SMC site is a lower or higher risk area and the general type of institutional controls that are needed. (Consider both hazard duration based on the half-life of nuclides in the contamination as well as hazard level (i.e., less than or greater than 100 millirem per year) based on dose assessment assuming no controls. This approach might result in identifying unrestricted use areas where no institutional controls are required and restricted use areas using either legally enforceable instimtional controls or durable and legally enforceable institutional controls.)	16.3	
	A demonstration that the size of the restricted use area has been minimized. (The staff considers that minimizing the size of the restricted use area would contribute to demonstrating ALARA for sites that are considering partitioning the site into unrestricted and restricted use portions. It would also result in a smaller area to control, which may make access limitations like fencing and surveillance simpler and thus more effective, compared to a much larger area.	16.3	
	a description of the specific type of legally enforceable institutional control(s) and an explanation of how the institutional control is a legally enforceable mechanism. (If such controls cannot be arranged, provide justification for appropriateness of using either the LTC license: durable institutional controls are required; and licensee was unable to establish other types of legally enforceable institutional controls and independent third party arrangements (e.g., letter from the State declining responsibility).	16.3.1	
	State the two specific types of institutional controls will be used: (1) describe that the LTC license is considered to be a specific type of legally enforceable and durable institutional control; (2) describe the licensee's responsibility to put in place and maintain a deed notice that notifies potential landowners of the LTC license requirement and the conditions of the LTC license.	16.3.1	

Topic	Acceptance Criterion	Location (Section No.)	Comment
	a description of the restrictions on present and future landowners. (Describe the access and land use restrictions based n the dose assessments assuming no controls. Identify specific access and land use scenarios that could lead to non-compliance with the dose criteria of the LTR and therefore should be prohibited (e.g., farming, construction of a residence, excavation into the cell for any purpose, or groundwater use).)	16.3.1	
	Indicate what access and land use that might be permitted (e.g., industrial, recreational or wildlife conservation area).	16.3.1	
	Describe what restrictions on land use would be needed to maintain effective engineered barrier performance (e.g., prohibit excavation of the cell cap and removal of cell cap material or contaminated material) as well as permitted access and land use.	16.3.1, 16.3.2	
	Describe the licensee's activities to restrict/control access and land use, including fences, signs, monuments and periodic surveillance (e.g., annual site surveillance and adverse event surveillance). (All of the above should be conditions in the LTC license, recognizing that the licensee will need to prepare a Long-Term Control Plan that will describe the details of how the licensee will implement the LTC license conditions.)	16.3.2	
	a description of the entities enforcing, and their authority to enforce, the institutional control(s). (Note that the USNRC considers the LTC license along with the deed notice to be a durable institutional control.)	16.3.1	As supplemented by 16.3.2 and 16.4
	a discussion of the durability of the institutional control(s), the basis for the duration, the conditions that will end the institutional control(s) and the activities that will be undertaken to end the institutional control(s). (Discuss that the duration of the LTC license will be pennanent for the SMC site based on the long half-life of the uranium and thorium contamination; however the license would be renewed in five-year increments.	16.3.1, 16.3.2	
	a description of the plans for corrective actions that may be undertaken in the event the institutional control(s) fail.	16.3.3	
	a description of the records pertaining to the institutional controls, how and where will they will be maintained, and how the public will have access to the records.	16.3.4	
	Identify both historical and new records to be retained under the LTC license by the licensee that are necessary for the licensee to provide effective long-term protection. (This includes the Decommissioning Plan, Final Status Survey Report, LTC hcense, Long-Term Control Plan and all correspondence under the LTC license).	16.3.4	
	Identify the location and methods used for retention of records by the licensee. (Note that the USNRC will retain all licencing records as part of it's Agency record keeping system and that these records will be available to the public in the future as they are today.)	16.3.4	

Topic	Acceptance Criterion	Location (Section No.)	Comments
	A description of any detriments associated with the maintenance of the institutional control(s). (Describe any detriments to using the LTC license. For example, describe potential impacts on sale of property or value of property due to the USNRC license "stigma" or perceptions that the USNRC could potentially requiring further cleanup in the future (i.e., finality). Detriments might also be a result of restricted use of the land, independent of the type of legal instruments used (LTC license). Include stakeholder inputs, if provided.	16.3	
	the contribution of engineered barriers towards compliance with the criteria of 10 CFR 20.1403 with institutional controls in place including maintenance);	16.3	
	the contribution of engineered barriers towards compliance with the criteria of 10 CFR 20.1403 assuming loss of institutional controls (including loss of maintenance) such that the barrier degrades over time;	16.3	Section 8.3.3
	Analysis of human and natural dismptiye processes	16.3	Section 5.3.3
	the heed for durable engineered barriers that remain effective over the compliance time period, especially for long-lived radionuclides;	16.3	Section 8.3
	the need for designs that simplify long-term care and minimize the extent of routine maintenance and associated costs, especially for sites with long-lived radionuclides;	16.3	Section 8.3
	the need for robust designs that mitigate potential future failures of the engineered barrier over the compliance time period and the resulting need for and high cost of major repairs or replacement of major portions of the engineered barrier (in particular, for sites with long-lived radionuchdes, natural events such as erosion and biointrusion should be evaluated over the compliance time period to determine the design of the engineered barrier and the plans for maintenance);	16.3	Section 8.3, 5.4.3.2 (surface soil erosion rate)
	The technical basis for engineered barrier performance should address design and functionality of engineered barriers, including interactive effects (both positive and negative) from the implementation of multiple barriers; technical basis for design and functionality of engineered barriers; degradation mechanisms and sensitivity analysis; uncertainty in design and functionality of engineered barriers; suitability of numerical models; model support; and quality assurance.	16.3	Section 8.3, 5.4.3.2 (surface soil erosion rate)
	adequate financial assurance that considers the cost of both routine maintenance and need for potential major repairs of the engineered barrier over the time period of compliance;	16.3	Section 15.1
	the reasonableness of a breach of a barrier by an inadvertent intruder that adversely impacts the effectiveness of the barrier	16.3	Section 5.3.3
	the extent and impact of a barrier's degradation over time.		Section 8.3, 5.4.3.2 (surface soil erosion rate)

Topic	Acceptance Criterion	Location (Section No.)	Comment
Section 16.4 Site Maintenance, Long-term Monitoring and Financial Assurance	a demonstration that an appropriately qualified entity has been provided to control and maintain the site. (Under the LTC license, the entity could be the licensee or a contractor to the licensee. Discuss the qualifications of the personnel that are necessary to conduct the planned LTC activities.)	16.4	
	a description of the site maintenance and control program and the basis for concluding that the program is adequate to control and maintain the site; For the LTC hcense, the maintenance activities would be conditions of the license and the detailed plans and procedures to implement the conditions would be included in the Long-Term Control Plan.	16.4	
	Describe the general maintenance and control activities that should be required as conditions of the LTC license, such as visual surveillance and routine maintenance of physical controls and engineered barriers (e.g., fence repair, cutting grass or removing vegetation)	16.4	
	Describe radiological monitoring of surface or groundwater, if such monitoring is needed to verify dose modeling results of potential radionuclide contamination in surface or groundwater. Include location and frequency of sampling, duration of monitoring and supporting justifications.		n.a.
	Reference the Long-Term Control Plan that will be prepared by the licensee that will give the detailed activities and procedures to implement the license conditions.	16.4	
	Demonstrate that the design of any engineered barriers are sufficientiy robust so that ongoing active maintenance or periodic repair necessary to maintain the effectiveness of the engineered barrier is not needed. For example, the design objective should be to preclude the occurrence and need for repair of deep gullies in the erosion protection cap that would expose residual contamination. Similarly, the cover design (thickness and material) that might be needed for shielding of the residual contamination should be designed to preclude erosion that might reduce its thickness and shielding effectiveness and not rely on repairs to restore the cover thickness. Note that an acceptable erosion cover design would be one that is consistent with USNRC's guidance for erosion protection in NUREG-1620, Rev. 1 and NUREG-1623.	16.4	
	a description of the arrangement or contract with the entity charged with carrying out the actions necessary to maintain control at the site. (This applies if the licensee plans on using a contractor.)		n.a.
	a demonstration that the contract or arrangement will remain in effect for as long as feasible, and include provisions for renewing or replacing the contract;		n.a.

Topic	Acceptance Criterion	Location (Section No.)	Comments
	A description of licensee reporting to USNRC and State and local officials, including an annual report and event corrective actions reports, as needed. The annual report should describe licensee surveillance and routine maintenance. Event corrective actior reports would identify the adverse eyent that occurred and the licensee's planned corrective actions. Follow-up reports would summarize the results of the corrective actions taken and an analysis of lessons leamed from the event and plans to prevent similar future events from occurring.	16.3.4, 16.4	
	a description of the activities that the party with the authority to enforce the institutional controls will undertake to enforce the institutional control(s) ;	16.3.1	
	a description of the manner in which the entity with the authority to enforce the institutional control(s) will be replaced if that entity is no longer willing or able to enforce the institutional control(s);	16.3.1	
	a description of the periodic site inspections that will be performed by the third party, including the frequency of the inspections.	16.3.1	
	a description of the manner in which independent oversight of the entity charged with maintaining the site will be conducted and what entity will conduct die oversight;	16.3.1	
	demonstration that the entity providing the oversight has die authority to replace the entity charged with maintaining the site;	16.3.1	
	a description of the authority granted tb the third party to perform, or have performed, any necessary maintenance activities;	16.3.1	
	unless the entity is a govemment entity, a demonstration that the third party is not the entity holding the financial assurance mechanism;		n.a.
	a demonstration that sufficient records evidencing to official actions and financial payments made by the third party (including NRC under the LTC license) are open to public inspection;	16.3.4	
	a description of the periodic site inspections that will be performed by the third party, including the frequency of the inspections.	16.3.1	
Section 16.5 Obtaining Public Advice	a description of how individuals and institutions that may be affected by the decommissioning were identified and informed of the opportunity to provide advice to the licensee	16.5	
	a description of the manner in which the licensee obtained advice from these individuals or institutions;	16.5	
	a description of hpw the licensee provided for participation by a broad cross-section of community interests in obtaining the advice;	16.5.1	

Topic	Acceptance Criterion	Location (Section No.)	Comment
	a description of how the licensee provided for a comprehensive, collective discussion of the issues by the participants represented;	16.5.2	
	a copy of the publicly available summary of the results of discussions, including individual viewpoints of the participants on the issues and the extent of agreement and disagreement among the participants;	16.5.3	Appendix 19.7
	a description of how this summary has been made available to the public;	16.5.3	
	a description of how the licensee evaluated the advice, and the rationale for incorporating, or not incorporating, the advice from affected members of the community into the DP.	16.5.4	
	Seek advice on whether the provisions for institutional controls will:— provide reasonable assurance that annual doses will not exceed 0.25 mSv/y (25 mrem/y);— be enforceable; and— not impose undue burden on the local community or other affected parties.	16.5.2	
	Seek advice from representatives of a broad cross-section of individuals and institutions in the community that may be affected by the decommissioning (affected parties).	16.5.1	
	Provide a publicly available summary of the results of all such discussions, including a description of the individual viewpoints of the participants on the issues and the extent of agreement and disagreement among the participants on the issues.	16.5.3	
Section 16.6 Dose Modeling and ALARA Demonstration	a summary of the dose to the average member of the critical group when radionuclide levels are at the DCGL with institutional controls in place, as well as the estimated doses if they are no longer in place;	16.6	
	a summary of the evaluation performed pursuant to Chapter 6 in Volume 2 of this NUREG series demonstrating that these doses are ALARA;	16.6	
	a demonstration that further reductions in residual radioactivity necessary to comply with the 1.0 mSv/y (100 mrem/y) requirement are not technically achievable, would be prohibitively expensive, or would result in net public or environmental harm, if the estimated dose to the average member of the critical group could exceed 1.0 mSv/y (100 mrem/y), but would be less than 5.0 mSv/y (500 mrem/y) when the radionuclide levels are at the DCGL;	16.6	
	provisions for durable institutional controls are in place;	16.6	
	sufficient financial assurance to allow an independent third party to carry out rechecks at the site no less frequently than every 5 years and to assume and carry out responsibilities for any necessary control and maintenance of the controls at the site has been provided.	16.6	

Topic	Acceptance Criterion	Location (Section No.)	Comments
Section 16.8 Altemate Criteria	a summary of the dose in TEDE(s) to the average member of the critical group when the radionuclide levels are at the DCGL (considering all man-made sources other than medical);	16.7	n.a.
	a summary of the evaluation performed pursuant to Chapter 6 of Volume 2 of this NUREG series demonstrating that these doses are ALARA		n.a.
	an analysis of all possible sources of exposure to radiation at the site and a discussion of why it is unlikely that the doses from all man-made sources, other than medical, will be more than 1 mSv/y (100 mrem/y);		n.a.
	a description of the legally enforceable institutional control(s) and an explanation of how the institutional control is a legally enforceable mechanism		n.a.
	description of any detriments associated with the maintenance of the institutional control(s);		n.a.
	a description of the restrictions on present and future landowners;		n.a.
	a description of the entities enforcing and their authority to enforce the institutional control(s)		n.a.
	a discussion of the durability18 of the institutional control(s);		n.a.
	a description of the activities that the party with the authority to enforce the institutional controls will undertake to enforce the institutional control(s) ;		n.a.
	a description of the manner in which the entity with the authority to enforce the institutional control(s) will be replaced if that entity is no longer willing or able to enforce the institutional control(s);		n.a.
	a description of the duration of the institutional control(s), the basis for the duration, the conditions that will end the institutional control(s) and the activities that will be undertaken to end the institutional control(s);		n.a.
	a description of the corrective actions that will be undertaken in the event the institutional control(s) fail;		n.a.
	a description of the records pertaining to the institutional controls, how and where they will be maintained, and how the public will have access to the records.		n.a.
	a description of how individuals and institutions that may be affected by the decommissioning were identified and informed of the opportunity to provide advice to the licensee;.		n.a.
	a description of the manner in which the licensee obtained advice from affected individuals or institutions;		n.a.

Topic	Acceptance Criterion	Location (Section No.)	Commen.
	a description of how the licensee provided for participation by a broad cross-section of community interests in obtaining the advice;		n.a.
	a description of how the licensee provided for a comprehensive, collective discussion on the issues by the participants represented;		n.a.
	a copy of the publicly available summary of the results of discussions, including individual viewpoints of the participants on the issues and the extent of agreement and disagreement among the participants;		n.a.
	a description of how this summary has been made available to the public;		n.a.
	a description of how the licensee evaluated advice from individuals and institutions that could be affected by the decommissioning and the manner in which the advice was addressed.		n.a.

CHECKLIST DEMONSTR IG COMPLIANCE WITH ACCEPTANCE CRITERIA IN FEBRUARY 28, 2003 LETTER FROM THE USNRC[1]

Shieldalloy Metallurgical Corporation Decommissioning Plan (Rev. 1)

Topic	Acceptance Criterion	Location (Section No.)	Comments
Decommissioning Plan Acceptance Review	Additional information is required regarding your site-specific dose modeling	Chapter 5	
	Additional information is required regarding a quantitative site specific cost-benefit analysis to demonstrate that the proposed alternative is As Low As Reasonably Achievable (ALARA)	Chapter 7	
	Additional information is required regarding specific institutional controls for restricted release	16.3	
	Additional information is required regarding an agreement by a competent party to assume control of and responsibility for maintenance of the site	16.3.1	
	Additional information is required regarding financial assurance	15.1	
	Additional information is required regarding advice from affected parties.	16.5	
Dose Modeling	The exposure scenario includes a situation in which the deed restrictions and prohibition of building a residence near the storage pile fal, yet the cover and shape of the capped pile remain intact. Please provide a justification for how the cell has been designed to withstand erosion and other activities or an exposure scenario should also be included that erodes the cap through natural and human activities if the institutional controls and site maintenance were to fail.	Appendix 19.3	

[1] Bellamy, R. R., U. S. Nuclear Regulatory Commission, letter to D. R. Smith, Shieldalloy Metallurgical Corporation, "Rejection of Decommissioning Plan for the Newfield Facility and Denial of the Exemption Request to Postpone Initiation of Decommissioning Process, Control No. 132074", February 28, 2003.

Topic	Acceptance Criterion	Location (Section No.)	Comments
	The exposure scenario as stated eliminated the direct exposure pathway by placing the house 20 feet away from the contaminated area, and estimated an exposure of less than 10 microrem per hour above background. Please provide the basis for selecting a distance of 20 feet. In addition, provide a basis as to why exposure to direct gamma radiation from other plausible scenarios should not be considered. For example, the average member of the critical group could be the family farm member engaging in outdoor activities, such as tending to crops and livestock or recreational activities such as fishing in the on-site pond.	5.3.3.2	
	Please consider other exposure scenarios where there could be land activities on top of the engineered call. For example, an exposure scenario to a worker providing maintenance on and near the cell, or an intruder scenario because of loss of institutional controls, resulting in an occupational re-use of the land over the cell. Comparison of the results for modeling these scenarios to the residential farming scenario should be included to demonstrate the reason for selecting the residential farming scenario as the bounding scenario.	Chapter 5	
	An esposure scenario for other areas of the site where licensed materials were not used is not addressed in the DP. The DP should address the dose contribution for other portions of the site to meet the overall dose limits for the site.	Chapter 5	
	The input parameters used in Shieldalloy's analysis are primarily the RESRAD default parameters. There was no sensitivity analysis to identify key parameters. Please provide the justification for the values used for key parameters for the Newfield site. Note that information determined based on past groundwater studies may be acceptable.	Chapter 5	

Topic	Acceptance Criterion	Location (Section No.)	Comments
	The input parameters model an impermeable cover remaining intact and not affected by erosion or water runoff (water runoff coefficient to 100%). Yet input parameters erode the contaminated slag pile over time. Provide or reference the basis for why the engineering cover would remain in place. Also justify how the slag pile erodes with time, although the impermeable cover is not eroded.	5.4.3.2	
	The partition coefficients were changed based on a referenced source. Compare these Kd values to calculations of estimated travei times based on the uranium and thorium found in ground-water samples from wells near the existing slag piles. Also explain the basis for inputting groundwater concentration as zero under the initial conditions.	n.a.	Site-specific distribution coefficients have been obtained since the release of Rev. 0 of the Plan (see Appendix 19.4 of Rev. 1)
Decommissioning Altemative and Rationale and ALARA Analysis	Section 6.2 states, in part, that the regulatory decision on the preferred decommissioning alternative for another facility with similar radioactive slag is equally applicable to the SMC's Newfield facility. However, site-specific factors and a thorough examination of other altematives were not presented.	Chapter 7	
	Section 7 states that the estimated cost of off-site disposal was calculated to be approximately $102-112 nullion versus about $3.0 million for the on-site disposal options. Please elaborate on the other altematives and explain the cost differences.	7.3.6 and Tables 17.14, 17.15 and 17.16	
	See 10 CFR 51.60 for the general requirements for a licensee's Environmental Report and NUREG-1748 for developing a site specific Environmental Report.	Appendix 19.9	
	Examine other conservative altematives such as offsite disposal to other facilities (compare cost factors per ton or cubic feet) and offsite disposal of the soils and bag-house dust and its impact of reduction on the source term. For example, leaching of thorium and uranium from the bag-house dust in comparison to the slag, and the cost-benefit of the action.	7.1	

Topic	Acceptance Criterion	Location (Section No.)	Comments
	Develop and submit a site specific quantitative cost-benefit analysis to support the in-situ stabilization option as ALARA, since the chosen altemative is not the environmentally preferable alternatives. The ALARA demonstration should be performed pursuant to Section 7 fo NUREG-1727.	7.4	
Radioactive Waste Management Program	Section 12.3 states that no solid or liquid mixed wastes are expected to be generated during the decommissioning process. However, a soil remediation plan is under review by EPA. Please state whether any mixed waste could be generated from remediation of these soils in areas impacted or potentially impacted by NRC regulated source material.	12.3	
Financial Assurance	Section 15.1 stats that costs of implementing this plan is $2,731,161 as shown in Table 17.14. Piease separate the cost of long term surveillance from the cost of site stabilization and cell construction.	15.1 and Table 17.14	
	The cost for site stabilization and long term surveillance and maintenance of the cap, wildlife area and nature trails fo 1,000 years was estimated at $781.300. Please show the cost for long-term care on a yearly basis and the method used to determine the total estimate (refer to NRC guidance to calculate this amount) assuming a duration of 1,000 years. Also explain the assumptions used regarding the potential for requiring major repair of the cell (see comments regarding maintenance of the site).	15.1 and Table 17.14	Annual surveillance & monitoring costs provided for planting engineered cap with grass
	Describe the financial assurance mechanism provided by the licensee or responsible party for an independent third party to carry out the necessary control and maintenance activities.	16.4	
	Address whether costs for additional remediation/recovery actions related to being an EPA National Priorities List site are assumed to be secured with the existing irrevocable stand-by letter of credit.	15.3	

Topic	Acceptance Criterion	Location (Section No.)	Comments
Institutional Controls (IC)	Section 16.2 provides a summary of the variety of institutional controls that will be implemented. Explain how the proposal for the institutional controls are legally enforceable, such as the authority to enforce and manner in which controls will be enforced. In its DP, SMC proposed the use of a deed notice after license termination while it remains the owner of the site. NRC staff is concemed because a deed notice is not a legally enforceable type of institutional control. Furthermore, SMC did not address enforceability of the institutional controls after transfer of ownership to some other govemment entity. Such institutional control plans must be agreed to and documented in the revised DP.	16.3.1	
	Identify whether there is an agreement by an independent third party to assume control of and responsibility for the maintenance of the site. Residual contamination at the SMC site will consist of uranium and thorium, both long-live3d radionuclides requiring "more stringent" IC according to the LTR SOC. Although SMC proposed eventually transferring their site ownership to some local or state govemment entity, the DP did not discuss the capacity or willingness by any govemment entity to accept this responsibility in perpetuity. SMC must also address the willingness of entities to accept the funds to be provided and that they are sufficient for control and maintenance as well as resolving concems over long-term liability due to potential engineered call/cap repair after transfer of ownership. Therefore, SMC has not demonstrated that its proposal is feasible.	n.a.	No third party participation is required.
Engineered Barriers	The DP states that the cell has been designed to meet New Jersey (see executive summary) and NRC (see Section 8.3.3) requirements, that it is designed to ast 1,000 years, and will prevent future erosion. However, specific guidance documents are not referenced. Please do so.	n.a.	Information is no longer used.
	No basis is provided for the cell lasting 1,000 years or preventing future erosion, especially with steep 3/1 slopes. Furthermore, no basis is provided that the geotextile layer will last 1,000 years or the affect on performance if it fails.	Appendix 19.3	

Topic	Acceptance Criterion	Location (Section No.)	Comments
	There is no discussion that the cell and cap have been designed not to rely on maintenance or to preclude major cell failure and major repair or partial replacement over the 1,000 year time period. Reference to NRC's Part 40 Appendix A engineered cell cap design guidance for designing disposal cells within the objectives to last 1,000 years with no reliance on maintenance may be useful to consider.	8.3	Supported by Appendix 19.3
Maintenance of the Site	Describe any detriments associated with the maintenance of the institutional controls. For example, discuss the potential for vegetation growth or presence of hazardous wildlife that could prevent the completion of quarterly maintenance inspections or impact the engineered cell (i.e., burrowing by animals.	16.3, footnote; 16.4	Footnote to Section 16.3 describes detriments associated with limitations on selling of unrestricted portion of property specified in USNRC guidance.
	Describe maintenance expected for the engineered cap and nature trails after SMC transfers titie of the property. Include a discussion of the potential for and the cost of major repair or partial replacement pf the engineered cell cap should the cap fail. NOTE the relationship to the degree of design robustness.	15.1, 15.4	
Obtaining Public Advice	Because SMC with its RAB most likely will develop the mechanisms for soliciting public advice from the local parties, please outline in more detail what actions are planned or will be taken to establish an RAB.	16.5.5	
	As stated in Section 4, the RAB should be meeting during the planning phase to provide valuable input. NRC recommends that a SSAB or other effective methods be selected as soon as practical after the licensee notifies the NRC of its intention to decommission and terminate the license.	16.5	
	Describe the administrative support and access to licensee studies and analysis pertinent to the proposed decommissioning for the SSAB. Describe how the summary of the results of all collective discussions and reports by the SSAB will be made publically available.	16.5	

Topic	Acceptance Criterion	Location (Section No.)	Comments
	Although SMC indicated general plans for future interactions to seek advice from affected parties, the DP did not include the results of interactions as required. The advice from affected parties should have been part of the input that SMC used to prepare its DP.	16.5	

Appendix 19.2 - Chapter 3 Reference Material

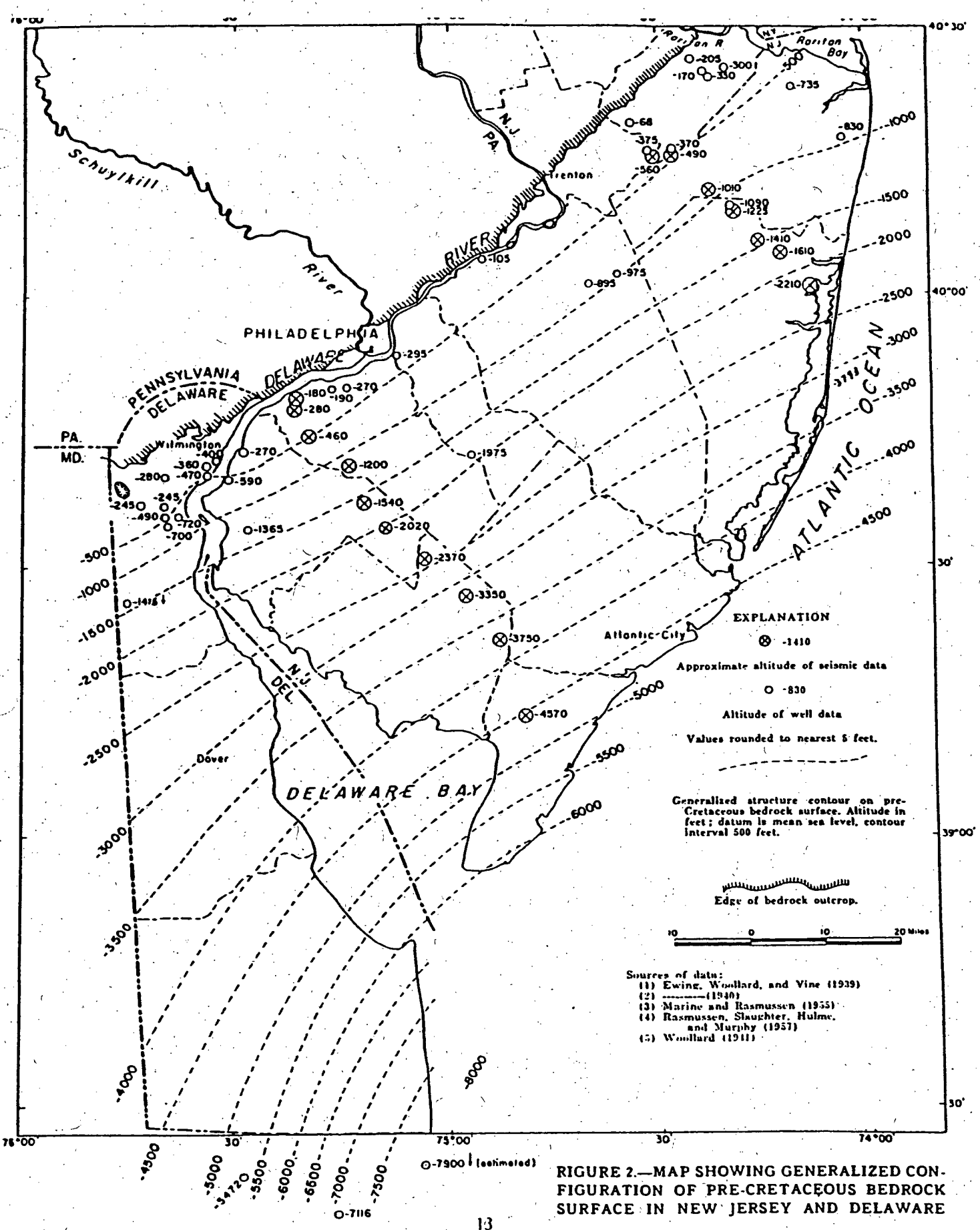
COASTAL PLAIN STRUCTURAL GEOLOGY INFORMATION

Excerpted From:

New Jersey Geological Survey
Geologic Report Series No. 4

"Generalized Structural Contour Maps of the New Jersey Coastal Plain"

Horace Richards
Filt Olmsted
James Ruhle



RIGURE 2.—MAP SHOWING GENERALIZED CONFIGURATION OF PRE-CRETACEOUS BEDROCK SURFACE IN NEW JERSEY AND DELAWARE

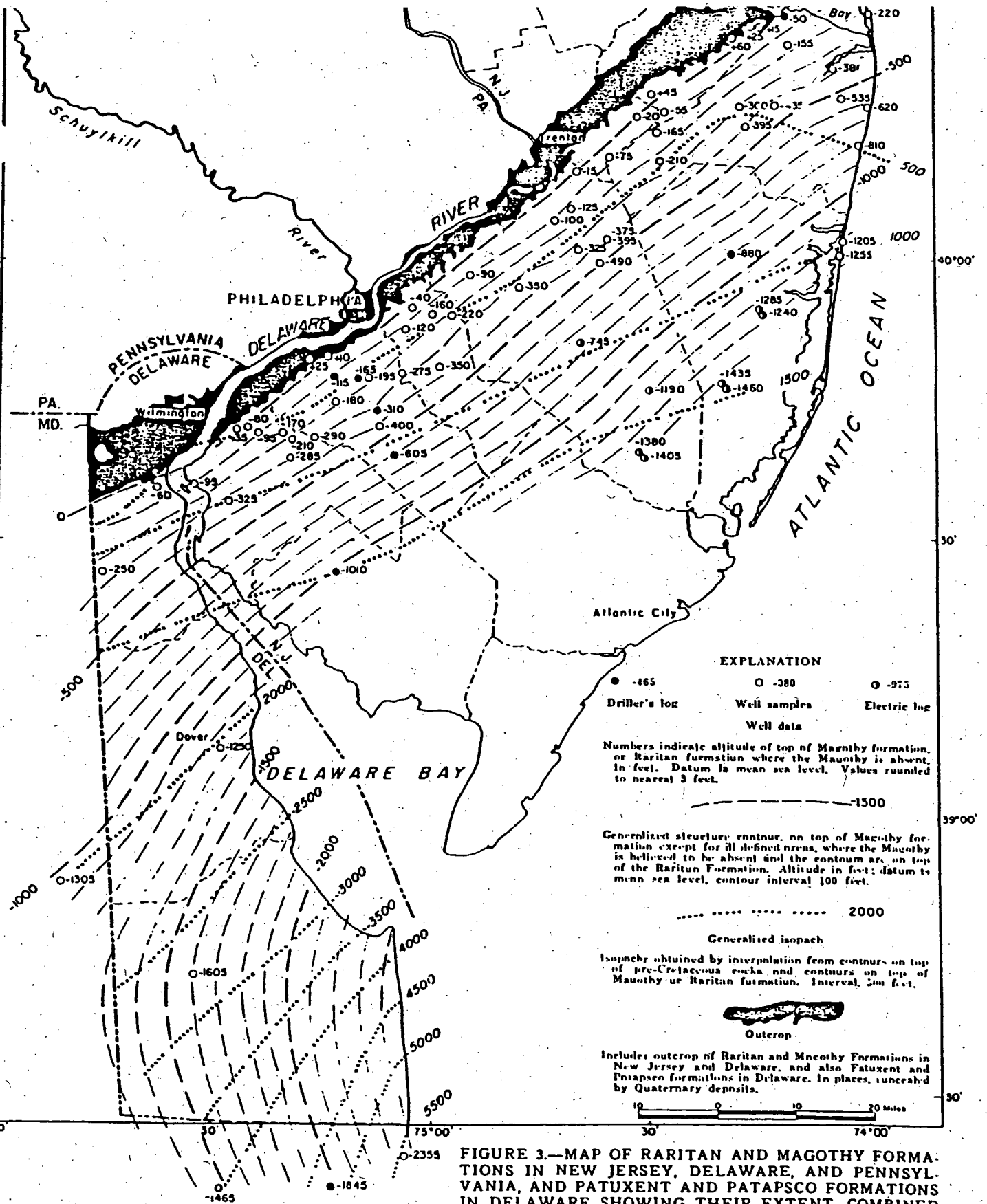


FIGURE 3.—MAP OF RARITAN AND MAGOTHY FORMATIONS IN NEW JERSEY, DELAWARE, AND PENNSYLVANIA, AND PATUXENT AND PATAPSCO FORMATIONS IN DELAWARE SHOWING THEIR EXTENT, COMBINED THICKNESS AND SUBSURFACE CONFIGURATION

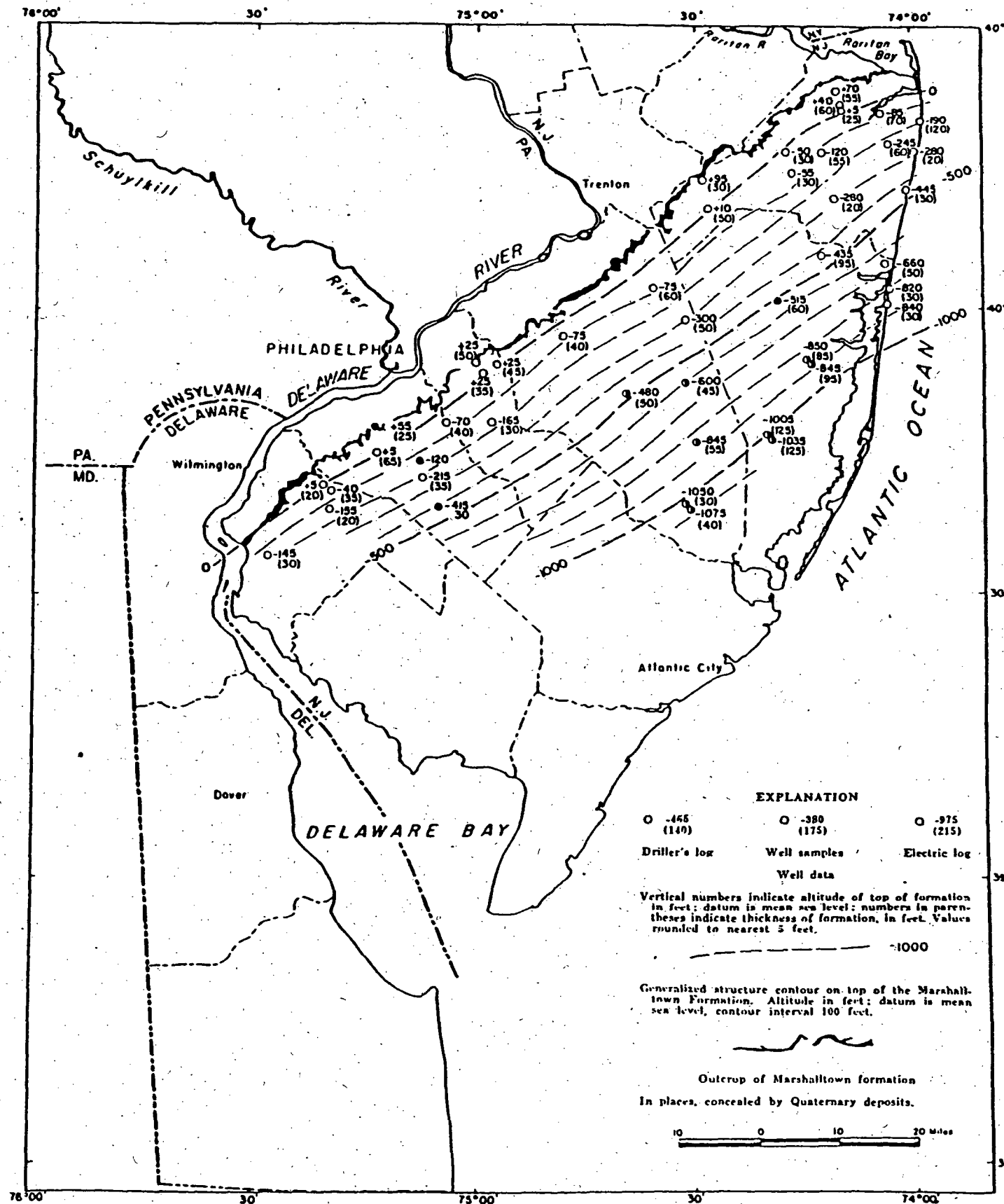


FIGURE 6.—MAP OF MARSHALLTOWN FORMATION SHOWING ITS EXTENT AND SUBSURFACE CONFIGURATION IN NEW JERSEY

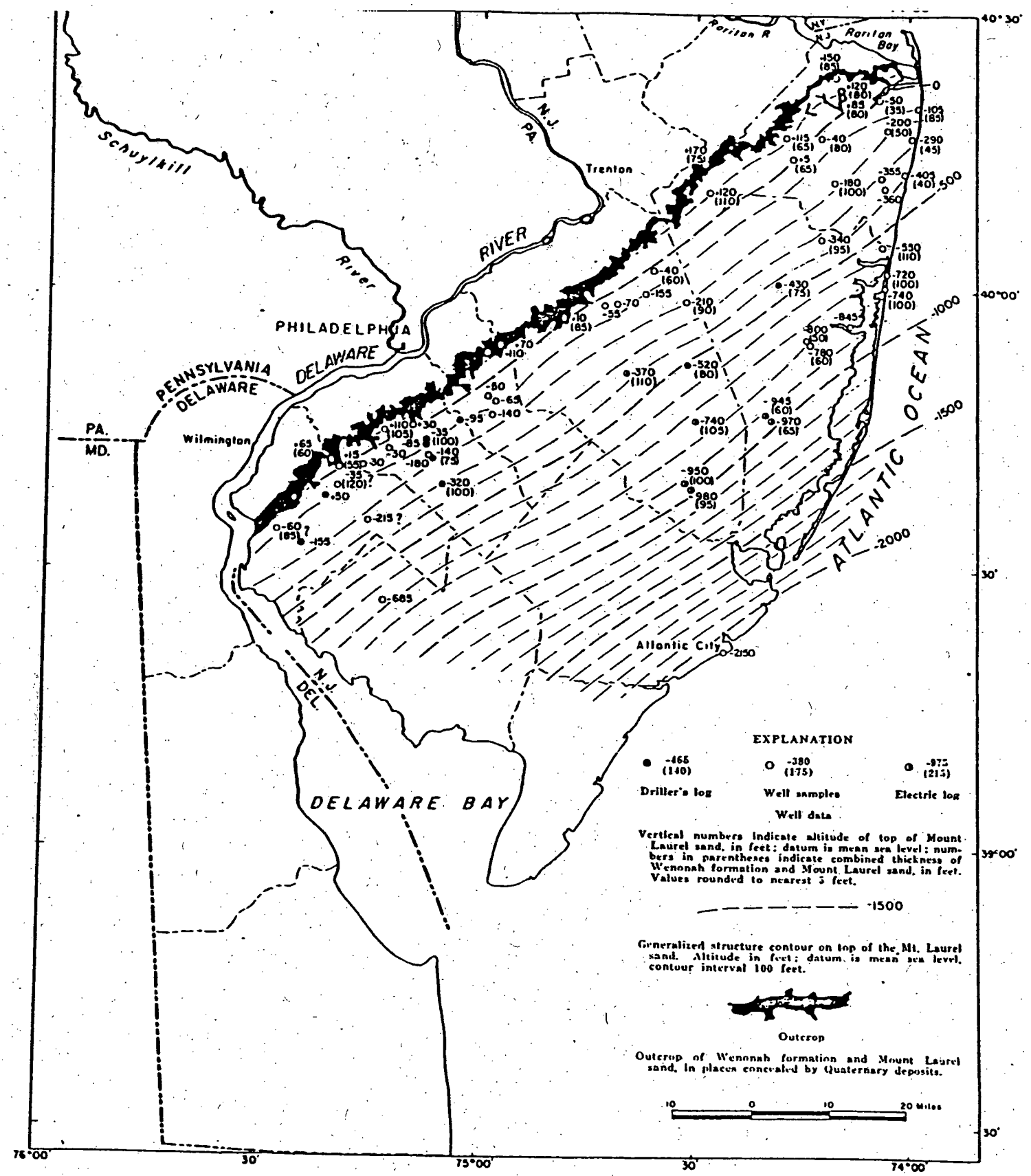


FIGURE 7.—MAP OF WENONAH FORMATION AND MOUNT LAUREL SAND SHOWING THEIR EXTENT AND SUBSURFACE CONFIGURATIONS IN NEW JERSEY

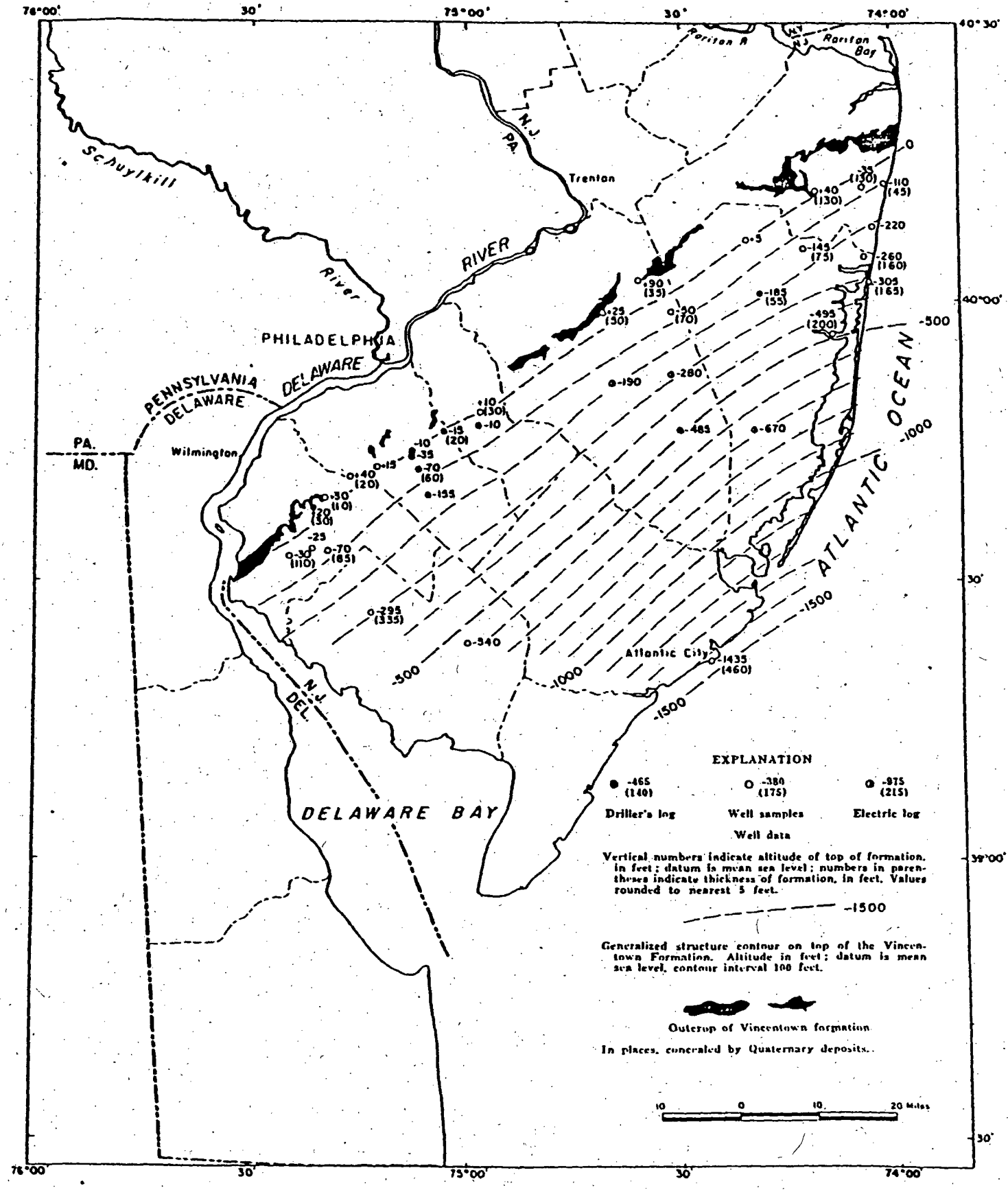


FIGURE 11.—MAP OF VINCENTOWN FORMATION SHOWING ITS EXTENT AND SUBSURFACE CONFIGURATION IN NEW JERSEY

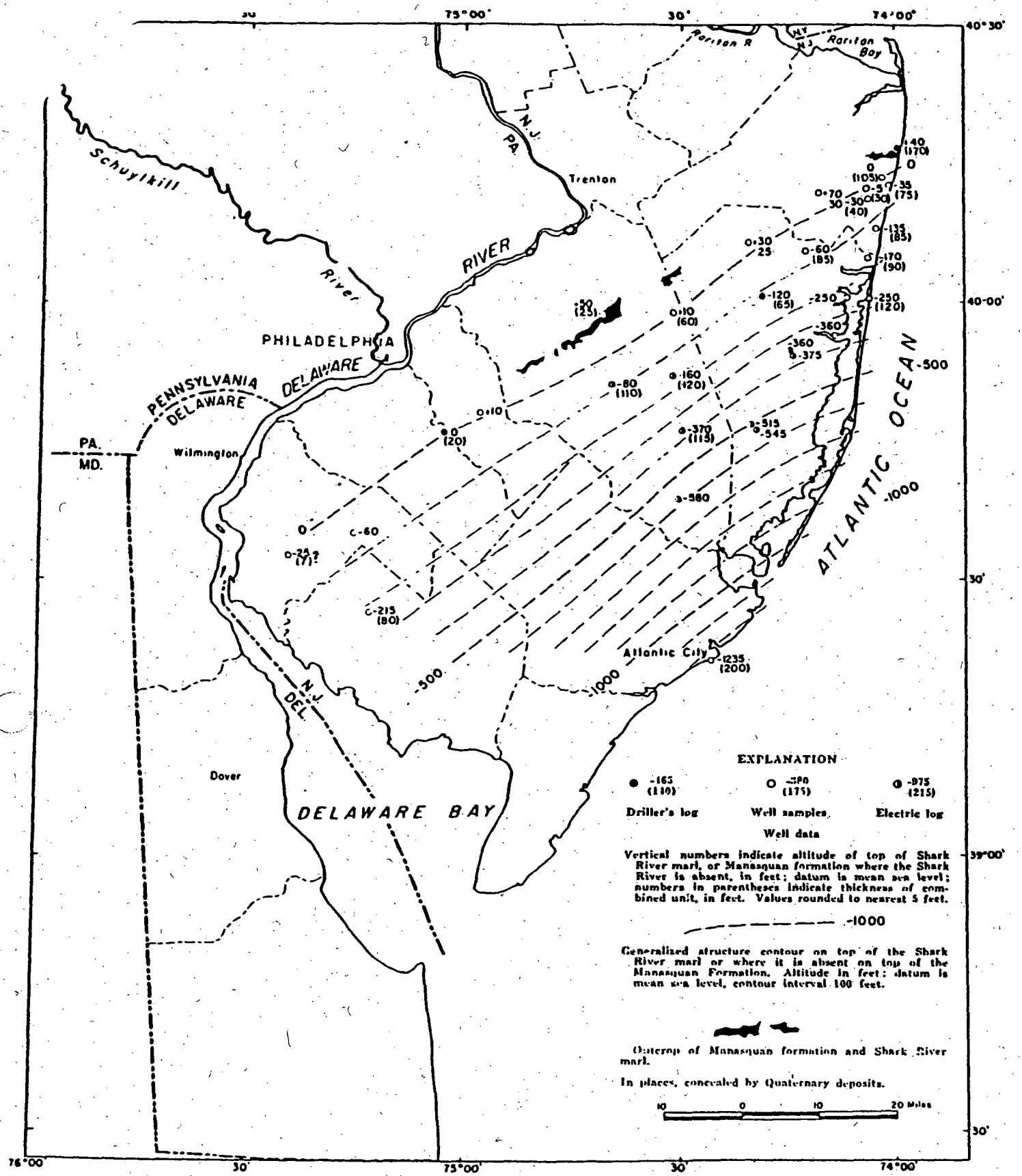


FIGURE 12.—MAP OF MANASQUAN FORMATION AND SHARK RIVER MARL SHOWING THEIR EXTENT AND SUBSURFACE CONFIGURATIONS IN NEW JERSEY

Geologic Map of Newark 1 x 2° Quadrangle, New Jersey Pennsylvania, and New York

U.S. Geological Survey
Miscellaneous Investigation Series 1-1715

NO MAPS

NO MAPS

Generalized Geological Cross Section

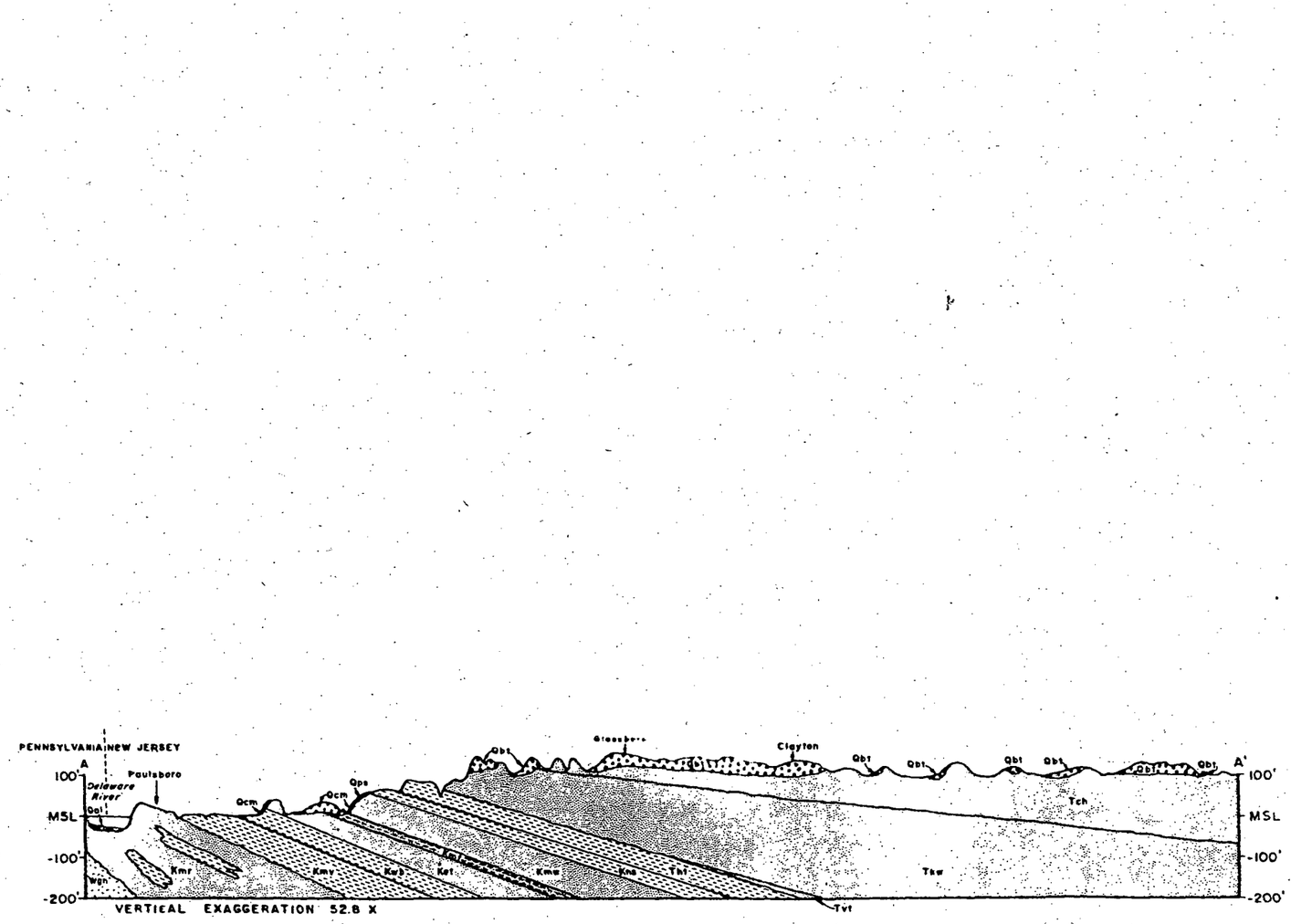
Figure 2 from:

"Water Resources and Geology of Gloucester County, New Jersey

Special Report 30, NJDCED

William Hardt
George Hultin

1969



Modified by W. F. Hoffert after the Geolog... Surv. of New Jersey (1950)

Figure 2.—Generalized geologic maps and cross-section of Gloucester County, N. J.

SR 30

Gloucester County Special Report No. 30

C D E

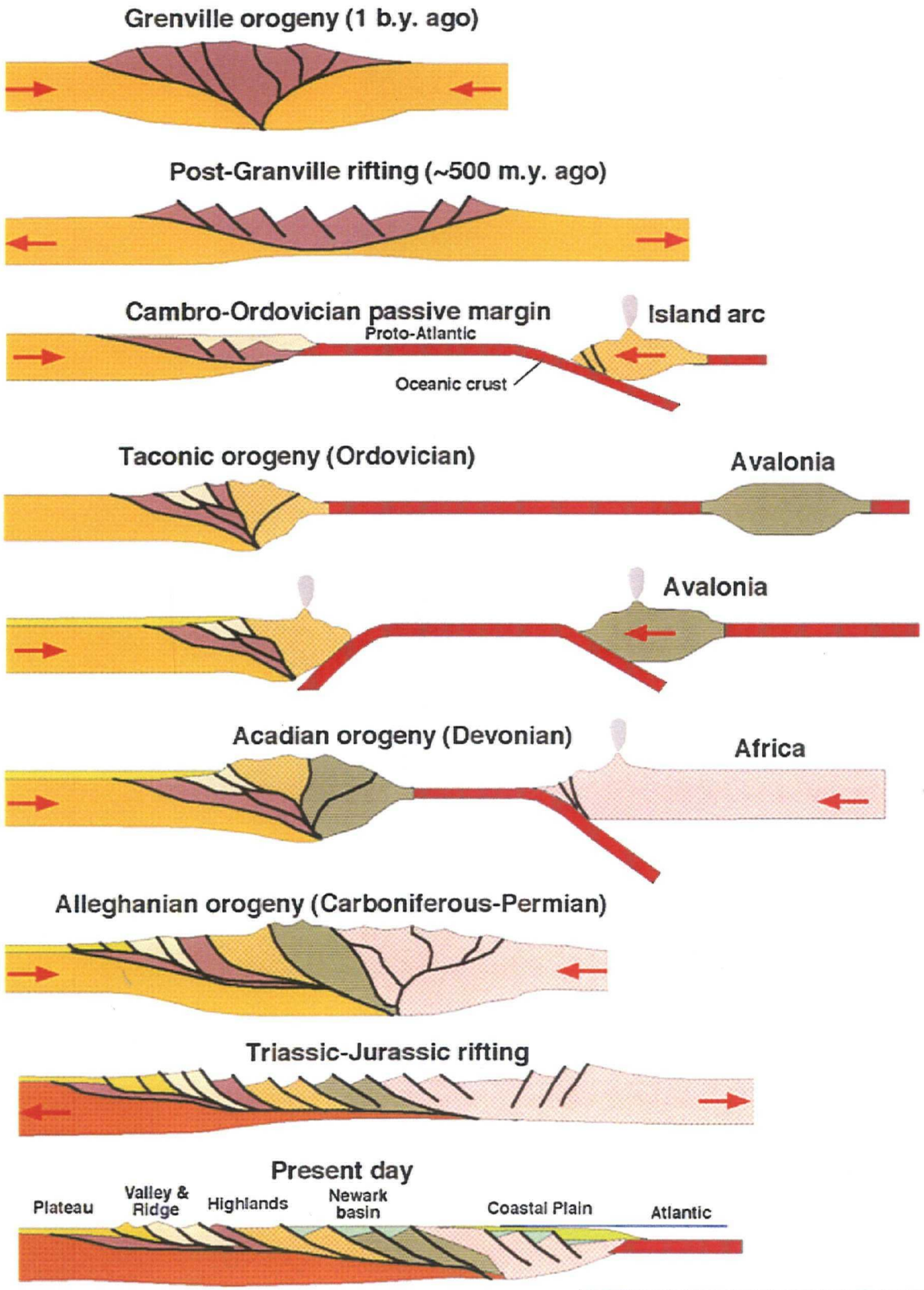


Plate tectonic history of eastern North America for the last billion years shown in cross-sectional view at the approximate latitude of NJ. Oceanic crust is shown in red; pre-Grenville crust is mustard; crust created during Grenville orogeny is purplish-brown. "Island arc" and "Avalonia" are small continents that were added to North America during the Taconic and Acadian orogenies. b.y.=billion years; m.y.=million years. Source: Schlische, Roy W. undated. Modified from Marshak (2001).

pers/jw/haz/26770 smc/Plate Tectonic History of Eastern North America.fh10

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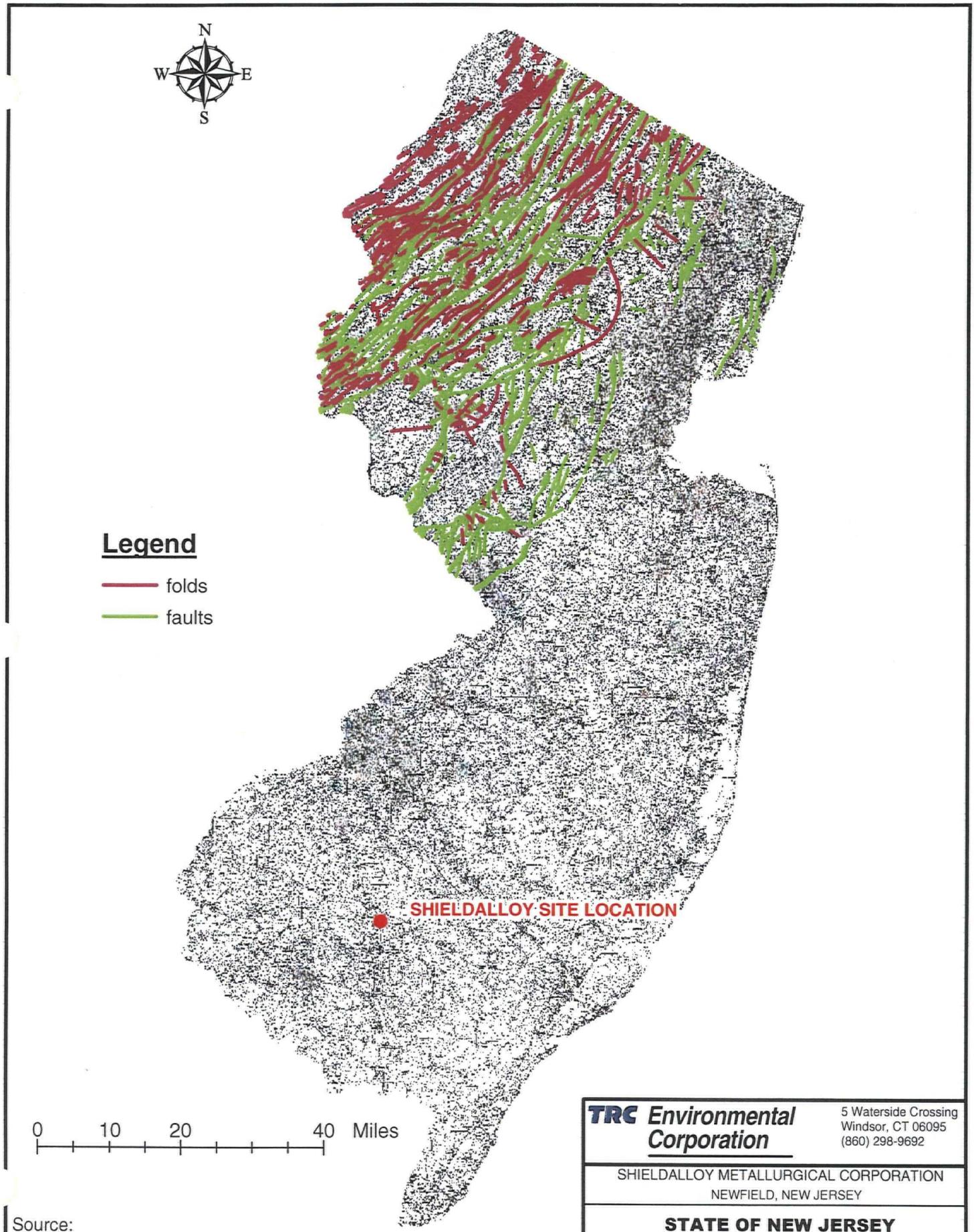
PLATE TECTONIC HISTORY OF EASTERN NORTH AMERICA

Date: 09/05 | **Project No.** 26770-0000-00000



Source:
New Jersey Geographic Information Network, 2005.

GIS-HazWaste\Shieldalloy\26770\NJ Faults and Folds

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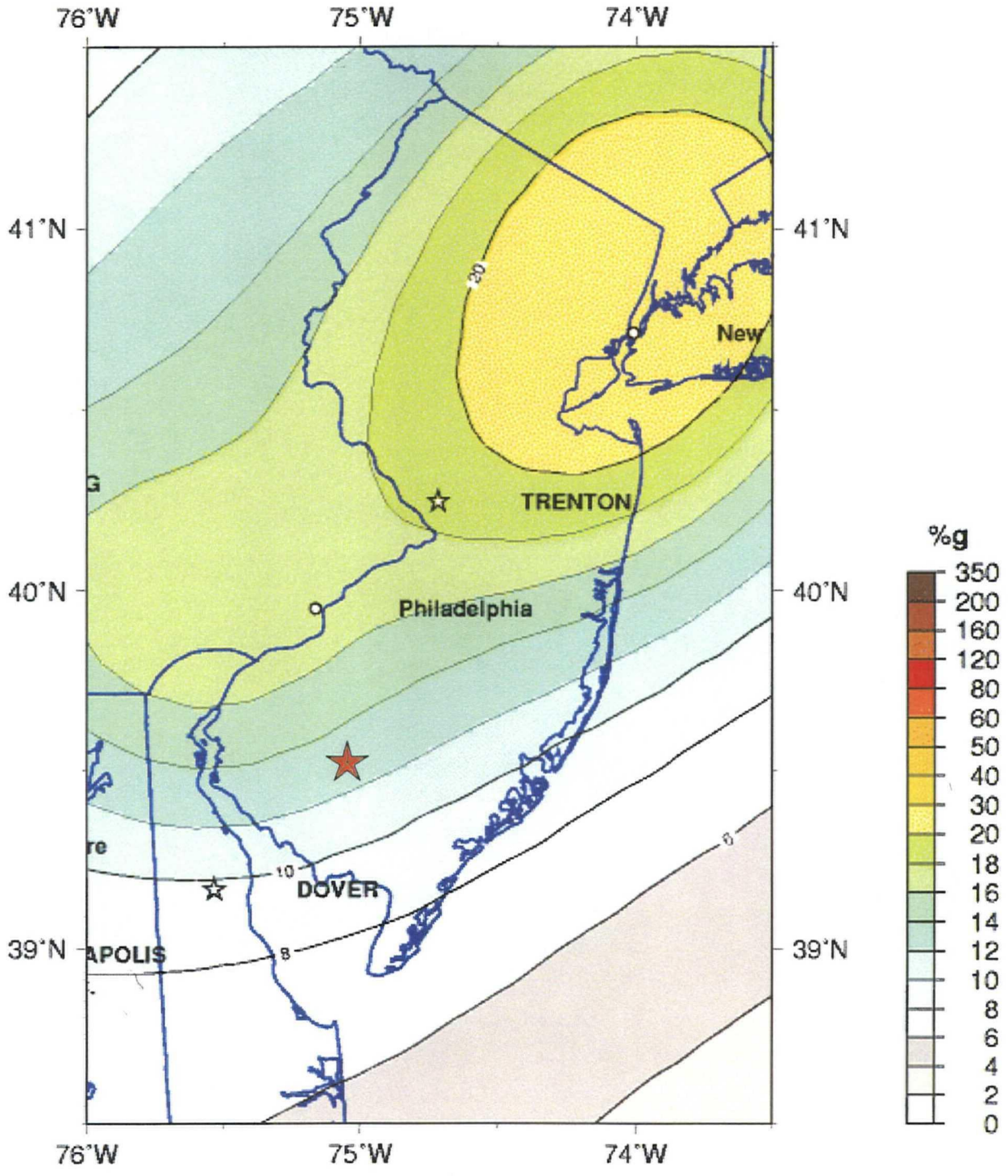
STATE OF NEW JERSEY
FAULTS AND FOLDS

Date: 09/12/05

Project No: 26770-0000-00000



Peak Acceleration (%g) with 2% Probability of Exceedance in 50 Years
site: NEHRP B-C boundary
National Seismic Hazard Mapping Project

KEY
★ Approximate SMC Site Location

Source: USGS, http//neic.usgs.gov/neis/states/new_jersey/hazards.html; last updated 08/05/03.

pers/jw/haz/26770 smc/Seismic Hazard Map of New Jersey.fh10

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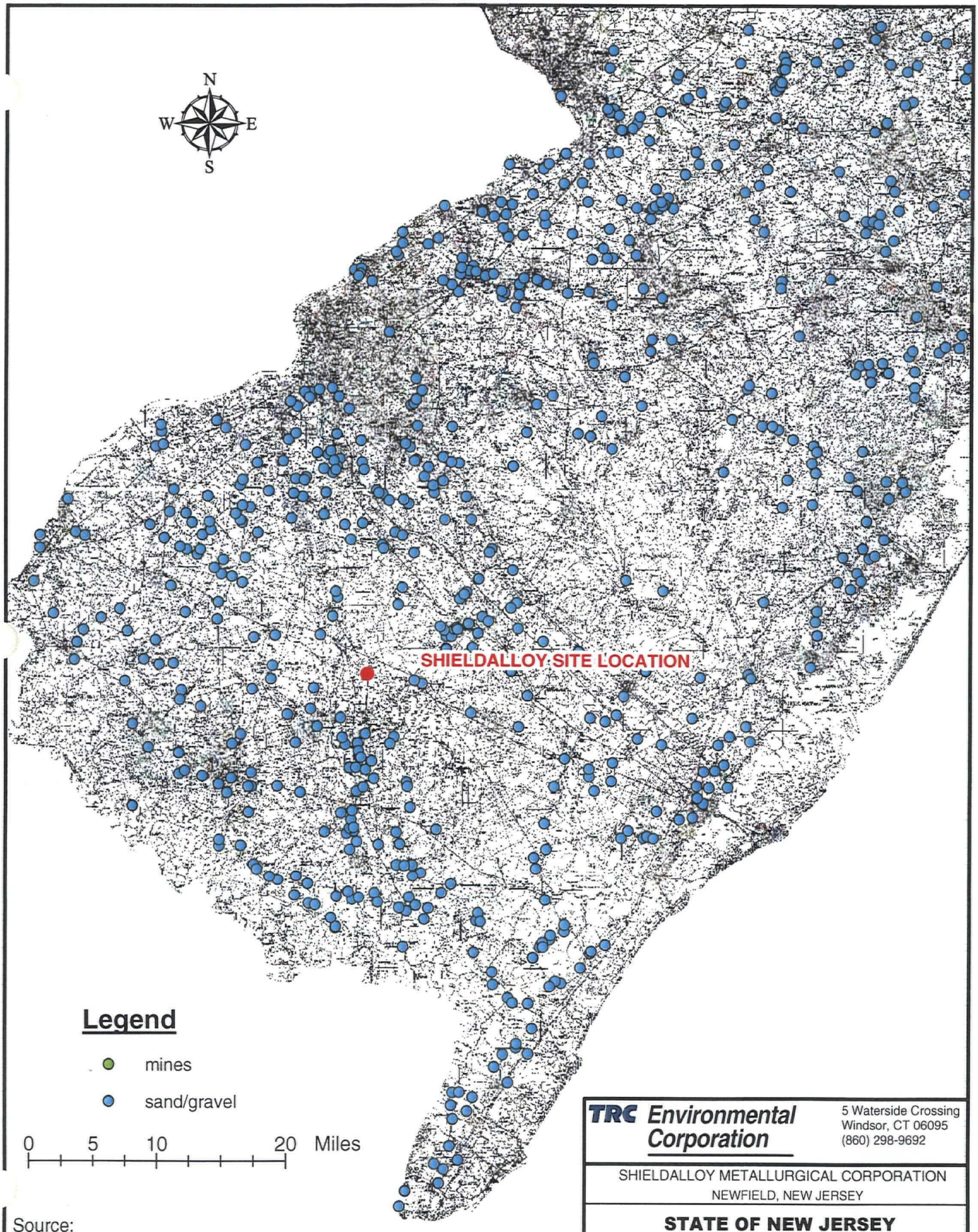
SEISMIC HAZARD MAP OF NEW JERSEY

Date: 09/05 | **Project No.** 26770-0000-00000



Source:
New Jersey Geographic Information Network, 2005.

GIS-HazWaste\Shieldalloy\26770\NJ Mines and Gravelpits

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SHIELDALLOY METALLURGICAL CORPORATION
NEWFIELD, NEW JERSEY

STATE OF NEW JERSEY
MINES AND SAND/GRAVEL PITS

Date: 09/12/05

Project No: 26770-0000-00000

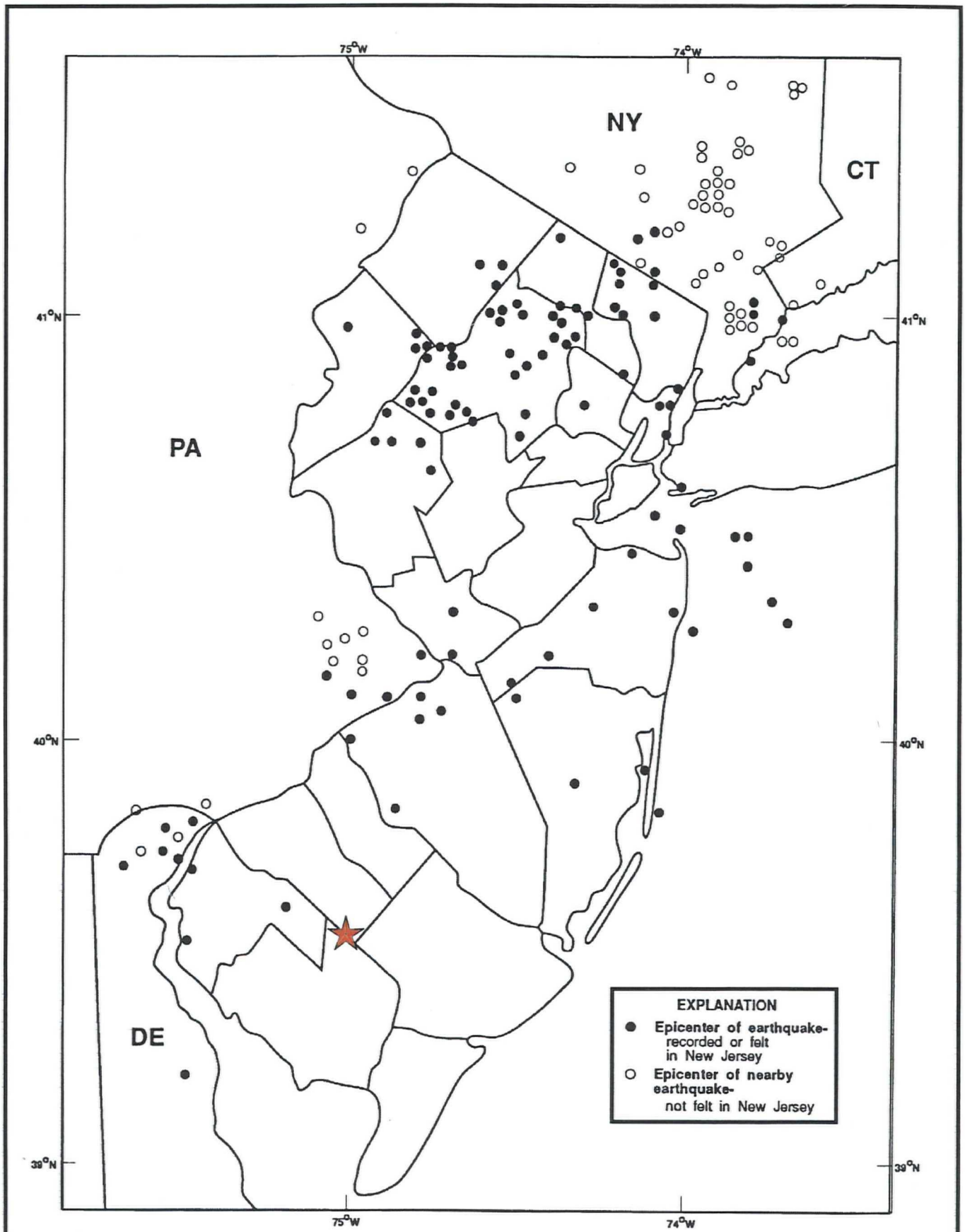


Figure 1. Map showing earthquake epicenters in and near New Jersey.

Source: NJDEPE-Division of Science and research, USGS Geological Survey, Geological Survey Report 31, Catelog of NH Earthquakes through 1990, pg 3 Fig1.

pers/jw/haz/26770 smc/earthquake epicenter NJ.fh10

SUMMARY OF SAND AND GRAVEL OPERATIONS IN CUMBERLAND AND GLOUCESTER COUNTIES

ID	NAME	FORMATION	PRODUCTS	DETAILS	COMMENTS	COUNTY	TOWN	NORTHING	EASTING	LATNAD83	LONNAD83
74	Bonham Sand & Stone	Cape May	Sand & gravel	Building sand and some fine gravel.		CUMBERLAND	BRIDGETON CITY	209766	287855	39.407059	75.222966
350	Lupton A.H.		Sand & gravel	0-7 ft. clayey gravel, 7-25 ft., crossbedded brown, yellow, and white sand.	Active in 1931	CUMBERLAND	BRIDGETON CITY	215824	289473	39.423727	75.217410
639	Unknown	Bridgeton/Cohansey		3 ft gravel overlying fine brown, yellow, and white sand.		CUMBERLAND	BRIDGETON CITY	213335	284431	39.416782	75.235187
389	Morie J. and Son Inc.		Sand & gravel			CUMBERLAND	COMMERCIAL TWP	168378	348297	39.294559	75.008231
491	Ricci Bros. Sand Co., Inc.		Sand & gravel	Construction grade sand and gravel, Masonry supply.		CUMBERLAND	COMMERCIAL TWP	154576.68	332190.43	39.256404	75.064839
602	U.S. Silica		Industrial sand			CUMBERLAND	COMMERCIAL TWP	164642.99	349623.74	39.284324	75.003470
606	Unimin Corporation		Sand & gravel	Industrial minerals.		CUMBERLAND	COMMERCIAL TWP	167061.74	332486.05	39.290687	75.064070
621	Unknown					CUMBERLAND	COMMERCIAL TWP	165802	339090	39.287339	75.040710
622	Unknown					CUMBERLAND	COMMERCIAL TWP	166546	341833	39.289427	75.031034
623	Unknown					CUMBERLAND	COMMERCIAL TWP	168963	337417	39.295991	75.046688
584	Tony Brago c/o Maurice DiLiberta		Sand		Former, Maurice DiLiberta.	CUMBERLAND	DEERFIELD TWP	230284.39	315528.54	39.463960	75.125532
601	U.S. Silica		Industrial sand			CUMBERLAND	DOWNE	163630.36	323617.33	39.281110	75.095325
402	Newport Station Pit		Sand & gravel	4-6 ft. of gravel on fine glass sand.	Opened before 1897	CUMBERLAND	DOWNE TWP	173995	308477	39.309281	75.149074
438	Pennsylvania Glass Sand				Active in 1979	CUMBERLAND	DOWNE TWP	164296	321146	39.282893	75.104071
490	Ricci Bros. Sand Co., Inc.		Sand & gravel	Construction grade sand and gravel, Masonry supply.		CUMBERLAND	DOWNE TWP	154039.42	332047.96	39.254926	75.065330
539	South Jersey Sand Company	Cape May	Sand	Sand, cross bedded up to 20 ft. thick.		CUMBERLAND	DOWNE TWP	167573	315271	39.291780	75.124907
600	U.S. Silica		Industrial sand			CUMBERLAND	DOWNE TWP	158204.02	330219.50	39.266329	75.071880
603	U.S. Silica	Cohansey	Industrial sand			CUMBERLAND	DOWNE TWP	172407.94	320623.04	39.305155	75.106111
604	U.S. Silica		Industrial sand			CUMBERLAND	DOWNE TWP	175603.49	315887.31	39.313840	75.122925
202	Fairton Sand and Gravel					CUMBERLAND	FAIRFIELD TWP	190568	284638	39.354281	75.233799
223	George Griner				Active in 2002.	CUMBERLAND	FAIRFIELD TWP	201744.18	296666.70	39.385226	75.191564
542	South State Inc.					CUMBERLAND	FAIRFIELD TWP	212299.62	297771.03	39.414228	75.187941
543	South State Inc.					CUMBERLAND	FAIRFIELD TWP	218024.18	297695.72	39.429943	75.188363
571	Thompson's Paving Inc.		Sand & gravel			CUMBERLAND	FAIRFIELD TWP	212350.32	296463.29	39.414340	75.192571
597	Tri State Sand Company	Bridgeton	Sand & gravel	1-2 ft, gray-yellow sand, 8-10 ft., coarse irregular bedded brown sand and gravel.		CUMBERLAND	FAIRFIELD TWP	212405	308260	39.414731	75.150819
632	Unknown		Sand & gravel	2 ft. of loam over 3 ft. of gravel up to 3/4".		CUMBERLAND	GREENWICH TWP	204442	248792	39.391502	75.361027
86	Bridgeton Washed Gravel Corp.	Bridgeton	Sand & gravel	0-17 ft. gravel. 17-18 ft. red sand.		CUMBERLAND	HOPEWELL TWP	226121	268061	39.451504	75.293525
211	Fithians	Bridgeton	Sand & gravel	Over 10 feet pf gravel with a minor amount of sand.		CUMBERLAND	HOPEWELL TWP	217520	268143	39.427893	75.292967
434	Paxson J.W.	Cape May	Sand & gravel	Fluvialite, unconsolidated fine yellow to brown sand, bonded sand with glauconite.	Active in 1927	CUMBERLAND	HOPEWELL TWP	244964	277085	39.503448	75.262134
641	Unknown	Bridgeton	Sand & gravel	Gravel		CUMBERLAND	HOPEWELL TWP	216628	277709	39.425670	75.259077
643	Unknown	Bridgeton	Sand & gravel			CUMBERLAND	HOPEWELL TWP	218833	270526	39.431555	75.284572
665	Unknown	Bridgeton	Sand & gravel	0-10 ft. yellow to brown clayey coarse sand and gravel.		CUMBERLAND	HOPEWELL TWP	247771	268409	39.510949	75.292968
118	Cedanille Block S & G	Cape May	Sand & gravel	Maximum 8 ft. brown to white coarse pebbly sand. 95% quartz.		CUMBERLAND	LAWRENCE TWP	188160	284650	39.347670	75.233687
439	Pettinos	Bridgeton/Cohansey	Sand & gravel	0-4 ft.sand, clay, and gravel. 4-24 ft.light salmon colored sand.		CUMBERLAND	LAWRENCE TWP	180441	298779	39.326782	75.183520
624	Unknown	Cape May	Sand	Sand		CUMBERLAND	LAWRENCE TWP	175435	305187	39.313169	75.160739
625	Unknown	Cohansey	Sand	Minimum 25 ft. of brown/yellow/white sand. Most sand Ilmonite stained.		CUMBERLAND	LAWRENCE TWP	178610	300023	39.321781	75.179074
627	Unknown		Sand & gravel	0-10 ff. gravel, 10-16 ft. yellow sand.		CUMBERLAND	LAWRENCE TWP	188171	293496	39.347894	75.202408
15	Albrecht & Heun inc.	Cohansey	Sand & gravel	Deposit at least 17 ft. deep, sand is white to yellow.		CUMBERLAND	MAURICE RIVER TWP	163262.14	365283.36	39.280759	74.948121
17	Albrecht and Heun Inc.					CUMBERLAND	MAURICE RIVER TWP	157515	368865	39.265027	74.935370
257	Harris John J.	Bridgeton	Sand & gravel	8-9 ft. clayey, rust-yellow sand and gravel.	Active in 1930	CUMBERLAND	MAURICE RIVER TWP	168394	375892	39.294987	74.910724
360	Mays Landing Sand and Gravel		Sand & gravel			CUMBERLAND	MAURICE RIVER TWP	166658.33	362539.91	39.290046	74.957873
370	Menantico-Tuckahoe Sand	Cape May	Sand	Light yellow sand, 98-99% quartz.		CUMBERLAND	MAURICE RIVER TWP	188503	349903	39.349838	75.002952
405	NJ Silica Sand	Cohansey	Sand	Wide variety of constmction sands, up to 84 feet thick.	?1956-?	CUMBERLAND	MAURICE RIVER TWP	188759	358702	39.350671	74.971841
422	Owens-Illinois	Cape May	Sand	Mainly foundry sand.		CUMBERLAND	MAURICE RIVER TWP	176777	367285	39.317893	74.941282
470	Port Silica Sand Co.					CUMBERLAND	MAURICE RIVER TWP	180065	357400	39.326782	74.976284
569	The Morie Co.	Cape May	Sand	Gray to light yellow sand, 98-99% quartz, 0-0.5% feldspar, 0.5-1% heavy minerals.		CUMBERLAND	MAURICE RIVER TWP	180032	363764	39.326782	74.953785
605	U.S. Silica		Industrial sand			CUMBERLAND	MAURICE RIVER TWP	175460	364090	39.314233	74.952552
617	Unknown	Cape May	Sand			CUMBERLAND	MAURICE RIVER TWP	146158	360132	39.233726	74.966008
628	Unknown	Bridgeton	Sand	4 described zones to 11 ft. coarse sand in all, 2-3% clay.		CUMBERLAND	MAURICE RIVER TWP	194525	373590	39.366704	74.919287
978	Whibco	Cohansey	Sand			CUMBERLAND	MAURICE RIVER TWP	160821	361545	39.274005	74.961284
979	Whibco	Bridgeton	Sand			CUMBERLAND	MAURICE RIVER TWP	162092	370537	39.277616	74.929541
980	Whibco	Bridgeton	Sand			CUMBERLAND	MAURICE RIVER TWP	172139	379735	39.305317	74.897203
981	Whibco Inc.	Bridgeton	Sand & gravel			CUMBERLAND	MAURICE RIVER TWP	179799.45	360678.42	39.326100	74.964689
982	Whibco Inc.		Sand & gravel			CUMBERLAND	MAURICE RIVER TWP	162283.33	358480.66	39.277976	74.972135
167	Dun-Rite Sand and Gravel Co.		Sand & gravel		New 2004.	CUMBERLAND	MILLVILLE	213901.99	361390.93	39.419741	74.962788
11	Ada Silica Co.	Cohansey	Sand	0-6 ft. medium to coarse yellow sand, 6-14 ft. white stratified sand, 14 ft. water.		CUMBERLAND	MILLVILLE CITY	210207	340762	39.409283	75.035732
61	Better Materials Corp		Sand & gravel			CUMBERLAND	MILLVILLE CITY	193785.97	327419.77	39.363972	75.082579
278	Hilliards, Samuel		Sand	12-16 ft. glass sand under 3 ft. loam, 4-5 ft. gray-whit clay, 1 ft. yellow sand.		CUMBERLAND	MILLVILLE CITY	186447	338028	39.344004	75.044901
440	Pettinos	Bridgeton	Sand & gravel	0-1.5 ft. gray-yellow gravelly sand. 1.5-8 ft.red-brown coarse sand, some pebbles.		CUMBERLAND	MILLVILLE CITY	193032	336654	39.362061	75.049901
441	Pettinos	Cohansey	Sand & gravel	0-2 ft. pebbly sand. 10-12 ft. fine brown, yellow, white sand.		CUMBERLAND	MILLVILLE CITY	194025	339723	39.364838	75.039068
442	Pettinos	Bridgeton	Sand & gravel	0-1.5 ft. gray-yellow pebbly sand. 1.5-9.5 ft. brown to red coarse sand.		CUMBERLAND	MILLVILLE CITY	195149	337924	39.367894	75.045455

SUMMARY OF SAND AND GRAVEL OPERATIONS IN CUMBERLAND AND GLOUCESTER COUNTIES

ID	NAME	FORMATION	PRODUCTS	DETAILS	COMMENTS	COUNTY	TOWN	NORTHING	EASTING	LATNAD83	LONNAD83
446	Pettinos G.F.	Bridgeton	Sand & gravel	Five described layers to 26 ft.		CUMBERLAND	MILLVILLE CITY	189667	340954	39.352893	75.034622
447	Pettinos G.F.	Bridgeton	Sand & gravel	0-6 ft.brown gravel, pebbly sand. 6-26 ft. white to brown coarse cross bedded sand.		CUMBERLAND	MILLVILLE CITY	198585	338573	39.377339	75.043232
448	Pettinos G.F.	Cape May	Sand	Fine yellow sand with clay bond.		CUMBERLAND	MILLVILLE CITY	202326	338988	39.387617	75.041844
511	Samano Brothers				Acfive in 1979	CUMBERLAND	MILLVILLE CITY	201443	334350	39.385115	75.058234
608	Unisil Corp.					CUMBERLAND	MILLVILLE CITY	193521	357313	39.363726	74.976842
629	Unknown		Sand	5 layers in 40 ft. bank, seperated by thin clay seams, coarsens downward.		CUMBERLAND	MILLVILLE CITY	195442	339575	39.368726	75.039621
635	Unknown		Sand & gravel	Gravel		CUMBERLAND	MILLVILLE CITY	209849	317526	39.407893	75.117961
637	Unknown	Bridgeton	Sand & gravel	Gravel		CUMBERLAND	MILLVILLE CITY	211910	343519	39.414003	75.026010
650	Unknown	Bridgeton	Sand & gravel	Gravel on yellow/brown sand. Deposit over 9' thick.		CUMBERLAND	STOW CREEK TWP	228462	255375	39.457615	75.338526
435	Paxson J.W.				Active in 1904	CUMBERLAND	UPPER DEERFIELD TWP	252080	298069	39.523448	75.187961
653	Unknown	Bridgeton	Sand & gravel			CUMBERLAND	UPPER DEERFIELD TWP	229885	289821	39.462338	75.216574
657	Unknown	Bridgeton	Sand & gravel	20 ff. of Bridgeton gravel and sand.		CUMBERLAND	UPPER DEERFIELD TWP	233702	293380	39.472894	75.204074
32	Amstrong Cork Company	Bridgeton	Sand	Used for glass sand.	Active in 1956.	CUMBERLAND	VINELAND CITY	229933	341193	39.463448	75.034621
69	Bidwell		Sand & gravel	0-3 ft. fine sarid. 3-11 ft. coarse white sarid.		CUMBERLAND	VINELAND CITY	240297	334042	39.491783	75.060178
94	Bmnetti Brothers	Bridgeton	Sand & gravel	Sand and gravel for concrete and plaster.		CUMBERLAND	VINELAND CITY	232479	356265	39.470672	74.981284
165	Drinker J.B.	Cohansey	Sand	Pure silica sand.		CUMBERLAND	VINELAND CITY	224466	341867	39.448449	75.032119
231	Golder Pit	Bridgeton	Sand	0-2 ft. loose sandy loam. 8-10 ft. yellow to reddish brown sand.		CUMBERLAND	VINELAND CITY	219937	337838	39.435949	75.046290
232	Colder Pit No. 2	Bridgeton	Sand & gravel	Gravel, yellow to redish brown, coarse.		CUMBERLAND	VINELAND CITY	220023	340428	39.436228	75.037121
385	Morie J. & Son Inc.	Cohansey	Sand	Sand, approx 99% quartz, 0.5-1% heavy minerals, traces of limonite, rnica.		CUMBERLAND	VINELAND CITY	212114	361807	39.414838	74.961283
386	Morie J. & Son Inc.	Cohansey		Clay, 20-30 ft. thick, up to 5 ft. of gravel cap.		CUMBERLAND	VINELAND CITY	215427	347856	39.423728	75.010729
387	Morie J. & Son Inc.		Sand & gravel	Construction grade sand and gravel, glass sand.		CUMBERLAND	VINELAND CITY	219089	344424	39.433728	75.022954
388	Morie J. & Son Inc.					CUMBERLAND	VINELAND CITY	229756	354603	39.463171	74.987119
430	Pasquale James	Bridgeton	Sand & gravel	Gravel, up to a 30 fl. deposit, quartzite up to 2 inch diameter.		CUMBERLAND	VINELAND CITY	233759	344352	39.474003	75.023510
431	Pasquale, J.D. L	Cape May	Sand	0-1 ft. gray sand, 1-4 fl. brown, medium grain sand.		CUMBERLAND	VINELAND CITY	229459	336014	39.462061	75.052954
454	Piermattei, Cario	Bridgeton	Sand & gravel	Seven described layers up to 20.5 ft. deep.		CUMBERLAND	VINELAND CITY	203610	362941	39.391506	74.957117
647	Unknown		Sand	Glass sand.		CUMBERLAND	VINELAND CITY	222615	347033	39.443450	75.013788
649	Unknown		Sand	Numerouse abandoned glass sand pits.		CUMBERLAND	VINELAND CITY	226795	341567	39.454839	75.033230
655	Unknown					CUMBERLAND	VINELAND CITY	232303	334781	39.469848	75.057384
984	Whitehall Tatem Co.	Bridgeton/Cohansey	Sand & gravel	0-7 ft. sand and gravel, 7-15 ft. white sand, below 15 ft. clay.		CUMBERLAND	VINELAND CITY	224156	342492	39.447608	75.029899
168	Dun-Rite Sand and Gravel Cb.	Cohansey				GLOUCESTER	BUENA VISTA TWP	276717.52	380770.08	39.592456	74.895165
102	Buzby Bros.	Cape May	Sand & gravel	90% sand 10% gravel9Quartz, quartzite, flint, ironstone conglomerate.		GLOUCESTER	DEPTFORD TWP	373932	321932	39.858446	75.106287
152	Davidson, E. Pit	Pensauken	Sand & gravel	4-6 fL of almost solid gravel. South pit over 2 fl. yellow sand under 2-4 fl. grav.		GLOUCESTER	DEPTFORD TWP	374155	318971	39.859003	75.116840
312	Jericho Pit	Kirkwood	Sand & gravel	5 feet of gravel over several feet of fine sand.		GLOUCESTER	DEPTFORD TWP	354672	312437	39.805390	75.139619
357	Martco Inc.					GLOUCESTER	DEPTFORD TWP	357282	315499	39.812615	75.128785
744	Unknown	Bridgeton	Sand			GLOUCESTER	DEPTFORD TWP	349330	324108	39.790947	75.097950
756	Unknown					GLOUCESTER	DEPTFORD TWP	368203	315960	39.842605	75.127417
758	Unknown	Cape May	Sand & gravel	2-5 ft. yellow-brown sand and gravel over 10 ft of fine yellow sand.		GLOUCESTER	DEPTFORD TWP	371916	320905	39.852893	75.109896
975	Wenonah Cement Products Co.	Cape May	Sand & gravel	3 ft. of loam and gravel, over 13 ft. of medium to coarse sand, much glauconite.		GLOUCESTER	DEPTFORD TWP	345885	310343	39.781226	75.146846
747	Unknown	Pensauken	Sand			GLOUCESTER	EAST GREENWICH TWP	352475	295093	39.799002	75.201292
976	Wenonah Sand and Gravel Co.	Cape May	Sand & gravel	0-3' gray-yellow fine sand, 3-4' brown sand and gravel.		GLOUCESTER	EAST GREENWICH TWP	359521	287033	39.818168	75.230182
701	Unknown	Pensauken	Sand			GLOUCESTER	ELK TWP	306335	295122	39.672335	75.199906
238	Grays Ferry Brick Co.	Cape May	Sand	Terrace deposit of light yellow sand.		GLOUCESTER	FRANKLIN TWP	282205	330702	39.606782	75.072958
241	Grochowski Excavating, Inc.					GLOUCESTER	FRANKLIN TWP	289898.59	332685.61	39.627938	75.066090
242	Grochowski Excavating, Inc.					GLOUCESTER	FRANKLIN TWP	292387.31	331898.55	39.634757	75.068940
507	Sahara Sand of Franklin					GLOUCESTER	FRANKLIN TWP	286797.49	357785.01	39.619825	74.976919
85	Brida, A.M.					GLOUCESTER	GLASSBORO BORO	322488	313691	39.717060	75.134344
75	Borden, Samuel					GLOUCESTER	HARRISON TWP	326961	297081	39.729002	75.193513
90	Brooks, Chas.					GLOUCESTER	HARRISON TWP	335898	292932	39.753447	75.208516
133	Continental Sand		Sand & gravel			GLOUCESTER	HARRISON TWP	320815	293751	39.712058	75.205181
258	Harris, Henry L.					GLOUCESTER	HARRISON TWP	321833	293055	39.714838	75.207683
335	Larrimore, R.R.					GLOUCESTER	HARRISON TWP	316617	300127	39.700669	75.182403
721	Unknown		Sand & gravel	0-1' gray-yellow sand and gravel. 1-2.5' red-brown clayey gravel.		GLOUCESTER	HARRISON TWP	324377	291122	39.721780	75.214627
724	Unknown					GLOUCESTER	HARRISON TWP	327714	293937	39.731002	75.204712
728	Unknown	Cape May	Sand & gravel	12 ft. cross bedded light brown sand and gravel.		GLOUCESTER	HARRISON TWP	331553	279774	39.741224	75.255184
349	Logan Sand and Gravel		Sand & gravel	Construction grade sand and gravel.		GLOUCESTER	LOGAN TWP	358030	260644	39.813446	75.324076
475	R.E. Pierson Materials Corporafion	Cape May	Sand			GLOUCESTER	LOGAN TWP	351866.35	258283.91	39.796466	75.332273
492	Richard Pierson					GLOUCESTER	LOGAN TWP	360766	260279	39.820948	75.325465
607	Union Paving	Cape May	Sand & gravel	Yellow - brown sand on at least 35 ft of yellow sand and gravel.		GLOUCESTER	LOGAN TWP	352661	261297	39.798724	75.321576
299	Inversand Company		Green sand			GLOUCESTER	MANTUA TWP	338546.25	315501.91	39.761180	75.128307
733	Unknown		Sand & gravel	Gravel, contains red shale material.		GLOUCESTER	MANTUA TWP	338135	318879	39.760115	75.116284
734	Unknown	Bridgeton	Sand & gravel	36-46 feet of Bridgeton formation.		GLOUCESTER	MANTUA TWP	338217	293966	39.759836	75.204903

SUMMARY OF SAND AND GRAVEL OPERATIONS IN CUMBERLAND AND GLOUCESTER COUNTIES

ID	NAME	FORMATION	PRODUCTS	DETAILS	COMMENTS	COUNTY	TOWN	NORTHING	EASTING	LATNAD83	LONNAD83
741	Unknown	Pensauken,Navesink/Homersto	Sand & gravel	4 feet of Pensauken gravel on marl.		GLOUCESTER	MANTUA TWP	345153	299876	39.779003	75.184070
1008	Zeco Inc.					GLOUCESTER	MANTUA TWP	333684	304554	39.747614	75.167121
9	Action Services					GLOUCESTER	MONROE TWP	308218	364256	39.678726	74.954332
87	Brimfield Bros. No. 2	Bridgeton	Sand	0-6' red-brown coarse sand, 6-9' light brown and yellow sand.	Molding sand. Active in 1956.	GLOUCESTER	MONROE TWP	273754	377625	39.584282	74.906278
162	Downer Silica	Bridgeton	Sand			GLOUCESTER	MONROE TWP	313626	338096	39.693172	75.047395
229	Gloucester Recycling					GLOUCESTER	MONROE TWP	311526	351139	39.687616	75.001002
301	Irish, James					GLOUCESTER	MONROE TWP	293876	359489	39.639283	74.971002
509	Sahara Sand of Monroe					GLOUCESTER	MONROE TWP	276368.78	376624.76	39.591448	74.909869
510	Sahara Sand of Monroe					GLOUCESTER	MONROE TWP	277823.19	375087.27	39.595422	74.915349
529	Sicklers, J.A.	Bridgeton	Industrial sand	Four defined levels to 15 feel deep, glass sand.		GLOUCESTER	MONROE TWP	316657	356483	39.701783	74.982110
706	Unknown		Sand & gravel	10 fl. of gravel on brown-yellow sand.		GLOUCESTER	MONROE TWP	310005	351678	39.683448	74.999057
713	Unknown	Bridgeton	Sand & gravel	10-11' red-brown stratified sand and gravel. 11-13' gravel. 13-15' yellow-white.		GLOUCESTER	MONROE TWP	319813	335633	39.710116	75.056284
715	Unknown	Bridgeton	Sand & gravel	0-8' coarse sand and gravel. 8-17' fine white glass sand.		GLOUCESTER	MONROE TWP	320375	343061	39.711782	75.029892
983	White, Frank Pit	Bridgeton	Sand & gravel	4-8' of gravel on 8-10' of yellow clayey sand on 5' of white sand.		GLOUCESTER	MONROE TWP	315426	359524	39.698448	74.971279
562	Strathman Sand and Gravel	Cape May	Sand & gravel	12 ft. of yellow sand and gravel, dredged to 15' below water table.		GLOUCESTER	PAULSBORO BORO	362487	283234	39.826225	75.243794
323	Kindle, Geo.C.	Pensauken	Sand & gravel	8 fl. of yellow-brown gravel.		GLOUCESTER	PITMAN BORO	331258	318284	39.741224	75.118232
729	Unknown	Bridgeton		25 ft. of cross stratified sand with little gravel.		GLOUCESTER	PITMAN BORO	332700	314623	39.745113	75.131287
295	Hurffs', Lervis	Bridgeton	Sand & gravel	12 fl. of hard compacted sand and gravel.		GLOUCESTER	SOUTH HARRISON TWP	315788	277530	39.697893	75.262687
455	Pierson Recyling Compariy					GLOUCESTER	SOUTH HARRISON TWP	324593.37	270769.41	39.721906	75.286987
700	Unknown	Pensauken		Gravel, mostly quartz pebbles, some ironstone.		GLOUCESTER	SOUTH HARRISON TWP	305496	286201	39.669837	75.231574
705	Unknown	Vincentown	Sand	Vincentown limesand.		GLOUCESTER	SOUTH HARRISON TWP	309772	271068	39.681224	75.285464
712	Unknown	Bridgeton	Sand & gravel	Gravelly sand and gravel.		GLOUCESTER	SOUTH HARRISON TWP	317781	281064	39.703446	75.250187
716	Unknown					GLOUCESTER	SOUTH HARRISON TWP	320784	273323	39.711509	75.277791
717	Unknown	Bridgeton	Sand	Three layers to 9 fl. depth.		GLOUCESTER	SOUTH HARRISON TWP	321013	280458	39.712305	75.252437
730	Unknown	Cape May	Sand & gravel	8 fL of sand and gravel, sand is yellow medium grained.		GLOUCESTER	SWEDESBORO BORO	334205	265736	39.748169	75.305188
99	Bunker Hill Pit	Bridgeton	Sand & gravel	0-2 fl. loam and gravel, 2-4 ft. coarse and fine sand, 4-8 ft. white sand.		GLOUCESTER	WASHINGTON TWP	333016	327826	39.746227	75.084340
356	Marlco Inc.					GLOUCESTER	WASHINGTON TWP	339310	319585	39.763354	75.113802
449	Pettinos, G.F.	Cape May	Sand	0-1.5 fl. coarse sand, some pebbles. 1.5-20 ft. fine, white to pink sand.		GLOUCESTER	WASHINGTON TWP	346639	333536	39.783727	75.064338
720	Unknown	Bridgeton	Sand & gravel	Gravel		GLOUCESTER	WASHINGTON TWP	324118	326909	39.721782	75.087394
738	Unknown		Sand & gravel	Gravel		GLOUCESTER	WASHINGTON TWP	342736	326797	39.772893	75.088227
996	Wilson Thorn no. 107	Kirkwood	Sand	0-4.5 ft. overburden, 4.5-18 fl. yellow, white, red, very fine sand.		GLOUCESTER	WASHINGTON TWP	343711	332425	39.775669	75.068225
998	Wilson Thorn no. 111	Kirkwood	Sand	0-1 fl. overburden, 1-7 ft. yellow-gray very fine sand, 7+ fl. very fine sand.		GLOUCESTER	WASHINGTON TWP	341092	330612	39.768447	75.074616
999	Wilson Thorn no. 112	Kirkwood	Industrial sand	Molding sand, 3 layers described to 47 feet.		GLOUCESTER	WASHINGTON TWP	342298	331869	39.771780	75.070172
1000	Wilson Thorn no. 48	Kirkwood	Industrial sand	Molding sand, brown to white.		GLOUCESTER	WASHINGTON TWP	350002	329732	39.792893	75.077951
1002	Woodbury Park Pit	Pensauken	Sand	Fine arkosic sand.		GLOUCESTER	WOODBURY CITY	370249	313250	39.848170	75.137120
709	Unknown					GLOUCESTER	WOOLWICH TWP	314408	261884	39.693726	75.318244
714	Unknown		Sand & gravel	Yellow sand and gravel, quartzite stones up to 12" diamater.		GLOUCESTER	WOOLWICH TWP	319826	255837	39.708446	75.339912
722	Unknown	Pleistocene/Homerstown	Sand & gravel	Gravel		GLOUCESTER	WOOLWICH TWP	325113	264091	39.723169	75.310745

Source: Selected Sand, Gravel and Rock Surficial Mining Operations in New Jersey; Digital Geodata Series DGS05-1, http://www.state.nj.us/dep/njgs/geodata/archive.htm; accessed September 9, 2005.

Monitoring Well Logs

Historic Ground Water Elevation Contour Maps

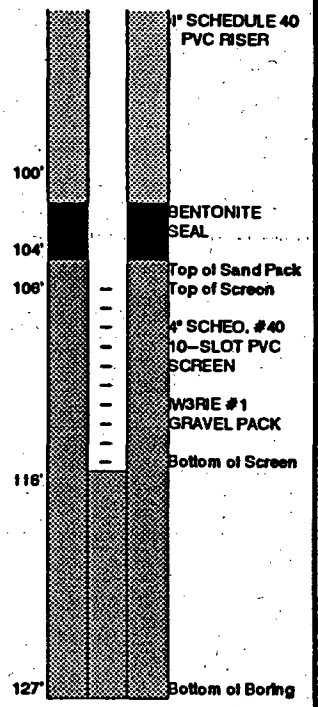
BORING NO.:	SC-20 (R)	CONTRACTOR:	UNI-TECH DRILLING	DATE STARTED:	1/2/92
PROJECT NO.:	7690-N51	DRILLERS:	CONOVER, JANDRAS	DATE COMPLETED:	1/3/92
PROJECT:	SHIELDALLOY	TRC INSPECTOR:	DFAKE	STATIC WATER LEVEL:	85.00 FT
CUENT:	SMC	DRILLMG METHOD:	MUD ROTARY	NJDEP PERMIT NUMBER:	31-38194
LOCATION:	NEWFIELD, NJ	GROUND ELEVATION:	90.62 FT		
BORING DEPTH:	127 FT	CASING ELEVATION:	82.70 FT		

DEPTH (FT)	BLOWS		SOIL DESCRIPTION	WELL CONSTRUCTION
0 – 2	3	2	BROWN MEDIUM SAND, ORGANICS AT TOP OF SPOON	
	2	3		LOCKING COVER
2–4	7	6	BROWN / ORANGE FINE TO MEDIUM GRAVEL, SOME SANO	0.0
	8	11		
4 – 6	10	27	TAN TO UGHT BROWN SAME AS ABOVE. TIGHTLY PACKEO	
	41	47		
6 – 8	12	17	UGHT BROWN MEDIUM SANO	
	16	14		
10 – 12	8	15	ORANGE SILTY SAND, WET	
	16	18		
12–14	15	15	0 – 14" TAN SILTY SAND; 14 – 24" ORANGE FINE SILTY SANO	4" SCHEDULE 40 PVC RISER
	23	22		
20 – 22	7	8	ORANGE FINE–COARSE SAND, TRACE SILT RECOVERY = 10"	20'
	14	18		
25 – 27	14	18	ORANGE/UCHT BROWN MEDIUM COURSE SAND, TRACE SILT, RECOVERV = 12"	BENTONITE SLURRY
	25	30		
30 – 32	26	27	ORANGE / UGHT BROWN FINR – MEDIUM SANO, SOME SILT. RECOVERY = 14"	
	68	75		
35 – 37	30	58	UGHT BROWN FINE – MEDIUM SILT. RECOVERV = 10"	
	100			
40 – 42	42	68	ORANGE UGHT BROWN FINE – MEDIUM SAND, TRACE SILT. RECOVERY = 1	40'
	100			
50 – 52	30	52	0 – 3" RED & UGHT BROWN LAYERS OF FINE–MEDIUM SAND, SOME SILT & CLAY;	
	75	75	3 – 15" ORANGE & RED LAYERS OF MEDIUM TO COURSE SAND, TRACE SILT.	
			RECOVERY = 15"	
55 – 57	39	40	RED FINE SAND, LITTI E SILT. RECOVERY = 14"	
	60	75		
60 – 62	45	70	RED FINE SAND, UTTI E SILT	60'
	80	100/5"	SILT & CLAY;3 – 15" ORANGE & RED LAYERS OF MEDIUM–COURSE SAND, TRACE SILT	
			RECOVERY = 19"	
65 – 67	33	65	RED FINE SAND TRACE SILT	
	100/4"		RECOVERY = 10"	
70 – 72	35	80	UGHT BROWN & RED LAYERS OF FINE SAND, SOME SILT	
	100/5"		RECOVERV = 13"	
75 – 77	20	50	UGHT BROWN & ORANGE LAYERS OF FINE SAND, TRACE SILT	
	65	70	RECOVERY=11"	
80 – 82	20	25	UGHT BROWN FINE SAND WITH THIN WHITE SILT CLAY STRIMGERS.	80'
	35	45	RECOVERY = 8"	
85 – 87	60	105	UGHT BROWN FINE SAND, TRACE SILT	
	100/5"		RECOVERY = 8"	

CONTINUED ON NEXT PAGE

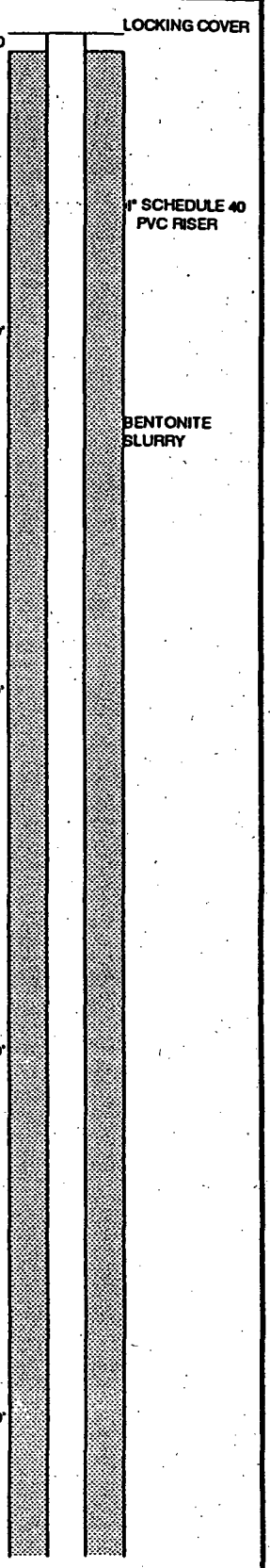
BORING NO.: SC–20 (R)
PROJECT NO.: 7o50–N51

DEPTH (FT)	BLOWS		SOIL DESCRIPTION
90 – 92	20 15	27 22	UGHT BROWN MEDIUM TO FINE SANO, TRACE SILT, RECOVERY = 9"
95 – 97	S1 42	27 40	UGHT BROWN FINE–MEDIUM SAND, SOME SILTY CLAY LAYERS RECOVERY = 11"
100–102	80	100/1.5"	UGHT BROWN MEDIUM SAND TRACE SILT RECOVERY=19"
105–107	107	10W4"	SAME AS ABOVE RECOVERY=16"
110–112	125	100/2"	0 – 16" SAME AS ABOVE; 16–24" ORANGE MEDIUM SAND, SOME SILTY GRAY STRINGER& RECOVERY = 24"
115–117	18 31	29 41	GRAY–BLACK FINE–MEDIUM SAND, SOME SILT, UTTLE CLAY. RECOVERY = 16"
117–118	15 22	18 33	GRAY/BLACK FINE–MEDIUM SAND, UTTLE SILT & CLAY RECOVERY = 6"; LARGE AMOUNTS OF WASH
118 – 121	13 20	18 29	GRAY/BLACK FINE–MEDIUM SAND, UTTI E SILT & CLAY RECOVERY = 6"
121 –123	14 70	35 54	SAME AS ABOVE RECOVERY = 3"
123 – 125	25 33	26 43	0–2" VARIED CLAY/SILT LAYERS; 2–4" MEDIUM–FINE SAND LITTLE SILT AND CLAY, ONE STRINGER OF SILT/CLAY; RECOVERY = 6"
125–127	17 10	23 25	FINE–MEDIUM SAND, UTTLE SILT AND CLAY RECOVERY = 5"
			END OF BORING = 127'



BORING NO.:	SC-30 (R)	CONTRACTOR:	I.S.G.-TECH DRILLING	DATE STARTED:	1/6/82
PROJECT NO.:	7650-N51	DRILLERS:	CONOVER, JANDRAS	DATE COMPLETED:	1/7/82
PROJECT:	SHIELDALLOY	TFIC INSPECTOR:	DRAKE	STATIC WATER LEVEL:	86.01 FT
CLIENT:	SMC	DRILLING METHOD:	MUD ROTARY	NJDEP PERMIT NUMBER:	31-38185
LOCATION:	NEWFIELD, NJ	GROUND ELEVATION:	88.75 FT		
BORING DEPTH:	127 FT	CASING ELEVATION:	91.36 FT		

DEPTH (FT)	BLOWS		SOIL DESCRIPTION
0 – 2	4 3	2 4	0–6" BLACK ORGANICS; 6–20" BROWN/TAN MEDIUM–FINE SAND, LITTLE SILT, NO ODOR. WATER TABLE AT 2.5'. RECOVERY = 20".
5 – 7	12 30	18 31	BROWN/TAN MEDIUM–COURSE SAND, SOME FINE SAND AND GRAVEL, TRACE SILT, NO ODOR. RECOVERY = 12"
10 – 12	17 19	12 20	0–6" WASH; 6–14" BROWN/TAN MEDIUM–FINE SAND, LITTLE FINE GRAVEL, TRACE SILT, NO ODOR. RECOVERY = 14"
15–17	2 10	8 7	0 – 12" GRAY FINE SAND, SOME SILT; 12–18" RED/BROWN MEDIUM–COURSE SAND AND GRAVEL, TRACE SILT, NO ODOR. RECOVERY = 18"
20 – 22	10 25	18 28	0–2" WASH: 2–14" LAYERS OF WHITE AND TAN MEDIUM SAND AND FINE SAI TRACE SILT, NO ODOR. RECOVERY = 14"
25 – 27	16 34	25 40	0–6" LIGHT BROWN MEDIUM–COURSE SAND, SOME GRAVEL; 6–7" GRAVEL LAYER; 7–17" LIGHT ORANGE–BROWN MEDIUM–COURSE SAND, LITTLE GRAVEL AND FINE SAND, TRACE SILT. NO ODOR. RECOVERY = 17"
30 – 32	19 60	40 60	LIGHT BROWN MEDIUM–COURSE SAND, SOME FINE GRAVEL. COURSE GRAVEL AT 12" FINER SANDS AT BASE OF SPOON. NO ODOR. RECOVERY = 24"
35 – 37	25 40	40 43	0–15" LIGHT BROWN MEDIUM–COURSE SAND, LITTLE FINE SAND TRACE SILT; 15–24" WHITE MEDIUM SAND, LITTLE FINE SAND. RECOVERY = 24"
40 – 42	27 48	30 56	TAN MEDIUM–COURSE SAND, LITTLE FINE SAND, TRACE GRAVEL. RECOVERY = 18"
45 – 47	20 25	25 26	TAN MEDIUM–COURSE SAND, LITTLE FINE SAND, TRACE GRAVEL. RECOVERY = 18"
50 – 52	8 17	7 15	0–8" TAN–BROWN MEDIUM–FINE SAND, 8–14" RED–BROWN COURSE SAND, LITTLE FINE–MEDIUM SAND. RECOVERY = 14".
55 – 57	5 5	5 11	0–8" TAN–BROWN MEDIUM–FINE SAND, LITTLE SILT; 8–14" RED–BROWN MEDIUM–FINE SAND, LITTLE SILT. RECOVERY = 14"
60 – 62	42 63	58 67	TAN–BROWN MEDIUM SAND, LITTLE FINE SAND, TRACE SILT RECOVERY = 20"
65 – 67	13 37	13 45	TAN WITH PINK LAYERS: 0–4" MEDIUM–COURSE SAND; 4–16" FINE SAND, LITTLE SILT. RECOVERY = 18"
70 – 72	40 100/5"	54	0–2" TAN MEDIUM–COURSE SAND; 2–12" TAN AND RED LAYERS OF FINE SAND LITTLE SILT, THIN WHITE FINE SAND NEAR BASE OF SPOON, RECOVERY = 18"
75 – 77	50 100/5"	56	0–6" WASH; 6–8" TAN MEDIUM FINE SAND, 8–18" LIGHT BROWN FINE SAND, LITTLE SILT, RECOVERY=18"
80 – 82	42 100/5"	57	0–8 TAN MEDIUM FINE SAND, 6–8" TAN FINE SAND, LITTLE SILT, RECOVERY = 8"
85 – 87	34 58	62 64	0–2" TAN MEDIUM–FINE SAND; 2–12" LIGHT BROWN FINE SAND, TRACE SILT, RECOVERY = 12"



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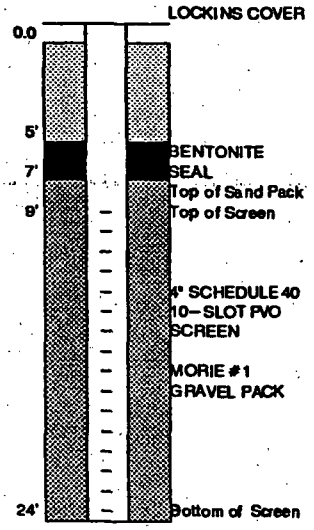
BORING NO.: 6C–3D (P)
PROJECT NO.: 7650–N51

DEPTH (FT)	BLOWS		SOIL DESCRIPTION	WELL CONSTRUCTION
80 – 82	34 58	62 84	0–6" TAN FINE–COURSE SAND, UTTLE GRAVEL; 6–12" BROWN–TAN FINE–MEDIUM SAND, UTTLE SILT, RECOVERY 12"	4" SCHEDULE 40 PVC RISER
95 – 97	54 100/5"	58	0–10' TAN MEDIUM SAND;10–12" REO MEDIUM–COURSE SANO; 12–15" ORANGE–BROWN MEDIUM–COURSE SAND WIYH SILT STRINGEFIS. RECOVERY = 15"	94' BENTONITE SEAL 97' Top of Sand Pack
100–102	25 35	32 28	0–3" TAN MEDIUM SAND, SOME COURSE SANO; 3–10" TAN–BROWN FINE V SAND WITH SILT STRINGERS, UTTLE SILT, RECOVERY = 10"	100' Top of Screen 4" SCHEO. #40 10–SLOT PVC SCREEN MORIE #1 GRAVEL PACK
105–107	38 100/5"	45	0–14" TAN MEDIUM SANO, SDME COURSE SAND; 14–21" TAN–BROWN FINE–MEDIUM SAND, UTTLE GRAVEL ANO SILT STRINGERS. RECOVERV = 21"	
110–112	17 20	27 35	0–12" TAN MEDIUM SAND, SOME COURSE SAND; 12–24" VARIGATED MEDIUM SANO (TAN, REO, AND BROWN LAYERS) WITH SILT STRINGERS, SOME FINE SANO UTTLE SILT. RECOVERY = 24"	Bottom of Well 111'
			ENO OF BORING = 115'	115' Bottom of Boring

BORING NO.:	SC-11S (R)	COHTR/CTOR:	UNI-TECH DRILLING	DATE STARTED:	7/1/92
PROJECT NO.:	7650-N51	DRILLERS:	FRECK	DATE COMPLETED:	7/1/92
PROJECT:	SHIELDALLOY	SMC INSPECTOR:	VALENTI	STATIC WATER LEVEL.:	91.10 FT
CLIENT:	SMC	DRILLING METHOD:	MUD ROTARY	NJDEP PERMIT NUMBER:	31-38500
LOCATION:	NEWFIELD, NJ	GROUND ELEVATION:	108.91 FT		
BORING DEPTH:	24 FT	CASING ELEVATION:	108.12 FT		

DEPTH (FT)	BLOWS		SOIL DESCRIPTION
0 - 2			AUGERED TO 5'
5 - 7	3 6	4 7	ORANGE TO LIGHT BROWN SILTY SAND WITH GRAVEL.
10 - 12	2 5	4 2	ORANGE-LIGHT BROWN SILTY SAND WITH GRAVEL.
15 - 17	2 3	2 3	ORANGE-TAN GRAVEL.
20 - 22	3 6	3 7	ORANGE-TAN GRAVEL.
	END OF BORING = 24'		

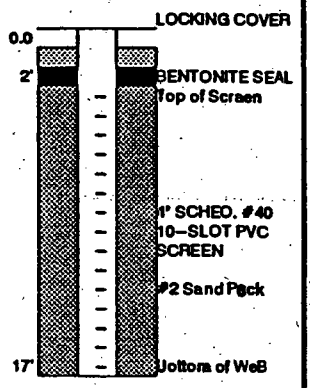
WELL CONSTRUCTION



BORING NO.:	SC–W2 (F)	CONTRACTOR:	UNI–TECH DRILLING	DATE STARTED:	12/20/91
PROJECT NO.:	7850–N51	DRILLERS:	CONOVER: EVANS	DATE COMPLETED:	12/20/91
PROJECT:	SHIELDALLOY	SMC INSPECTOR:	VALENTI	STATIC WATER LEVEL:	03.20 FT
CLIENT:	SMC	DRILLING METHOD:	MUD ROTARY	NJDEP PERMIT NUMBER:	
LOCATION:	NEWFIELD, NJ	GROUND ELEVATION:	95.96 FT		
BORING DEPTH:	17 FT	CASING ELEVATION:	97.96 FT		

DEPTH (FT)	BLOWS		SOIL DESCRIPTION
0 – 2	15	8	Light brown to light orange, GRAVEL, (0–.5'); light brown, sandy
	6	7	gravel, well rounded to subangular pebbles, (.5'–2')
2 – 4	4	7	Light brown to light orange SAND, medium to fine, water table at 2.5'
	15	13	
4 – 6	11	8	Light brown, SAND, fine
	8	10	
10 – 12	6	7	Light gray, SAND & GRAVEL, pebbles to 3/4", silty sand at 11'
	7	10	
15 – 17	5	7	Light brown, SAND & GRAVEL to 1/4", well graded and well rounded
	10	7	
			END OF BORING = 17'

WELL CONSTRUCTION



BORING NO.:	SC-200	CONTRACTOR:	LINI-TECH DRILLING	DATE STARTED:	1/8/82
PROJECT NO.:	7650-N51	DRILLERS:	CONOVER, JANDRAS	DATE COMPLETED:	1/10/82
PROJECT:	SHIELOALLOY	TRC INSPECTOR:	MULLEN	STATIC WATER LEVEL:	68.65 FT
CLIENT:	SMC	DRILLING METHOD:	MUD ROTARY	NJDEP PERMIT NUMBER:	31-38187
LOCATION:	NEWFIELD, NJ	GROUND ELEVATION:	101.55 FT		
BORING DEPTH:	138 FT	CASING ELEVATION:	104.33 FT		

DEPTH (FT)	BLOWS		SOIL DESCRIPTION
0 - 2			AUGERED TO 20' SEE LOG OF SC-206 FOR SOIL DESCRIPTION
5 - 7			
10 - 12			
15 - 17			
20 - 22	8 18	14 24	BROWN-ORANGE MEDIUM-COARSE SAND, TRACE FINE SAND. NO ODOR. RECOVERY=8"
25 - 27	23 37	25 37	0-7" WASH; 7-17" SAME AS ABOVE WITH TRACE FINE GRAVEL. NO ODOR. RECOVERY=17"
30 - 32	21 48	28 50	0-2" WASH; 2-13" BROWN ORANGE MEDIUM SAND, LITTLE FINE SAND, TRACE FINE GRAVEL; 13-15" BROWN-ORANGE FINE SAND. NO ODOR. RECOVERY=15"
35 - 37	16 50	22 38	0-2" WASH; 2-15" BROWN-ORANGE FINE TO MEDIUM SAND. NO ODOR. RECOVERY=15"
40 - 42	34 45	27 50	0-3" WASH; 3-15" SAME AS ABOVE RECOVERY=19"
45 - 47	17 39	20 50	0-6" BROWN-ORANGE FINE SAND; 6-12" BROWN-ORANGE FINE TO MEDIUM SAND. RECOVERY=12"
			STEEL CASING SET TO 48'
50 - 52	22 45	37 83	0-2" WASH; 2-4" BROWN-ORANGE SILT, SOME CLAY, LITILE SAND; 4-21" BROWN-ORANGE MEDIUM SAND, LITTLE FINE SAND. RECOVERY=21"
55 - 57	48 70	65 65	BROWN-ORANGE FINE TO COARSE SAND, TRACE SILT. RECOVERY=12"
60 - 62	25 62	31 60	0-7" TAN MEDIUM SAND, LITTLE FINE SAND, TRACE FINE GRAVEL; 7-12" BROWN-ORANGE FINE TO MEDIUM SAND. RECOVERY=12"
65 - 67	43 48	43 53	VARIGATED TAN TO REDS MEDIUM SAND, SOME COARSE & FINE SAND, TRACE GRAVEL. RECOVERY=13"
70 - 72	14 45	22 56	SAME AS ABOVE EXCEPT SILT STRINGER IS LOCATED 4" DOWN FORM TOP OF SAMPLE. RECOVERY=12"
75 - 77	38 52	48 56	TAN FINE TO MEDIUM SAND; STRINGER OF FINE GRAVEL AT 4". RECOVERY=13"
80 - 82	42 100/5"	48	BROWN FINE SAND, LITTLE FINE GRAVEL. RECOVERY=12"
85 - 87	20 45	22 50	0-3" TAN CLAY, LITTLE SILT, TRACE FINE SAND, STFF; 3-21" TAN TO RED FINE SAND WITH SILT/CLAY STRINGERS. RECOVERY=21"

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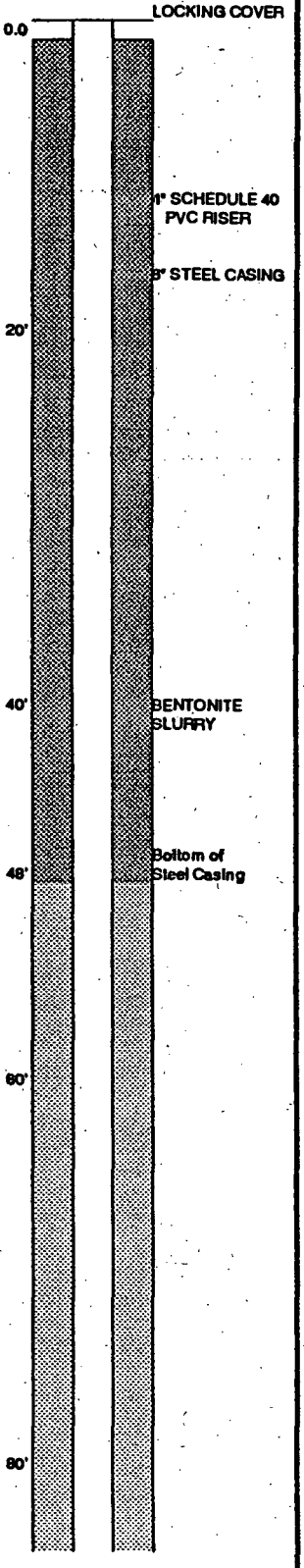
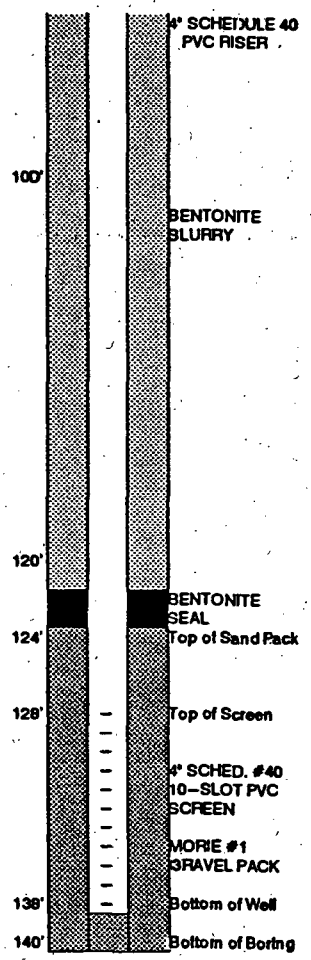


BORING NO.: SC-20D
PROJECT NO.: 7650-N51

DEPTH (FT)	BLOWS		SOIL DESCRIPTION
80 – 82	100/9"		LIGHT BROWN MEDIUM TO FINE SAND, TRACE SILT, RECOVERY = 8"
85 – 87	16 29	18 47	0–8" TAN FINE TO MEDIUM SAND, LITTLE COARSE SAND; 8–15" RED FINE TO MEDIUM SAND; LAYERS SEPARATED BY CLAY STRINGER RECOVERY=15"
100–102	48 33	29 38	RED–BROWN FINE SAND WITH WHITE SILT AND CLAY STRINGERS. RECOVERY=15"
105–107	67	100/4"	0–2" SAME AS ABOVE; 2–8" TAN–PINK FINE TO MEDIUM SAND, TRACE SILT. RECOVERY=8"
110–112	100/4"		BROWN–ORANGE FINE TO MEDIUM SAND, TRACE SILT. RECOVERY=4"
115–117	81	100/4"	LIGHT TAN–BROWN MEDIUM SAND, LITTLE FINE SAND. RECOVERY=8"
120–122	22 26	20 13	TAN FINE SAND WITH RED LAMINATIONS, SOME SILT. RECOVERY=10"
125–127	53	133	BROWN–RED FINE SAND, LITTLE SILT. RECOVERY= 8"
130–132	25 33	24 32	SAME AS ABOVE. RED AT TOP TO TAN AT BOTTOM. RECOVERY=6"
137–138	28 28	24 34	DARK GRAY; 0–6" FINE SAND; 8–24" STFF SILT & CLAY LAYERS, SOME TO LITTLE SAND AT BASE OF SPOON. RECOVERY=24"

END OF BORING = 140'
8" STEEL CASING SET FROM 0 TO 48'

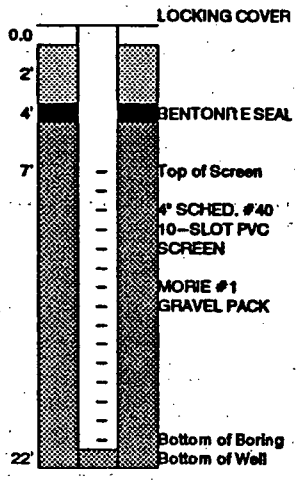
WELL CONSTRUCTION



BORING NO.:	SC–W2SS	CONTRACTOR:	UNI–TECH DRILLING	DATE STARTED:	12/23/81
PROJECT NO.:	7B80–N51	DRILLERS:	CONOVER, EVANS	DATE COMPLETED:	12/23/81
PROJECT:	SHIELDALLOY	SMC INSPECTOR:	VALENTE	STATIC WATER LEVEL:	80.40 FT
CLIENT:	SMC	DRILLING METHOD:	MUD ROTARY	NJDEP PERMIT NUMBER:	
LOCATION:	NEWFIELD, NJ	GROUND ELEVATION:	86.60 FT		
BORING DEPTH:	22 FT	CASING ELEVATION:	102.27 FT		

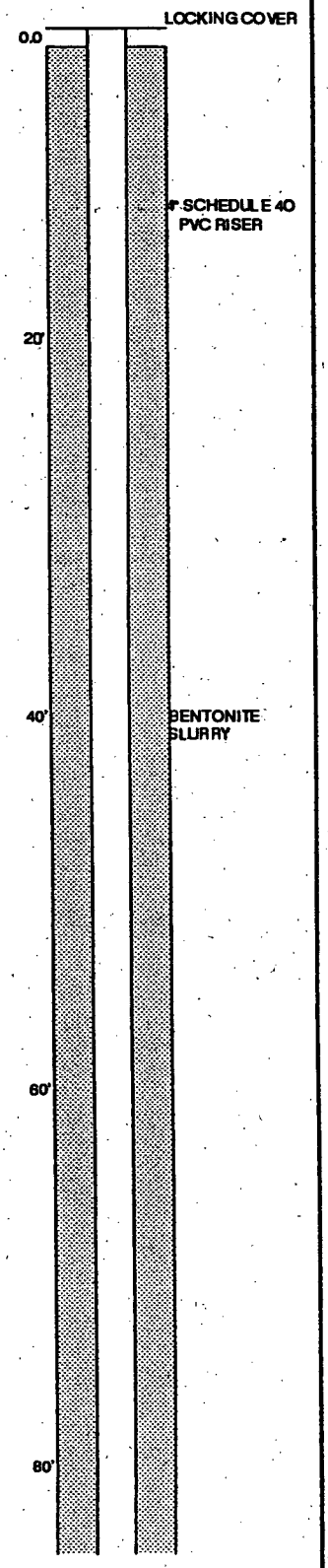
DEPTH (FT)	BLOWS		SOIL DESCRIPTION
0 – 2	10	44	Gray, FILL, gravel, sand, and slag fragments
	20	14	
2 – 4	7	6	Light brown, SAND, gravel, pebbles to 1/2", damp
	7	6	
4 – 6	10	7	Same as above
	15	16	
6 – 8	16	16	Same as above
	17	16	
8 – 10	10	6	Saturated, water table at +/– 9'
	5	5	
15 – 17	6	6	Light brown to light orange, SAND & GRAVEL
	4	6	
20 – 22	2	2	Light brown to light orange, GRAVEL
			END OF BORING = 22 FT

WELL CONSTRUCTION



BORING NO.:	SC-260	CONTRACTOR:	LINI-TECH DRILLING	DATE STARTED:	7/09/92
PROJECT NO.:	7850-N51	DRILLERS:	FRECK, VISALLI	DATE COMPLETED:	7/08/92
PROJECT:	SHIELDALLOY	TRC INSPECTOR:	SMITH	STATIC WATER LEVEL:	88.40 FT
CLIENT:	SMC	DRILLING METHOD:	MUD ROTARY	NJDEP PERMIT NUMBER:	31-39512
LOCATION:	NEWFIELD, NJ	GROUND ELEVATION:	100.68 FT		
BORING DEPTH:	143 FT	CASING ELEVATION:	100.49 FT		

DEPTH (FT)	BLOWS		SOIL DESCRIPTION
0 - 2			
5 - 7	10 20	14 20	Brown, fine-medium SAND, trace silt, no odor, dry, 1.6' recovery
10 - 12	10 16	15 15	Same as above, 0.67' recovery
15 - 17	7 7	8 8	Same as above, 1' recovery
20 - 22	8 17	10 16	Brown, medium SAND, some fine sand, little silt, wet, no odor, 0.67' recovery
25 - 27	10 18	12 22	Same as above, 1' recovery
30 - 32	20 28	20 24	Brown, fine-medium SAND, little silt, no odor, wet, 1.2' recovery
35 - 37	37 41	38 51	Light, reddish-brown, fine-medium SAND, little silt, no odor, wet 1' recovery
40 - 42	48	94/8"	Same as above, 1' recovery
45 - 47	45	50/5"	Same as above, 0.5' recovery
50 - 52	20 42	28 30	Light brown, fine-medium SAND, little silt, no odor, wet, 1.2' recovery
55 - 57	20 50/4	38	Same as above, 1' recovery
60 - 62	30	50/6"	Same as above, 0.5' recovery
65 - 67	40	50/2"	Reddish-brown, same as above, 0.5' recovery
70 - 72	34 45	38 43	Same as above, 1.8' recovery
75 - 77	48	50/4"	Light brown, fine-medium SAND, little silt, no odor, wet, 0.67' recovery
80 - 82	36	50/3"	Same as above, 0.67' recovery
85 - 87	50/3		Same as above, 0.25' recovery



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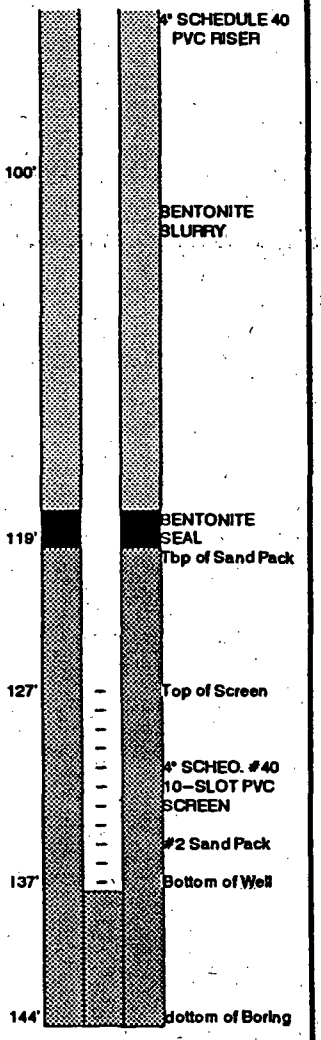
BORING NO.: SC–26D
PROJECT NO.: 7650–N51

DEPTH (FT)	BLOWS		SOIL DESCRIPTION
95 – 97	42	50/3"	Brown, fine S/tND and SILT, little medium sand, no odor, wet, 0.67' recovery
105–107	50/3		Same as above, 0.5' recovery
115–117	49	50/2"	Same as above, 1' recovery
120–122	25	50/3"	Light brown, reddish brown, fine–medium SAND, little silt, no odor, 1' recovery
126–127	46	50/4"	Light brown, fine–medium SAND, little silt, no odor, wet, 0.5' recovery
135–137	9 20	23 37	Same as above, 1' recovery
			Start of Clay Layer
145–147	9 1	9 47	Dark gray CLAY, little silt, dry, no odor, 2' recovery

END OF BORING = 144'

WELL CONSTRUCTION



WELL NO:	SC-28D	CONTRACTOR:	UNI-TECH DRILLING	DATE STARTED:	8/24/93
PROJECT NO:	19080-0080-00010	DRILLERS:	JESTER, SAOOO, WARREN	DATE COMPLETED:	8/25/93
PROJECT:	SHIELO ALLOY (SMC)	TRC INSPECTOR:	SUSCA	WATER TABLE EL:	86.03 (8/31/95)
LOCATION:	NEWFIELD, NJ	DRILLING METHOD:	MUD ROTARY	LOCATION:	N 256,668.00
WELL DEPTH:	153 FEET	GROUND EL:	107.41		E 1,899,472.69
PERMIT NO.:	3147408	CASING EL:	107.02		

DEPTH (FT)	BLOWS	SOIL DESCRIPTION	WELL CONSTRUCTION
			LOCKING COVER
0 - 2	7 13 17 21	0-3" Topsoil; Dk. Brown F-M SAND, little silt-clay 3-13" Orange F-M SAND, little m-c gravel, dry.	
			CEMENT/BENTONITE GROUT
5 - 7	2 8 21 18	Orange/Yellow F-C SAND, some f-c gravel to 1" 8" Recovery.	10.0
			BENTONITE GROUT
10 - 12	3 9 9 12	Orange F-M SAND, tr C sand, damp, dense 11" Recovery	
15 - 17	7 13 13 14	Same as Above 8" Recovery	
			8" BOREHOLE
20 - 22	13 13 10 15	Orange F-M SAND, tr c sand, tr med. gravel, some cobbles, wet 14" Recovery	
25 - 27	10 14 16 15	Orange F-M SAND, tr c sand, tr gravel. 14" Recovery	
			4" PVC RISER
30 - 32	15 17 21 18	Orange F-C SAND, tr-little f-c gravel, wet 14" Recovery	
35 - 37	12 15 18 18	Orange M-C SAND, tr f sand, tr-little gravel, wet 13" Recovery	
40 - 42	8 20 39 32	Orange M-C SAND, tr gravel. 11" Recovery	
45 - 47	21 25 32 40	Tan F-M SAND, little c sand, tr gravel 12" Recovery	
50 - 52	20 75 100/0"	Tan/pink fine SAND, little-some m-c sand. 13" Recovery	
55 - 57	40 90 100/5"	Tan/pink Med. SAND, tr-little f sand in bands 10" Recovery	
60 - 62	25 100/0"	White/Tan F-C SAND 9" Recovery	
		(CONTINUED)	

SHIBI D ALLOY METALLURGICAL
SC-28D, continued

DEPTH (FT)	BLOWS	SOIL DESCRIPTION	WELL CONSTRUCTION
65 - 67	47 100/5"	Tao/white/pink Fine SAND, lr m-c sand, lr n luita clay stringers 10" Recovery	
70 - 72	48 52 100/4"	Same as Above 12" Recovery	8" BOREHOLE
75 - 80	62 100/4"	Tan M-C SAND, tr f sand, tr gravel 10" Recovery	
80 - 82	40 100/3"	Tan F-C SAND, tr gravel 12" Recovery	
85 - 87	36 100/4"	Tan F-C SAND, u f-c gravel 10" Recovery	100% BENTONITE GROUT
90 - 92	61 100/3"	Tan F-C SAND, tr gravel 10" Recovery	
95 - 97	19 32 38 46	Tan F-VF SAND, tr clay stringers @ 2" and 8". 13" Recovery	
100 - 102	17 26 50 67	Orange/Tan/Red F-VF SAND, some white sand stringers 17" Recovery	4" PVC RISER (SCHEDUL 40)
105 - 107	35 100/5"	Tan/Orange F SAND 8" Recovery	
110 - 112	20 25 60 100/2"	Orange/Tan F-VF SAND, little white clay stringers 11" Recovery	
115 - 117	64 100/2"	Orange/Tan F-M SAND, tr c sand 6" Recovery	
120 - 122	55 100/4"	Tan F-M SAND, tr c sand, white clay stringer in tip of sample 6" Recovery	
125 - 127	14 24 37 42	Tan/White F-VF SAND, tr clay striagers 10" Recovery	
			127 #00 SAND SEAL
130 - 132	30 100/3"	Tan/Brown F-VF SAND 7" Recovery	130 TOP OF SAND PACK
			133 - TOP OF SCREEN

SHIELD ALLOY METALLURGICAL

SC-28D, continued

DEPTH (FT)	BLOWS	SOIL DESCRIPTION	WELL CONSTRUCTION
135 - 137	52 100/5"	Tan F SAND (possibly all wash) 7" Recovery	8" BOREHOLE
140 - 142	34 42 22 28	Tan F SAND, tr clay stringers 9" Recovery	#1 SAND PACK
143 - 147	23 30 37 40	Tan F SAND, tr clay stringers 10" Recovery	4" PVC SCREEN 10 sLOT
150 - 152	36 59 66 70	Same as Above 8" Recovery	
			153.0 BOTTOM OF WELL
155 - 157	26 22 50 25	Gray CLAY, tr f sand, dense. 24" Recovery	
		END OF BORING = 157 FEET	

WELL NO:	SC-29D	CONTRACTOR:	UNI-TECN DRILLING	DATE STARTED:	2/18/97
PROJECT NO:	09030-00SO-00010	DRILLER:	DAVE, MIKE, GEORGE	DATE COMPLETED:	2/20/97
PROJECT:	SHIELD ALLOY (SnMC)	ENG INSPECTOR:	BROWN	WATER TABLE EL:	
LOCATION:	NEWFIELD, NT	DRILLING METHOD:	MUD ROTARY	LOCATION:	N
WELL DEPTH:	148 FEET	GROUND EL:			E
PERMIT NO.:	3147409	CASING EL:			

DEPTH (FT)	BLOWS	SOIL DESCRIPTION	WELL CONSTRUCTION
0 - 2	4 6	0-2" Topsoil; Dk. Brown F Sand and Silt, some organics	FLUSH MOUNT LOCKING COVER
	6 10	2-6" Brown F Sand and Silt, trace Gravel	CEMENT PAD
		6-16" Yellow brown F-M SAND, some gravel, little Silt	CEMENT GROUT
		16" Recovery; No Odor; OVA = ND	5.0
5 - 7	13 17	0-5" Yellow brown C Sand and Gravel	
	12 12	5-10" Yellow brown F-M SAND	
		10" Recovery; No Odor; OVA=2 ppm	
10 - 12	10 11	Yellow brown F-M SAND, little Silt, tr C Sand	CEMENT/BENTONITE GROUT
	10 10	10" Recovery; No Odor	
15 - 17	5 8	Yellow brown M-C SAND, some Gravel	
	8 10	8" Recovery; No Odor; OVA=ND	
		Drillers estimate of water table (all samples have been wet due to drilling slurry)	8" BOREHOLE
20 - 22	5 5	No Recovery, several pieces of gravel	
	S 8	0" Recovery	
25 - 27	5 10	Yellow orange F Sand and Silt, little Clay	
	10 8	12" Recovery; No Odor; OVA=ND	4" PVC RISER
30 - 32	12 18	Yellow orange F-M SAND, little C Sand; C Sand increasing w/depth	
	20 20	Last 2" Red orange color	
		10" Recovery; OVA=ND	
35 - 37	17 25	Reddish brown F-M SAND, Silty at tip of spoon	
	27 28	8" Recovery; No Odor; OVA=1 ppm	
40 - 42	17 25	Orange yellow M-C SAND, tr F Sand	
	27 29	5" Recovery; No Odor; OVA=5 ppm	
41 - 47	27 23	0-4" Yellow F SAND	
	25 29	4-7" Yellow brown F-M SAND, little C Sand	
		7-9" Dark Red F SAND	
		9" Recovery; No Odor; OVA=10 ppm	
50 - 52	37 35	Tan F-M SAND	
	37 50/2"	9" Recovery; No Odor; OVA=3 ppm	
55 - 57	18 32	Tan F SAND, little Silt; some orange color	
	34 45	7" Recovery; No Odor; OVA=6 ppm	
00 - 62	34 37	0-4" Brown M-C SAND, tr. F Sand	
	45 50/2"	4-N" Yellow orange F-M SAND	
		14" Recovery; No Odor; OVA=12 ppm	
		(CONTINUED)	

SHIELD ALLOY METALLURGICAL

SC-29D, continued

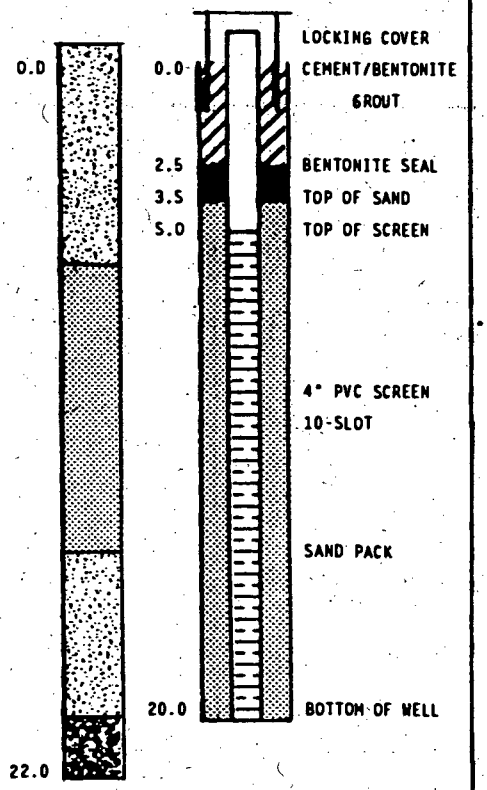
DEPTH (FT)	BLOWS	SOIL DESCRIPTION	WELL CONSTRUCTION
65 - 67	37 44 49 50/3"	Tan F-M SAND; tight/compact 6" Recovery; No Odor; OVA=2 ppm	
70 - 72	34 44 50/3"	0-4" Tan F-M SAND 4-8" Tan F-M SAND, some Gravel, little C Sand 8-10" Tan F 44 SAND, little C Sand. Lt. Red F-M Sand in tip of spoon 10" Recovery; No Odor; OVA=ND;	8" BOREHOLE
75 - 77	12 34 48 50/3"	0-2" Tan F SAND 2-5" GRAVEL, little F Sand 5-12" Tan F SAND 12" Recovery; No Odor.	
80 - 82	20 31 44 50	Lt. Tan F SAND 5" Recovery; No Odor; OVA=6 ppm	
85 - 87	44 50/3"	Lt. Tan F SAND; lots of wash 4" Recovery; No Odor; OVA=2.5 ppm	CEMENT/BENTONITE Grout
90 - 92	21 50/4"	Tan F SAND, little M Sand 4" Recovery. No Odor; OVA=ND	
95 - 97	47 50/4"	Tan VF SAND; slightly orange at top, reddish at tip 4" Recovery. No Odor; OVA=1.8 ppm	
100 - 102	17 44 50/4"	No Recovery, all wash 0" Recovery	4" PVC RISER (SCHEDULE 40)
105 - 107	33 44 49 30	Orange brown F-C SAND, lt. Clay stringer, tight 10" Recovery. OVA=<1 ppm	
110 - 112	22 39 54 50/4"	Orange brown F-M SAND, little C Sand 6" Recovery; No Odor; OVA=<1 ppm	
115 - 117	33 45 49 50	Tan F-M SAND, little C Sand; wash on top <1" Recovery	
120 - 122	49 100/4"	Tan F SAND, some M Sand, tr. C Sand; very tight 6" Recovery. OVA=2 ppm	120.0 #00 SAND SEAL 121.0 TOP OF SAND PACK
125 - 127	51 100/3"	Tan F SAND, little M Sand; tight 5" Recovery; No Odor; OVA=1.9 ppm	
130 - 132	30 100/5"	Tan/Orange F SAND, tr. Clay. light 8" Recovery. No Odor; OVA=2.25 ppm (CONTINUED)	128.0 TOP OF SCREEN

SHIELD ALLOY METALLURGICAL
SC-29D, continued

DEPTH (FT)	BLOWS	SOIL DESCRIPTION	WELL CONSTRUCTION
135 - 137	32 47	0-4" Lt. Ony CLAY	
	70 63	4-5" F Sand and Clay	8" BOREHOLE
		5-14" Orange brown F-M SAND	
		14" Recovery, No Odor, OVA=2.3 ppm	
140 - 142	40 65	0-5" Tan F SAND	
	68 83	5-8.5" Tan F Smd Gray, Clay, tight	
		8.5" Recovery, No Odor, OVA=2.25 ppm	#3 MORIE SAND PACK
145 - 147	24 23	0-6" Tan F SAND	4" PVC SCREEN
	24 24	6-8" Orange F SAND, lr. Clay	10 SLOT
		8" Recovery. No Odor, OVA=2.9 ppm	
			148.0 BOTTOM OF WELL
148.5		Dk. Gray CLAY	
		On drill bit	
			150.0 BOTTOM OF BOREHOLE
		END OF BORING = 150 FEET	

BORINC NO.:	SC-5S	CONTRACTOR:	EMPIRE SOILS	OATE STARTED:	11/28/90
PROJECT NO.:	76S0-N51	ORILIERS:	KENNET. EOUAROS	DATE COMPLETED:	11/28/90
PROJECT:	SHIELD ALLOY	TRC INSPECTOR:	MCMORROU	MATER TABLE LEVEL:	8 FT
CLIENT:	SMC	DRILLINB METHOD:	6 1/4" AUEERS	LOCATION: N	256790.C7
LOCATION:	NEUFIELD, NJ	SROUNO ELEVATION:	94.18	E	1897854.14
BORING OEPTH:	22 FT	INNER CASING ELEVATION:	96.SS	NJDEP PERMIT NUMBER:	313S434-1

DEPTH (TT)	BLOWS	SOIL DESCRIPTION
0 - 2	3 5	BROWN FINE TO MEDIUM SAND, TRACE SILT, DRY
	S 4	RECOVERY - 24"
2 - 4	S 4	LT. BROMN FINE TO MEDIUM SAND, LITTLE SILT, MOIST
	3 7	RECOVERY - 24"
4 - 6	12 10	LT. BROUN FINE TO MEDIUM SAND, TRACE CLAY, DRY
	16 IS	RECOVERY - 20"
6 - 8	20 12	IT. BROMN FINE SAND, LITTLE SILT, LITTLE CLAY, DRY
	12 12	RECOVERY - 24"
8 - ID	10 8	SAME AS ABOVE, MET AT B FT
	11 10	RECOVERY - 24"
16 - 17	S 4	LT. BRONK FINE TO MEDIUM SANC MITH THIN LAYERS OF GRAY SILT
	7 13	RECOVERY - 18"
20 - 22	9 17	0-6" SAME AS ABOVE 6-14" RED F-C SAND, TRACE GRAVEL
	10 12	14-20" BBOMN/YELLOM FINE TO COARSE SAND
		END OF BORING - 22 FT



BORING NO.:	SC-12D	CONTRACTOR:	EMPIRE SOILS	DATE STARTED:	11/16/90
PROJECT NO.:	76B0-NS1	ORILLERS:	KENNEY, EDWARDS	DATE COMPLETED:	11/19/90
PROJECT:	SMIELD ALLOY	TRC INSPECTOR:	MCMORROU	WATER TABLE LEVEL:	9.0 FT
CLIENT:	SMC	DRILLING METHOO:	MUD ROTARY	LOCATION: N	2S800B.4S
LOCATION:	NEWFIELD, NJ	GROUND ELEVATION:	102.16	E	1901049.83
BORING DEPTM:	142 FT	INNER CASING ELEVATION:	103.19	NJDEP PERMIT NUMBER:	313S226-0

DEPTM (FT)	BLOWS	SOIL DESCRIPTION
0 - 2	9 11	DARK BROWN, FINE TO MEDIUM SAND, TRACE SILT, MOIST
	5 7	RECOVERY = 22"
2 - 4	7 6	BROWN FINE TO MEDIUM SAND, MOIST
	6 6	RECOVERY = 18"
4 - 6	S 8	BROWN/ORANGE FINE TO COARSE SAND, TRACE GRAVEL, MOIST
	9 8	RECOVERY = 22"
6 - 8	6 S	0-12" BROWN FINE SAND, LITTLE SILT, TRACE CLAY, MOIST
	10 IS	12-20" BROWN/ORANGE FINE TO MEDIUM SAND, MOIST
8 - 10	13 11	BROUN/ORANGE FINE TO COARSE SAND, TRACE SILT, MET
	6 8	RECOVERY = 24"
IS - 17	4 S	BROUN FINE TO COARSE SAND, TRACE GRAVEL, NET
	4 6	RECOVERY = 8"
20 - 22	8 7	BROUN/ORANGE FINE TO COARSE SAND
	7 6	RECOVERY = 10"
2S - 27	10 9	BROUN/ORANGE FINE TO COARSE SAND, LITTLE GRAVEL
	8 11	RECOVERY = 6"
30 - 32	6 1	0-3" SAME AS ABOVE
	1 3	3-10" DARK GRAY CLAY, VERY STIFF
3S - 37	3 4	0-12" IT. GRAY CLAY, LITTLE SILT
	S 8	12-16" BROUN SILT, SOME FINE SAND, TRACE CLAY, MOIST
40 - 42	2 3	BROWN FINE TO COARSE SAND
	3 S	RECOVERY = 8"

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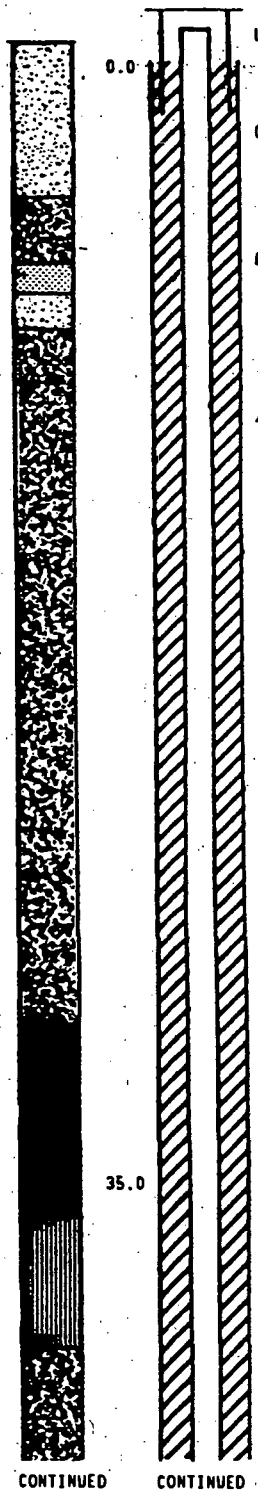
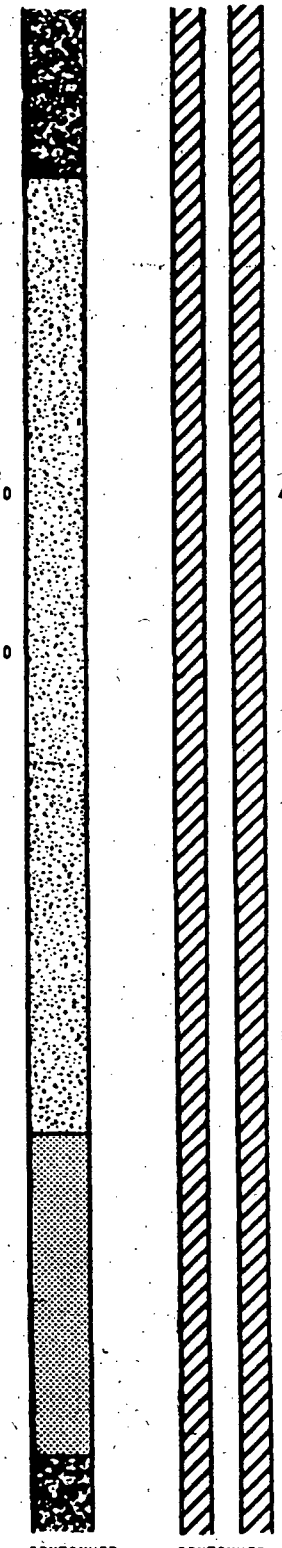


DEPTH (FT)	BLOWS	SOIL DESCRIPTION	LITHOLOGY	WELL CONSTRUCTION
45 - 47	2 8	BROWN FINE TO COARSE SAND		
	9 13	RECOVERY = 12"		
50 - 52	3 5	LT. BROWN FINE TO MEDIUM SAND, TRACE SILT		
	30 30	RECOVERY = 4"		
55 - 57	5 11	SAME AS ABOVE WITH THIN WHITE LAYERS OF SILT THROUGHOUT		
	15 20	RECOVERY = 14"		
60 - 62	10 15	LT. BROWN TO WHITE FINE TO MEDIUM SAND	60.0	4" SCHEDULE 40 PVC RISER
	20 20	RECOVERY = 14"		
65 - 67	9 15	LT. BROWN FINE TO MEDIUM SAND	65.0	
	21 21	RECOVERY = 12"		
70 - 72	10 15	SAME AS ABOVE		
	33 37	RECOVERY = 8"		
75 - 77	22 24	SAME AS ABOVE		BENTONITE SLURRY
	28 32	RECOVERY = 12"		
80 - 82	20 19	BROWN FINE SAND, TRACE SILT		
	17 18	RECOVERY = 2"		
85 - 87	10 12	LT. BROWN FINE SAND, TRACE SILT		
	11 20	RECOVERY = 22"		
90 - 92	15 29	LT. BROWN FINE TO COARSE SAND		
	16 16	RECOVERY = 12"		



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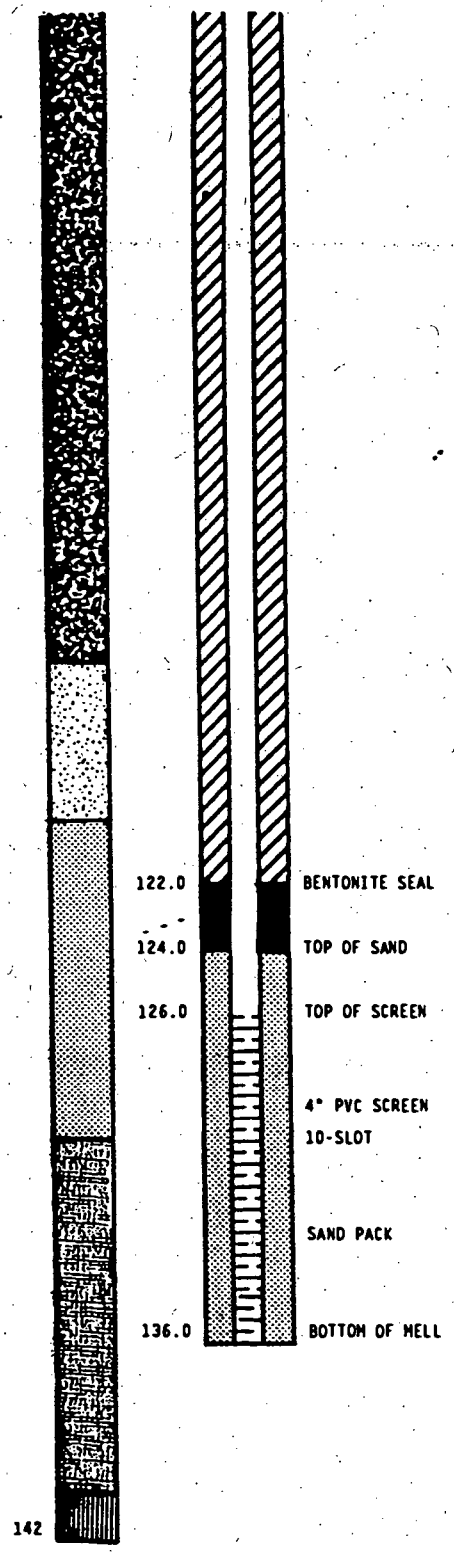
DEPTH (FT)	BLOWS	SOIL DESCRIPTION
95 - 97	19 21	LT. BROWN FINE TO COARSE SAND
	32 29	RECOVERY = 12"
100 - 102	35 42	BROWN/ORANGE FINE TO COARSE SAND, TRACE SILT
	67 65	RECOVERY = 8"
105 - 107	25 52	SAME AS ABOVE
	67 100	RECOVERY = 14"
110 - 112	34 100/5"	SAME AS ABOVE
		RECOVERY = 8"
115 - 117	100/5"	BROWN/RED FINE TO MEDIUM SAND, TRACE SILT
		RECOVERY = 3"
120 - 122	12 11	BROWN FINE SAND, LITTLE SILT
	19 26	RECOVERY = 10"
125 - 127	12 22	LT. BROWN FINE SAND, LITTLE SILT
	20 16	RECOVERY = 12"
130 - 132	6 6	DARK GRAY FINE SAND AND SILT
	9 9	RECOVERY = 14"
135 - 137	5 6	SAME AS ABOVE
	5 8	RECOVERY = 20"
140 - 142	3 5	0-18" SAME AS ABOVE
	12 16	18-24" DARK GRAY SILT, SOME CLAY
		END OF BORING = 142 FT



BORING NO.:	SC-13D	CONTRACTOR:	EMPIRE SOILS	DATE STARTED:	11/20/90
PROJECT NO.:	7650-N51	DRILLERS:	KENNEY, EDWARDS	DATE COMPLETED:	11/21/90
PROJECT:	SHIELD ALLOY	TRC INSPECTOR:	MCMORROW	WATER TABLE LEVEL:	5.5 FT
CLIENT:	SMC	DRILLING METHOD:	MUD ROTARY	LOCATION: N	257662.57
LOCATION:	NEWFIELD, NJ	GROUND ELEVATION:	99.67	E	1901067.82
BORING DEPTH:	142 FT	INNER CASING ELEVATION:	101.99	NJDEP PERMIT NUMBER:	3135227-B

DEPTH (FT)	BLOWS	SOIL DESCRIPTION
0 - 2	2 3	BROWN/ORANGE FINE TO COARSE SAND, TRACE GRAVEL, MOIST
	3 3	RECOVERY = 18"
2 - 4	4 1	0-8" SAME AS ABOVE
	2 3	8-12" DARK BROWN FINE TO MEDIUM SAND, TRACE SILT
4 - 6	4 2	0-12" SAME AS 8-12" ABOVE
	2 2	12-24" GRAY FINE TO MEDIUM SAND, TRACE SILT, WET
10 - 12	10 8	BROWN FINE TO MEDIUM SAND, TRACE SILT, TRACE GRAVEL
	15 12	RECOVERY = 8"
15 - 17	4 4	BROWN/ORANGE FINE TO COARSE SAND, TRACE GRAVEL
	4 4	RECOVERY = 6"
20 - 22	3 4	LT. BROWN FINE TO COARSE SAND, TRACE SILT
	4 6	RECOVERY = 6"
25 - 27	1 1	0-4" BLACK FINE TO MEDIUM SAND, TRACE SILT
	1 2	4-8" DARK GRAY SILT AND FINE SAND
30 - 32	3 7	0-12" GRAY SILT, LITTLE FINE SAND, LITTLE CLAY
	12 15	12-24" BROWN FINE TO COARSE SAND, TRACE SILT
35 - 37	7 8	LT. BROWN FINE TO COARSE SAND, TRACE SILT
	13 16	RECOVERY = 12"
40 - 42	7 13	LT. BROWN FINE TO COARSE SAND
	11 12	RECOVERY = 8"

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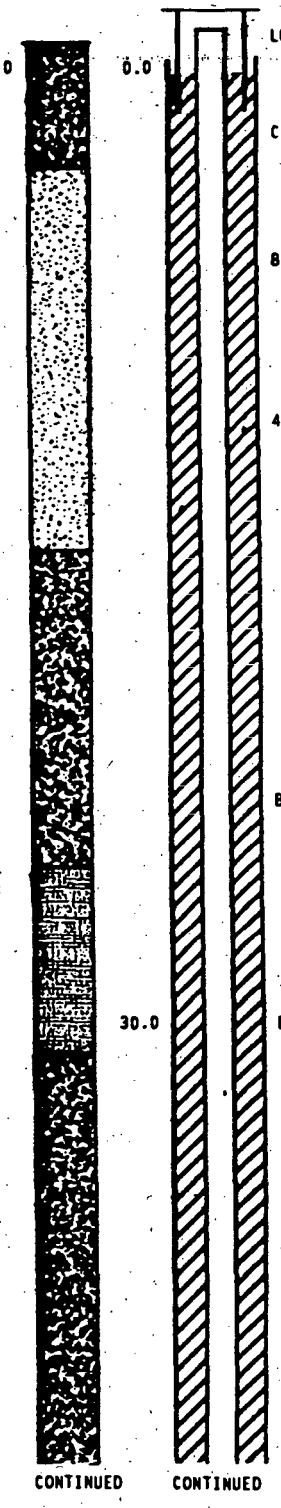
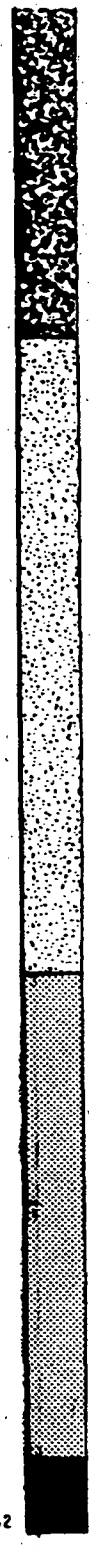


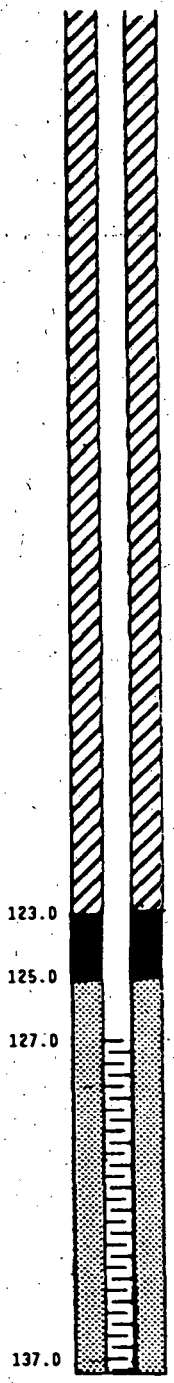
DEPTH (FT)	BLOWS	SOIL DESCRIPTION	LITHOLOGY	WELL CONSTRUCTION
45 - 47	10 14 17 25	LT. BROWN FINE TO COARSE SAND RECOVERY - 8"		
50 - 52	S 19 21 24	LT. BROWN FINE TO COARSE SAND, TRACE SILT RECOVERY - 10"		
55 - 57	8 14 21 25	SAME AS ABOVE RECOVERY - 10"		
60 - 62	S 15 18 19	SAME AS ABOVE, COLORS RANGE FROM REDDISH BROWN, TO WHITE, TO LT. BROWN 60.0 BACK TO REDDISH BROWN. RECOVERY - 8"		4" SCHEDULE 40 PVC RISER
65 - 67	IS 20 30 30	REDDISH BROWN FINE TO MEDIUM SAND, TRACE COARSE SAND, TRACE SILT 65.0 RECOVERY - 12"		
70 - 72	21 44 64 62	SAME AS ABOVE RECOVERY - 18"		
75 - 77	23 36 34 39	SAME AS ABOVE RECOVERY - 14"		BENTONITE SLURRY
80 - 82	23 30 SO/S"	SAME AS ABOVE RECOVERY - 14"		
BS - 67	20 3D 33 37	SAME AS ABOVE RECOVERY - 12"		
90 - 92	17 35 32 30	RED FINE TO MEDIUM SAND, TRACE SILT RECOVERY - 12"		
		CONTINUED ON NEXT PAGE	CONTINUED	CONTINUED

DEPTH (FT)	BLOWS	SOIL DESCRIPTION
95 - 97	22 30	0-12" RED/BROWN FINE TO COARSE SAND, TRACE SILT
	16 30	12-18" RED/BROWN FINE SAND, LITTLE SILT, TRACE CLAY
100 - 102	13 20	RED/BROWN FINE TO COARSE SAND, TRACE SILT
	24 36	RECOVERY = 14"
105 - 107	21 63	BROWN/ORANGE FINE TO MEDIUM SAND, TRACE SILT
	53 69	RECOVERY = 16"
110 - 112	15 29	SAME AS ABOVE
	46 50/1"	RECOVERY = 18"
116 - 117	17 BC	BROWN/ORANGE FINE TO MEDIUM SAND, TRACE SILT
	100/5"	RECOVERY = 12"
120 - 122	8 20	LT. BROWN FINE TO MEDIUM SAND WITH STRINGS OF GRAY CLAY AT 2"
	22 22	RECOVERY = 8"
125 - 127	13 23	LT. BROWN FINE SAND, TRACE SILT
	33 30	RECOVERY = 12"
130 - 132	NOR 17	DARK GRAY FINE SAND, TRACE SILT
	26 24	RECOVERY = 14"
135 - 137	5 8	SAME AS ABOVE
	17 16	RECOVERY = 20"
140 - 142	6 6	DARK GRAY SILT AND CLAY
	10 9	RECOVERY = 24"
//		END OF BORING = 142 FT

LITHOLOGY



WELL CONSTRUCTION

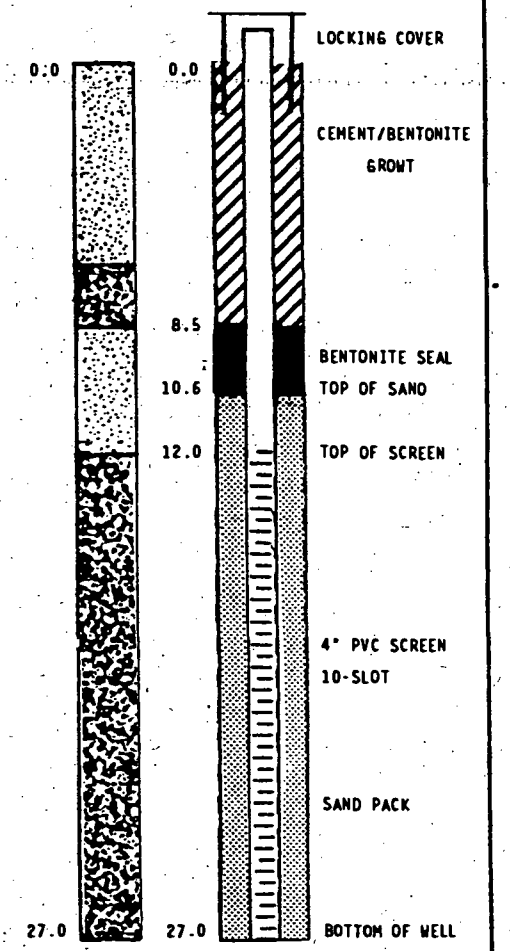


BORING NO.:	SC-14S	CONTRACTOR:	EMPIRE SOILS	DATE STARTED:	11/14/90
PROJECT NO.:	7650-NSI	DRILLERS:	KENNEY, EDWARDS	DATE COMPLETED:	11/15/90
PROJECT:	SHIELD ALLOY	TRC INSPECTOR:	MCMORROW	WATER TABLE LEVEL:	15 FT
CLIENT:	SMC	DRILLING METHOD:	6 1/4" AUGERS	LOCATION: N	258497.60
LOCATION:	NEWFIELD, NJ	GROUND ELEVATION:	105.83	E	1900828.94
BORING DEPTH:	27 FT	INNER CASING ELEVATION:	108.36	NJDEP PERMIT NUMBER:	3135215-4

DEPTH (FT)	BLOWS	SOIL DESCRIPTION
0 - 2	7 10	BROWN FINE TO MEDIUM SAND, TRACE SILT, MOIST
	9 7	RECOVERY = 20"
2 - 4	6 6	BROWN FINE TO MEDIUM SAND, TRACE SILT, TRACE GRAVEL, MOIST
	7 8	RECOVERY = 24"
4 - 6	7 9	SAME AS ABOVE
	11 9	RECOVERY = 24"
6 - 8	14 36	BROWN FINE TO COARSE SAND, LITTLE GRAVEL, DRY
	35 30	RECOVERY = 22"
8 - 10	30 40	BROWN FINE TO MEDIUM SAND, TRACE SILT, TRACE GRAVEL, MOIST, DENSE
	26 34	RECOVERY = 24"
10 - 12	18 43	SAME AS ABOVE, DRY
	44 57	RECOVERY = 18"
12 - 14	44 42	BROWN FINE TO COARSE SAND, TRACE GRAVEL, TRACE SILT, DENSE, MOIST
	36 40	RECOVERY = 24"
14 - 16	10 12	SAME AS ABOVE, WET AT 15 FT.
	11 15	RECOVERY = 18"
20 - 22	9 14	BROWN FINE TO COARSE SAND, TRACE GRAVEL, WET
	17 19	RECOVERY = 16"
26 - 27	7 13	LT. BROWN FINE TO COARSE SAND, LITTLE GRAVEL, WET
	19 19	RECOVERY = 20"

END OF BORING = 27 FT

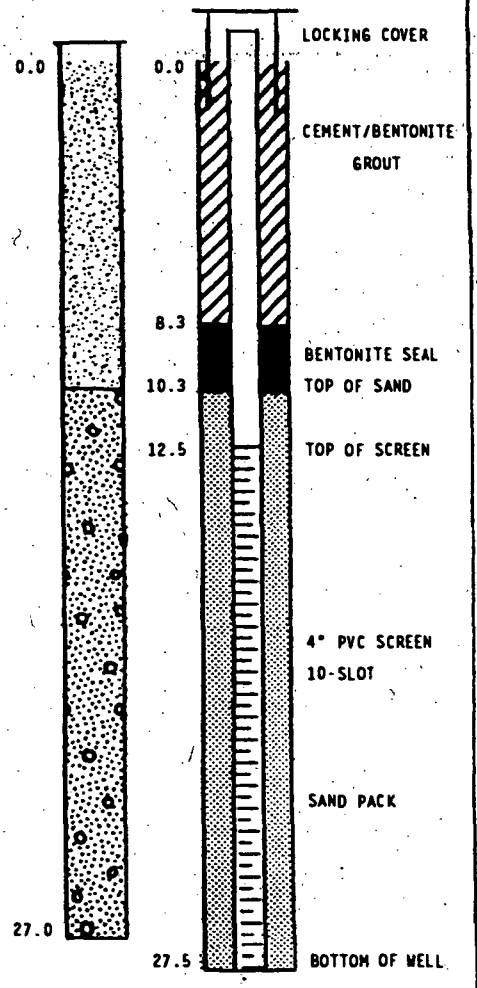
LITHOLOGY / WELL CONSTRUCTION



BORING NO.:	SC-15S	CONTRACTOR:	EMPIRE SOILS	DATE STARTED:	11/13/90
PROJECT NO.:	76S0-N51	DRILLERS:	KENNEY, EDWARDS	DATE COMPLETEO:	11/13/90
PROJECT:	SMIELD ALLOY	TRC INSPECTOR:	MCMORROW, DRAKE	MATER TABLE LEVEL:	15 FT
CLIENT:	SMC	DRILLING METHOD:	S 1/4" AUGERS	LOCATION: N	258687.72
LOCATION:	NEUFIELD, NJ	GROUND ELEVATION:	106.06	E	1899984.34
BORING DEPTM:	27 FT	INNER CASING ELEVATION:	108.32	NJDEP PERMIT NUMBER:	3135216-2

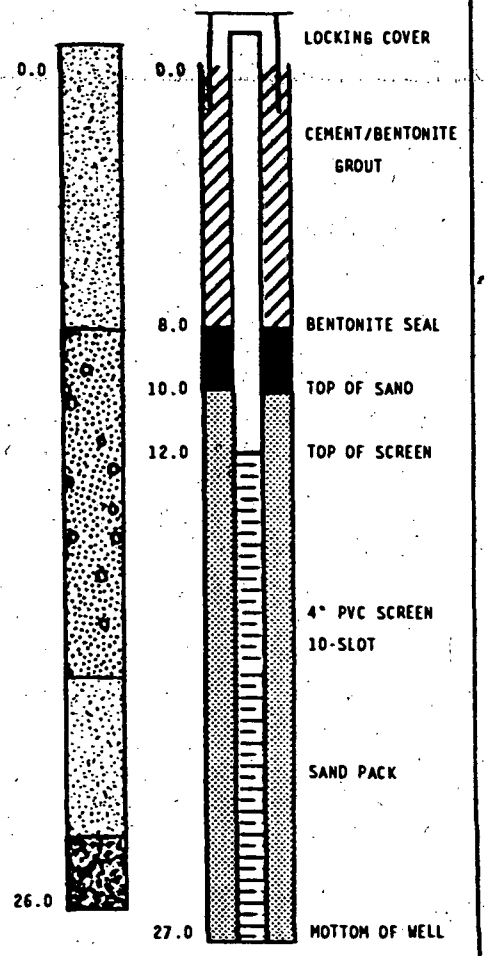
OEPTM (FT)	BLOWS	SOIL OESCRIPTION
0 - 2	60 17	0-4" GRAY CRUSHED GRAVEL
	12 13	4-18" BLACK FINE TO MEDIUM SAND, TRACE GRAVEL, DRY
2 - 4	7 8	BROUN FINE SANO, LITTLE SILT, MOIST.
	9 9	RECOVERY - 6"
4 - 6	13 17	BROWN FINE TO MEDIUM SAND, DRY
	14 IB	RECOVERY - 2"
6 - 8	34 35	BROUN/RED FINE TO MEDIUM SAND, TRACE SILT, TRACE GRAVEL, MOIST
	31 30	RECOVERY - IB"
6 - 10	40 52	SAME AS ABOVE
	55 57	RECOVERY - 15"
10 - 12	26 29	ORANGE/RED MEDIUM TO COARSE SANO, LITTLW GRAVEL, TRACE SILT, MOIST
	33 36	RECOVERY - 13"
12 - 14	45 47	SAME AS ABOVE
	30 40	RECOVERY - 10"
14 - 16	9 17	SAME AS ABOVE, SATURATED
	21 22	RECOVERY - 11"
20 - 22	9 17	LT. BROUN/ORANGE COARSE TO MEDIUM SANO, TRACE SILT
	25 27	RECOVERY - 9"
25 - 27	9 9	LT. BROUN COARSE TO MEDIUM SAND, TRACE GRAVEL
	14 17	RECOVERY - 12"

END OF BORING - 27 FT



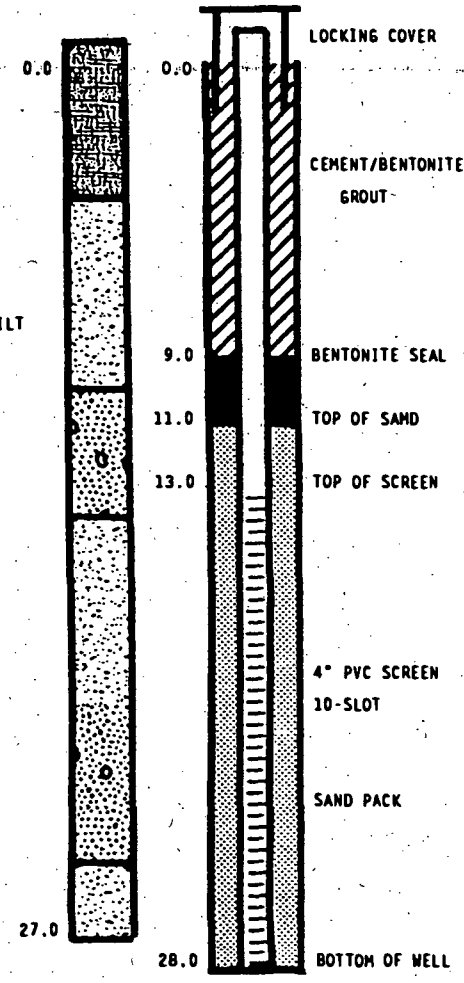
BORING NO.:	SC-16S	CONTRACTOR:	EMPIRE SOILS	DATE STARTED:	11/14/90
PROJECT NO.:	7650-N51	DRILLERS:	MATT, BOB	DATE COMPLETED:	11/14/90
PROJECT:	SHIELD ALLOY	TRC INSPECTOR:	MULLEN	WATER TABLE LEVEL:	15 FT
CLIENT:	SMC	DRILLING METHOD:	6 1/4" AUGERS	LOCATION: N	258611.23
LOCATION:	NEWFIELD, NJ	GROUND ELEVATION:	105.32	E	1899321.81
BORING DEPTH:	26 FT	INNER CASING ELEVATION:	108.05	NJDEP PERMIT NUMBER:	3136217-5

DEPTH (FT)	BLOWS	SOIL DESCRIPTION
0 - 2	1 2	0-8". DARK BROWN MEDIUM TO FINE SAND, LITTLE SILT
	4 1	8-17" ORANGE/BROWN COARSE TO MEDIUM SAND, SOME SILT
2 - 4	2 1	BROWN/ORANGE MEDIUM TO FINE SAND, SOME SILT
	1 2	RECOVERY - 18"
4 - 6	1 2	ORANGE MEDIUM TO FINE SAND, SOME SILT
	2 2	RECOVERY - 14"
6 - 8	2 2	ORANGE MEDIUM TO FINE SAND, TRACE SILT
	4 2	RECOVERY - 20 "
8 - 10	3 3	ORANGE COARSE TO MEDIUM SAND, TRACE SILT, MOIST
	5 4	RECOVERY - 22"
10 - 12	3 4	SAME AS ABOVE
	6 4	RECOVERY - 22"
12 - 14	9 10	SAME AS ABOVE
	10 14	RECOVERY - 18"
14 - 16	12 15	SAME AS ABOVE, WATER AT 15 FT.
	20 20	RECOVERY - 12"
19 - 21	6 8	ORANGE/BROWN MEDIUM TO FINE SAND
	10 11	RECOVERY - 16"
24 - 26	5 6	ORANGE COARSE TO FINE SAND, TRACE SILT
	10 10	RECOVERY - 8"
		END OF BORING - 26 FT



BORING NO.:	SC-17S	CONTRACTOR:	EMPIRE SOILS	DATE STARTED:	11/19/90
PROJECT NO.:	7650-N51	DRILLERS:	MAFT, BOB	DATE COMPLETED:	11/19/90
PROJECT:	SHIELD ALLOY	TRC INSPECTOR:	MULLEN	WATER TABLE LEVEL:	16.0 FT
CLIENT:	SMC	DRILLING METHOD:	6 1/4" AUGERS	LOCATION: N	257929.97
LOCATION:	NEWFIELD, NJ	GROUND ELEVATION:	106.53	E	1899214.12
BORING DEPTH:	27 FT	INNER CASING ELEVATION:	109.26	NJDEP PERMIT NUMBER:	3135229-4

DEPTH (FT)	BLOWS	SOIL DESCRIPTION
		(LITHOLOGIES FROM 0-27 FT TAKEN FROM BORING LOG SC-17D)
0 - 2	3 1	ORANGE/BROWN SILT AND FINE SAND, SOME WOOD FRAGMENTS IN TIP
	2 5	RECOVERY = 3"
2 - 4	6 10	ORANGE FINE SAND AND SILT, TRACE MEDIUM SAND, TRACE GRAVEL
	8 11	RECOVERY = 12"
4 - 6	14 22	ORANGE FINE TO MEDIUM SAND AND GRAVEL, TRACE COBBLES
	24 28	RECOVERY = 12"
6 - 8	17 26	ORANGE FINE TO MEDIUM SAND, SOME GRAVEL, TRACE COBBLES
	28 28	RECOVERY = 18"
8 - 10	17 24	ORANGE FINE TO MEDIUM SAND, SOME COARSE SAND, LITTLE GRAVEL, TRACE SILT
	26 27	RECOVERY = 22"
10 - 12	6 5	ORANGE MEDIUM TO COARSE SAND, SOME GRAVEL
	9 12	RECOVERY = 18"
12 - 14	12 7	SAME AS ABOVE
	13 13	RECOVERY = 18"
14 - 16	16 22	ORANGE FINE TO MEDIUM SAND, TRACE SILT, MOIST
	20 27	RECOVERY = 19"
16 - 18		ORANGE FINE TO MEDIUM SAND, SOME COARSE SAND, TRACE SILT, WET
		RECOVERY = 18"
20 - 22	11 18	LT. BROWN MEDIUM TO COARSE SAND, LITTLE GRAVEL
	22 29	RECOVERY = 18"
25 - 27	10 12	LT. TAN FINE TO MEDIUM SAND, TRACE COARSE SAND, 1" OF WHITE SILTY
	11 26	CLAY IN TIP OF SPOON. RECOVERY = 8"
		END OF BORING = 27 FT



BORING NO.:	SC-17D	CONTRACTOR:	EMPIRE SOILS	DATE STARTED:	11/14/90
PROJECT NO.:	7660-N51	DRILLERS:	EMPSON, SNYDER	DATE COMPLETED:	11/28/90
PROJECT:	SMIELD ALLOY	TRC INSPECTOR:	GLEZEN	WATER TABLE LEVEL:	16.0 FT
CLIENT:	SMC	DRILLING METHOD:	MUD ROTARY	LOCATION: N	257933.78
LOCATION:	NEUFIELD, NJ	GROUND ELEVATION:	106.48	E	1899201.04
BORING DEPTH:	155 FT	INNER CASING ELEVATION:	108.07	NJDEP PERMIT NUMBER:	3136223-5

DEPTH (FT)	BLOWS	SOIL DESCRIPTION
0 - 2	3 1	ORANGE/BROWN SILT AND FINE SAND, SOME WOOD FRAGMENTS IN TIP
	2 5	RECOVERY = 3"
2 - 4	6 10	ORANGE FINE SAND AND SILT, TRACE MEDIUM SAND, TRACE GRAVEL
	8 11	RECOVERY = 12"
4 - 6	14 22	ORANGE FINE TO MEDIUM SAND AND GRAVEL, TRACE COBBLES
	24 28	RECOVERY = 12"
6 - 8	17 26	ORANGE FINE TO MEDIUM SAND, SOME GRAVEL, TRACE COBBLES
	28 26	RECOVERY = 18"
8 - 10	17 24	ORANGE FINE TO MEDIUM SAND, SOME COARSE SAND, LITTLE GRAVEL, TRACE SILT
	26 27	RECOVERY = 22"
10 - 12	6 5	ORANGE MEDIUM TO COARSE SAND, SOME GRAVEL
	9 12	RECOVERY = 18"
12 - 14	12 7	SAME AS ABOVE
	13 13	RECOVERY = 18"
14 - 16	16 22	ORANGE FINE TO MEDIUM SAND, TRACE SILT, MOIST
	20 27	RECOVERY = 19"
16 - 18		ORANGE FINE TO MEDIUM SAND, SOME COARSE SAND, TRACE SILT, WET
		RECOVERY = 16"
20 - 22	11 18	LT. BROWN MEDIUM TO COARSE SAND, LITTLE GRAVEL
	22 29	RECOVERY = 18"
25 - 27	10 12	LT. TAN FINE TO MEDIUM SAND, TRACE COARSE SAND, 1" OF WHITE SILTY
	11 26	CLAY IN TIP OF SPOON. RECOVERY = 8"
30 - 32	10 16	BROWN MEDIUM TO COARSE SAND, SOME GRAVEL, TRACE CLAY
	16 21	RECOVERY = 14"
35 - 37		LT. BROWN/PINK FINE TO MEDIUM SAND
		RECOVERY = 12"
40 - 42	28 64	LT. TAN/PINK FINE TO MEDIUM SAND, TRACE COARSE SAND, TIGHT
	73 78	RECOVERY = 12"

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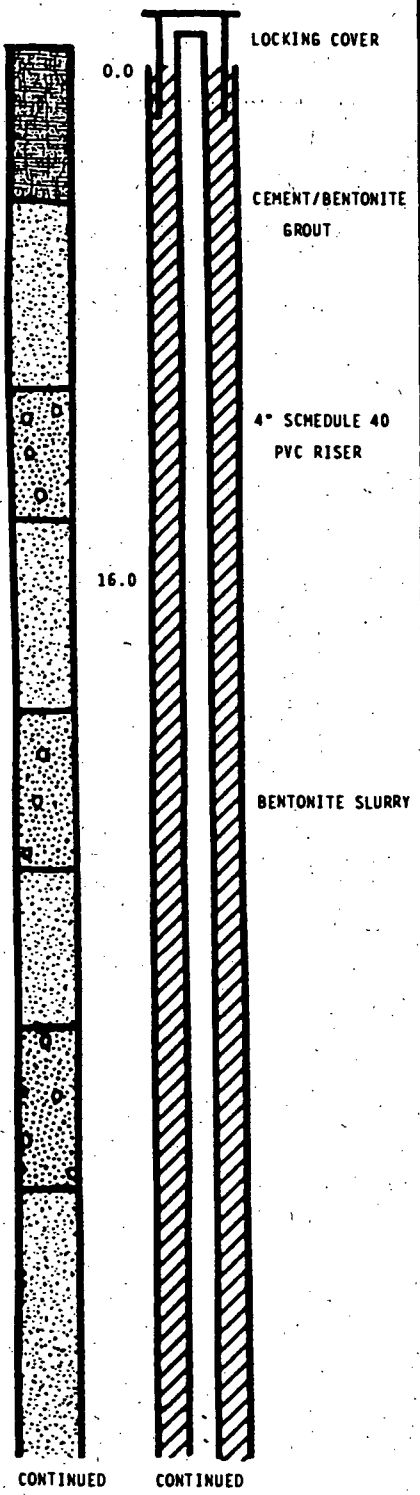

DEPTH (FT)	BLOWS	SOIL DESCRIPTION
45 - 47	15 35 65 65	LT. TAN/PINK FINE TO MEDIUM SAND, TRACE COARSE SAND, TIGHT RECOVERY - 5"
50 - 52	12 14 25 32	LT. BROWN MEDIUM TO COARSE SAND, LITTLE GRAVEL RECOVERY - 12"
55 - 57	21 35 100/6"	TAN/PINK FINE TO MEDIUM SAND, TRACE COARSE SAND RECOVERY - 4"
60 - 62	22 43 44 59	LT. TAN/PINK FINE TO MEDIUM SAND, TRACE COARSE SAND, TIGHT RECOVERY - 12"
66 - 67	18 60 71 60	LT. TAN/PINK FINE SAND, TRACE MEDIUM SAND, TIGHT RECOVERY - 8"
70 - 72	24 26 36 32	SAME AS ABOVE, SOME COARSE SAND RECOVERY - 8"
76 - 77	35 22 28 28	LT. TAN/PINK FINE TO MEDIUM SAND, SOME COARSE SAND, LITTLE GRAVEL RECOVERY - 8"
80 - 82	16 22 26 26	LT. TAN/PINK FINE SAND, SOME SILT, WITH FINE LAMINATIONS OF WHITE SILT RECOVERY - 14"
85 - 87	6 13 16 35	LT. TAN FINE TO VERY FINE SAND, SOME SILT, WITH SMALL WHITE SILT LAYERS RECOVERY - 14"
88 - 90	18 35 75/6"	PINK/TAN FINE TO VERY FINE SAND, LITTLE SILT RECOVERY - 6"

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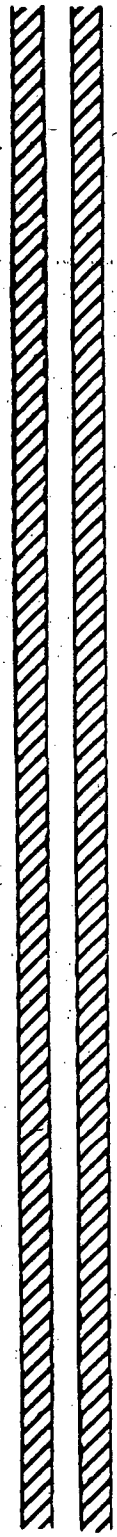
LITHOLOGY

WELL CONSTRUCTION

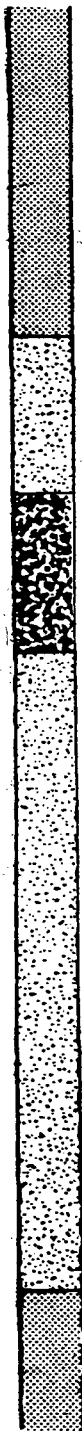
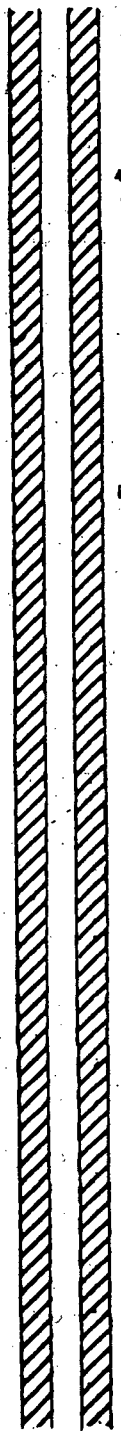


4" SCHEDULE 40 PVC RISER

BENTONITE SLURRY

CONTINUED

CONTINUED

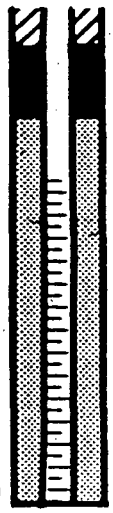
DEPTH (FT)	BLOWS	SOIL DESCRIPTION	LITHOLOGY	WELL CONSTRUCTION
93 - 95	14 26 34 36	BROWN/ORANGE FINE SAND, TRACE SILT, SOME SMALL WHITE SILTY CLAY LAMINATIONS. RECOVERY = 18"		 4" SCHEDULE 40 PVC RISER
98 - 100	30 50 75/6"	LT. TAN FINE SAND, LITTLE MEDIUM SAND, TRACE SILT, SOME SMALL VARVED CLAY LAYERS. RECOVERY = 14"		
103 - 105	35 75/6"	BROWN/ORANGE FINE TO MEDIUM SAND, SOME COARSE SAND, TRACE CLAY RECOVERY = 12"		
108 - 110	32 55 75/6"	LT. TAN FINE TO COARSE SAND, LITTLE FINE GRAVEL RECOVERY = 12"		BENTONITE SLURRY
113 - 116	38 75/6"	BROWN/ORANGE FINE TO MEDIUM SAND, SOME COARSE SAND, TRACE GRAVEL RECOVERY = 6"		
118 - 120	36 76/6"	BROWN/ORANGE FINE TO MEDIUM SAND, LITTLE SILT RECOVERY = 4"		
123 - 126	46 62 48 30	LT. TAN FINE TO MEDIUM SAND, SOME COARSE SAND, LITTLE GRAVEL RECOVERY = 14"		
126 - 130	46 26 16 10	NO RECOVERY		
133 - 135	16 22 24 30	LT. TAN FINE TO VERY FINE SAND, SOME MEDIUM SAND, LITTLE SILT RECOVERY = 12"		
		CONTINUED ON NEXT PAGE	CONTINUED	CONTINUED

DEPTH (FT)	BLOWS	SOIL DESCRIPTION
138 - 140	26 16	LT. TAN/GRAY FINE TO VERY FINE SAND AND SILT, TRACE CLAY
	15 10	RECOVERY = 12"
143 - 145	12 27	SAME AS ABOVE
	27 23	
148 - 150	69 92	0-8" LT. TAN FINE TO COARSE SAND AND GRAVEL
	29 30	8-12" LT. TAN FINE SAND AND SILT, LITTLE CLAY
153 - 166	8 10	VARVED DARK GRAY SILTY CLAY, WITH SMALL SILT LAYERS
	17 23	

END OF BORING = 155 FT

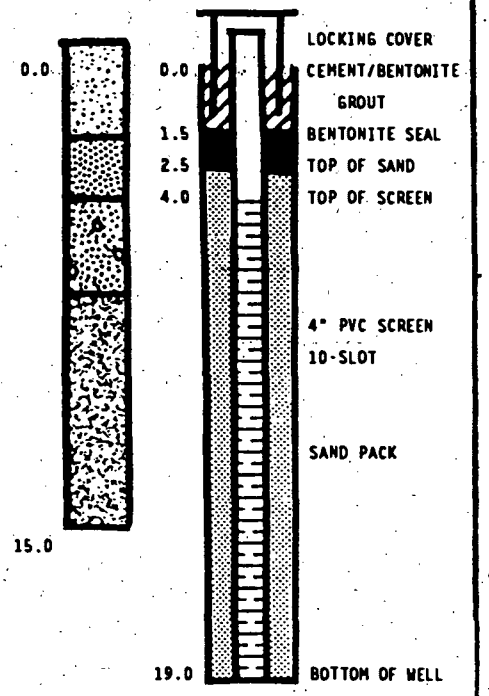
LITHOLOGY

WELL CONSTRUCTION



BORING NO.:	SC-16S	CONTRACTOR:	EMPIRE SOILS	DATE STARTED:	11/15/90
PROJECT NO.:	7650-N61	DRILLERS:	MATT, BOB	DATE COMPLETED:	11/15/90
PROJECT:	SHIELD ALLOY	TRC INSPECTOR:	MULLEN	WATER TABLE LEVEL:	7 FT
CLIENT:	SMC	DRILLING METHOD:	6 1/4" AUGERS	LOCATION: N	257244.49
LOCATION:	NEWFIELD, NJ	GROUND ELEVATION:	93.43	E	1698296.26
BORING DEPTH:	15 FT	INNER CASING ELEVATION:	96.72	NJDEP PERMIT NUMBER:	3135230-8

DEPTH (FT)	BLOWS	SOIL DESCRIPTION
0 - 2	2 5	BROWN MEDIUM TO FINE SAND
	3 2	RECOVERY - 18"
2 - 4	2 2	ORANGE/BROWN MEDIUM SAND, LITTLE GRAVEL, MOIST
	2 3	RECOVERY - 16"
4 - 6	5 8	ORANGE COARSE TO MEDIUM SAND AND GRAVEL, MOIST
	10 16	RECOVERY - 20"
6 - 8	20 20	D-6" SAME AS ABOVE
	16 14	6-12" ORANGE COARSE SAND, SOME GRAVEL, WET
13 - 16	2 2	RED COARSE SAND AND GRAVEL
	2 2	RECOVERY - 6"
		END OF BORING - 15 FT



BORING NO.:	SC-IBD	CONTRACTOR:	EMPIRE SOILS	DATE STARTED:	11/19/90
PROJECT NO.:	7650-N51	DRILLERS:	EMPSON, SNYDER	DATE COMPLETED:	11/20/90
PROJECT:	SHIELD ALLOY	TRC INSPECTOR:	GLEZEN	WATER TABLE LEVEL:	7.0 FT
CLIENT:	SMC	DRILLING METHOD:	MUD ROTARY	LOCATION: N	257247.66
LOCATION:	NEWFIELD, NJ	GROUND ELEVATION:	93.56	E	1696261.06
BORING DEPTH:	137 FT	INNER CASING ELEVATION:	96.01	NJDEP PERMIT NUMBER:	3135228-6

DEPTH (FT)	BLOWS	SOIL DESCRIPTION
0 - 2	2 5	BROWN MEDIUM TO FINE SAND
	3 2	RECOVERY = 18"
2 - 4	2 2	ORANGE/BROWN MEDIUM SAND, LITTLE GRAVEL, MOIST
	2 3	RECOVERY = 16"
4 - 6	5 8	ORANGE COARSE TO MEDIUM SAND AND GRAVEL, MOIST
	10 16	RECOVERY = 20"
6 - 8	20 20	0-6" SAME AS ABOVE
	15 14	6-12" ORANGE COARSE SAND, SOME GRAVEL, WET
13 - 15	2 2	RED COARSE SAND AND GRAVEL
	2 2	RECOVERY = 6"
20 - 22	7 10	RED MEDIUM TO COARSE SAND AND GRAVEL, TRACE FINE SAND
	10 10	RECOVERY = 8"
25 - 27	6 7	SAME AS ABOVE, ORANGE
	7 8	RECOVERY = 12"
30 - 32	13 14	ALTERNATING LAYERS OF RED TO BROWN, FINE TO MEDIUM SAND, SOME
	14 17	COARSE SAND, TRACE GRAVEL.
35 - 37	10 11	RED/ORANGE FINE TO COARSE SAND, SOME GRAVEL, LITTLE SILT, TRACE CLAY
	11 13	RECOVERY = 12"
40 - 42	18 27	PINK FINE TO MEDIUM SAND, TRACE COARSE SAND
	34 48	RECOVERY = 12"

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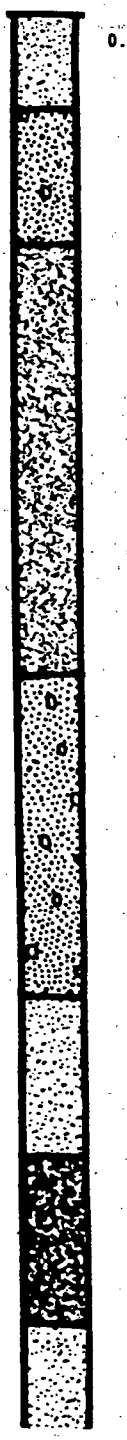
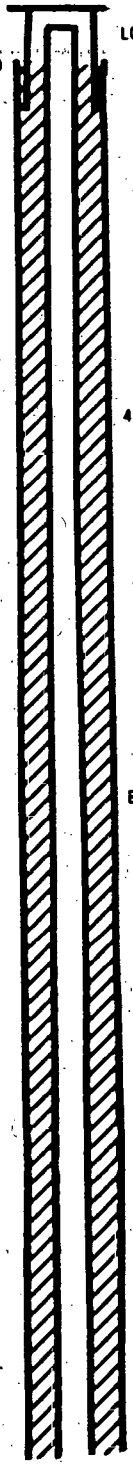
LITHOLOGY



WELL CONSTRUCTION



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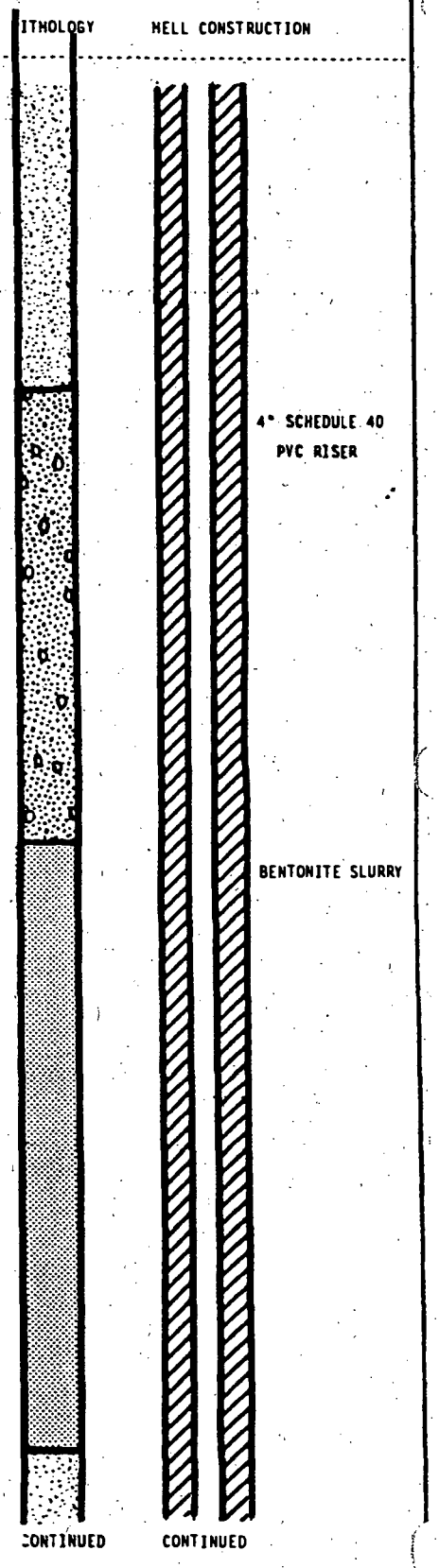
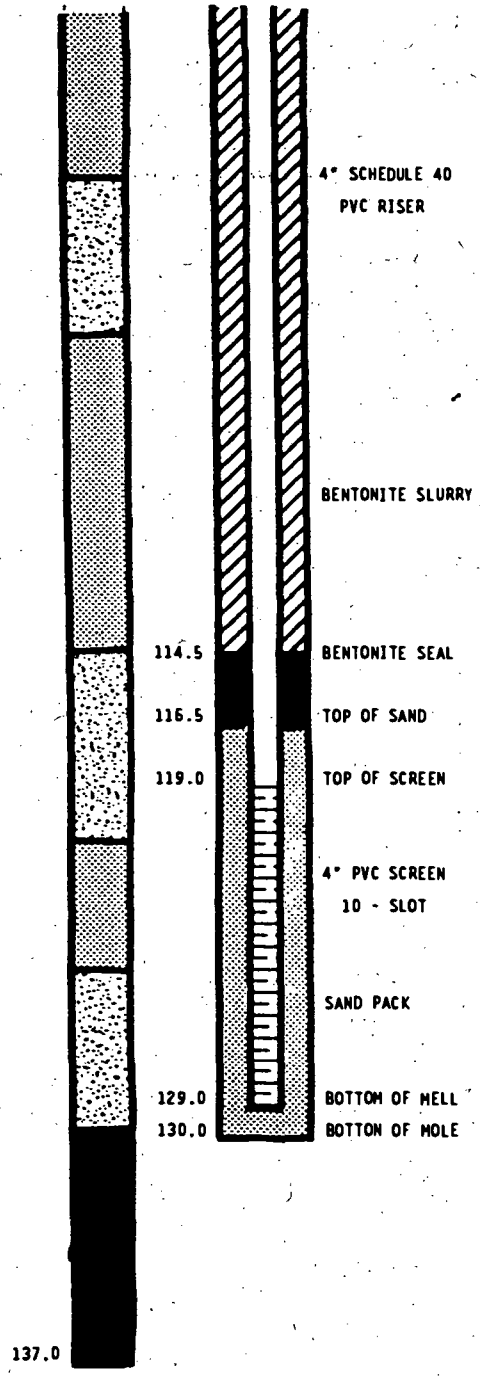
DEPTH (FT)	BLOWS	SOIL DESCRIPTION
45 - 47	18 24 22 32	PINK FINE TO MEDIUM SAND, TRACE COARSE SAND, TRACE CLAY. RECOVERY - 14".
50 - 52	18 25 27 30	PURPLE/RED FINE TO MEDIUM SAND, TRACE COARSE SAND RECOVERY - 16"
55 - 57	30 45 55 62	PEO/PINK MEDIUM TO COARSE SAND, LITTLE GRAVEL, TRACE FINE SAND RECOVERY - 14"
60 - 62	32 42 47 55	ORANGE/BROWN MEDIUM TO COARSE SAND, SOME FINE SAND, LITTLE GRAVEL RECOVERY - 18"
65 - 67	38 45 47 62	ORANGE/YELLOW MEDIUM TO COARSE SAND, SOME FINE SAND, TRACE GRAVEL RECOVERY - 14"
70 - 72	26 32 45 58	LT. TAN/WHITE FINE TO VERY FINE SAND, LITTLE SILT RECOVERY - 14"
75 - 77	18 18 21 22	LT. TAN FINE TO VERY FINE SAND, FEW WHITE SILT AND CLAY LAYERS RECOVERY - 18"
80 - 82	21 26 26 26	ORANGE FINE TO VERY FINE SAND, OOTTOM 3" WHITE SILT, LITTLE CLAY, TRACE FINE SAND
85 - 87	13 15 16 16	INTERBEDDED TAN FINE TO VERY FINE SAND, WITH WHITE SILT, FINE SAND, LITTLE CLAY LAYERS. RECOVERY - 16"
90 - 92	16 32 75/6"	ORANGE FINE TO MEDIUM SAND, TRACE SILT, TRACE CLAY RECOVERY - 12"
		CONTINUED ON NEXT PAGE



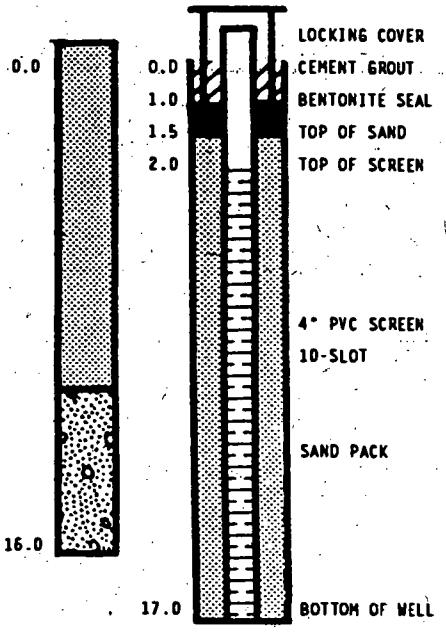
DEPTH (FT)	BLOWS	SOIL DESCRIPTION
96 - 97	30 40 42 67	TAN FINE SAND, SOME VERY FINE SAND, LITTLE SILT RECOVERY - 12"
100 - 102	35 45 75/6"	TAN/ORANGE FINE TO MEDIUM SAND, LITTLE SILT, TRACE COARSE SAND RECOVERY - 12"
105 - 107	25 15 10 10	LT. TAN/PINK FINE TO VERY FINE SAND, SOME SILT, LOOSE RECOVERY - 12"
110 - 112	20 30 75/6"	TAN/PINK FINE SAND, LITTLE MEDIUM SAND, TRACE SILT RECOVERY - 14"
116 - 117	26 26 12 12	LT. GRAY AND RUST LAYERS OF FINE TO MEDIUM SAND, SOME SILT RECOVERY - 16"
120 - 122	6 7 8 12	0-14" ORANGE FINE TO MEDIUM SAND, LITTLE COARSE SAND, TRACE SILT 14-18" DARK GRAY/BLACK FINE SAND, SOME SILT
126 - 127	26 26 27 25	GRAY/BLACK VERY FINE TO MEDIUM SAND, SOME SILT, LITTLE CLAY REOVERY - 18"
130 - 132	8 10 13 16	BLACK VARVED SILT AND CLAY, TRACE VERY FINE SAND
136 - 137	36 42 76/6"	BLACK VARVED SILT AND CLAY, SOME FINE SAND
		END OF BORING - 137 FT



BORING NO.:	SC-19S	CONTRACTOR:	EMPIRE SOILS	DATE STARTED:	11/15/90
PROJECT NO.:	7650-N51	DRILLERS:	MATT, BOB	DATE COMPLETED:	11/15/90
PROJECT:	SMIELD ALLOY	TRC INSPECTOR:	MULLEN	WATER TABLE LEVEL:	2.0 FT
CLIENT:	SMC	DRILLING METHOD:	6 1/4" AUGERS	LOCATION: N	256600.44
LOCATION:	NEWFIELD, NJ	GROUND ELEVATION:	90.14	E	1696682.30
BORING DEPTH:	17 FT	INNER CASING ELEVATION:	92.96	NJDEP PERMIT NUMBER:	3135224-3

DEPTH (FT)	BLOWS	SOIL DESCRIPTION
		(LITHOLOGIES FROM 0-17 FT TAKEN FROM BORING LOG SC-19D)
0 - 2	3 3	0-5" DARK BROWN FINE SAND, SOME SILT, TRACE ORGANICS
	4 5	5-18" ORANGE FINE SAND, SOME MEDIUM SAND, MOIST
2 - 4	5 5	0-4" ORANGE MEDIUM TO COARSE SAND
	7 7	4-18" LT. BROWN, FINE SAND, SOME SILT, WET
10 - 12	8 8	ORANGE MEDIUM TO COARSE SAND, SOME GRAVEL
	11 9	RECOVERY - 14"
16 - 17	6 6	SAME AS ABOVE
	10 10	RECOVERY - 12"
		END OF BORING - 17 FT

LITHOLOGY / WELL CONSTRUCTION



BORING NO.:	SC-190	CONTRACTOR:	EMPIRE SOILS	DATE STARTED:	11/09/90
PROJECT NO.:	7650-N51	DRILLERS:	EMPSON, SNYDER	DATE COMPLETED:	11/27/90
PROJECT:	SMIELD ALLOY	TRC INSPECTOR:	GLEZEN	MATER TABLE LEVEL:	2.0 FT
CLIENT:	SMC	DRILLING METHOD:	MUD ROTARY	LOCATION: N	256817.02
LOCATION:	NEWFIELD, NJ	GROUND ELEVATION:	89.65	E	1898694.73
BORING DEPTH:	135 FT	INNER CASING ELEVATION:	92.03	NJDEP PERMIT NUMBER:	3135221-9

DEPTH (FT)	BLOWS	SOIL DESCRIPTION
0 - 2	3 3	0-5" DARK BROUN FINE SAND, SOME SILT, TRACE ORGANICS
	4 5	5-18" ORANGE FINE SAND, SOME MEDIUM SAND, MOIST
2 - 4	5 5	0-4" ORANGE MEDIUM TO COARSE SAND
	7 7	4-18" LT. BROUN, FINE SAND, SOME SILT, WET
10 - 12	8 6	ORANGE MEDIUM TO COARSE SAND, SOME GRAVEL
	11 9	RECOVERY - 14"
15 - 17	6 6	SAME AS ABOVE
	10 10	RECOVERY - 12"
20 - 22	6 9	SAME AS ABOVE
	12 10	RECOVERY - 6"
26 - 27	6 11	LT. TAN/ORANGE FINE SAND, LITTLE SILT, LITTLE MEDIUM SAND
	12 12	RECOVERY - 12"
30 - 32	14 15	LT. TAN/PINK FINE SAND, SOME SILT, SOME THIN WHITE SILT LAYERS
	24 30	RECOVERY - 22"
35 - 37	13 13	LT. TAN/PINK MEDIUM TO COARSE SAND, LITTLE GRAVEL, TRACE FINE SAND
	19 19	RECOVERY - 12"
40 - 42	17 22	LT. TAN/PINK FINE TO MEDIUM SAND, TRACE SILT
	23 29	RECOVERY - 14"

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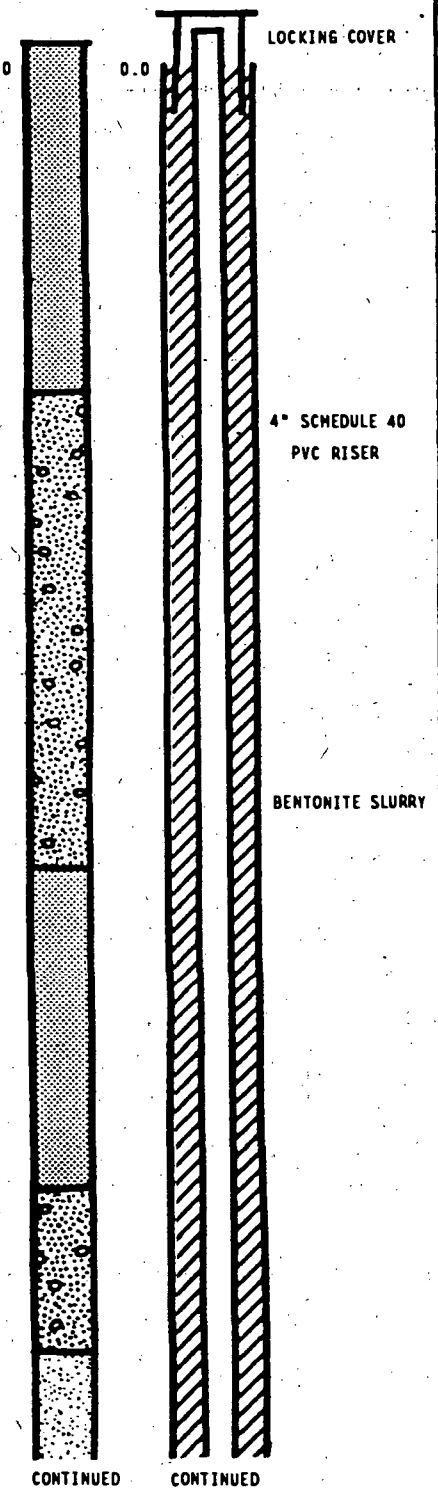
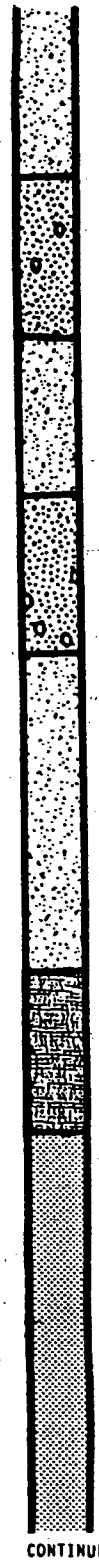
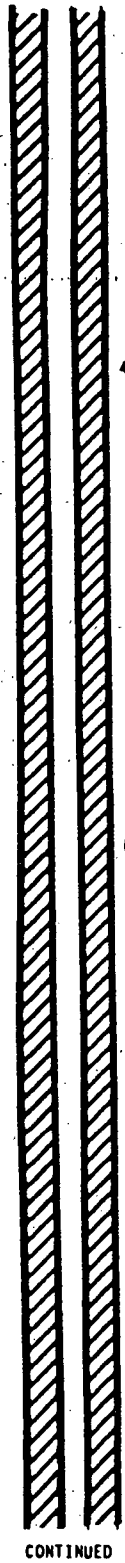


DEPTH (FT)	BLOWS	SOIL DESCRIPTION
45 - 47	13 22 27 29	LT. TAN FINE TO MEDIUM SAND, TRACE SILT RECOVERY = 12"
50 - 52	22 29 36 38	LT. BROWN MEDIUM TO COARSE SAND, LITTLE FINE SAND, LITTLE GRAVEL RECOVERY = 12"
55 - 57	15 37 60 61	LT. BROWN/PINK FINE TO MEDIUM SAND, SOME GRAVEL RECOVERY = 12"
60 - 62	17 26 77 62	LT. BROWN/PINK MEDIUM TO COARSE SAND, LITTLE GRAVEL RECOVERY = 14"
66 - 67	32 34 48 52	TAN/PINK FINE TO MEDIUM SAND, TRACE GRAVEL RECOVERY = 4"
70 - 72		NO RECOVERY
75 - 77	9 9 10 16	BROWN/ORANGE FINE SAND AND SILT WITH THIN WHITE SILT LAYERS, TRACE CLAY
80 - 62	8 6 10 12	BROWN/ORANGE FINE SAND WITH THIN WHITE SILT LAYERS, TRACE CLAY RECOVERY = 20"
66 - 87	10 15 16 16	SAME AS ABOVE RECOVERY = 22"
66 - 90	11 11 11 10	SAME AS ABOVE RECOVERY = 6"
		CONTINUED ON NEXT PAGE

LITHOLOGY



WELL CONSTRUCTION



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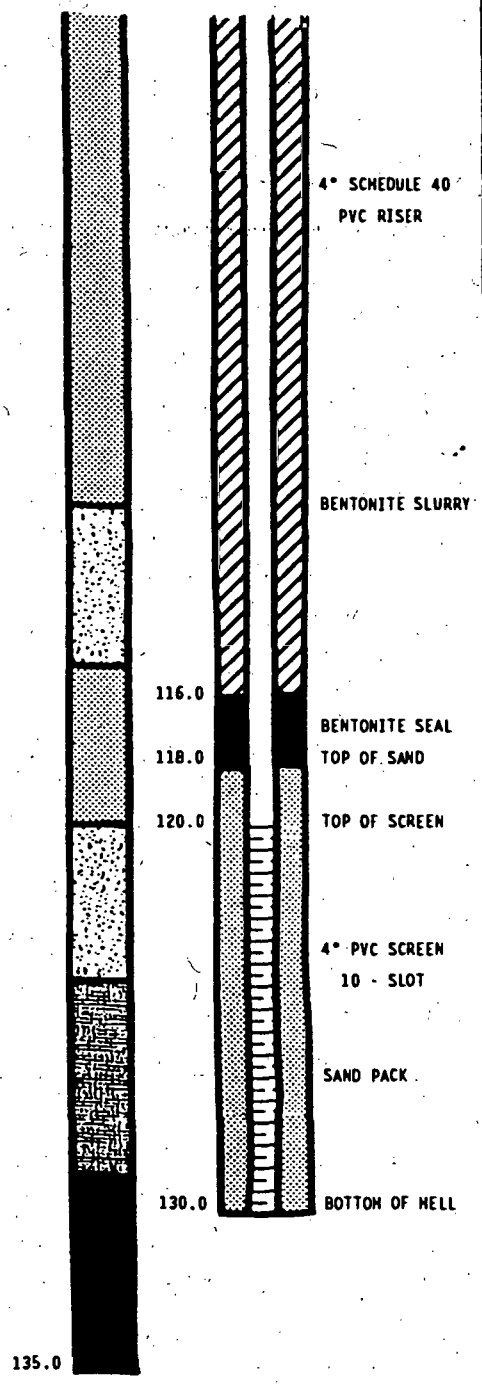
CONTINUED

DEPTH (FT)	BLOWS	SOIL DESCRIPTION
93 - 96	38 62 100/6"	LT. TAN/BROWN FINE TO VERY FINE SAND, LITTLE SILT, TIGHT RECOVERY = 5"
96 - 100	9 27 100/6"	LT. BROWN FINE SAND, TRACE MEDIUM SAND, TRACE SILT, TIGHT RECOVERY = 6"
103 - 105	18 36 28 24	SAME AS ABOVE WITH SOME VERY SMALL WHITE SILTY LAMINATIONS RECOVERY = 7"
106 - 110	18 26 53 46	LT. BROWN/ORANGE FINETO MEDIUM SAND, LITTLE COARSE SAND RECOVERY = 13"
113 - 115	29 61 100/6"	LT. BROWN FINE TO VERY FINE SAND, LITTLE MEDIUM SAND RECOVERY = 2"
118 - 120	14 16 15 16	LT. BROWN/ORANGE FINE TO MEDIUM SAND, TRACE SILT RECOVERY = 8"
123 - 126	4 4 5 12	BROWN/ORANGE FINE SAND AND SILT WITH SMALL WHITE SILT AND CLAY LAYERS
128 - 130	6 10 16 24	0-12" SAME AS ABOVE 12-18" LT. GRAY CLAY
133 - 135	5 4 8 10	ALTERNATING LAYERS OF DARK GRAY SILT, TRACE FINE SAND AND DARK GRAY CLAY. RECOVERY = 24"
		END OF BORING = 135 FT

LITHOLOGY

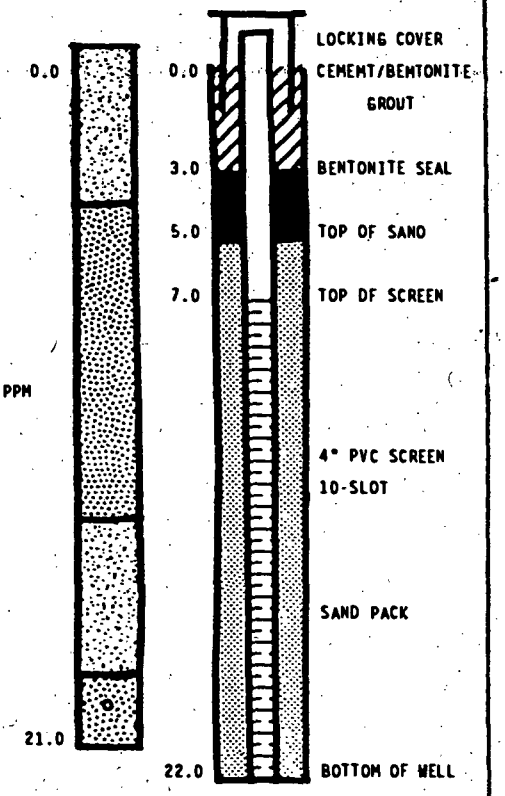
WELL CONSTRUCTION



BORING NO.:	SC-20S	CONTRACTOR:	EMPIRE SOILS	DATE STARTED:	11/13/90
PROJECT NO.:	7650-N61	DRILLERS:	MATT, BOB	DATE COMPLETED:	11/13/90
PROJECT:	SHIELD ALLOY	TRC INSPECTOR:	MULLEN	WATER TABLE LEVEL:	10 FT
CLIENT:	SMC	DRILLING METHOD:	6 1/4" AUGERS	LOCATION: N	256312.33
LOCATION:	NEUFIELD, NJ	GROUND ELEVATION:	101.74	E	1900204.99
BORING DEPTH:	21 FT	INNER CASING ELEVATION:	104.46	NJDEP PERMIT NUMBER:	3135218-3

DEPTH (FT)	BLOWS	SOIL DESCRIPTION
0 - 2		REINFORCED CONCRETE
2 - 4	1 1	BROWN FINE TO MEDIUM SAND, MOIST, PETROLEUM ODOR, OVA = 600 PPM
	1 2	RECOVERY = 14"
4 - 6	1 1	ORANGE/BROWN MEDIUM SAND, TRACE SILT, DRY, PETROLEUM ODOR OVA = 0
	2 2	RECOVERY = 18"
6 - 8	3 4	SAME AS ABOVE, MOIST, NO ODOR OVA = 250 PPM
	6 12	RECOVERY = 20"
8 - 10	10 12	SAME AS ABOVE, MOIST, NO ODOR, OVA = 300 PPM
	12 10	RECOVERY = 20"
10 - 12	15 16	ORANGE/BROWN MEDIUM SAND, TRACE SILT, TRACE GRAVEL, WET. OVA = 300 PPM
	20 20	RECOVERY = 24"
14 - 16	3 4	ORANGE/BROWN MEDIUM TO FINE SAND, TRACE SILT. OVA = 0
	5 7	RECOVERY = 16"
19 - 21	2 2	BROWN COARSE TO MEDIUM SAND, WET
	4 6	RECOVERY = 12"

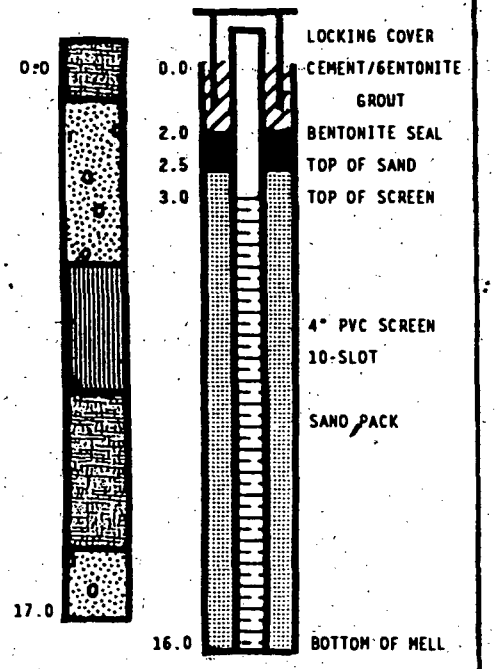
END OF BORING = 21 FT



BORING NO.:	SC-21S	CONTRACTOR:	EMPIRE SOILS	DATE STARTED:	11/15/90
PROJECT NO.:	7650-NSI	DRILLERS:	KENNEY, EDUARDS	DATE COMPLETED:	11/15/90
PROJECT:	SMIELD ALLOY	TRC INSPECTOR:	MCMORROW	MATER TABLE LEVEL:	4 FT
CLIENT:	SMC	DRILLING METHOD:	6 1/4" AUGERS	LOCATION:	N 256539.26
LOCATION:	NEUFIELD, NJ	GROUND ELEVATION:	90.57		E 1898453.22
BORING DEPTH:	18 FT	INNER CASING ELEVATION:	92.64	NJDEP PERMIT NUMBER:	3135225-1

DEPTH (FT)	BLOWS	SOIL DESCRIPTION
0 - 2	3 3	0-12" DARK BROWN SILT AND FINE SAND, TRACE ORGANICS
	3 3	12-16" ORANGE/BROWN MEDIUM TO COARSE SAND, TRACE GRAVEL, TRACE SILT
2 - 4	6 6	0-4" TAN MEDIUM TO COARSE SAND, LITTLE GRAVEL
	12 17	4-14" ORANGE MEDIUM TO COARSE SAND, LITTLE GRAVEL, TRACE SILT
4 - 6	14 16	0-6" TAN MEDIUM TO COARSE SAND, LITTLE FINE SAND, TRACE GRAVEL
	18 12	6-15" ORANGE MEDIUM TO COARSE SAND, TRACE GRAVEL
6 - 8	11 14	0-20" ORANGE/BROWN MED. SAND, SOME C. SAND, TRACE GRAVEL, TRACE SILT.
	16 30	20-24" ORANGE SILT, LITTLE CLAY, LITTLE FINE SAND, WET
6 - 10	26 25	NO RECOVERY
	22 21	
10 - 12	4 3	LT. BROWN/ORANGE FINE SAND AND SILT, LITTLE CLAY STRINGERS, DAMP
	4 7	RECOVERY - 16"
12 - 14	6 6	ORANGE FINE SAND AND SILT W/LT. GRAY CLAY STRINGERS, TRACE GRAVEL.
	4 9	RECOVERY - 15"
15 - 17	6 9	ORANGE MEDIUM TO COARSE SAND, LITTLE FINE SAND, TRACE GRAVEL
	14 14	RECOVERY - 12"

END OF BORING - 17 FT



BORING NO.:	SC-210	CONTRACTOR:	EMPIRE SOILS	DATE STARTED:	11/06/90
PROJECT NO.:	7650-N51	DRILLERS:	KENNEY, EDUAROS	DATE COMPLETED:	11/27/90
PROJECT:	SMIELD ALLOY	TRC INSPECTOR:	GLEZEN, MCMORROU	MATER TABLE LEVEL:	6.0 FT
CLIENT:	SMC	DRILLING METMOD:	MUD ROTARY	LOCATION: N	256546.97
LOCATION:	MEUFIELD, NJ	GROUND ELEVATION:	90.44	E	1698454.64
BORING DEPTN:	137 FT	INNER CASING ELEVATION:	91.65	NJDEP PERMIT NUMBER:	3136220-1

DEPTH (FT)	BLOUS	SOIL DESCRIPTION
0 - 2	3 3	0-12" DARK BROWN SILT AND FINE SAND, TRACE ORGANICS
	3 3	12-16" ORANGE/BROUN MEDIUM TO COARSE SAND, TRACE GRAVEL, TRACE SILT
2 - 4	6 8	0-4" TAN MEDIUM TO COARSE SAND, LITTLE GRAVEL
	12 17	4-14" ORANGE MEDIUM TO COARSE SAND, LITTLE GRAVEL, TRACE SILT
4 - 6	14 16	0-6" TAN MEDIUM TO COARSE SAND, LITTLE FINE SAND, TRACE GRAVEL
	18 12	6-15" ORANGE MEDIUM TO COARSE SAND, TRACE GRAVEL
6 - 8	11 14	0-20" ORANGE/BROUN MED. SAND, SOME C. SAND, TRACE GRAVEL, TRACE SILT.
	16 30	20-24" ORANGE SILT, LITTLE CLAY, LITTLE FINE SAND, MET
8 - 10	28 25	NO RECOVERY
	22 21	
10 - 12	4 3	LT. BROWN/ORANGE FINE SAND AND SILT, LITTLE CLAY STRINGERS, DAMP
	4 7	RECOVERY - 15"
12 - 14	6 6	ORANGE FINE SAND AND SILT W/LT. GRAY CLAY STRINGERS, TRACE GRAVEL.
	4 9	RECOVERY - 16"
15 - 17	6 9	ORANGE MEDIUM TO COARSE SAND, LITTLE FINE SAND, TRACE GRAVEL
	14 14	RECOVERY - 12"
20 - 22	7 16	0-2" ORANGE FINE SAND, SOME SILT, LITTLE CLAY
	25 23	2-12" TAN FINE SAND, SOME MEDIUM SAND
25 - 27	16 41	LT. BROWN/ORANGE MEDIUM TO COARSE SAND AND GRAVEL, TRACE FINE SAND
	44 40	RECOVERY - 18"
30 - 32	14 20	LIGHT TAN/PINK FINE SAND, TRACE SILT, TRACE MEDIUM SAND
	22 29	RECOVERY - 14"
35 - 37	13 22	LT. TAN/PINK MEDIUM SAND, LITTLE FINE SAND
	25 39	RECOVERY - 12"
40 - 42	21 29	LIGHT BROWN MEDIUM SAND, TRACE COARSE SAND, TRACE FINE SAND
	39 45	RECOVERY - 12"

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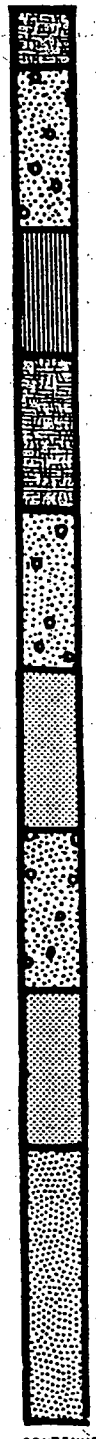
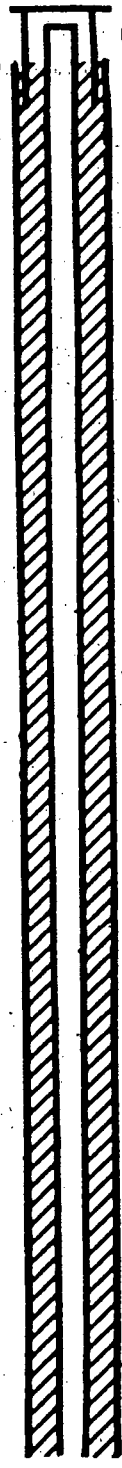
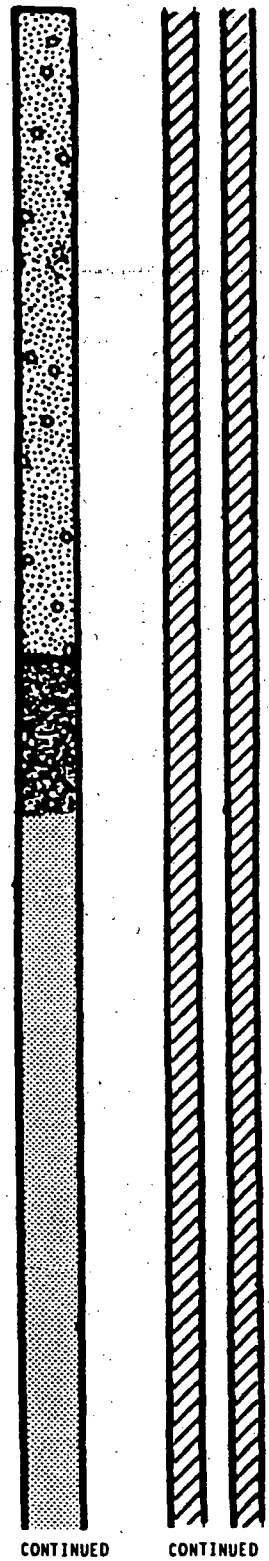
LITHOLOGY



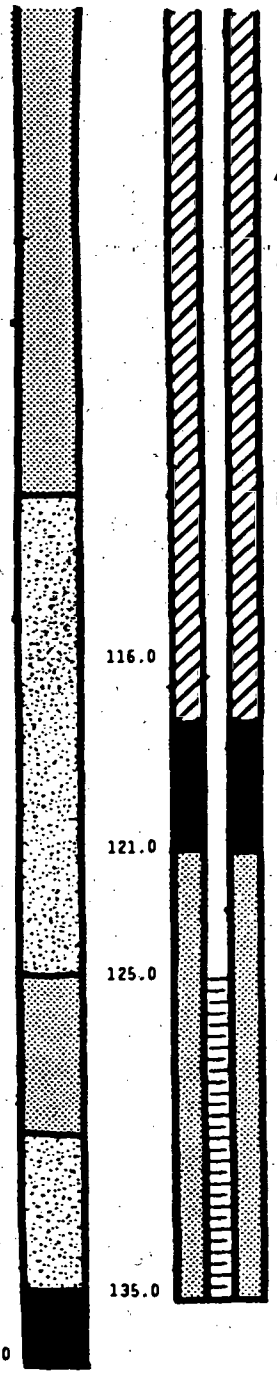
WELL CONSTRUCTION



DEPTH (FT)	BLOWS	SOIL DESCRIPTION
45 - 47	22 36 60 60	TAN MEDIUM TO COARSE SAND, TRACE GRAVEL, TRACE FINE SAND RECOVERY = 18"
50 - 52	21 41 54 70	TAN MEDIUM TO COARSE SAND, SOME GRAVEL IN TOP 4", SOME FINE SAND RECOVERY = 18"
55 - 57	41 56 57 43	TAN MEDIUM TO COARSE SAND, SOME GRAVEL RECOVERY = 14"
60 - 62	22 47 66 76	ORANGE/BROWN MEDIUM TO COARSE SAND, TRACE SILT, TRACE GRAVEL RECOVERY = 14"
66 - 67	21 26 9 8	RED/BROWN FINE TO COARSE SAND, TRACE GRAVEL, TRACE SILT RECOVERY = 2"
70 - 72	14 41 47 53	ORANGE/TAN FINE SAND, SOME SILT RECOVERY = 10"
75 - 77	25 22 32	SAME AS ABOVE RECOVERY = 10"
80 - 82	22 30 42 46	SAME AS ABOVE RECOVERY = 14"
85 - 87	7 20 25 37	LT. BROWN FINE SAND, LITTLE SILT RECOVERY = 18"
90 - 92	15 21 32 44	SAME AS ABOVE RECOVERY = 14"
		CONTINUED ON NEXT PAGE



DEPTH (FT)	BLOWS	SOIL DESCRIPTION	LITHOLOGY	WELL CONSTRUCTION
96 - 97	30 30	LT. BROWN FINE SAND, LITTLE SILT		
	22 18	RECOVERY - 16"		
100 - 102	11 16	LT. BROWN/ORANGE FINE SAND, TRACE SILT WITH THIN WHITE SILT LAYERS		4" SCHEDULE 40 PVC RISER
	22 26	RECOVERY - 12"		
105 - 107	13 15	SAME AS ABOVE, NO SILT LAYERS		
	27 30	RECOVERY - 12"		
110 - 112	22 32	BROWN/ORANGE FINE TO MEDIUM SAND, TRACE SILT		BENTONITE SLURRY
	34 30	RECOVERY - 12"		
116 - 117	21 52	SAME AS ABOVE		116.0
	100/5"	RECOVERY - 8"		BENTONITE SEAL
120 - 122	6 8	BROWN/ORANGE FINE TO MEDIUM SAND WITH THIN WHITE SILT LAYERS THROUGHOUT		
	10 15	RECOVERY - 12"		121.0 TOP OF SAND
125 - 127	3 5	BROWN FINE SAND, SOME SILT, TRACE CLAY		125.0 TOP OF SCREEN
	15 18	RECOVERY - 20"		4" PVC SCREEN 10 - SLOT
130 - 132	20 21	DROWN FINE TO MEDIUM SAND, TRACE SILT, TRACE CLAY		SAND PACK
	20 25	RECOVERY - 12"		
135 - 137	5 10	DARK GRAY SILT AND CLAY, LITTLE FINE SAND		135.0 BOTTOM OF WELL
	26 47	RECOVERY - 24"		
			137.0	
		END OF BORING - 137 FT		



BORING NO.:	SC-22D	CONTRACTOR:	EMPIRE SOILS	DATE STARTED:	11/16/90
PROJECT NO.:	765D-N51	DRILLERS:	EMPSON, SNYDER	DATE COMPLETED:	
PROJECT:	SMIELD ALLOY	TRC INSPECTOR:	GLEZEN	WATER TABLE LEVEL:	5.0 FT
CLIENT:	SNC	DRILLING METHOD:	MUD ROTARY	LOCATION: N	257593.05
LOCATION:	NEWFIELD, NJ	GROUND ELEVATION:	96.18	E	1900417.75
BORING DEPTH:	122 FT	INNER CASING ELEVATION:	98.72	NJDEP PERMIT NUMBER:	3135222-7

DEPTH (FT)	BLOWS	SOIL DESCRIPTION
0 - 2	3 3	BROWN MEDIUM SAND, SOME GRAVEL, MOIST
	2 2	RECOVERY = 10"
2 - 4	1 1	BROWN COARSE TO MEDIUM SAND, SOME GRAVEL, MOIST
	2 2	RECOVERY = 10"
4 - 6	3 3	SAME AS ABOVE, WET
	5 6	RECOVERY = 10"
9 - 11	2 2	SAME AS ABOVE
	4 3	RECOVERY = 16"
14 - 16	2 2	TAN/ORANGE COARSE SAND, TRACE GRAVEL
	4 6	
20 - 22	13 17	ORANGE MEDIUM TO COARSE SAND, TRACE GRAVEL
	17 21	RECOVERY = 5"
25 - 27	16 16	BROWN/ORANGE MEDIUM TO COARSE SAND, SOME FINE SAND, TRACE GRAVEL
	17 15	RECOVERY = 12"
30 - 32	6 4	0-4" LT. BROWN/RED SILT AND CLAY, SOME FINE SAND
	6 7	4-20" BROWN/RED FINE SAND, SOME SILT, SOME CLAY
		NOTE: CLAY OCCURS IN WHITE/PINK LAYERS
35 - 37	7 7	ORANGE/PINK FINE TO VERY FINE SAND, SOME SILT, SOME CLAY WITH STRINGERS
	6 7	RECOVERY = 16"
40 - 42	2 2	ORANGE SILT AND FINE SAND WITH WHITE/GRAY CLAY LAYERS
	3 2	RECOVERY = 24"

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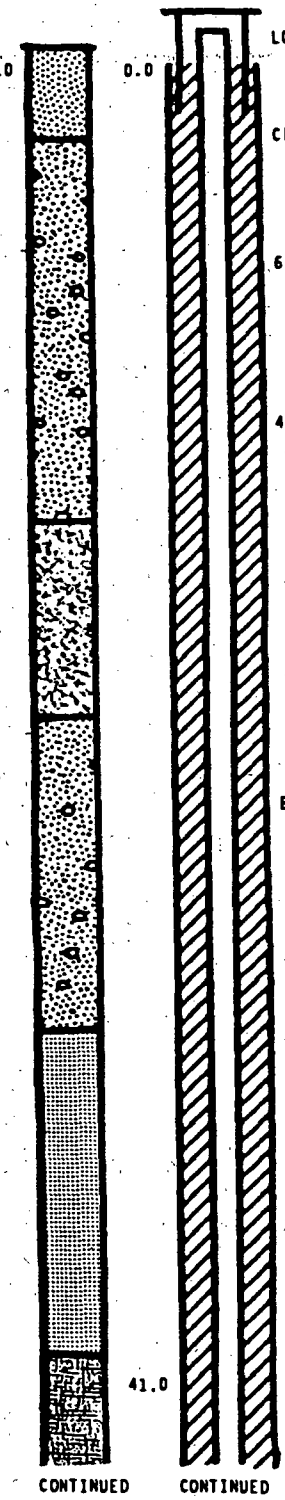
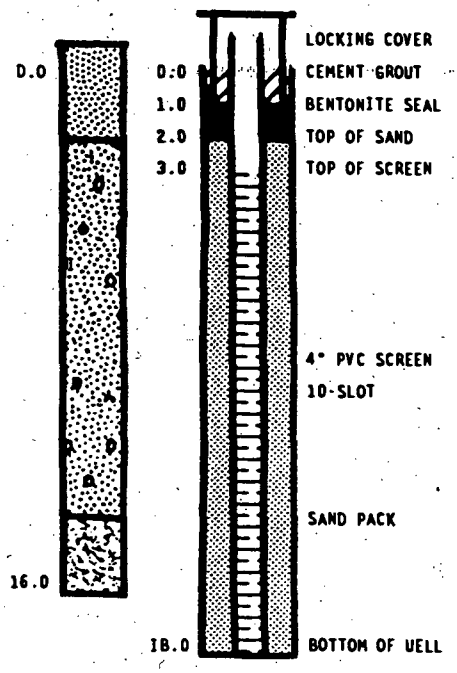


BORING NO.:	SC-22S	CONTRACTOR:	EMPIRE SOILS	DATE STARTED:	11/13/90
PROJECT NO.:	7650-N51	DRILLERS:	MATT, BOB	DATE COMPLETED:	11/14/90
PROJECT:	SHIELD ALLOY	TRC INSPECTOR:	MULLEN	MATER TABLE LEVEL:	5 FT
CLIENT:	SMC	DRILLING METHOD:	6 1/4" AUGERS	LOCATION: N	257595.22
LOCATION:	NEUFIELD, NJ	GROUND ELEVATION:	96.17	E	1900430.04
BORING DEPTH:	16 FT	INNER CASING ELEVATION:	99.65	NJDEP PERMIT NUMBER:	3135219-7

DEPTH (FT)	BLOWS	SOIL DESCRIPTION
0 - 2	3 3	BROWN MEDIUM SAND, SOME GRAVEL, MOIST
	2 2	RECOVERY = 10"
2 - 4	1 1	BROWN COARSE TO MEDIUM SAND, SOME GRAVEL, MOIST
	2 2	RECOVERY = 10"
4 - 6	3 3	SAME AS ABOVE, WET
	5 6	RECOVERY = 10"
9 - 11	2 2	SAME AS ABOVE
	4 3	RECOVERY = 16"
14 - 16	2 2	TAN/ORANGE COARSE SAND, TRACE GRAVEL
	4 6	
		END OF BORING = 16 FT

LITHOLOGY / WELL CONSTRUCTION



DEPTH (FT)	BLOWS	SOIL DESCRIPTION	LITHOLOGY	WELL CONSTRUCTION
45 - 47	33 33 48 42	RED/ORANGE MEDIUM TO COARSE SAND, SOME FINE SAND, TRACE GRAVEL RECOVERY - 18"		
50 - 62	34 43 48 53	ORANGE MEDIUM SAND, SOME COARSE SAND, LITTLE FINE SAND, TRACE GRAVEL RECOVERY - 14"		
55 - 57	6 12 19 24	LT. TAN/PINK FINE TO MEDIUM SAND, SOME COARSE SAND, TRACE GRAVEL RECOVERY - 16"		4" SCHEDULE 40 PVC RISER
60 - 62	16 23 26 30	ORANGE MEDIUM TO COARSE SAND, SOME FINE SAND, TRACE SILT RECOVERY - 14"		
65 - 67	13 25 28 28	LT. TAN FINE TO MEDIUM SAND, TRACE COARSE SAND, TRACE SILT RECOVERY - 12"		
70 - 72	6 12 13 13	TAN FINE TO MEDIUM SAND, LITTLE SILT RECOVERY -12"		BENTONITE SLURRY
75 - 77	24 43 36 50	TAN/PINK MEDIUM TO COARSE SAND, SOME FINE SAND, LITTLE GRAVEL RECOVERY - 14"		
80 - 82	15 9 7 7	ORANGE FINE TO MEDIUM SAND, TRACE CLAY RECOVERY - 7"		
85 - 87	60 100/6"	BROWN MEDIUM TO COARSE SAND, SOME GRAVEL, LITTLE FINE SAND RECOVERY - 12"		
90 - 92	43 100/6"	BROWN/PINK FINE TO MEDIUM SAND, SOME COARSE SAND RECOVERY - 12"		

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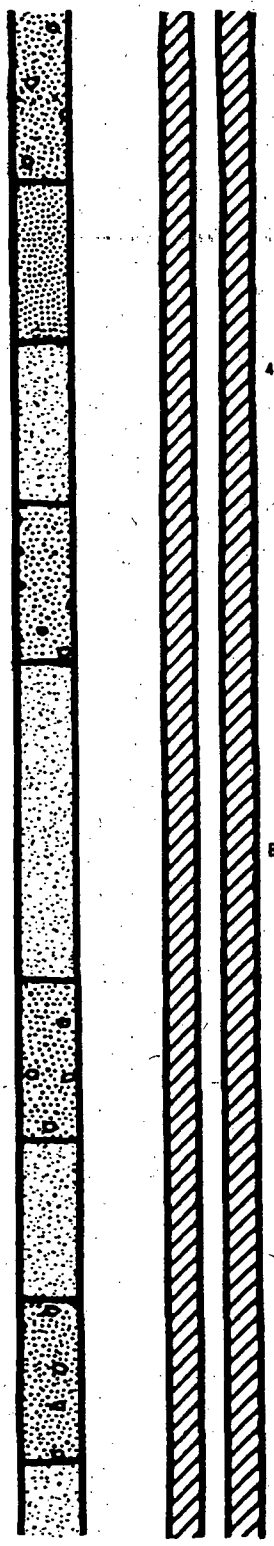
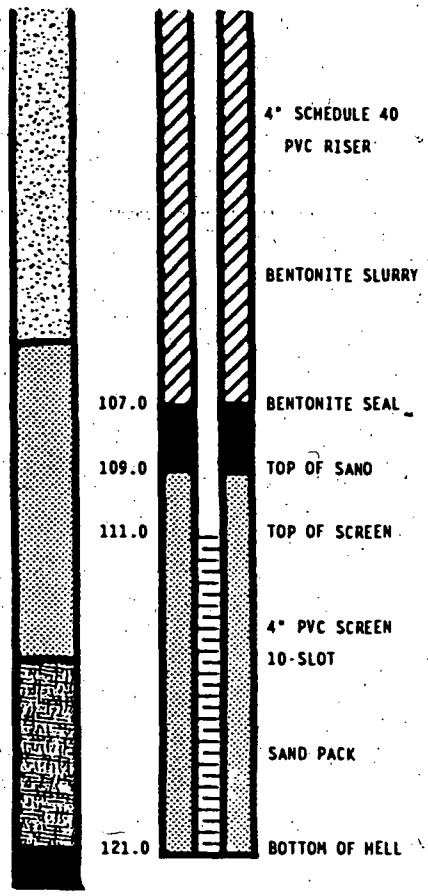
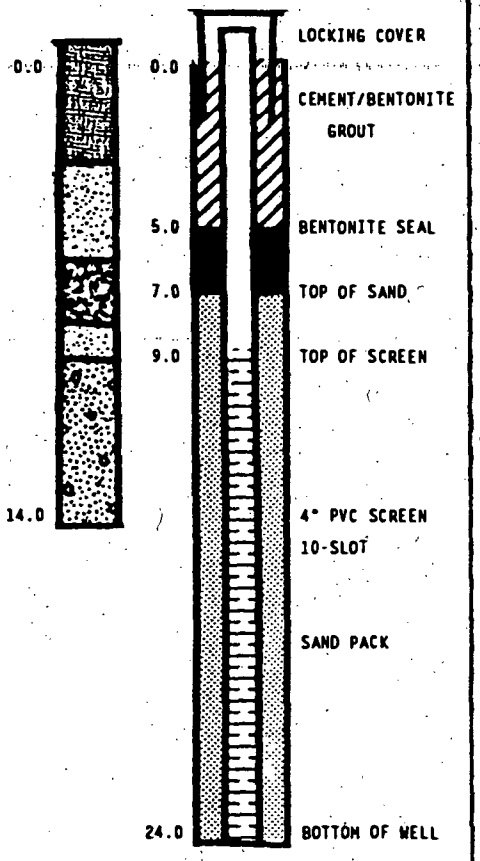


DEPTH (FT)	BLOWS	SOIL DESCRIPTION
95 - 97	100/6"	LT. BROWN/ORANGE FINE TO MEDIUM SAND, TRACE3 COARSE SAND RECOVERY = 6"
100 - 102	43 100/6"	LT. BROWN FINE TO MEDIUM SAND, LITTLE COARSE SAND, TRACE GRAVEL RECOVERY = 12"
105 - 107	100/6"	LT. BROWN FINE SAND, LITTLE MEDIUM SAND, TRACE SILT RECOVERY = 6"
110 - 112	22 30 75/6"	LT. TAN/ORANGE FINE TO VERY FINE SAND, LITTLE SILT RECOVERY = 12"
115 - 117	50 60 75/6"	ORANGE/RED VERY FINE SAND AND SILT, DENSE RECOVERY = 6"
120 - 122	20 23 26 27	0-12" LT. TAN FINE TO VERY FINE SAND WITH LIGHT GRAY CLAY INTERBEDS 12-14" DARK GRAY SILTY CLAY, STIFF
		END OF BORING = 122 FT



ORING NO.:	SC-23S	CONTRACTOR:	EMPIRE SOILS	DATE STARTED:	11/16/90
ROJECT NO.:	7650-N51	DRILLERS:	MATT, 608	DATE COMPLETED:	11/16/90
ROJECT:	SMIELD ALLOY	TRC INSPECTOR:	MULLEN	MATER TABLE LEVEL:	12.0 FT
LIENT:	SMC	DRILLING METHOD:	6 1/4" AUGERS	LOCATION: N	258661.41
	NEWFIELD, NJ	GROUND ELEVATION:	102.83	E	1899693.28
DEPTH:	14 FT	INNER CASING ELEVATION:	102.21	NJDEP PERMIT NUMBER:	3136437-6

DEPTH (FT)	BLOWS	SOIL DESCRIPTION
		(LITHOLOGIES FROM 0-17 FT TAKEN FROM BORING LOG SC-19D)
0.5 - 2	6	BROWN FINE SAND AND SILT
	4 3	RECOVERY = 16"
2 - 4	3 4	0-6" SAME AS ABOVE
	5 7	6-18" BROWN FINE TO MEDIUM SAND, LITTLE GRAVEL, TRACE SILT
4 - 6	8 16	SAME AS 6-18" ABOVE WITH FRACTURED ROCK
	8 13	RECOVERY = 18"
6 - 6	8 15	BROWN FINE TO COARSE SAND, TRACE SILT, TRACE GRAVEL
	12 13	RECOVERY = 20"
8 - 10	4 8	0-5" BROWN/ORANGE MEDIUM TO FINE SAND, TRACE SILT
	10 12	5-24" ORANGE MEDIUM TO COARSE SAND
10 - 12	10 11	ORANGE MEDIUM TO COARSE SAND
	12 12	RECOVERY = 24"
12 - 14	10 16	ORANGE/BROWN COARSE TO MEDIUM SAND, LITTLE GRAVEL, TRACE SILT, WET
	18 22	RECOVERY = 24"
		END OF BORING = 14 FT

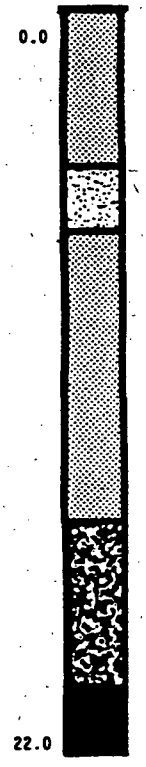


BORING NO.:	SC-24S	CONTRACTOR:	EMPIRE SOILS	DATE STARTED:	11/28/90
PROJECT NO.:	7650-N51	DRILLERS:	KENNEY, EDWAROS	DATE COMPLETED:	11/26/90
PROJECT:	SMIELO ALLOY	TRC INSPECTOR:	MCMORROW	WATER TABLE LEVEL:	8 FT
CLIENT:	SMC	DRILLING METHOD:	6 1/4" AUGERS	LOCATION:	N 256466.19
LOCATION:	NEWFIELD, NJ	GROUND ELEVATION:	91.57		E 1697227.09
BORING DEPTH:	22 FT	INNER CASING ELEVATION:	93.57	NJDEP PERMIT NUMBER:	3135435-1

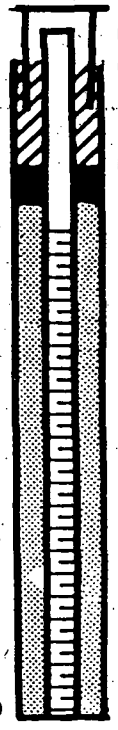
DEPTH (FT)	BLOWS	SOIL DESCRIPTION
0 - 2	3 4	LT. BROWN FINE SAND, SOME SILT, DRY
	3 4	RECOVERY = 24"
2 - 4	6 6	SAME AS ABOVE
	10 10	RECOVERY = 24"
4 - 6	14 16	LT. BROWN FINE TO MEDIUM SAND, TRACE SILT, DRY
	16 10	RECOVERY = 18"
6 - 8	10 5	LT. BROWN FINE SAND, TRACE SILT, WET AT TIP
	5 6	RECOVERY = 24"
15 - 17	2 5	LT. BROWN FINE TO COARSE SAND, WET
	10 11	RECOVERY = 10"
20 - 22	1 1	0-4" BROWN F-M SAND, TRACE SILT, TRACE CLAY
	5 10	4-7" GRAY SILT AND CLAY 7-12" BROWN F-C SAND

END OF BORING = 22 FT

LITHOLOGY



WELL CONSTRUCTION



LEGEND

- NRC (CONTROLLED) AREAS
- W4 — EXISTING WELL LOCATION AND NUMBER
- SC18S — RI MONITORING WELL
- SW-5 / SD-5 — SURFACE WATER AND SEDIMENT SAMPLING LOCATION AND NUMBER
- DOMESTIC WELL
- IW-1 — IRRIGATION WELL AND NUMBER
- (86.38) — GROUND WATER ELEVATION (FEET ABOVE MEAN SEA LEVEL)

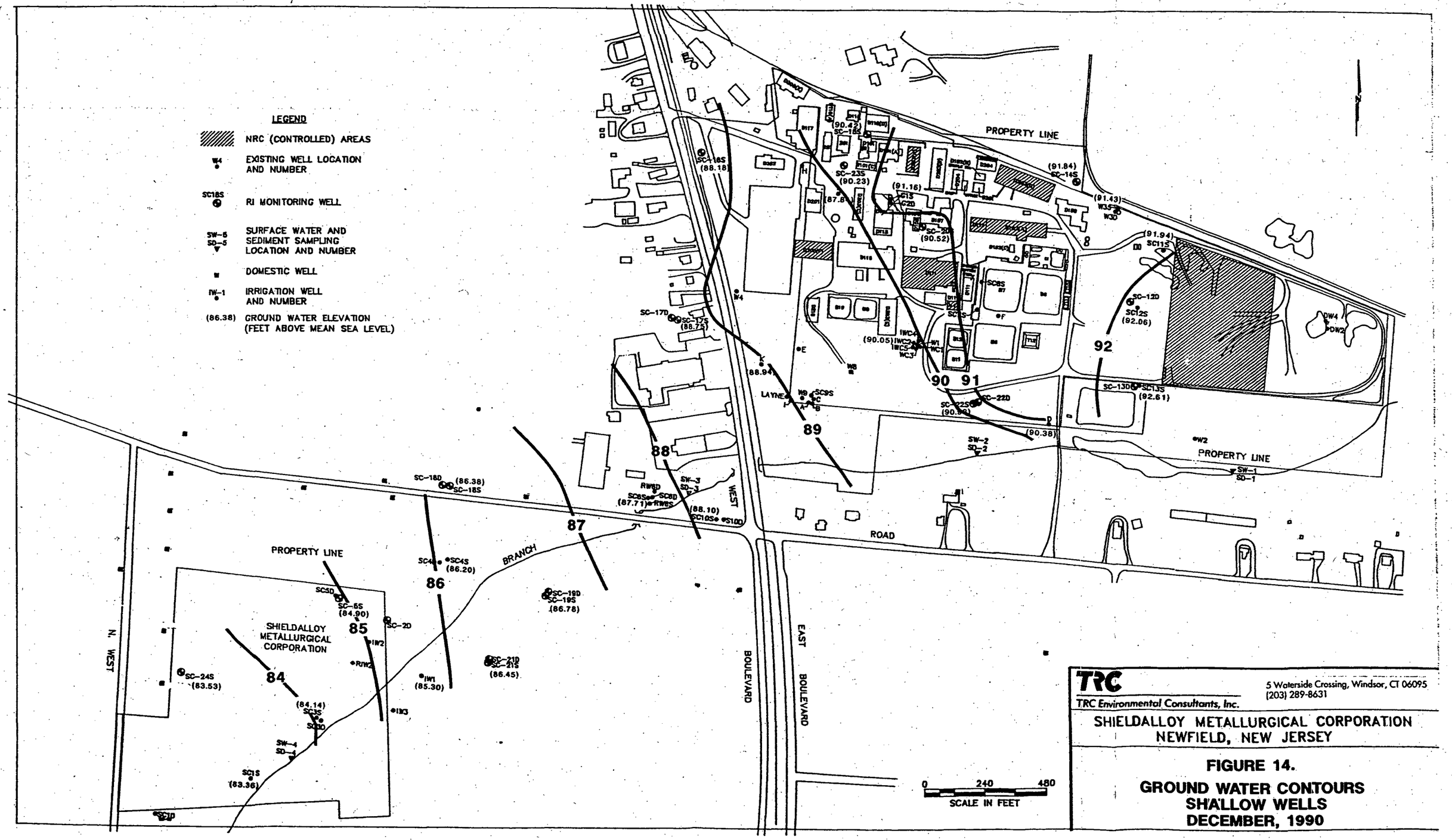


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FIGURE 14.

GROUND WATER CONTOURS SHALLOW WELLS DECEMBER, 1990

LEGEND

- NRC (CONTROLLED) AREAS
- W4 — EXISTING WELL LOCATION AND NUMBER
- SC18S — RI MONITORING WELL
- SW-5 / SD-5 — SURFACE WATER AND SEDIMENT SAMPLING LOCATION AND NUMBER
- DOMESTIC WELL
- IW-1 — IRRIGATION WELL AND NUMBER
- (88.06) — GROUND WATER ELEVATION (FEET ABOVE MEAN SEA LEVEL)

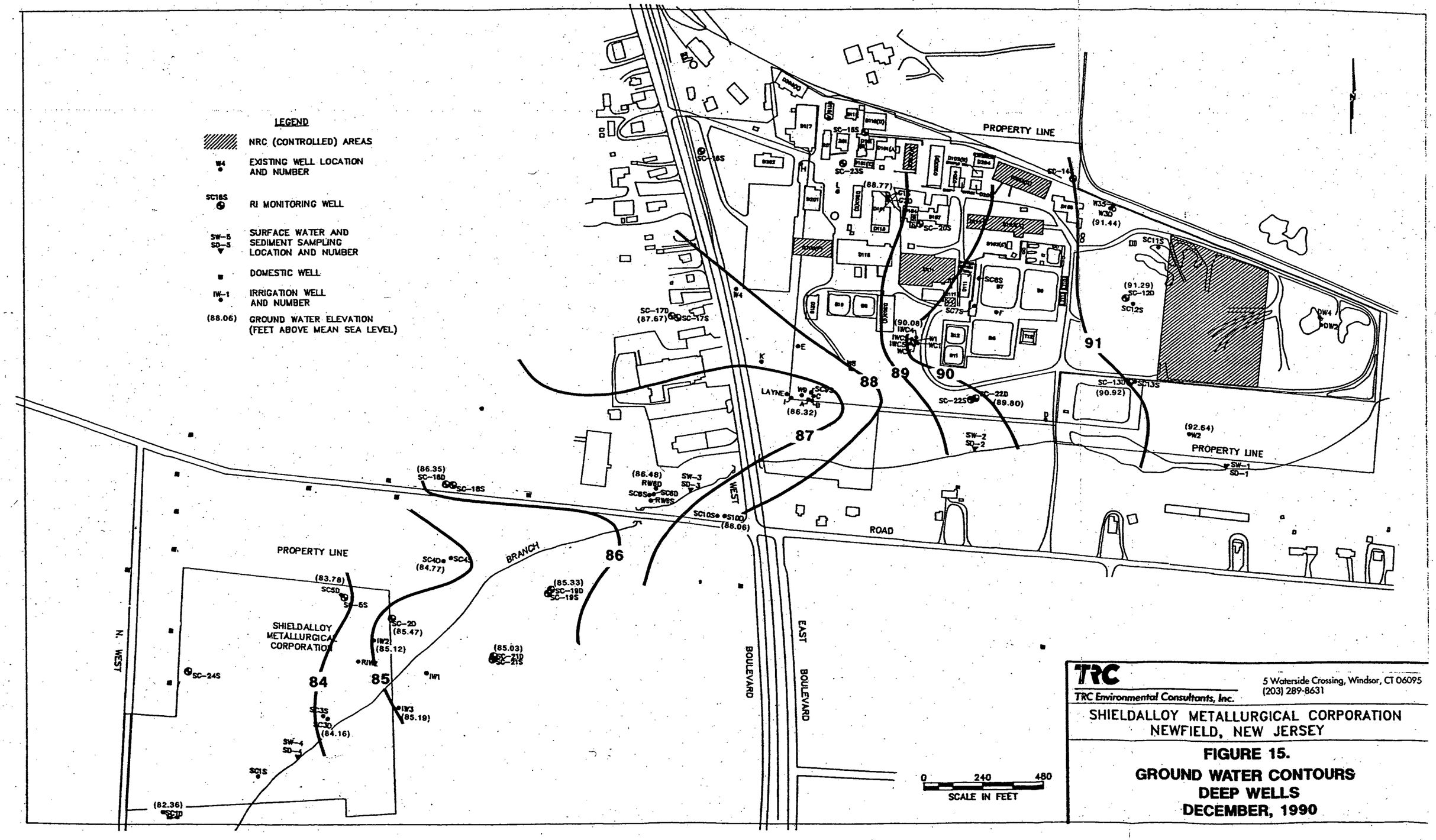

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FIGURE 15.
GROUND WATER CONTOURS
DEEP WELLS
DECEMBER, 1990

LEGEND

- NRC (CONTROLLED) AREAS
- W4 — EXISTING WELL LOCATION AND NUMBER
- SC18S — RI MONITORING WELL
- SW-5 / SD-5 — SURFACE WATER AND SEDIMENT SAMPLING LOCATION AND NUMBER
- DOMESTIC WELL
- IW-1 — IRRIGATION WELL AND NUMBER
- (91.60) — GROUND WATER ELEVATION (FEET ABOVE MEAN SEA LEVEL)

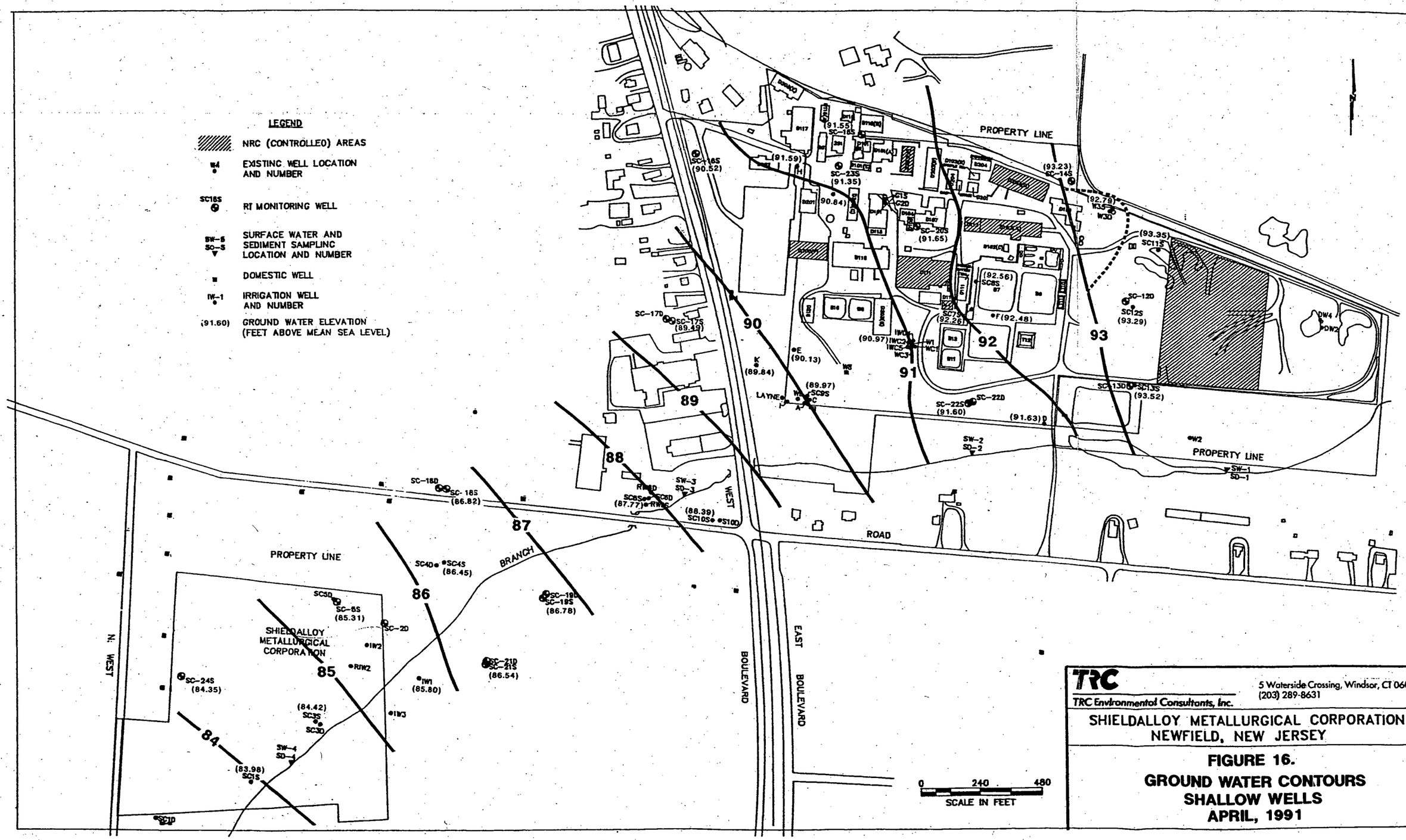

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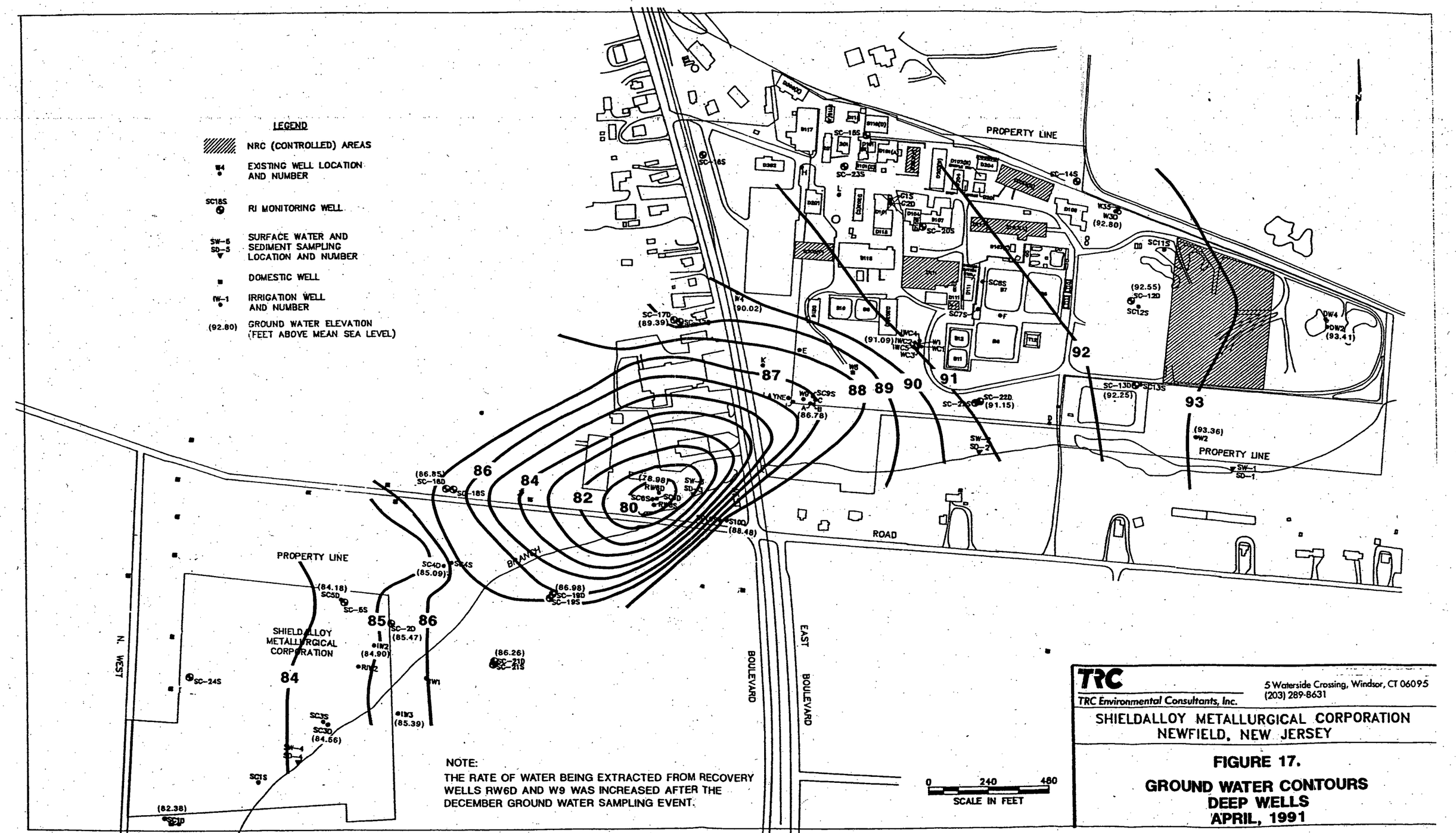
FIGURE 16.
GROUND WATER CONTOURS
SHALLOW WELLS
APRIL, 1991

LEGEND

- NRC (CONTROLLED) AREAS
- W4 — EXISTING WELL LOCATION AND NUMBER
- SC18S — RI MONITORING WELL
- SW-5 / SD-5 — SURFACE WATER AND SEDIMENT SAMPLING LOCATION AND NUMBER
- DOMESTIC WELL
- IW-1 — IRRIGATION WELL AND NUMBER
- (92.80) — GROUND WATER ELEVATION (FEET ABOVE MEAN SEA LEVEL)



NOTE:
THE RATE OF WATER BEING EXTRACTED FROM RECOVERY WELLS RW6D AND W9 WAS INCREASED AFTER THE DECEMBER GROUND WATER SAMPLING EVENT.

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FIGURE 17.

GROUND WATER CONTOURS DEEP WELLS APRIL, 1991

1) Aquifer Testing and Aquifer Test Analysis Summary
2) Monitoring Well Information
3) Analytical Results, Radiological Parameters

From:

Summary of Geohydrologic Information
Collected Since January 1988

Dan Raviv Associates, Inc., 4/1990

From: "Summary of Geohydrologic Information Collected Since January 1988" Dan Raviv Associates, Inc 4/1990

3.0 AQUIFER TESTING AND WATER LEVEL MEASUREMENTS

Aquifer testing was performed in August 1988 in conjunction with well development after installation of the three new recovery wells (RW6S, RW6D, and RIW2). Aquifer testing was also performed using all five of the recovery wells (the Layne Well and Wells W9, RW6S, RW6D, and RIW2) in July and August 1989, in conjunction with the initial testing of the new remediation system (Table II). Although extensive testing had previously been conducted at the site (DRAI, 10/84 and 1/88), additional testing of the shallow portion of the Cohansey Sand and of the interaction of the shallow and deep portions of the aquifer was advisable.

In addition, an extensive round of water level measurements was obtained in conjunction with the October 1989 ground water sampling. Using these measurements and the new well survey, a ground water elevation contour map was constructed for comparison with previous contour maps.

3.1 Aquifer Testing (August 1988)

Both variable and constant rate tests were conducted on the new recovery wells (RW6S, RW6D, and RIW2) in August 1988 to ensure that the wells were properly installed and to verify that the aquifer conditions off-site were not significantly different than on-site. The variable-rate tests (or step tests) were performed by pumping each well at a given rate until the water level stabilized in the recovery well, at which time the pumping rate was increased. Each test included at least four pumping rates. The constant-rate tests were performed by pumping each well and obtaining water level measurements in the closest observation well.

Graphs of water levels versus time during the step tests of Wells RW6S, RW6D, and RIW2 are included in Appendix C on Figures C1, C4, and C11, respectively. The step test data were used for a qualitative assessment of well efficiency. Quantitative analyses of well efficiency (e.g. calculating the well loss constant) can also be performed. However, the Cohansey Sand is very productive in this area and each of the three wells sustained a pumping rate on the order of 200 gallons per minute (gpm), which is twice the necessary rate for effective remediation from each of these wells (i.e. 100 gpm). Therefore, the quantitative analysis of the step test data was not considered necessary at this time.

Even though the recovery wells can be pumped at higher rates, increased pumping reduces the effectiveness of the remediation system because clean water is pumped with contaminated water. However, one of the goals of the remediation system design was flexibility. The step test results indicate that, if necessary, the pumping rates in the recovery wells can be balanced. For example, if the Cr+6 concentrations in Well W9 decrease rapidly, it is possible to pump more from another, more contaminated well, such as RW6S, while reducing the pumping rate from Well W9. (The initial pumping rates selected for the new system are: Well RIW2 - 100 gpm; Well RW6S - 100 gpm; Well RW6D - 100 gpm; the Layne Well - 50 gpm; and Well W9 - 50 gpm. The basis for selection of these rates is discussed in greater detail in DRAI's January 1988 report and the NJDEP letter of December 9, 1987.)

During the constant-rate tests, water level measurements were obtained from a close observation well, rather than from the recovery well. The data from the observation wells were analyzed to determine aquifer transmissivity (T), storage coefficient (S or specific yield, S, in unconfined conditions) and vertical hydraulic conductivity (p'), using a variety of methods. These calculated aquifer characteristics are summarized on Table III.

The graphs of water level drawdown(s) versus time (t) since pumping started and residual drawdown(s') versus the ratio of time since pumping started to time since it stopped (t/t'), which were used for the analyses, as well as the analytical equations and the calculations, are included on the figures in Appendix C (Figures C2 and C3 for Well RW6S, Figures C5 through C10 for Well RW6D, and Figures C12 through C17 for Well RIW2). It should be noted that some of the applied analyses are for confined aquifers. However, these analyses are routinely applied to unconfined or semi-confined aquifers where the horizontal gradients are significantly larger than the vertical gradients and because of the practical difficulties of complete analysis of an unconfined flow system (Freeze and Cherry, 1979).

From the drawdown and recovery data obtained from Well SC6S during pumping of Well RW6S, transmissivity values of 575,500 and 230,200 gallons per day per foot (gpd/ft), respectively were calculated using the "straight-line" or "Jacob" method developed by Cooper and Jacob (Driscoll, 1986). The magnitude of these values are indicative of the very productive nature of the Cohansey Sand in this region. The data from Well SC6S were not suitable for other analyses due to the high transmissivity and proximity (5 feet) to the pumping well which resulted in rapid equilibrium of the water levels (i.e. no change in drawdown over time after the first few minutes of pumping).

The drawdown data from Well SC6D during pumping of Well RW6D were analyzed by the "Hantush" (or "Walton") method (Kruseman and DeRidder, 1970) of type-curve matching, as well as by the Jacob method. The transmissivities calculated from the drawdown data from this well ranged from 26,200 to 96,000 gpd/ft, and the calculated storage coefficient ranged from 8.0x10-4 to 5.6x10-2. As discussed in Section 3.3, the lower transmissivity values were expected in the deeper portion of the Cohansey Sand. The leakage factors (r/B) from the type curves which most closely match the data were 0.075 and 0.05, which yield vertical hydraulic conductivities of 114 and 235 gallons per day per square foot (gpd/ft2), assuming the thickness of the overlying clay/sand leaky confining layer is 40 feet. These vertical conductivities are higher than expected and may be a function of the proximity of the two wells (10 feet).

The drawdown data from Wells IW2 and SC3S during pumping of Well RIW2 were analyzed by the "Boulton" and "Theis" methods of type-curve matching, (Kruseman and DeRidder, 1970), as well as by the Jacob method. The "Boulton" method was developed specifically for the delayed water-table response often observed soon after pumping begins in unconfined aquifer testing, and the data from Well IW2 appeared characteristic of the delayed

response. Not unexpectedly, the data from Well SC3S, which is farther from Well RIW2, did not show the delayed response. The calculated transmissivities from these two tests range from 103,000 to 144,100 gpd/ft, as expected in the shallow aquifer. The calculated storage coefficients range from 2.1x10-4 to 1.2x10-3, somewhat lower than are typical for unconfined aquifers. The Boulton delay index, which is dependent on the testing parameters such as distance from the pumped well as well as the aquifer parameters, was 1.0 for Well IW2.

3.2 Aquifer Testing (July-August 1989)

Constant-rate tests were performed in July-August 1989 using the Layne/W9 well pair, the RW6S/RW6D well pair, and Well RIW2. At each location, water level drawdown and recovery were measured in both the pumped well(s) and the surrounding observation wells. The purpose of the testing was to refine available measurements of the characteristics of both the shallow and deep portions of the Cohansey Sand aquifer and to refine measurements of the vertical hydraulic conductivity between the two portions.

The pumping schedule is summarized on Table II and was determined in part by the performance of the remediation system because it was being tested simultaneously. Several of the pumping/recovery segments were of short duration and were not considered useful for quantitative analysis of the aquifer characteristics. However, a long enough constant-rate test was performed at each of the three recovery centers for quantitative analysis.

For qualitative analysis, linear graphs of water levels versus time are included on Figures 2 through 7. Graphs of drawdown versus t and residual drawdown versus t/t', which were used for the quantitative analyses, as well as the analytical equations and calculations are included in Appendix D. The quantitative results are summarized on Table III, and both the qualitative and quantitative results are discussed below by testing date.

July 26, 1989. Well W9 (deep) was pumped intermittently at 50 gpm. There are essentially three different segments in this test, because the well was shut off twice, once after 47 minutes of pumping and their after 18 minutes of recovery and another 27 minutes of pumping. Between the pumping segments, the well was allowed to recover to within about 90% of the static water level before the pump was restarted.

Water levels were also measured in a few of the closest observation wells. The data from Wells C, B, and SC9S are plotted on Figure 2, along with the data from Well W9. The observation well measurements illustrate the degree of interconnection between the shallow and deep aquifers. Well C is completed between the shallow and deep portions of the aquifer and Wells B and SC9S are both shallow wells. The water levels in all three fluctuated in response to the pumping of Well W9, although the magnitude of the fluctuations are on the order of less than 0.1 foot and there appears to be a time lag in the responses, as would be expected. (In contrast, drawdown in a nearby deep monitoring well would be on the order of feet, rather than less than 0.1 feet, as evident in Well A on July 27, 1989).

The joint response of the two aquifers, such as during the pumping of Well W9 is advantageous in pumping for remediation because of the additional drawdown. However, the magnitude of the response is not sufficient to allow for pumping from only the shallow or the deep portion of the Cohansey Sand in areas where both portions are contaminated. Also, care must be taken to avoid cross-contamination by pumping frpm an uncontaminated portion of the aquifer, e.g. pumping of the deep portion near the toe of the plume is not advisable because it is not yet contaminated in that area although the shallow portion is.

Data from the three pumping segments and two drawdown segments were used to calculate transmissivity (Figures D1 through D5) using the Jacob method. The calculated values range from 10,400 to 33,000, which are typical of the deeper portion of the Cohansey Sand in which Well W9 is completed.

July 27, 1989. The Layne Well was pumped at 50 gpm for 150 minutes and then both the Layne Well and Well W9 were pumped simultaneously at 50 gpm each (100 gpm total) for about another 200 minutes. Water levels were measured in: the pumped wells; in several shallow observation wells (Wells B, E, I, K, and SC9S); in the one, close, deep well (Well A); and in Well C, which is completed between the upper and lower portions of the Cohansey Sand.

The data from the latter portion of the test, with both wells pumping, were not analyzed quantitatively due to the simultaneous pumping. For similar reasons, recovery was not measured after this test. However, the increase in the drawdown when the deep Well W9 is also turned on is apparent on the graphs of the water levels versus time on Figure 3.

The data from the portion of the test during which only the Layne Well was pumping were analyzed for transmissivity, storage coefficient and vertical hydraulic conductivity, as summarized on Table III and detailed in Appendix D. The analytical methods included Hantush and Jacob plus the "distance-drawdown" method, which is related to the Jacob method. The calculated transmissivity values range from 24,900 to 440,000, and the storage coefficients range from 5.2x10-6 to 2.4x10-2.

For this test, the transmissivities calculated from the Hantush method (and the distance-drawdown method) are less than those from the Jacob method. This is apparently a function of the assumptions used in both methods, in particular the influence of vertical flow components, due to vertical anisotropy within the shallow portion of the aquifer and/or the anisotropy between the shallow and deep portions of the aquifer.

The upper portion of the Cohansey Sand does contain thin clay "stringers" and layers (on the order of a few inches thick), and not all the wells are completed at the same depth. Therefore, the observed influence could be due to "leakage" within the shallow portion of the aquifer or upward leakage from the deep portion.

It was assumed that the Hantush method was applicable, although the phenomenon could be an indication of delayed yield. Even so, use of the Hantush analysis results in a "worst case" calculation in that the lower the transmissivity, the higher the required pumping rate(s). The leakage factors from the Hantush analysis range from 0.2 to 1.0. The vertical hydraulic conductivities, which were calculated using the difference in the screened well depths, range from 2 to 99 gpd/ft2.

Well RW6S was also pumped at 100 gpm, later in the day on July 27, 1989, and water level measurements were obtained during pumping from Wells SC6S/6D and SC10S/10D. Well SC6D was of particular interest for vertical hydraulic conductivities and Wells SC10S/10D were of particular interest for evaluating the influence of Hudson Branch. Recovery was not measured.

Graphs of the water levels versus time are shown on Figure 4. Similar to aquifer conditions in the southwest corner of the plant (the Layne Well and Well W9), both the shallow and deep wells responded to pumping of the shallow well. Also, the wells on the opposite side of the stream (SC10S/10D) responded to pumping of Well RW6S.

The data from this test was analyzed for transmissivity, storage coefficient and vertical hydraulic conductivity using the Hantush and Jacob methods. The calculated transmissivities range from 39,500 to 713,500 gpd/ft, and the storage coefficients range form 1.7x10-6 to 4.5x10-1. The calculated values from Well SC6D and Well SC10S are of interest for two distinct reasons.

As in the analyses of the 1988 testing of Well RW6D, a high vertical hydraulic conductivity was calculated from the Well SC6D data. (In fact, the 1989 value is extremely high, 11,000 gpd/ft2.) Also, the stbrage coefficient calculated from the Well SC6D data is very high, on the order of 4.0x10-1. These calculated values are considered suspect due to the proximity (10 feet) of Well SC6D and the pumping well RW6S and the potential for increased vertical leakage due to well interference.

Analysis of the data from Well SC10S, which was only suitable for the Jacob analysis, resulted in an extremely high calculated transmissivity of 713,500 gpd/ft (and an unusually low storage coefficient, 1.7x10-6). The high transmissivity could result from the influence of another water source, as would be expected from ground/surface water exchange along Hudson Branch.

If the results from Wells SC6D and SC10S are omitted, the calculated transmissivities (shallow - 203,100 to 330,000; deep - 39,500) and storage coefficients (deep - 8.8x10-4) from this test are considered representative of "average" aquifer conditions (Table III). The leakage factor from the Well SC10D data was 1.5, which results in a vertical hydraulic conductivity of 38 gpd/ft2.

July 28, 1989. Wells RW6S and RW6D were pumped simultaneously at 100 gpm each (200 gpm total). Although the water level measurements in the observation wells were not used for quantitative analysis due to the simultaneous pumping, graphs of the water levels versus time are shown on Figure 5. Again, the mutual response of the shallow and deep portions of the aquifer are apparent.

July 31, 1989. Wells RW6S and RW6D were pumped at 100 gpm each (200 gpm total). This was the first day that water level measurements could be obtained from the Galena wells. As shown on Figure 6, there is a definite response in the closer Galena wells to pumping of the RW6S/6D well pair. This is of particular importance to the VOC remediation because Galena is considered to be one of the VOC sources. Also, Cr+6 concentrations slightly in excess of 0.05 ppm have been detected during one sampling round of the Galena wells. Therefore, influence of the Galena wells is considered advantageous to complete remediation.

August 3, 1989. Well RIW2 was pumped at 100 gpm, and water levels were measured in: the pumped well; several shallow observation wells (IW1, IW2, SCIS, and SC3S); several deep observation wells (SCID, SC3D, SC5D), and an irrigation well completed in both portions of the aquifer (IW4). Drawdowns versus time in those wells which responded are shown on Figure 7. Recovery was not measured. Due to the low pumping rate relative to the capacity of the aquifer and the relatively short duration of the test (less than 3 hours), apparent responses in Wells SCID, SC3D, SC5D, and IW4 are questionable. The drawdown data from the other wells were analyzed using the Boulton, Hantush, Jacob, and distance-drawdown methods.

From the shallow well data (RIW2, IW1, and IW2), the calculated transmissivities range from 101,500 to 264,000 gpd/ft) and the storage coefficients range from 2.8x10-4 to 2.5x10-3. The delayed yield indices for Wells IW1 and IW2 were 0.6 and 0.4, respectively. Of interest is the apparently "normal" response of Well IW1 which, like Well SCIOS, is located on the opposite side of Hudson Branch from the pumping well. However, stream sampling data (Section 4.2) has indicated that this portion of the stream is a "gaining" stream, i.e. ground water contributes to the stream flow. Therefore, influence of the stream would probably not be evident until very large drawdowns were created underneath the stream.

From the deep well data (SC2D), the calculated transmissivity range from 95,500 to 203,100 gpd/ft and the storage coefficients range from 3.3x10-4 to 8.9x10-3. The leakage factor is 0.4, which results in a vertical hydraulic conductivity of 12 gpd/ft2, assuming the thickness of the clay/sand layer is 40 feet.

3.3 Comparison of Previous and Recent Aquifer Testing Results

The average aquifer characteristics reported in January 1988, which were based on four aquifer tests conducted for SMC and two tests conducted for the Borough of Newfield, were:

Portion of Aquifer	Transmissivity (gpd/ft)	Storage Coefficient (dimensionless)	Vertical Hydraulic Conductivity (gpd/ft2)
Overall	130,000	3.0x10-2	0.06 - 3.0
Deep	74,000	2.0x10-3	

No "shallow" characteristics were reported because none of the tests were conducted using wells completed only in the shallow portion of the Cohansey Sand. For the simulation of the ground water remediation system, described in the January 1988 report, a slightly higher transmissivity of 146,000 gpd/ft was used, and the vertical hydraulic conductivity was assumed to range from 1/10 to 1/2 of the horizontal conductivity. (Use of the higher values represented "worst case" conditions, i.e. higher pumping rates would be required.)

The aquifer characteristics based on the recent aquifer testing are summarized, by well, on Table III, and the averages are:

Portion of Aquifer	Transmissivity (gpd/ft)	Storage Coefficient (dimensionless)	Vertical Hydraulic Conductivity (gpd/ft2)
Shallow	187,500	6.3x10-3	2 - 99
Deep	78,100	9.8x10-3	

These transmissivities are very similar to the previously reported values. The storage coefficients are also within the same orders of maghitude as the previous results. The similarity of the storage coefficient in the shallow and deep portions is probably due to the interconnection between the two portions. The range of the vertical hydraulic conductivity is somewhat greater than previously reported, but it is still less than that used for the mathematical simulation. It should be noted that the reported ranges do not include some of the values from SC6D and SCIOS. As discussed in the previous section, some of the values from SC6D are not considered representative due to the proximity of the wells at the Vineland Car Wash, i.e. Wells SC6S/6D and RW6S/6D.

Overall, the recent aquifer testing results indicate that the aquifer characteristics used for the mathematical simulation of the ground water remediation system are appropriate.

Table I

Well Information
Shieldalloy Metallurgical Corporation
Newfield, New Jersey

Well No. or Name	Permit Number	Date Installed	Elevation (ft,msl)	Hole Diameter (in)	Casing Type / Diameter (in)	Total Depth Drilled	Total Depth Cased	Screened Interval	Condition	Comments
On-Site Monitoring Wells (i.e. on SMC plant property)										
dw1	---	Before 1970	---	-	-	-	-	-	Destroyed	
dw2	51-225	Before 1970	110.52	-	Steel/2	-	94	-	Good	
dw3	---	Before 1970	---	-	-	-	94	-	Destroyed	
dw4	51-226	Before 1970	---	-	Steel/2	-	94	-	Good	
dw6	---	Before 1970	---	-	-	-	-	-	Destroyed	
A	51-142	1970	94.82	J	Steel/2	124	124	114-124	Good	
B	51-143	1970	94.33	J	Steel/2	46	46	36-46	Good	
C	51-144	1970	96.29	J	Steel/2	85	85	75-85	Good	
D	51-145	1970	99.42	J	Steel/2	47	47	37-47	Good	
E	51-146	1970	98.92	J	Steel/2	48	48	38-48	Good	
F	51-147	1971	108.58	J	Steel/2	41	41	31-41	Good	
G1(s)	51-148	1971	104.74	J	Steel/2	49	49	39-49	Good	
G2(d)	51-149	1971	104.59	J	Steel/2	128	128	118-128	Good	
H	51-150	1971	103.02	J	Steel/2	54	54	44-54	Good	
I	51-151	1971	96.09	J	Steel/2	46	46	36-46	Good	
J	---	1971	---	J	Steel/2	46	46	-	Destroyed	
K	51-152	1971	99.18	J	Steel/2	46	46	36-46	Good	
L	51-153	1971	103.51	J	Steel/2	52	52	42-52	Good	
W1	---	1-29-74	98.80	8	PVC/4	160	122	18-23/38-43/58-63/78-83/118-123	Good	To be sealed. Gravel Interval 122-160.
W2	51-218	5-21-74	100.84	8	PVC/4	142	120	65-60/116-120	Good	
W3	---	5-17-74	---	8	PVC/4	142	125	15-20/30-35/120-125	Sealed	Replaced with W3S/W3D.
W3S	31-25760	12-05-85	108.37	8	PVC/4	63	62	42-62	Good	
W3D	31-25759	12-05-85	107.85	8	PVC/4	111	108	88-108	Good	
W4	51-219	5-08-74	104.58	8	PVC/4	162	75	65-75	Good	Cemented from 80-162 feet.
W8	---	10-18-74	97.44	10	PVC/6	140	126	35-45/80-100/118-126	Good	To be sealed. Gravel over entire casing length.
IWC1	51-220	1-74	98.13	J	Steel/2	20	20	15-20	Good	
IWC2	51-221	1-74	98.51	J	Steel/2	40	40	35-40	Good	
IWC3	51-222	1-74	97.33	J	Steel/2	60	60	55-60	Good	
IWC4	51-223	1-74	98.61	J	Steel/2	80	80	75-80	Good	
IWC5	51-224	1-74	98.03	J	Steel/2	100	100	95-100	Good	
SC7S	31-23386-0	7-31-85	107.41	8	PVC/4	31	30	15-30	Good	

See Notes at end of Table I.

Dan Raviv Associates, Inc.
Job No. 83C152

Table I (cont'd)

Well Informati
Shieldalloy Metallurgical Corporation
Newfield, New Jersey

Well No. or Name	Permit Number	Date Installed	Elevation (ft,msl)	Hole Diameter (in)	Casing Type / Diameter (in)	Total Depth Drilled	Total Depth Cased	Screened Interval	Condition	Comments
On-Site Monitoring Wells (cont'd)										
SC8S	31-23367-8	7-31-85	107.66	8	PVC/4	31	30	15-30	Good	
SC9S	31-23368-6	8-01-85	96.23	8	PVC/4	31	30	15-30	Good	
SC11S	31-29139-2	9-01-88	108.33	5	PVC/2	27	27	20-27	Good	
SC12S	31-29140-6	9-02-88	104.76	5	PVC/2	25	25	15-25	Good	
SC13S	31-29570-3	9-09-88	101.41	5	PVC/2	26	24.7	14.7-24.7	Good	

See Notes at end of Table I.

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Job No. 83C152

Table I (cont'd)
Well Information
Shieldalloy Metallurgical Corporation
Newfield, New Jersey

Well No. or Name	Permit Number	Date Installed	Elevation (ft,msl)	Hole Diameter (in)	Casing Type / Diameter (in)	Depth Drilled	Depth Cased	Screened Interval	Condition	Comments
Off-Site Monitoring Wells										
W5	---	5-30-74	---	8	PVC/4	142	95	75-95	Sealed	Sealed w/ NJDEP approval in 1970's.
W6	---	6-13-74	---	8	PVC/4	182	120	15-20/35-40/ 55-60/75-80/ 95-100/115-120	Sealed	Sealed w/ NJDEP approval in 1970's.
W7	---	10-08-74	---	8	PVC/4	122	100	20-25/95-100	Unknown	Has not been found, possibly sealed.
SC1S	31-28825-1	6-22-88	87.26	8	PVC/4	80	55	35-55	Good	
SC1D	31-21619-6	5-30-84	90.90	5	PVC/2	125	115	85-95/100-115	Good	
SC2D	31-31620-0	6-01-84	90.62	5	PVC/2	115	115	65-85/95-115	Good	
SC3S	31-28914-2	6-08-88	90.32	8	PVC/4	65	55	35-55	Good	
SC3D	31-21621-8	6-06-84	88.90	5	PVC/2	121	108	78-88/98-108	Good	
SC4S	31-21689-7	6-07-84	93.65	5	PVC/2	45	45	35-45	Good	Permission withdrawn for sampling.
SC4D	31-21690-1	6-08-84	92.64	5	PVC/2	120	120	110-120	Good	Permission withdrawn for sampling.
SC5D	31-21876-8	6-12-84	97.00	5	PVC/2	120	120	90-120	Good	
SC6S	31-21691-5	6-21-84	94.62	5	PVC/2	80	75	45-75	Good	
SC6D	31-21878-4	6-26-84	94.38	12	PVC/6	95	95	Blank Casing	Good	
				5	PVC/2	125	125	110-120		
SC10S	31-23369	11-11-85	95.38	8	PVC/4	60	55	35-55	Good	
SC10D	31-23370	11-12-85	95.72	8	PVC/4	127	125	105-125	Good	
IW2	31-23369	11-12-85	92.18	8	PVC/6	70	70	40-70	Good	Originally private well.
IW4	31-21877	6-19-84	96.94	10	PVC/6	40	40	Blank Casing	Good	Originally private well.
				6	PVC/5	130	120	40-65/105-130		
SMC House	---	---	---	-	-	-	-	-	--	

See Notes at end of Table I.

Dan Raviv Associates, Inc.
Job No. 83C152

Table I (cont'd)
Well Information
Shieldalloy Metaliurgical Corporati
Newfield, New Jersey

Well No. or Name	Permit Number	Date Installed	Elevation (ft,msl)	Hole Diameter (in)	Casing Type / Diameter (in)	Depth Drilled	Depth Cased	Screened Interval	Condition	Comments
Recovery Wells										
Layne	61-154	1971	94.11	8	Steel/6	170	47	42-47	Good	Gravel Interval 54-106.
W9	31-19648	10-17-82	94.43	12	PVC/6	140	130	110-130	Good	
RW6S	31-28710	6-16-88	92.70	14	PVC/8	80	75	55-75	Good	
RW6D	31-28711	8-05-88	93.08	14	PVC/8	127	125	90-125	Good	
RIW2	31-28712	8-02-88	91.52	14	PVC/8	60	75	30-55	Good	
Private Wells (Note: Only wells specifically discussed in this report are listed here. Information on other private wells provided in Weston February 1972 report and DRAI October 1984 report.)										
Molvin-Shallow	--	--	--	--	--	--		--	Good	Not used.
-Deep	--	--	--	--	--	--	100	--	Good	Used for domestic supply.
Zip's Garage	--	--	102.81	--	Steel/4	--	80	--	Good	Not used.
Merlie-Shallow	--	--	--	--	--	--		--	Good	Not uaed. Information from Mr. Merlie.
-Deep	--	--	--	--	Steel/2	--	70	64-70	Good	Shallow well installed when house built, deep well installed 1955-1965.
IW1	--	4-05-83	90.33	--	PVC/6	--	62	32-62(?)	Good	Used occasionally for irrigation.
IW3	--	--	91.05	--	Steel/4	--	60	--	Good	Not used.
Andrews										
AMW#1	31-28083-8		104.65	--	--	--	--	--	Good	
AMW#2	31-28084-6		99.40	--	--	--	--	--	Good	
AMW#3	31-28085-4		103.75	--	--	--	--	--	Good	
AMW#4	31-28086-2		96.47	--	--	--	--	--	Good	
AMW#5	31-28087-1		97.07	--	--	--	--	--	Good	
AMW#6			103.03	--	--	--	--	--	Good	
Galena										
GMW#1	31-27957-1		96.42	--	--	--	--	--	Good	
GMW#2	31-27953-8		94.73	--	--	--	--	--	Good	
OMW#3	31-27954-6		94.23	--	--	--	--	--	Good	
OMW#4	31-27950-2		94.24	--	--	--	--	--	Good	
GMW#5	--		--	--	--	--	--	--	Destroyed	

Notes: (1) Elevations from survey performed by Albert A. Frelinger, Jr., P.A., in August 1989, except fpr Zip's well which was from survey performed by Jack C. Hann in July 1984.
(2) J indicates well was installed using jetting technique.
(3) Dashes indicate information not available.

Dan Raviv Associates, Inc.
Job No. 83C152

Table II

Aquifer Testing Chronology
Shieldalloy Metallurgical Corporation
Newfield, New Jersey

July 25, 1989

Well No.	On	Off	Pumping Rate (GPM)
W9	11:58	13:30:30	50
	14:30	18:23	

July 27, 1989

Layne	12:13	18:30	50
W9	14:51	13:30	50
RW6S	16:46	19:00	100

July 28, 1989

W9	10:07:30	10:45	50
Layne	10:09	10:45	50
RW6S	10:43	10:45	100
W9	10:58	14:07	50
Layne	10:58	14:07	50
RW6S	10:58	14:07	100
RW6D	13:00	14:07	100
W9	16:02	16:45	50
Layne	16:10	16:45	50
RW6S	16:35	16:45	100
RW6D	16:40	16:45	100

July 31, 1989

W9	14:40	17:20	50
Layne	14:45	17:20	50
RW6S	15:15	17:20	100
RW6D	15:20	17:20	100
RIW2	17:17	17:20	100

August 1, 1989

Remediation system was never brought on-line.

August 2, 1989

Remediation system was never brought on-line.

August 3, 1989

RIW2	14:03	16:45	94

Table III
Summary of Calculated Aquifer Ch eristics
1988-1989 Testing
Shieldalloy Metallurgical Corporation - Newfield, New Jersey

Date	Pumping Well(s)	Pumping Rate (gpm)	Obsv. Well(s)	Distance to Pumped Well (feet)	Drawdown: Theis, Hantush or Boulton T (gpd/ft)	S (---)	r/B or r/D (---)	p' (gpd/ft2)	Drawdown: Jacob T (gpd/ft)	S (---)	Drawdown: Distance T (gpd/ft)	S (---)	Becovery: Jacob T (gpd/ft)
8/15/88	RW6S	218			--	--	--	--	--	--	--	--	--
			SC6S	5	--	--	--	--	575,500	--	--	--	230,200
8/16/88	RW6D				--	--	--	--	--	--	--	--	--
		309 (1st run)	SC6D	10	26,200	5.6x10-2	0.075	235	96,000	8.0x10-4	--	--	52,600
		298 (2nd run)	SC6D	10	28,500	3.0x10-3	0.05	114	87,400	--	--	--	52,500
8/17/88	RIW2				--	--	--	--	--	--	--	--	--
		262 (1st run)	IW2	110	103,500	4.6x10-4	1.0	--	125,800	2.1x10-4	--	--	111,600
		273 (2nd run)	SC3S	269	120,300	1.2x10-3	--	--	144,100	6.0x10-4	--	--	103,000
7/26/89	W9	50	--	--	--	--	--	--	26,400	--	--	--	10,400
		50	--	--	--	--	--	--	26,400	--	--	--	10,700
		50	--	--	--	--	--	--	33,000	--	--	--	--
7/27/89	Layne	50			--	--	--	--	440,000	--	37,700	3.8x10-2	--
			B	103	79,600	4.0x10-4	0.2	2	264,000	5.2x10-6	--	--	--
			C	102	57,300	5.9x10-3	0.8	99	220,000	2.4x10-2	--	--	--
			E	191	--	--	--	--	220,000	1.2x10-4	--	--	--
			I	28	30,200	2.0x10-3	0.3	21	220,000	--	--	--	--
			K	168	--	--	--	--	330,000	9.8x10-3	--	--	--
			SC9S	96	24,900	2.3x10-3	1.0	32	440,000	--	--	--	--
7/27/89	RW6S	100			--	--	--	--	--	--	--	--	--
			SC6S	5	--	--	--	--	220,000	--	--	--	--
			SC6D	10	76,400	4.5x10-1	0.6	11,000	203,100	4.2x10-1	--	--	--
			SC10S	291	--	--	--	--	713,500	1.7x10-6	--	--	--
			SC10D	305	39,500	1.7x10-3	1.5	38	330,000	8.8x10-4	--	--	--
8/3/89	RIW2	100			--	--	--	--	132,000	--	101,500(S)	2.5x10-2(S)	--
					--	--	--	--	--	--	132,000(D)	6.8x10-3(D)	--
			IW1	279	176,300	2.5x10-3	0.6	--	264,000	7.0x10-4	--	--	--
			1W2	110	127,300	5.8x10-4	0.4	--	165,000	2.8x10-4	--	--	--
			SC2D	227	95,500	8.9x10-3	0.4	12	203,100	3.3x10-4	--	--	--

Averages: T - 206,400 gpd/ft (Shallow) 85,500 gpd/ft (Deep).
S - 6.0x10-3 (Shallow) 1.0x10-1 (Deep) (3.7x10-3 without SC6D].

Notes: (1) Well locations are shown on Figure 1.
(2) See Appendices C and D for tables of water level measurements during testing and graphical analyses.
(3) Dashes indicate method not applicable to data or data indicates very little or erratic change in drawdown.
(4) Wells 1W2 and 1W4 are no longer considered private wells because the property was purchased by SMC.
(5) Values from Wells W9, SC2D, SC6D, and SC10D used for "deep" average, all others used for "shallow".

Dan Raviv Associates, Inc.
Job No. 83C152

Table VII

Summary of Analytical Results - Radiological Parameters
Quarterly Sampling of "Slag Area" Wells
Shieldalloy Metallurgical Corporation
Newfield, New Jersey

Well No.	W3S - Background							
Date Sampled	12/17/88				4/25/89			
DRAI Sample Number	W3S-F	W3S-U			W3S-F	W3S-U		W3S-P
Laboratory	MT	MT	MT	SHC	MT	MT	SMC	MT
Laboratory Number	24056	24057	24058	--	28500	28S01		28501
RADIOLOGICAL PARAMETERS (pCi/L)								
Gross Alpha	<5	<5	--	--	3.7 +/- 1.1	4.4 +/- 1.2	--	<1
Gross Beta	<6	<6	--	--	6.9 +/- 1.8	7.6 +/- 1.9	--	<3
Total Uranium	<1	<1	--	--	--	--	--	--
Thorium 230	<1	<1	--	--	--	--	--	--
Thorium 232	<1	<1	--	--	--	--	--	--
INORGANIC PARAMETERS (ppm)								
pH	--	--	--	5.48	--	--	4.79	--
Total Chromium	--	--	0.011	<0.05	--	--	<0.05	--
Hexavalent Chromium	--	--	0.016	<0.05	--	--	<0.05	--
Sodium	--	--	7.4	<10	--	--	<10	--
Sulfate	--	--	5.3	12	--	--	<10	--

See Notes at end of Table VII.

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Table VII (cont'd)

Sumnary of Analytical Results - Radiological Parameters
Quarterly Sampling of "Slag Area" Wells
Shieldalloy Metallurgical Corporation
Newfield, New Jersey

Well No.	W3S - Background (cont'd)					
Date Sampled	8/1/89			9/28/89		
DRAI Sample Number	W3S-F	W3W-U	W3S-P1	W3S-F	W3S-U	W3S-P
Laboratory	Teledyne	Teledyne	Teledyne	Teledyne	Teledyne	Teledyne
Laboratory Number	74125	74126	74127	79770	79771	79772
RADIOLOGICAL PARAMETERS (pCi/L)						
Gross Alpha	<2.0	1.2 +/ -0.8	<0.4	<2.0	<2.0	<0.4
Gross Beta	6.6 +/- 1.7	7.5 +/ -1.8	<0.8	6.2 +/- 3.3	7.6 +/- 3.4	<0.7
Total Uranium	--	--	--	--	--	--
Thorium 230	--	--	--	--	--	--
Thorium 232	--	--	--	--	--	--
INORGANIC PARAMETERS (ppm)						
pH	--	--	--	--	--	--
Total Chromium	--	--	--	--	--	--
Hexavalent Chromium	--	--	--	--	--	--
Sodium	--	--	--	--	--	--
Sulfate	--	--	--	--	--	--

Sec Notes at end of Table VII.

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Table VII (cont'd)

Summary of Analytical Results - Radiological Parameters
Quarterly Sampling of "Slag Area" Wells
Shieldalloy Metallurgical Corporation
Newfield, New Jersey

Well No.	W2						
Date Sampled	12/17/88				4/25/89		
DRAI Sample Number	W2-F	W2-U			W2-F	W2-U	
Laboratory	MT	MT	MT	SMC	MT	MT	SMC
Laboratory Number	24069	24070	24071	--	28S09	28510	--
RADIOLOGICAL PARAMETERS (pCi/L)							
Gross Alpha	<2	<2	--	--	1 (<1)	1.9 +/- 1.0	--
Gross Beta	40 +/- 4	39 +/- 4	--	--	12 +/- 2 (14 +/- 2)	14 +/- 2	--
Total Uranium	--	--	--	--	--	--	--
Thorium 230	--	--	--	--	--	--	--
Thorium 232	--	--	--	--	--	--	--
INORGANIC PARAMETERS (ppm)							
pH	--	--	--	6.34	--	--	6.09
Total Chromium	--	--	0.010	<0.05	--	--	<0.05
Hexavalent Chromium	--	--	<6	<0.05	--	--	<0.05
Sodium	--	--	120	124	--	--	46
Sulfate	--	--	220	253	--	--	90

See Notes at end of Table VII.

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Table VII (cont'd)

Summary of Analytical Results - Radiological Parameters
Quarterly Sampling of "Slag Area" Wells
Shieldalloy Metallurgical Corporation
Newfield, New Jersey

Well No.	W2 (cont'd)					
Date Sampled	8/1/89			9/28/89		
DRAI Sample Number	W2-F	W2-U	W2-P	W2-F	W2-U	W2-P2
Laboratory	Teledyne	Teledyne	Teledyne	Teledyne	Teledyne	Teledyne
Laboratory Number	74132	74133	74134	79767	79768	79769
RADIOLOGICAL PARAMETERS (pCi/L)						
Gross Alpha	<3.0	<4.0	<0.4	<2.0	<2.0	<0.4
Gross Beta	20 +/- 0.4	24 +/- 0.6	<0.8	14 +/- 0.4	12 +/- 0.4	<0.7
Total Uranium	--	--	--	--	--	--
Thorium 230	--	--	--	--	--	--
Thorium 232	--	--	--	--	--	--
INORGANIC PARAMETERS (ppm)						
pH	--	--	--	--	--	--
Total Chromium	--	--	--	--	--	--
Hexavalent Chromium	--	--	--	--	--	--
Sodium	--	--	--	--	--	--
Sulfate	--	--	--	--	--	--

See Notes at end of Table VII.

Table VII (cont'd)

Summary of Analytical Results - Radiological Parameters
Quarterly Sampling of "Slag Area" Wells
Shieldalloy Metallurgical Corporation
Newfield, New Jersey

Well No.	SC11S										
Date Sampled	12/17/88				4/26/89			8/1/89			
DR\I Sample Number	SC11-F	SCI1-U			SC11-F		SCI1-U	SC11S-F	SC11S-U	SC11S-P1	SC11S-P2
laboratory	MT	MT	MT	SMC	MT	MI	SMC	Teledyne	Teledyne	Teledyne	Teledyne
Laboratory Number	24059	24060	24061	--	28502	28503	--	74121	74122	74123	74124
RADIOLOGICAL PARAMETERS (pCi/L)											
Gross Alpha	<2	4.0 +/- 2.6	--	--	<1	5.5 +/- 1.3	--	<5.0	5.4 +/- 3.7	<0.5	<0.4
Gross Beta	3.8 +/- 2.0	28 +/- 8	--	--	<3	75. +/- 1.9	--	<8.0	16.0 +/- 0.7	<0.7	<0.8
Total Uranium	<1	3.9 +/- 1.0	--	--	--	--	--	--	--	--	--
Uranium 234	--	--	--	--	--	2.6 +/- 1.1	--	--	0.33 +/- 1.8	--	--
Uranium 235	--	--	--	--	--	<1	--	--	<0.1	--	--
Uranium 238	--	--	--	--	--	2.8 +/- 1.1	--	--	0.33 +/- 2.0	--	--
Throlum 228	--	--	--	--	--	<1	--	--	<10.0	--	--
Thorium 230	<1	<1	--	--	--	--	--	--	--	--	--
Thorium 232	<1	<1	--	--	--	<1	--	--	<3.0	--	--
Radium 226	--	--	--	--	--	1.2 +/- 0.2	--	--	1.4 +/- 0.8	--	--
INORGANIC PARAMETERS (ppm)											
pH	--	--	--	6.52	--	--	6.62	--	--	--	--
Total Chromium	--	--	0.070	0.24	--	--	0.41	--	--	--	--
Hexavalent Chromium	--	--	0.058	0.24	--	--	<0.05	--	--	--	--
Sodium	--	--	12	16	--	--	13	--	--	--	--
Sulfate	--	--	60	81	--	--	42	--	--	--	--

See Notes at end of Table VII.

Table VII (cont'd)

Summary of Analytical Results - Radiological Parameters
Quarterly Sampling of "Slag Area" Wells
Shieldalloy Metallurgical Corporation
Newfield, New Jersey

Well No.	SC12S								
Date Sampled	10/26/88	12/17/88				4/25/89			
DRAI Sample Number	SC12-U	SC12-F	SC12-UA(B)			SC12-F	SC12-U		SC12-P
Laboratory	AKEM (NUS)		MT	MT	SMC	MT	MT	SMC	MT
Laborntory Number	P0103719	24062	24063 (4)	24065	--	28504	28505	--	28505
RADIOLOGICAL PARAMETERS (pCi/L)									
Gross Alpha	5.0 +/- 3.1	4.5 +/- 2.0	<3 (<3)	--	--	1.0 +/- 1.6	4.4 +/- 1.4	--	<2
Gross Beta	83 +/- 9	59 +/- 6	100 +/- 10 (130 +/- 20)	--	--	71 +/- 8	38 +/- 4	--	<3
Total Uranium	--	<1	<2 (<2)	--	--	--	--	--	--
Thorium 230	--	<1	<1 (2.8 +/- 0.6)	--	--	--	--	--	--
Thorium 232	--	<1	<1 (<1)	--	--	--	--	--	--
INORGANIC PARAMETERS (ppm)									
pH	--	--	--	--	7.55	--	--	6.98	--
Total Chromium	--	--	--	1.30	0.76	--	--	0.84	--
Hexavalent Chromium	--	--	--	0.78	0.59	--	--	<0.05	--
Sodium	--	--	--	200	229	--	--	182	--
Sulfate	--	--	--	46	81	--	--	79	--

See Notes at end of Table VII.

Table VII (cont'd)

Summary of Analytical Results - Radiological Parameters
Quarterly Sampling of "Slag Area" Wells
Shieldalloy Metallurgical Corporation
Newfield, New Jersey

Well No.	SC12S (cont'd)						
Date Sampled	8/1/89				9/28/89		
DRAI Sample Number	SC12-F	SC12-U	SC12-P1	SC12-P2	SC12-F	SC12-U	SC12-P2
Laboratory	Teledyne	Teledyne	Teledyne	Teledyne	Teledyne	Teledyne	Teledyne
Laboratory Number	74128	74129	74130	74131	79773	79774	79775
RADIOLOGICAL PARAMETERS (pCi/L)							
Gross Alpha	<5.0	<9.0	<0.5	<0.4	<9.0	<9.0	<0.4
Gross Beta	39 +/- 0.9	73 +/- 1.7	<0.7	<0.8	59 +/- 1.5	70 +/- 1.5	<0.7
Total Uranium	--	--	--	--	--	--	--
Thorium 230	--	--	--	--	--	--	--
Thorium 232	--	--	--	--	--	--	--
INORGANIC PARAMETERS (ppm)							
pH	--	--	--	--	--	--	--
Total Chromium	--	--	--	--	--	--	--
Hexavalent Chromium	--	--	--	--	--	--	--
Sodium	--	--	--	--	--	--	--
Sulfate	--	--	--	--	--	--	--

See Notes at end of Table VII.

Table VII (cont'd)

Summary of Analytical Results - Radiological Paraaeters
Quarterly Sampling of "Slag Area" Wells
Shieldalloy Metallurgical Corparaticn
Newfield, New Jersey

Well No.	SC13S								
Date Sampled	10/26/88	12/17/88				4/25/89			
DRAI Sample Number	SC13-U	SC13-F	SC13-U			S0-13F			SC-13U
Laboratory	AKEM (NUS)	MT	MT	MT	SMC	MT		MT	SNC
Laboratory Number	P0102740	24066	24067	24068	—	28506 [28508]		28507	—
RADIOLOGICAL PARAMETERS (pCi/L)									
Gross Alpha	7.1 +/- 3.4	<2	<2	—	—	10 +/- 2	[7.2 +/- 1.8]	<2	—
Gross Beta	19 +/- 4	12 +/- 3	14 +/- 3	—	—	25 +/- 3	(31 +/- 4]	18 +/- 2	—
Total Uranium	—	<2	2.1 +/- 1.0	—	—	—	[—]	—	—
Uranium 234	—	—	—	—	—	6.5 +/- 1.4	(4.4 +/- 1.0]	—	—
(Laboratory Duplicate)	—	—	—	—	—	—	[(4.3 +/- 1.0)]	—	—
Uranium 235	—	—	—	—	—	<1	[<1 (<1)]	—	—
Uranium 238	—	—	—	—	—	5.6 +/- 1.2	(6.1 +/- 1.1)	—	—
(Laboratory Duplicate)	—	—	—	—	—	—	((6.6 +/- 1.1)]	—	—
Thorium 228	—	—	—	—	—	<1	[<1 (<1)]	—	—
Thorium 230	—	<1	<1	—	—	—	(—]	—	—
Thorium 232	—	<1	<1	—	—	<1	(<1 (2.1 +/- 0.4)]	—	—
Radium 226	—	—	—	—	—	<1	[1.0 +/- 0.1]	—	—
INORGANIC PARAMETERS (ppm)									
pH	—	—	—	—	6.S6	—	[—]	—	6.47
Total Chromium	—	—	—	0.076	0:16	—	[—]	—	<0.05
Hexavalent Chronium	—	—	—	0.095	0.16	—	[—]	—	<0.05
Sodium	—	—	—	190	286	—	[—]	—	186
Sulfate	—	—	—	310	409	—	[—]	—	259

See Notes at end of Table VII.

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Job No. 83C1S2

Table VII (cont'd)

Summary of Analytical Results - Radiological Paraaeters
Quarterly Sampling of "Slag Area" Wells
Shieldalloy Metallurgical Corporation
Newfield, New Jersey

Well No.	SC13S(cont'd)							
Date Sampled	8/1/89					9/28/89		
DRAI Sample Number	SC13-U	SC13-F	SC13-PI	SC13-P2	SC13-F	SC13-U	SC13-P1	SC13-P2
Laboratory	Teledyne	Teledyne	Teledyne	Teledyne	Teledyne	Teledyne	Teledyne	Teledyne
Laboratory Number	74135	74136	74137	74138	79779	79780	79781	79766
RADIOLOGICAL PARAMETERS (pCi/L)								
Gross Alpha	<20.0	<1.0	<0.5	<0.4	<10.0	<10.0	<0.6	<0.4
Gross Beta	<40.0	30 +/- 1.4	<0.7	<0.6	<20.0	<20.0	0.86 +/- 5.3	<0.7
Total Uranium	--	--	--	--	--	--	--	--
Uranium 234	--	--	--	--	--	--	--	--
(Laboratory Duplicate)	--	--	--	--	--	--	--	--
Uranium 235	--	--	--	--	--	--	--	--
Uranium 238	--	--	--	--	--	--	--	--
(Laboratory Duplicate)	--	--	--	--	--	--	--	--
Thorium 228	--	--	--	--	--	--	--	--
Thorium 230	--	--	--	--	--	--	--	--
Thorium 232	--	--	--	--	--	--	--	--
Radium 226	--	--	--	--	--	--	--	--
INORGANIC PARAMETERS (ppm)								
pH	--	--	--	--	--	--	--	--
Total Chromium	--	--	--	--	--	--	--	--
Hexavalent Chromium	--	--	--	--	--	--	--	--
Sodium	--	--	--	--	--	--	--	--
Sulfate	--	--	--	--	--	--	--	--

See Notes at end of Table VII.

Table VII (cont'd)

Summary of Analytical Results - Radiological Parameters
Quarterly Sampling of "Slag Area" Wells
Shieldalloy Metallurgical Corporation
Newfield, New Jersey

Well No.	A						
Date Sampled	12/17/88				4/25/89		
DRAI Sample Number	A-F	A-U			A-F	A-U	
Laboratory	MT	MT	MT	SMC	MT	MT	SMC
Laboratory Number	24072	24073	24074	--	28511	28512	--
RADIOLOGICAL PARAMETERS (pCi/L)							
Gross Alpha	<2	<2	--	--	<2	<2	--
Gross Beta	4.7 +/- 2.2	9.1 +/- 2.4	--	--	<3	3.2 +/- 1.7	--
Total Uranium	--	--	--	--	--	--	--
Thorium 230	--	--	--	--	--	--	--
Thorium 232	--	--	--	--	--	--	--
INORGANIC PARAMETERS (ppm)							
pH	--	--	--	10.70	--	--	10.32
Total Chromium	--	--	29.0	32.47	--	--	35.36
Hexavalent Chromium	--	--	23.3	32.36	--	--	37.26
Sodium	--	--	160	180	--	--	153
Sulfate	--	--	49	82	--	--	57

See Notes at end of Table VII.

Table VII (cont'd)

Summary of Analytical Results - Radiological Parameters
Quarterly Sampling of "Slag Area" Wells
Shieldalloy Metallurgical Corporation
Newfield, New Jersey

Well No.	A (cont'd)						
Date Sampled	8/1/89				9/28/89		
DRAI Sample Number	A-F	A-U	A-P1	A-P2	A-F	A-U	A-P2
Laboratory	Teledyne	Teledyne	Teledyne	Teledyne	Teledyne	Teledyne	Teledyne
Laboratory Number	74140	74139	74141	74142	79778	79778	79778
RADIOLOGICAL PARAMETERS (pCi/L)							
Gross Alpha	<4.0	<5.0	<0.5	<0.4	<3.0	<3.0	<0.4
Gross Beta	<5.0	<6.0	<0.7	<0.8	<5.0	<5.0	<0.7
Total Uranium	--	--	--	--	--	--	--
Thorium 230	--	--	--	--	--	--	--
Thorium 232	--	--	--	--	--	--	--
INORGANIC PARAMETERS (ppm)							
pH	--	--	--	--	--	--	--
Total Chromium	--	--	--	--	--	--	--
Hexavalent Chromium	--	--	--	--	--	--	--
Sodium	--	--	--	--	--	--	--
Sulfate	--	--	--	--	--	--	--

Notes: (1) Sample locations shown on Figure 1. Well SC12S (or SC12) was inadvertently listed on the 10/88 forms as SC13.
(2) Samples collected by DRAI.
MT = MetaTRACE, Ino. of Earth City, Missouri.
AKEM = AnalytiKEM, Ino. (subcontracted to NUS Corp. of Pittsburgh, Pennsylvania.
SMC = SMC Laboratory in Newfield, New Jersey.
Teledyne = Teledyne Isotopes of Westwood, New Jersey.
(3) "F" notation signifies filtered sample.
(4) "U" notation signifies unfiltered sample.
(5) "P" notation signifies filter paper sample.
(6) Less than (<) indicates compound nbt detected above the listed minimum detection limit.
(7) Dashes (--) indicate analysis not requested.
(8) Field duplicates are in brackets.
(9) Well SC11S was sampled in October 1988 for radiological analyses, but the sample bottle was broken in transit.

Dan Raviv Associates, Inc.
Job No. 83C152

Pumping Test Analysis – July 1994

From:

Preliminary Report
Ground Water Contamination Study
Phase II

Woodward-Moorhouse and Associates, Inc.
September 1974

APPENDIX J
IWC Pumping Test, 29-31 July 1974

Section J.1 Basic Theory of Pumping Test Analysis

Section J.2 Analyses of IWC Pumping Test

Section J.3 References

FROM:

"PRELIMINARY REPORT
Groundwater Contamination Study
Phase II"

12 September 1974

WOODWARD-MOORHOUSE & ASSOCIATES, INC.

J.1 Basic Theory of Pumping Test Analysis

J.1.1 Theis Formula. Theis (1935) developed a formula for describing the nonsteady drawdown distribution in the vicinity of a pumping well. Several assumptions are necessary for application of the Theis formula:

- The aquifer is homogeneous, isotropic, of uniform thickness, and effectively infinite in areal extent.
- The initial piezometric surface or water table is nearly horizontal.
- The discharge rate is constant and the pumped well is open throughout the entire thickness of the aquifer.
- The diameter of the pumped well is negligible compared with the overall dimensions of the aquifer.

Under these assumptions, the drawdown distribution is given by

$$s = (114.6\ Q/T)\ W(u), \qquad (1)$$

where

$$u = 2693\ r^2\ S/Tt, \qquad (2)$$

with

s = drawdown at time t and radial distance r from the pumped well, ft.

Q = (constant) well discharge, gpm

T = transmissivity of the aquifer, gpd/ft

r = radial distance from the pumped well to a point of drawdown observation, ft.

S = storage coefficient of the aquifer, nondimensional

t = elapsed time since pumping started, min

$W(u)$, termed the "nonleaky well function", is the negative of the exponential integral of $-u$.

The Theis formula can be applied to pumping test analysis by plotting u vs. $W(u)$ and t vs. s on full-logarithmic graphs of the same scale. The graphs are then overlain and values of u, $W(u)$, t, and s at a convenient match point are substituted into the following formulas:

$$T = 114.6\ Q\ W(u)/s \qquad (3)$$

$$S = Tut/(2693\ r^2) \qquad (4)$$

J.1.2 Jacob Method of Analysis. Jacob (Cooper and Jacob, 1946) noted that for small values of u, ($u \leq 0.01$),

$$W(u) \simeq -0.5772 - \ln u$$

and

$$s \approx -(114.6\ Q/T)\ (0.5772 + \ln u) \qquad (5)$$

From equations (1) and (2), it is seen that s is proportional to ln(t) for constant r. Thus a semi-logarithmic plot of s vs. t, with t plotted on the logarithmic axis, should give a straight line. The aquifer parameters can be determined from the slope of the straight line and the intercept of the extrapolated line with the zero-drawdown axis by applying the following formulas:

$$T = 264Q/\Delta s \qquad (6)$$

$$S = Tt_o/4790r^2 \qquad (7)$$

where, in addition to the parameters defined above,

Δs = drawdown difference per log cycle, ft.

t_o = intercept of extrapolated straight line with zero-drawdown axis, min.

J.1.3 Recovery Analysis. When pumping of the well is terminated, the water level in the well will recover toward its initial value. For small u, the residual drawdown, s', can be expressed as:

$$s' = (264Q/T) \log (t/t'), \qquad (8)$$

where

t = time since pumping started

t' = time since pumping stopped

T can thus be determined from the slope of a semi-logarithmic plot of s' versus t/t'.

J.1.4 Partial Penetration of Pumping Well. The above theories are based in part on the assumption that the pumping well completely penetrates the saturated thickness of the aquifer, so that flow is purely horizontal. If the well only partially pene-

trates the aquifer, vertical flow components can be significant within a distance of (1.5)b from the well, where b is the saturated thickness. In such a case, the observed drawdown measurements should be corrected for the effects of partial penetration before the above analyses are applied.

If the pumped well and observation well are open at approximately the same elevation, the following formula can be applied:

$$s = C_{po}\, s_{pp} \qquad (9)$$

If the pumped well penetrates the top of the aquifer and the observation well the bottom, or vice versa, the following equation can be used:

$$S = [C_{po}/(2C_{po} - 1)]\, s_{pp} \qquad (10)$$

For measurements of drawdown in the pumping well, the following formula can be applied:

$$s = C_{pp}\, s_{pp} \qquad (11)$$

In the above formulas,

s_{pp} = observed drawdown under partially-penetrating conditions

s = equivalent drawdown for fully-penetrating conditions

C_{po} = partial penetration constant for observation well, fraction

C_{pp} = partial penetration constant for pumping well, fraction

Tables of C_{po} and C_{pp} are readily available (Butler, 1957; Walton, 1962) and will not be reproduced here.

A type curve method of solving for T and S can be developed from the solution obtained by Hantush (1961) for flow to partially-penetrating wells. For a relatively long period of time, such that $t > b^2S/2T$, the drawdown in an observation well is given by,

$$s = (I14.6\ Q/T)\ [W(u) + \bar{f}_s\ (r/b,\ l/b,\ d/b,\ I'/b,\ d'/b)], \qquad (12)$$

where, in addition to the parameters defined previously, we have

b = saturated thickness of aquifer, ft.

l = depth to bottom of screen in pumped well, ft.

d = depth to top of screen in pumped well, ft.

l'= depth to bottom of screen in observation well, ft.

d'= depth to top of screen in observation well, ft.

$\bar{f}_s$ is an infinite series involving Bessel and trigonometric functions, and can be readily evaluated. $\bar{f}_s$ is independent of time, and thus is a constant for a given observation well.

Equation (12) can be used to construct a full-logarithmic type curve of u vs. $w(u)+\bar{f}_s$, which can be overlain on a full-logarithmic plot of t vs. s to obtain a match point, from which values of T and S can be obtained as discussed in Section J.1.1.

J.1.5 Analysis of Leaky Aquifers. The above formulas are based in part on the assumption that the aquifer is confined above and below by impermeable strata. This is rarely the case in practice, and the aquifer is usually subject to "leakage" through the confining layers. Hantush (Hantush and Jacob, 1955) obtained the drawdown distribution in the vicinity of a well pumping from a leaky aquifer:

$$s = (114.6Q/T)\ W(u,r/B), \qquad (13)$$

where, in addition to the parameters defined previously,

$r/B = r/\sqrt{T/(K'/b')}$

K' = vertical hydraulic conductivity of confining bed, gpd/ft^2

b' = thickness of confining bed, ft.

W(u,r/B), the "leaky well function," can be expressed as an infinite series similar to W(u). Equation (13) can be used to define type curves and applied to the calculation of T and S by overlaying full-logarithmic plots of the type curve and the measured field data, as discussed previously.

J.2 Analyses of IWC Pumping Test

J.2.1 Applicable Test Data. A pumpihg test was conducted at the IWC during 29-31 July 1974. Well W1-P4 (P4) was pumped for 24 hours at an average discharge rate of 31.5 gpm, and water levels were periodically measured in wells W1, W1-P1 (P1), W1-P2 (P2),

W1-P3 (P3), and W1-P5 (P5). Pumping was then terminated, and the recoyery of the water level in P4 was monitored for 6 hours.

The only data which proved to be sufficient for quantitative analysis were the drawdown data from well P1, and the recovery data from well P4. The data were analyzed under a variety of assumptions regarding the nature of the aquifer:

- The aquifer was treated as being confined. This is reasonable since the maximum observed drawdown during the 24-hour pumping test (0.44 foot in well P5) was very small compared with the total thickness of the aquifer (120 feet).

- Partial penetration corrections were applied. Although hydrochemical evidence indicates stratification of the aquifer, vertical permeabilities may be high enough that partial-penetration effects are significant. A match of observed data with the partial-penetration type curve was also made.

- If the stratification of the aquifer is significant enough, the aquifer may behave as if fully-penetrated but leaky. Thus, the observed data were also matched with the leaky artesian type curve.

J.2.2 Analyses. The results of the various analyses are summarized in Table J.1, and discussed below.

The recovery data from well P4 were analyzed by the Jacob method, equation (8). No corrections were applied to the data. This analysis does not allow an estimate of the storage coefficient S.

The drawdown data from well P1 were analyzed by the Jacob method, equations (5) and (6), both with and without correcting the data for partial penetration. The analysis based on the approximate partial penetration correction, equation (10), is not very reliable. The published tables of values of C_{po} have entries for a minimum fractional penetration of 0.3, and a minimum distance to the observation well of (0.3)b. In the present case, the fractional penetration is 5/120 = 0.04 and the distance to the observation well is (0.125)b, so a double extrapolation must be made in

order to estimate C_{po}.

The drawdown data from well P1 were also analyzed by the Hantush leaky aquifer type curve method, equation (13), as well as the Hantush partial-penetration type curve method, equation (12).

J.2.3 Discussion of Analyses. The results shown in Table J.1 indicate reasonable agreement among values of transmissivity determined by the various methods of analysis. Furthermore, these values are of the same order of magnitude as the average of values of T reported by Weston from tests on the Layne well (70,000 gpd/ft). A value of T = 100,000 gpd/ft will be used in analyses leading to the design and operation of the contaminant-withdrawal system.

The calculated values of the storage coefficient show an extremely wide variation, from $9X10^{-7}$ to 0.0205. In general, calculations of S from analyses of pumping test data show a similar lack of consistency. The problem is magnified in the present case by the fact that different assumptions as to the nature of the aquifer were made for the different analyses. In future work, a value of S = 0.005 will be used. This value is consistent with the results of two of the present analyses, as well as with the values determined by Weston for the Layne well tests and with the interpretation of the systen as behaving as a leaky artesian aquifer.

In general, the IWC pumping test of 29-31 July 1974 did not provide data sufficient for determination of the hydraulic properties of the various layers of the aquifer. However, hydraulic evidence indicating stratification of the aquifer was obtained from the fact that the data reasonably match a leaky-aquifer type curve, as well as the fact that the drawdown curve for P1 shows different behavior from the curves for P2, P3, and P5, which all behave similarly.

TABLE J.1

CALCULATED VALUES OF AQUIFER PARAMETERS

Well	R or D*	T(gpd/ft)	S	Method of Analysis
Wi-p4	R	90,400	--	Jacob, uncorrected
W1-P1	D	146,000	0.004	Jacob, uncorrected
W1-P1	D	59,800	$9X10^{-7}$	Jacob, approximate correction for partial penetration
W1-P1	D	97,600	0.0205	Hantush leaky type curve, uncorrected
W1-P1	D	241,000**	$8X10^{-6}$	Hantush partial penetration type curve, non-leaky
	Mean	98,500		

* Recovery (R) or drawdown (D) data.

** Excluded from calculation of mean.

J.3 References

Butler, Stanley S. (1957): Engineering Hydrology, Prentice-Hall, Englewood Cliffs, N. J., 356 pp.

Cooper, H. H., Jr., C. E. Jacob (1946): A generalized graphical method for evaluating formation constants and summarizing well-field history, Trans, Am. Geophys. Union, vol. 27.

Hantush, Mahdi S. (1961): Aquifer tests on partially penetrating wells, Proc. Am. Soc. Civil Eng., Hydraulics Diyision, HY5, 171-195.

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Theis, C. V. (1935): The relation between the lowering of piezometric surface and the rate and duration of discharge of a well using ground-water storage, Trans. Am. Geophys, Union, 16th Annual Meeting, Part 2.

Walton, William C. (1962): Selected analytical methods for well and aquifer evaluation, lllinois State Water Survey, Bulletin 49, Urbana, 81 pp.

Appendix 19.3 - Soil Erosion Analysis Summary

TRC

Customer-Focused Solutions

ESTIMATED SOIL LOSS FROM SOIL CAP

Prepared for

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ESTIMATED SOIL LOSS FROM SOIL CAP
Shieldalloy Metallurgical Corporation
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The potential rate of erosion for the soil cap over the NRG-regulated material pile at the SMC facility was evaluated using the Revised Universal Soil Loss Equation computer program, version 2 (RUSLE 2). The computer program was used to estimate rates of soil erosion caused by rainfall and associated overland flow. RUSLE 2 was developed and is maintained principally by the USDA-Agricultural Research Service (ARS), the USDA-Natural Resources Conservation Service (NRCS), and the University of Tennessee. The average annual soil loss can be calculated with the following formula, as described in RUSLE 2:

$$A = R K L S C P$$

where:

A = the average annual soil loss (erosion rate) in tons per acre per year,
R = the erosivity factor of the climate at a particular location,
K = the soil erodibihty factor,
L = the slope length factor,
S = the slope steepness factor,
C = the cover-management factor, and
P = the supporting practices factor.

The computer program RUSLE 2 uses the four major factors of climate, soil, topography, and land use to determine rates of erosion. Available databases within the RUSLE 2 program were used to characterize site-specific field conditions and the associated input parameters for these four factors. RUSLE2 then uses these site-specific factors/input parameters to compute erosion estimates. The factors and input parameters used to represent the field conditions at the SMC facility are described in more detail below.

The climate factor was defined by selecting Gloucester County, New Jersey for the site location from the available climate database.

Topography was characterized based on the slope and the length of slope of the capped pile, as presented in the August 2002 "Decommissioning Plan for the Newfield Facility" (Decommissioning Plan), Figure 18.11. The side slope was set at 3H:1V (3:1), with a length of 90 feet. Since the top of the pile has a shorter runoff distance (15 feet) with a smaller slope (4 percent), it was not taken into consideration for the erosion rate calculation. Only the side slope was used in the calculation (considered worst-case).

Next, the land use for the soil cover was evaluated. RUSLE 2 uses a combination of cover-management practices and support practices to describe land use. The cover-management practices were defined as one-year growth for non-harvested permanent cover, with hydroseeding for the application of the seed. A cool season grass was selected to represent the type of cover vegetation that would be used on the capped pile. The cool season grass, as defined in the model, consists of a mixture of Kentucky bluegrass, smooth bromegrass, timothy and tall fescue.

Finally, a representative soil type was selected for the cover material. A moderately low runoff sandy loam was selected to represent the type of cover material to be used on the capped pile. This is consistent with the soils that were identified on the site in the immediate vicinity of the

existing slag piles when an on-site wetland delineation was conducted in 1994 (Schoor, DePalma & Canger, 1994). Such a soil would also be compatible with the cool season grass that was selected as the cover type.

In summary, the factors/input parameters selected for calculating the soil loss from the capped pile at the SMC facility were as follows:

- climate based on data for Cloucester County, New Jersey;
- 3:1 slope with a side slope length of 90 feet;
- cool season grass, applied by hydroseeding; with no harvesting; and
- sandy loam, providing a moderately low runoff.

Based on the various combination of site-specific factors and input parameters described above, the erosion rate calculated by RUSLE 2 is 1.2 tons per acre per year. Using an average soil density of 120 pounds per cubic foot, the average yearly erosion rate would be 0.00046 feet, or 0.46 feet over 1,000 years.

In summary, based on site-specific factors, it is estimated that the erosion rate from the capped pile at the SMC facility would be approximately 0.5 feet over a 1,000-year period.

References:

USDA-Agricultural Service, 2005. Revised Universal Soil Loss Equation, Version 2. Available for download at:
ftp://fargo.nserl.purdue.edu/pub/RUSLE2/RUSLE2_Program_File/.
(ftp://fargo.nserl.perdue.edu/pub/RUSLE2/RUSLE2_Program_file/R2NRCS_20040914a.exe).
Associated climate data files available for download at:
ftp://fargo.nserl.purdue.edu/pub/RUSLE2/Climate_data/
(file NJ Clim011603.gdb).

Schoor, DePalma & Canger, 1994. Environmental Report, Wetlands and State Open Waters Delineation for Shiled (sic) Metallurgical Facility, Newfield, New Jersey, Schoor, DePalma & Canger Environmental Services, May 1994.

TRC

EROSION PROTECTION CALCULATIONS

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EROSION PROTECTION CALCULATIONS

Shieldalloy Metallurgical Corporation
Newfield, New Jersey

Calculations (attached) were completed to verify that the design of the proposed engineered barrier provides adequate protection agaiinst erosion (factor of safety = 4). Calculations were completed using guidance contained in the document entitied, "Design of Erosion Protection for Long-Term Stabilization", also known as NUREG-1623, published by the U.S. Nuclear Regulatory Commission (September 2002). As indicated in NUREG-1623, the "maximum permissible velocity" method, or MPV method, is recommended for evaluating erosion protection for the design of vegetated (grassed) slopes. Using MPV method calculations, it was determined that the proposed design provides a more than sufficient margin of safety for protection against erosion for the worst-case design storm recommended in NUREG-1623. The following is a summary of the methodology and parameters employed in the attached MPV calculations.

In the MPV method, actual maximum flow velocity is compared to a theoretical MPV, which is intended to protect against erosion under worst case conditions, and is typically selected from reference sources based on the slope and type of cover (grass in this case). In computing the maximum flow velocity, conservative yet realistic values must be selected for the various calculation parameters to ensure that the comparison to the MPV is valid.

As the first step, the maximum unit flow rate (volumetric flow rate per unit width of slope) from the engineered barrier must be determined. The flow rate is calculated using the Rational Method, modified to account for the possibility of flow concentration. As indicated in the attached calculations, rainfall intensity was based on the estimated Probable Maximum Precipitation (PMP) design storm and a suitably short time of concentration (5 minutes). The PMP is the design storm preferred in NUREG-1623, since it is considered representative of a worst-case scenario that is physically possible but with a low chance of recurrence over of a period of 1,000 years. PMP intensity data was obtained from the National Oceanic and Atmospheric Administration's Precipitation Frequency Data Server. The other required modified Rational Method parameters were based on the proposed side slope (0.3), length (90 feet) and cover material (dense/ untended grasses). Using these parameters, the maximum unit flow rate was computed to be 0.07 CFS/FT (cubic feet per second per foot).

Next, the MPV method requires calculation of the depth of flow under the design storm conditions (the PMP in this case) by solving for depth using Manning's equation and the previously computed maximum flow rate. As with the first step, equation parameters must be selected to be representative of the slope and cover material. In particular, the Manning's coefficient was chosen to reflect the hydraulic radius, and a vegetated cover matching what was proposed in previous Soil Loss calculations (TRC, January 2005) for the engineered barrier. The resulting calculations yielded a depth of flow of approximately 0.1 feet.

Lastly, the maximum flow velocity is calculated based on the results of the first two steps. In particular, dividing the maximum unit flow rate by the depth of flow yielded a maximum flow velocity of 0.65 feet per second. To complete the evaluation using the MPV method, this maximum flow velocity must be compared to the MPV. It is important that the MPV be adjusted from published values if necessary to account for low depth of flow. In this case, using values published by V. T. Chow in 1959 and summarized in NUREG-1623, the adjusted MPV was determined to be 2.5 feet/second. Therefore, given that the actual, worst-case maximum flow velocity was only approximately one quarter of the adjusted MPV, calculations using the MPV method verified the adequacy of the proposed design in terms of erosion protection.

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SUBJECT SMC ENGINEERED BARRIER

EROSION PROTECTION CALCULATIONS
MAXIMUM PERMISSIBLE VELOCITY METHOD

STEP 1 - MAX. UNIT FLOW FROM PILE

$Q = F \cdot C I A$ [MODIFIED RATIONAL METHOD]

$F = 2$ [CONSERVATIVE for SHORT, STEEP SLOPE]

$C = 0.7$ [UPPER RANGE FOR STEEP, GRASSED SLOPES PER USDA (2003)]

$A = 90'$ [LENGTH OF STEEP SLOPE, AS DESIGNED]

FOR I, USE SHORT-DURATION PMP*, SAY 5 MINUTES [VERY CONSERVATIVE].
ASSUME:

$$\frac{I_{AVG}\ (5\text{-MIN. PMP})}{I_{AVG}\ (6\text{-HR PMP})} \approx \frac{I_{AVG}\ (5\text{-MIN, 1000-YR STORM})}{I_{AVG}\ (6\text{-HR, 1000-YR STORM})}$$

[ALLOWS USE OF EXISTING, WELL DOCUMENTED DATA]

THEREFORE,

$$I_{AVG}\ (5\text{-MIN PMP}) = \frac{I_{AVG}\ (5\text{-MIN, 1000 YR})}{I_{AVG}\ (6\text{-HR, 1000 YR})} \times I_{AVG}\ (6\text{-HR PMP})$$

$$= \frac{10\ in/hr}{1.5\ in/hr} \times 4.3\ in/hr$$

[VALUES FROM NOAA ATLAS 14, VOL. 2, JUNE 2004]

$$= 28.6\ in/hr$$

$$= 0.0006\ ft/sec$$

*PMP = PROBABLE MAXIMUM PRECIPITATION

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SUBJECT SMC ENGINEERED BARRIER

EROSION PROTECTION CALCULATIONS
MAXIMUM PERMISSIBLE VELOCITY METHOD

STEP 1 - MAX UNIT FLOW, CONT'D

THEREFORE,

$$Q = 2 \times 0.7 \times 0.0006 \text{ ft/sec} \times 90 \text{ ft}$$

$$= 0.07 \text{ FT}^2/\text{s} \approx \boxed{0.07 \text{ CFS/FT}}$$

STEP 2 - DEPTH OF FLOW

$$y^{5/3} = \frac{Qn}{1.486 S^{1/2}}$$

$Q = 0.07$ CFS/FT [STEP 1]

$S = 0.33$ [DESIGN BASIS]

$n = 0.3$ [CHOW (1959), TABLE 7-4, FIGURE 7-14, TABLE 7-5]

ASSUMPTIONS: 1) R [HYDRAULIC RADIUS] APPROACHES ZERO FOR WIDE OPEN CHANNELS (i.e. wide piles)

2) VEGETATION IS DENSE GRASS, AS INDICATED IN TRC'S ESTIMATED SOIL LOSS REPORT, AND AS TYPICALLY DESIRED FOR STEEP SLOPES.

3) GRASS WILL NOT BE MOWED, SO VEGETAL RETARDANCE WILL BE HIGHER AS A RESULT

A

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SUBJECT SMC ENGINEERED BARRIER

EROSION PROTECTION CALCULATIONS
MAXIMUM PERMISSIBLE VELOCITY METHOD

STEP 2 - DEPTH OF FLOW (CONT'D)

THERREFORE,

$$y^{5/3} = \frac{(0.07)(0.3)}{(1.486)(0.33)^{1/2}} = 0.025$$

$$y = \boxed{0.108 \text{ ft}}$$

STEP 3 - MAX. PERMISSIBLE VELOCITY, ADJ FOR DEPTH OF FLOW

UNADJUSTED MPV = 5 ft/s [ARMY C.O.E, EM 1110-2-1601]

ASSUMPTIONS: STEEP SLOPE, THICK GRASS SPECIES

ADJUSTMENT FACTOR = 0.5 [BASED ON CHOW]

ADJUSTED MPV = 5 ft/s × 0.5 = 2.5 ft/s [REALISTIC FOR PMP, STEEP SLOPE]

STEP 4 - ACTUAL VELOCITY

$$V_a = Q/y = \frac{0.07 \text{ CFS/FT}}{0.108 \text{ FT}} = 0.65 \text{ ft/s}$$

STEP 5 - COMPARISON of MPV TO V_a

$V_a \approx \frac{1}{4}$ OF ADJUSTED MPV. THERREFORE DESIGN IS O.K.*

*DUE TO EXTREME CONSERVATISM OF DESIGN STORM [SHORT TERM, HIGH INTENSITY WITH RECURRANCE PERIOD << 1,000-YR STORM] THIS REPRESENTS A SIGNIFICANT SAFETY FACTOR.

A

From: LOW-VOLUME ROADS ENGINEERING BEST MANAGEMENT PRACTICES FIELD GUIDE BY GORDON KELLER & JAMES SHERAR USDA, FOREST SERVICE, JULY 2003

RECOMMENDED PRACTICES

- Use the best available hydrologic methods to determine design flows.
- Where appropriate, use drainage structures that are not sensitive to exact flow predictions, such as low water crossings (fords) and drivable dips versus culvert pipes.
- Add freeboard or extra capacity to structures in drainages with uncertain flow or for debris passage in watersheds with changing land uses, usually on the order of 120% to 150%.
- To minimize risk to structures, the recommended storm frequency (return period) for design of culverts is 20 to 50 years, and 100 to 200 years is recommended for bridges or drainages with sensitive environmental concerns.
- For culverts installed in areas with limited or inadequate hydrologic data or designs, include overflow (overtopping) protection to reduce risk of total failure or stream diversion (see Figure 7.10).
- Involve hydrologists, fisheries biologists and engineers in the process of hydrologic and hydraulic design.

PRACTICES TO AVOID

- Installing drainage structures without some rational or statistical assessment of the expected flow.

Table 5.1

DESIGN FLOW ANALYSIS METHODS FOR VARIOUS WATERSHED SIZES

Watershed Size	Typical Type of Analysis
Small (to 120 ha) (300 acres)	Rational Method, Talbot Method, Local Experience
Medium (to 4,000 ha) (10,000 acres)	Regression Analysis, High Water Marks + Manning, Local Experience
Large (over 4,000 ha)	Gauging Data, High Water Marks, Statistical or Regression Analysis

Table 5.2

RATIONAL METHOD VALUES OF "C"

Land Use or Type	"C" Value
Agriculture	
Bare Soil	0.20-0.60
Cultivated Fields (sandy soil)	0.20-0.40
Cultivated Fields (clay soil)	0.30-0.50
Grass	
Turf, Meadows	0.10-0.40
Steep Grassed Areas	0.50-0.70
Woodland/Forest	
Wooded Areas with Level Ground	0.05-0.25
Forested Areas with Steep Slopes	0.15-0.40
Bare Areas, Steep and Rocky	0.50-0.90
Roads	
Asphalt Pavement	0.80-0.90
Cobblestone or Concrete Pavement	0.60-0.85
Gravel Surface	0.40-0.80
Native Soil Surface	0.30-0.80
Urban Areas	
Residential, Flat	0.40-0.55
Residential, Moderately Steep	0.50-0.65
Commercial or Downtown	0.70-0.95

POINT PRECIPITATION FREQUENCY ESTIMATES FROM NOAA ATLAS 14

VINELAND , NEW JERSEY (28-9135) 39.4833 N 75 W 98 feet

from "Precipitation-Frequency Atlas of the United States" NOAA Atlas 14, Volume 2, Version 2
G.M. Bonnin, D. Todd, B. Lin, T. Parzybok, M.Yekta, and D. Riley
NOAA, National Weather Service, Silver Spring, Maryland, 2004

Extracted: Wed Sep 14 2005

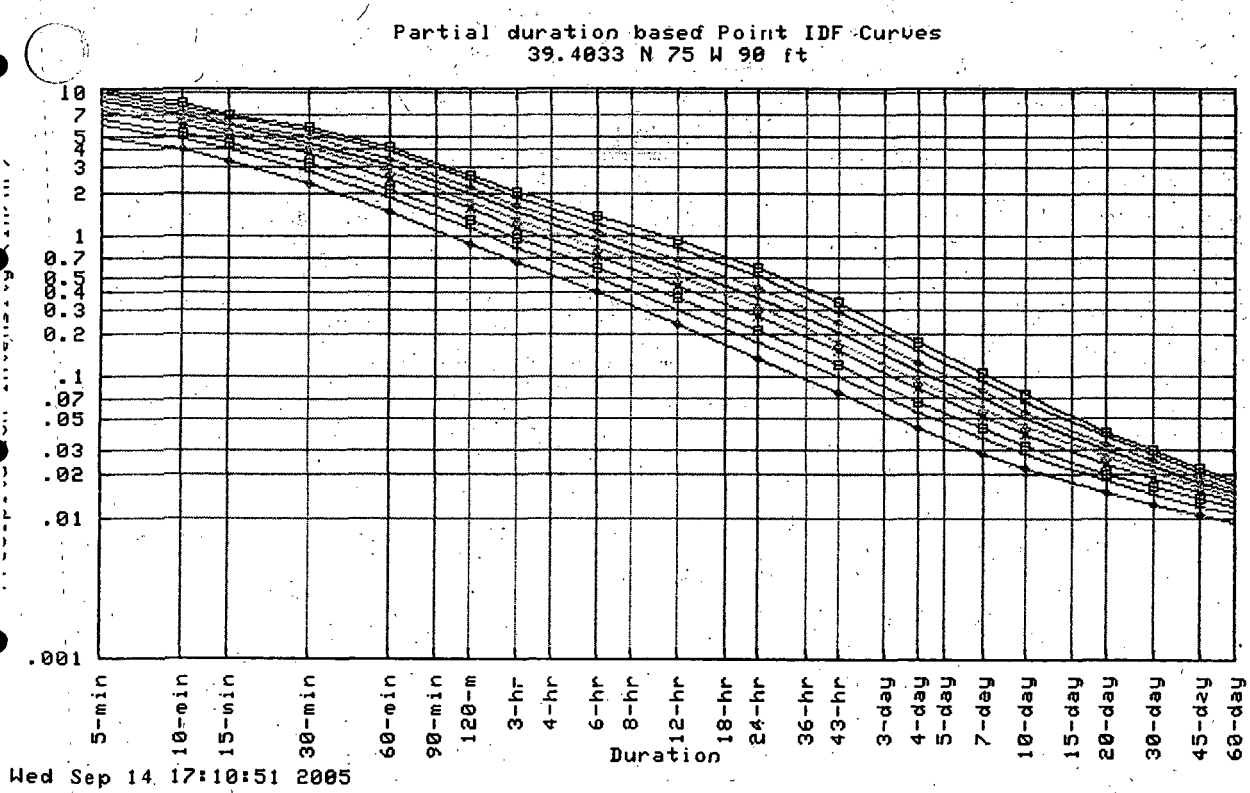
Confidence Limits | Seasonality | Location Maps | Other Info. | Grids | Maps | Help | Docs | U.S. Map

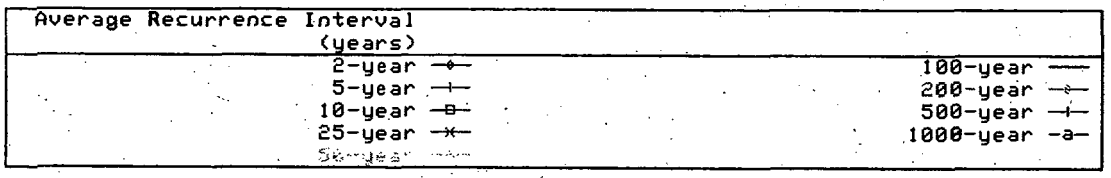
Precipitation Intensity Estimates (in/hr)

ARI* years)	5 min	10 min	15 min	30 min	60 min	120 min	3 hr	6 hr	12 hr	24 hr	48 hr	4 day	7 day	10 day	20 day	30 day	45 day	60 day
2	5.03	4.02	3.37	2.33	1.46	0.88	0.64	0.40	0.24	0.14	0.08	0.04	0.03	0.02	0.01	0.01	0.01	0.01
5	5.99	4.79	4.04	2.87	1.84	1.12	0.81	0.50	0.30	0.18	0.10	0.06	0.04	0.03	0.02	0.01	0.01	0.01
10	6.68	5.35	4.51	3.27	2.13	1.30	0.95	0.59	0.36	0.21	0.12	0.07	0.04	0.03	0.02	0.02	0.01	0.01
25	7.57	6.04	5.10	3.78	2.51	1.55	1.14	0.71	0.44	0.27	0.15	0.08	0.05	0.04	0.02	0.02	0.02	0.01
50	8.21	6.54	5.52	4.16	2.82	1.75	1.29	0.81	0.51	0.31	0.18	0.10	0.06	0.04	0.03	0.02	0.02	0.01
100	8.86	7.04	5.93	4.54	3.13	1.96	1.46	0.93	0.59	0.37	0.21	0.11	0.07	0.05	0.03	0.02	0.02	0.02
200	9.47	7.51	6.32	4.92	3.45	2.17	1.63	1.05	0.68	0.43	0.24	0.13	0.08	0.06	0.03	0.03	0.02	0.02
500	10.25	8.11	6.80	5.41	3.88	2.46	1.86	1.22	0.81	0.52	0.29	0.15	0.09	0.07	0.04	0.03	0.02	0.02
1000	10.85	8.54	7.15	5.79	4.22	2.70	2.06	1.37	0.92	0.60	0.33	0.17	0.11	0.07	0.04	0.03	0.02	0.02

Text version of table

* These precipitation freauency estimates are based on a partial duration series. ARI is the Average Recurrence Interval. Please refer to the documentation for more information. NOTE: Formatting forces estimates near zero to appear as zero.





onfidence Limits -

*** Upper bound of the 90% confidence interval**
Precipitation Intensity Estimates (in/hr)

ARI** years)	5 min	10 min	15 min	30 min	60 min	120 min	3 hr	6 hr	12 hr	24 hr	48 hr	4 day	7 day	10 day	20 day	30 day	45 day	60 day
2	5.70	4.55	3.82	2.64	1.65	1.02	0.74	0.46	0.27	0.15	0.09	0.05	0.03	0.02	0.02	0.01	0.01	0.01
5	6.77	5.42	4.57	3.25	2.08	1.29	0.94	0.58	0.35	0.20	0.11	0.06	0.04	0.03	0.02	0.02	0.01	0.01
10	7.56	6.05	5.10	3.70	2.41	1.50	1.10	0.68	0.41	0.24	0.13	0.07	0.05	0.03	0.02	0.02	0.01	0.01
25	8.57	6.83	5.77	4.27	2.85	1.79	1.32	0.82	0.51	0.29	0.17	0.09	0.06	0.04	0.03	0.02	0.02	0.01
50	9.29	7.40	6.24	4.70	3.19	2.02	1.49	0.94	0.59	0.35	0.20	0.10	0.06	0.05	0.03	0.02	0.02	0.01
100	10.03	7.97	6.72	5.14	3.54	2.26	1.68	1.08	0.68	0.40	0.23	0.12	0.07	0.05	0.03	0.02	0.02	0.02
200	10.76	8.54	7.18	5.59	3.92	2.51	1.89	1.22	0.78	0.47	0.26	0.14	0.08	0.06	0.04	0.03	0.02	0.02
500	11.71	9.26	7.78	6.19	4.44	2.86	2.17	1.42	0.94	0.57	0.32	0.16	0.10	0.07	0.04	0.03	0.02	0.02
1000	12.46	9.81	8.21	6.65	4.85	3.15	2.41	1.60	1.07	0.65	0.37	0.19	0.11	0.08	0.04	0.03	0.02	0.02

ne upper bound of the confidence interval at 90% confidence level is the value which 5% of the simulated quantile values for a given frequency are greater than.
These precipitation frequency estimates are based on a partial duration series. ARI is the Average Recurrence Interval.
ase refer to the documeniation for more information. NOTE: Formatting prevents estimates near zero to appear as zero.

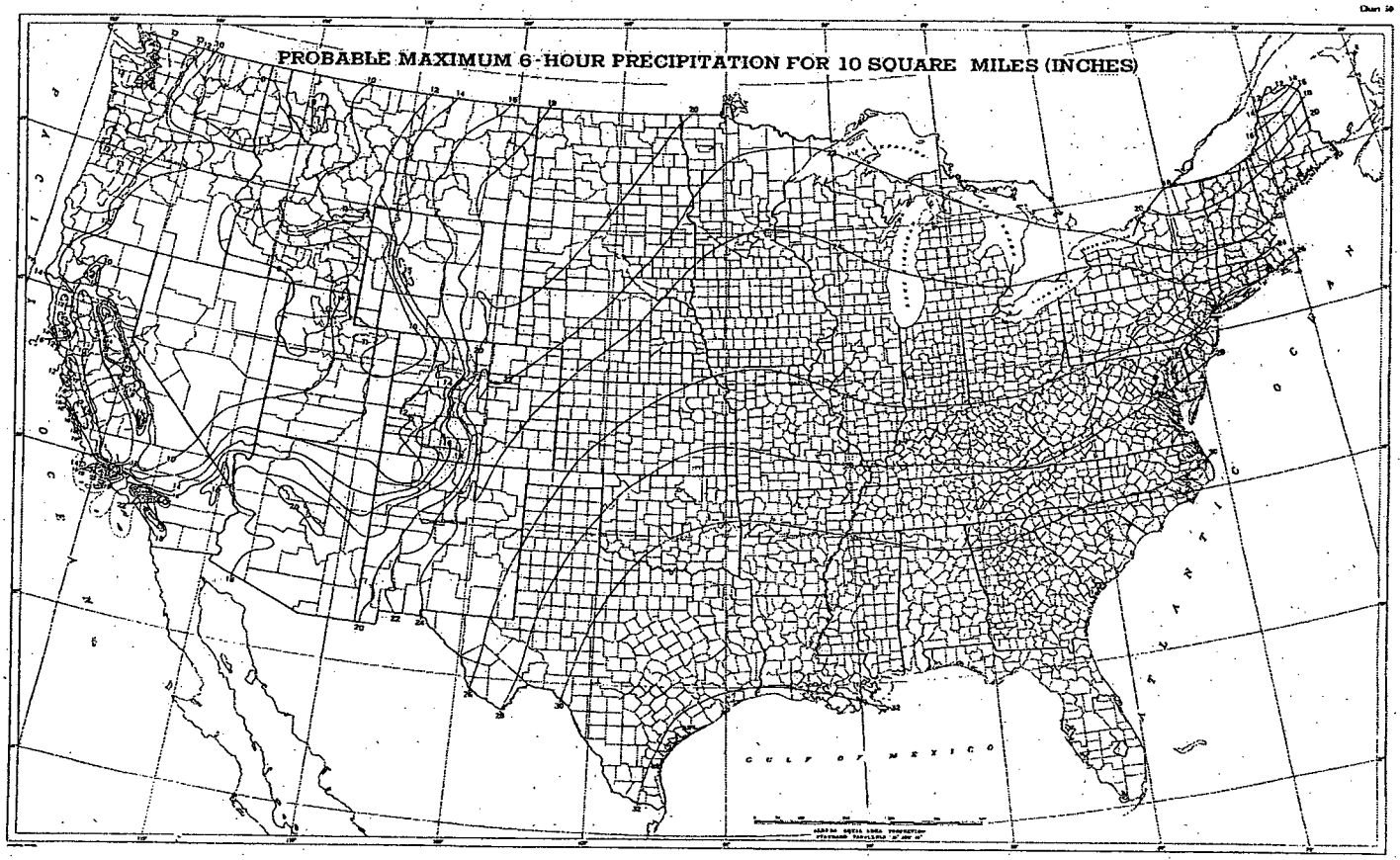
*** Lower bound of the 90% confidence interval**
Precipitation Intensity Estimates (in/hr)

ARI** ears)	5 min	10 min	15 min	30 min	60 min	120 min	3 hr	6 hr	12 hr	24 hr	48 hr	4 day	7 day	10 day	20 day	30 day	45 day	60 day
2	4.43	3.53	2.96	2.05	1.28	0.76	0.55	0.34	0.21	0.12	0.07	0.04	0.03	0.02	0.01	0.01	0.01	0.01
5	5.26	4.21	3.55	2.52	1.62	0.96	0.70	0.43	0.26	0.16	0.09	0.05	0.03	0.03	0.02	0.01	0.01	0.01
10	5.86	4.68	3.94	2.86	1.86	1.12	0.81	0.50	0.31	0.19	0.11	0.06	0.04	0.03	0.02	0.02	0.01	0.01
25	6.61	5.27	4.45	3.30	2.19	1.32	0.97	0.61	0.38	0.24	0.13	0.08	0.05	0.04	0.02	0.02	0.01	0.01
50	7.14	5.69	4.80	3.61	2.45	1.49	1.10	0.69	0.43	0.28	0.16	0.09	0.06	0.04	0.03	0.02	0.02	0.01
100	7.68	6.10	5.14	3.93	2.71	1.66	1.22	0.78	0.50	0.32	0.18	0.10	0.06	0.05	0.03	0.02	0.02	0.01
200	8.15	6.46	5.43	4.23	2.96	1.83	1.36	0.87	0.56	0.37	0.21	0.11	0.07	0.05	0.03	0.02	0.02	0.02
500	8.72	6.90	5.79	4.61	3.31	2.05	1.53	1.00	0.65	0.44	0.25	0.14	0.08	0.06	0.03	0.03	0.02	0.02
1000	9.17	7.22	6.04	4.89	3.57	2.23	1.68	1.10	0.73	0.50	0.28	0.15	0.09	0.07	0.04	0.03	0.02	0.02

ne lower bound of the confidence interval at 90% confidence level is the value which 5% of the simulated quantile values for a given frequency are less than.
These precipitation frequency estimates are based on a partial duration maxima series. ARI is the Average Recurrence Interval.

ase refer to the documentation for more information. NOTE: Fonnatting prevents estimates near zero to appear as zero.

laps -

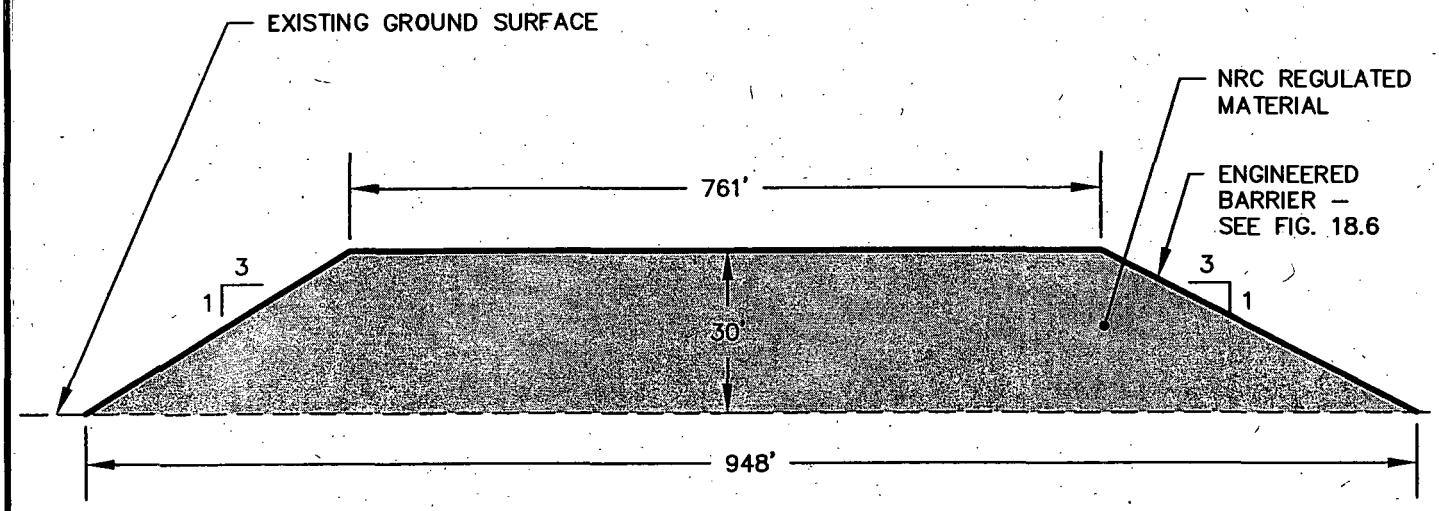

PROBABLE MAXIMUM 6-HOUR PRECIPITATION FOR 10 SQUARE MILES (INCHES)
GULF OF MEXICO

critical scour velocities is given by the Task Committee on Preparation of Sedimentation Manual (1966). Table 2-5 gives a set of permissible velocities that can be used as a guide to design nonscouring flood control channels. Lane (1955) presents curves showing permissible channel shear stress to be used for design, and the Soil Conservation Service (1954) presents information on grass-lined channels. Departures from suggested permissible velocity or shear values should be based on reliable field experience or laboratory tests. Channels whose velocities and/or shear exceed permissible values will require paving or bank revetment. The permissible values of velocity and/or shear should be determined so that damage exceeding normal maintenance will not result from any flood that could be reasonably expected to occur during the service life of the channel.

Table 2-5
Suggested Maximum Permissible Mean Channel Velocities

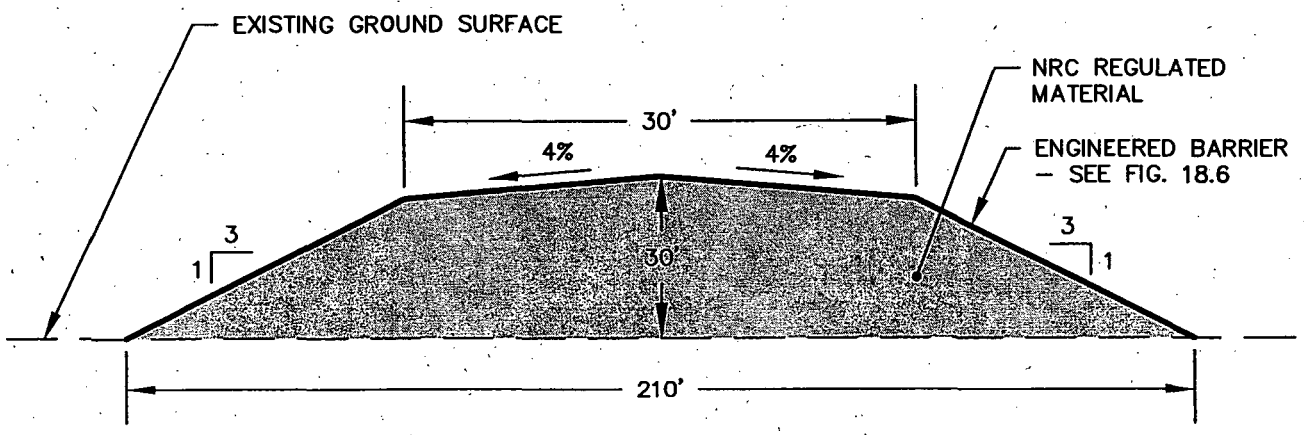
Channel Material	Mean Channel Velocity, fps
Fine Sand	2.0
Coarse Sand	4.0
Fine Gravel[1]	6.0
Earth	
Sandy Silt	2.0
Silt Clay	3.5
Clay	6.0
Grass-lined Earth (slopes less than 5%)[2]	
Bermuda Grass	
Sandy Silt	6.0
Silt Clay	8.0
Kentucky Blue Grass	
Sandy Silt	5.0
Silt Clay	7.0
Poor Rock (usually sedimentary)	10.0
Soft Sandstone	8.0
Soft Shale	3.5
Good Rock (usually igneous or hard metamorphic)	20.0

Notes:
1. For particles larger than fine gravel (about 20 millimetres (mm) = 3/4 in.), see Plates 29 and 30.
2. Keep velocities less than 5.0 fps unless good cover and proper maintenance can be obtained.



SECTION A–A'

N.T.S.



SECTION B–B'

N.T.S.

TRC
Customer-Focused Solutions
5 Waterside Crossing
Windsor, CT 06095
(860) 298-9692

SHIELDALLOY METALLURGICAL CORPORATION
NEWFIELD, NEW JERSEY

FIGURE 18.7
ENGINEERED BARRIER PILE SECTIONS

Date: 10/05 | Project No. 26770-0000-00000

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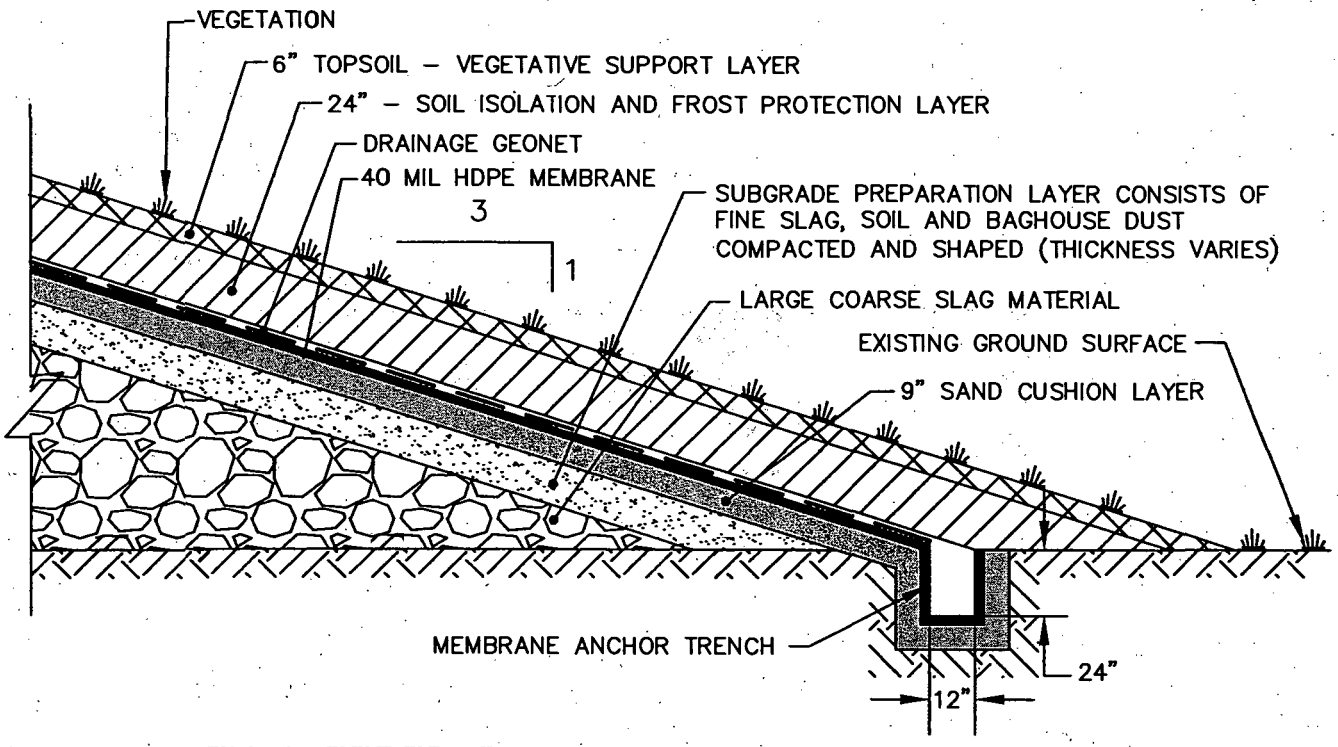
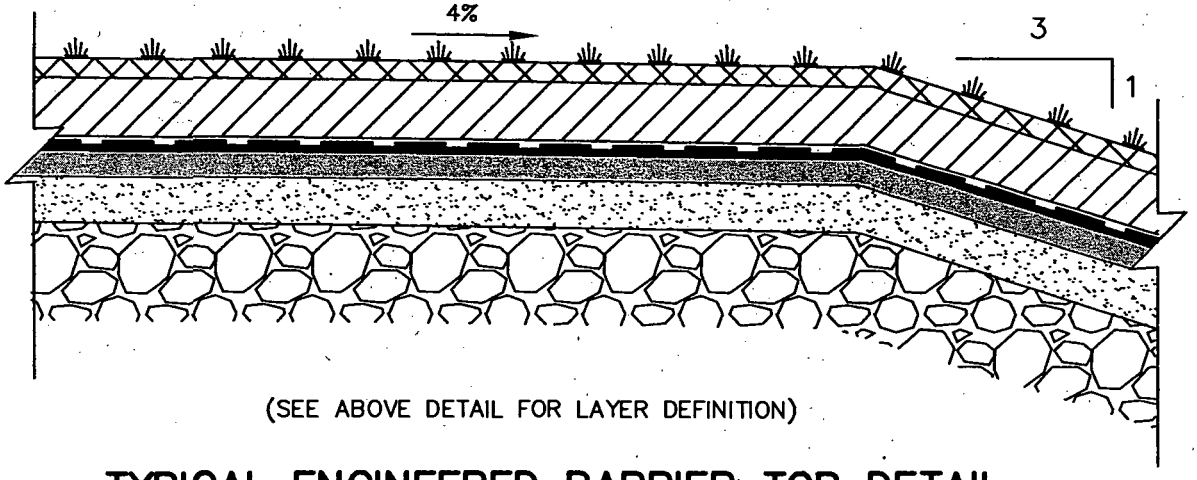


TYPICAL ENGINEERED BARRIER SIDE SLOPE DETAIL

N.T.S.



(SEE ABOVE DETAIL FOR LAYER DEFINITION)

TYPICAL ENGINEERED BARRIER TOP DETAIL

N.T.S.

TRC
Customer-Focused Solutions
5 Waterside Crossing
Windsor, CT 06095
(860) 298-9692

SHIELDALLOY METALLURGICAL
NEWFIELD, NEW JERSEY

FIGURE 18.8
ENGINEERED BARRIER
CONSTRUCTION DETAILS

Date: 10/05 | Project No. 26770-0000-00000

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FIG-18.8.dwg Layout:Model October 17, 2005-9:52AM KHOLLENBECK

Appendix 19.4 - Distribution Coefficients and Leachability

IEM
Integrated Environmental Management, Inc.

8 Brookes Avenue, Suite 205 • Gaithersburg, MD 20877
Phone (240) 631-8990 • Fax (240) 631-8991

www.IEM-Inc.com

September 16, 2005

Mr. David R. Smith
Shieldalloy Metallurgical Corporation
12 West Boulevard, PO Box 768
Newfield, NJ 08344

Re: Assessment of Distribution Coefficients and Leachability for Licensed Materials

Dear Mr. Smith:

Shieldalloy Metallurgical Corporation (SMC) is currently storing many tons of slag and bag house dust from a former ferrocolumbium production operation at its Newfield, New Jersey site. Because those operations were licensed by the U. S. Nuclear Regulatory Commission (USNRC) and because they are no longer on-going, SMC is pursuing decommissioning of the site and termination of the radioactive materials license. The decommissioning methodology being pursued is On-Site Stabilization and Long Term Control, or the LTC Altemative.

In order to demonstrate that the LTC Altemative will meet the USNRC's dose criteria for release of the Newfield site for restricted use, dose modeling using the RESRAD computer code (v. 6.22) will be performed.[1] A site-specific distribution coefficient based on the leachability of the thorium-contaminated slag and bag house dust is an important input parameter to the RESRAD model. While default distribution coefficients are available as part of the code's supporting data base, the unusual physical and chemical characteristics of the slag and baghouse dust were thought to present actual distribution coefficients that differ significantly from the defaults. Therefore, an assessment of the radionuclide release rate from the slag and the baghouse dust, using the toxicity characteristic leaching process (TCLP) as described in EPA Method 1311 and an assessment of the distribution coefficients (or K_d) from ASTM D4319, was performed. The purpose of this report is to describe the assessment protocol and summarize the results.

Protocol Description

On February 7, 2005, 1 sent you instmctions for collecting and shipping samples of slag to a commercial analytical laboratory. Attachment A contains a copy of those instmctions. On Febmary 9, 2005, three samples of slag were collected from the SMC Storage Yard pursuant to those instmctions. All were received by the laboratory on February 14, 2005.[2] There one of the samples was analyzed for leachate by TCLP and an assessment of K_d was performed. For the remaining two samples, only a K_d determination was made.

---

[1] Yu, C, Zielen, A.J, et al, *User's Manual for RESRAD Version 6*, ANL/EAD-4, Argonne National Laboratory, Argonne, Illinois, July, 2001.

[2] The analyses were performed by Outreach Laboratory of Broken Arrow, Oklahoma. Outreach is a NELAC-accredited laboratory (Certification ID No. OK001).

On July 19, 2005, two samples of baghouse dust were collected from the Storage Yard pursuant to the instmctions in Attachment A. These were then shipped to the same laboratory, where they were recorded as received on July 22, 2005 and subsequently analyzed for leachate by TCLP.

Results

Attachment B is a table that summarizes the results for the radionuclides present in SMC's licensed radioactive materials. Attachment C contains the Certificates of Analysis that were issued by the laboratory. We recommend these data be used as input to future dose modeling using the RESRAD computer code.

Thank you very much for the opportunity of assisting you in the acquisition of this important data. If I can answer any questions or provide you with additional information on this or any other radiation-related matter, please do not hesitate to call me at (240) 631-8990.

Sincerely,

INTEGRATED ENVIRONMENTAL MANAGEMENT, INC.

Carol D. Berger

Carol D. Berger, CHP

File 94005.01

ATTACHMENT A
Sample Collection Instructions

IEM
Integrated Environmental Management, Inc.

8 Brookes Avenue, Suite 205 • Gaithersburg, MD 20877
Phone (240) 631-8990 • Fax (240) 631-8991

www.IEM-Inc.com

Febmary 7, 2005

Mr. David R. Smith, RSO
Shieldalloy Metallurgical Corporation, Inc.
West Boulevard, Post Office Box 768
Newfield, New Jersey 08344

Re: Slag Sampling Program for Determination of Leachability

Dear Mr. Smith:

The purpose of this letter is to provide you with instmctions for collecting, packaging and shipping samples of ferrocolumbium slag in order to test for leachability. The following are the procedural steps that should be followed:

1. Select a reasonably sensitive hand-held survey instrument to guide you in the selection of samples.[3] Follow your standard procedures for assuring the performance of the instrument prior to use (i.e., RSP-008, "Instrumentation").

2. Complete a "Sample Collection and Survey Form" (enclosed).

3. Go to a location on the property that you will designate a "background" location (i.e., ambient exposure rates that are less than 20 microR per hour), measure the ambient exposure rate in that location, and record that value on the Form.

4. Leave the hand-held instmment at the background location, then collect a football-sized sample of slag from the slag pile, noting the collection location on the Form. (If you like you may do a drawing on the back of the Form showing the slag piles with respect to the perimeter fence, and the sample collection location.)

5. Take the sample back to the background location and position the survey instmment so that the sensitive area of the detector is within 0.25 inches of the surface of the slag at each measurement point. The meter reading and units should be recorded on the Form. Carefully evaluate the position of the range selector switch when observing the meter reading!

6. If the contact exposure rate on the sample is significantly the pre-recorded background, place the sample into a baggie or other collection container and record the sample number on the Form and on

[3] A micro-R meter (Ludlum Model 19 or equivalent) or GM Survey Instrument is recommended.

the container.[4] If the contact exposure rate is only marginally different from background, it is possible that the sample is a columbium or ferrovanadium slag sample, which *is not* what should be analyzed. Discard that sample and repeat steps 4 through 6 using another football-sized sample.

7. Place the collection container, a copy of the Form and a completed chain-of-custody form into a shipping container (box). Mail the container by overnight carrier (Federal Express or equivalent) to: Outreach Laboratory, Outreach Laboratory, 311 North Aspen, Broken Arrow, Oklahoma 74012. Please reference Lab Proposal No. 20040422, IEM Specification No. 94005.01 somewhere on the chain-of-custody form.

8. Forward a copy of the overnight carrier waybill and the completed form to me at IEM's Galthersburg, Maryland address.

A report of findings that includes the analytical data package and supporting documentation will be forwarded to you shortly after we receive the analytical results. Outreach has specified a turn-around time of 20 business days from the date of sample receipt for one of the tests, and 45 work days for the other. IEM will track the status of this commitment.

If you have any questions or if I can provide you with more detailed instructions, please give me a call at (240) 631-8990. Thank you for the opportunity of assisting you in this interesting project. I am looking forward to its timely and successful completion.

Sincerely,

[original signed by]

Carol D. Berger, C. H. P.

File 94005.01

[4] If collecting more than one sample, use a sequential numbering scheme such as "SMC-021005-1", where "SMC" is the company identifier, "021005" is the date of collection, and "1" is the sample number.

ATTACHMENT B
Summary of Results

Sample ID	Sample Type	Result Type	Units	Results						
				Ra-226	Ra-228	U-238	U-234	Th-228	Th-230	Th-232
2-9-05-001	Slag	K_d	ml/g	77	54	293000	75300	23289	65400	129000
2-9-05-001	Slag	Gross Activity	pCi/g	578	393	297	279	469	334	484
2-9-05-001	Slag	TCLP	pCi/l	1180	5480	1.2	6.2	25.4	2.82	<1.86
2-9-05-002	Slag	K_d	ml/g	51.7	35	9100	7930	2900	12700	17100
2-9-05-002	Slag	Gross Activity	pCi/g	428	91.3	274	253	226	135	254
2-9-05-003	Slag	K_d	ml/g	60.6	38	23100	13700	23300	65400	129000
2-9-05-003	Slag	Gross Activity	pCi/g	275	122	137	120	317	71.1	307
7-19-05-01	Baghouse Dust	Gross Activity	pCi/g	67	123	25.5	22.5	99	40.6	79.1
7-19-05-01	Baghouse Dust	TCLP	pCi/l	20.2	12.4	12.2	13.5	1.53	<0.551	0.732
7-19-05-02	Baghouse Dust	Gross Activity	pCi/g	17.3	32.7	10.2	10.4	37.2	20.4	37.7
7-19-05-02	Baghouse Dust	TCLP	pCi/l	11.6	7.79	12.8	13.1	1.13	<0.44	0.343

ATTACHMENT C
Certificates of Analysis

Appendix 19.5 - RESRAD and MicroShield Summary Reports

Summary : Shieldalloy Storage Pile Maintenance Worker
File : newfield 3004001.RAD

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Dose Conversion Factor (and Related) Parameter Summary
File: FGR 13 Morbidity

Menu	Parameter	Current Value	Default	Paramete Name
B-1	Dose conversion factors for inhalation, mrem/pCi:			
B-1	Ac-227+D	5.720E+00	6.720E+00	DCF2(1)
B-1	Pa-231	1.280E+00	1.280E+00	DCF2(2)
B-1	Pb-210+D	2.320E-02	2.320E-02	DCF2(3)
B-1	Ra-226+D	8.600E-03	8.600E-03	DCF2(4)
B-1	Ra-228+D	5.080E-03	5.080E-03	DCF2(5)
B-1	Th-228+D	3.450E-01	3.450E-01	DCF2(6)
B-1	Th-230	3.260E-01	3.260E-01	DCF2(7)
B-1	Th-232	1.640E+00	1.640E+00	DCF2(8)
B-1	U-234	1.320E-01	1.320E-01	DCF2(9)
B-1	U-235+D	1.230E-01	1.230E-01	DCF2(10)
B-1	U-238+D	1.180E-01	1.180E-01	DCF2(11)
D-1	Dose conversion factors for ingestion, mrem/pCi:			
D-1	Ac-227+D	1.480E-02	1.480E-02	DCF3(1)
D-1	Pa-231	1.060E-02	1.060E-02	DCF3(2)
D-1	Pb-210+D	7.270E-03	7.270E-03	DCF3(3)
D-1	Ra-226+D	1.330E-03	1.330E-03	DCF3(4)
D-1	Ra-228+D	1.440E-03	1.440E-03	DCF3(5)
D-1	Th-228+D	8.080E-04	8.080E-04	DCF3(6)
D-1	Th-230	5.480E-04	5.480E-04	DCF3(7)
D-1	Th-232	2.730E-03	2.730E-03	DCF3(8)
D-1	U-234	2.830E-04	2.830E-04	DCF3(9)
D-1	U-235+D	2.670E-04	2.670E-04	DCF3(10)
D-1	U-238+D	2.690E-04	2.690E-04	DCF3(11)
D-34	Food transfer factors:			
D-34	Ac-227+D , plant/soil concentration ratio, dimensionless	2.500E-03	2.500E-03	RTF(1,1)
D-34	Ac-227+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	2.000E-05	2.000E-05	RTF(1,2)
D-34	Ac-227+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	2.000E-05	2.000E-05	RTF(1,3)
D-34				
D-34	Pa-231 , plant/soil concentration ratio, dimensionless	1.000E-02	1.000E-02	RTF(2,1)
D-34	Pa-231 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	5.000E-03	5.000E-03	RTF(2,2)
D-34	Pa-231 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	5.000E-06	5.000E-06	RTF(2,3)
D-34				
D-34	Pb-210+D , plant/soil concentration ratio, dimensionless	1.000E-02	1.000E-02	RTF(3,1)
D-34	Pb-210+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	8.000E-04	8.000E-04	RTF(3,2)
D-34	Pb-210+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	3.000E-04	3.000E-04	RTF(3,3)
D-34				
D-34	Ra-226+D , plant/soil concentration ratio, dimensionless	4.000E-02	4.000E-02	RTF(4,1)
D-34	Ra-226+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-03	1.000E-03	RTF(4,2)
D-34	Ra-226+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	1.000E-03	1.000E-03	RTF(4,3)
D-34				
D-34	Ra-228+D , plant/soil concentration ratio, dimensionless	4.000E-02	4.000E-02	RTF(5,1)
D-34	Ra-228+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-03	1.000E-03	RTF(5,2)
D-34	Ra-228+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	1.000E-03	1.000E-03	RTF(5,3)
D-34				
D-34	Th-228+D , plant/soil concentration ratio, dimensionless	1.000E-03	1.000E-03	RTF(6,1)
D-34	Th-228+D , beef/livestpck-intake ratio, (pCi/kg)/(pCi/d)	1.000E-04	1.000E-04	RTF(6,2)
D-34	Th-228+D , milk/livestock-intake ratio, ( )/(pCi/d)	5.000E-06	5.000E-06	RTF(6,3)

Dose Conversion Factor (and Related) Parameter Summary (continued)
File: FGR 13 Morbidity

Menu	Parameter	Current Value	Default	Paramete Name
D-34	Th-230 , plant/soil concentration ratio, dimensionless	1.000E-03	1.000E-03	RTF(7,1)
D-34	Th-230 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-04	1.000E-04	RTF(7,2)
D-34	Th-230 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	5.000E-06	5.000E-06	RTF(7,3)
D-34				
D-34	Th-232 , plant/soil concentration ratio, dimensionless	1.000E-03	1.000E-03	RTF(8,1)
D-34	Th-232 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-04	1.000E-04	RTF(8,2)
D-34	Th-232 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	5.000E-06	5.000E-06	RTF(8,3)
D-34				
D-34	U-234 , plant/soil concentration ratio, dimensionless	2.500E-03	2.500E-03	RTF(9,1)
D-34	U-234 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	3.400E-04	3.400E-04	RTF(9,2)
D-34	U-234 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	6.000E-04	6.000E-04	RTF(9,3)
D-34				
D-34	U-235+D , plant/soil concentration ratio, dimensionless	2.500E-03	2.500E-03	RTF(10,1)
D-34	U-235+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	3.400E-04	3.400E-04	RTF(10,2)
D-34	U-235+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	6.000E-04	6.000E-04	RTF(10,3)
D-34				
D-34	U-238+D , plant/soil concentration ratio, dimensionless	2.500E-03	2.500E-03	RTF(11,1)
D-34	U-238+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	3.400E-04	3.400E-04	RTF(11,2)
D-34	U-238+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	6.000E-04	6.000E-04	RTF(11,3)
D-5	Bioaccumulation factors, fresh water, L/kg:			
D-5	Ac-227+D , fish	1.500E+01	1.500E+01	BIOFAC(1
D-5	Ac-227+D , crustacea and mollusks	1.000E+03	1.000E+03	BIOFAC(1
D-5				
D-5	Pa-231 , fish	1.000E+01	1.000E+01	BIOFAC(2
D-5	Pa-231 , crustacea and mollusks	1.100E+02	1.100E+02	BIOFAC(2
D-5				
D-5	Pb-210+D , fish	3.000E+02	3.000E+02	BIOFAC(3
D-5	Pb-210+D , crustacea and mollusks	1.000E+02	1.000E+02	BIOFAC(3
D-5				
D-5	Ra-226+D , fish	5.000E+01	5.000E+01	BIOFAC(4
D-5	Ra-226+D , crustacea and mollusks	2.500E+02	2.500E+02	BIOFAC(4
D-5				
D-5	Ra-228+D , fish	5.000E+01	5.000E+01	BIOFAC(5
D-5	Ra-228+D , crustacea and mollusks	2.500E+02	2.500E+02	BIOFAC(5
D-5				
D-5	Th-228+D , fish	1.000E+02	1.000E+02	BIOFAC(6
D-5	Th-228+D , crustacea and mollusks	5.000E+02	5.000E+02	BIOFAC(6
D-5				
D-5	Th-230 , fish	1.000E+02	1.000E+02	BIOFAC(7
D-5	Th-230 , crustacea and mollusks	5.000E+02	5.000E+02	BIOFAC(7
D-5				
D-5	Th-232 , fish	1.000E+02	1.000E+02	BIOFAC(8
D-5	Th-232 , crustacea and mollusks	5.000E+02	5.000E+02	BIOFAC(8
D-5				
D-5	U-234 , fish	1.000E+01	1.000E+01	BIOFAC(9
D-5	U-234 , crustacea and mollusks	6.000E+01	6.000E+01	BIOFAC(9
D-5				
D-5	U-235+D , fish	1.000E+01	1.000E+01	BIOFAC(10
D-5	U-235+D , crustacea and mollusks	6.000E+01	6.000E+01	BIOFAC(10

Dose Conversion Factor (and Related) Parameter Summary (continued)
File: FGR 13 Morbidity

Menu	Parameter	Current Value	Default	Paramete Name
D-5	U-238+D , fish	1.000E+01	1.000E+01	BIOFAC(11
D-5	U-238+D , crustacea and mollusks	6.000E+01	6.000E+01	BIOFAC(1i

Site-Specific Parameter Summary

Menu	Parameter	User Input	Default	Used by RESP (If different from u
R011	Area of contaminated zone (m**2)	1.823E+04	1.000E+04	---
R011	Thickness of contaminated zone (m)	2.800E+00	2.000E+00	---
R011	Length parallel to aquifer flow (m)	not used	1.000E+02	---
R011	Basic radiation dose limit (mrem/yr)	2.500E+01	2.500E+01	---
R011	Time since placement of material (yr)	0.000E+00	0.000E+00	---
R011	Times for calculations (yr)	1.000E+00	1.000E+00	---
R011	Times for calculations (yr)	1.000E+01	3.000E+00	---
R011	Times for calculations (yr)	1.000E+02	1.000E+01	---
R011	Times for calculations (yr)	3.000E+02	3.000E+01	---
R011	Times for calculations (yr)	5.000E+02	1.000E+02	---
R011	Times for calculations (yr)	7.000E+02	3.000E+02	---
R011	Times for calculations (yr)	9.000E+02	1.000E+03	---
R011	Times for calculations (yr)	1.000E+03	0.000E+00	---
R011	Times for calculations (yr)	not used	0.000E+00	---
R012	Initial principal radionuclide (pCi/g): Ac-227	8.000E+00	0.000E+00	---
R012	Initial principal radionuclide (pCi/g): Pa-231	8.000E+00	0.000E+00	---
R012	Initial principal radionuclide (pCi/g): Pb-210	1.820E+02	0.000E+00	---
R012	Initial principal radionuclide (pCi/g): Ra-226	1.820E+02	0.000E+00	---
R012	Initial principal radionuclide (pCi/g): Ra-228	1.820E+02	0.000E+00	---
R012	Initial principal radionuclide (pCi/g): Th-228	1.820E+02	0.000E+00	---
R012	Initial principal radionuclide (pCi/g): Th-230	1.820E+02	0.000E+00	---
R012	Initial principal radionuclide (pCi/g): Th-232	1.820E+02	0.000E+00	---
R012	Initial principal radionuclide (pCi/g): U-234	1.820E+02	0.000E+00	---
R012	Initial principal radionuclide (pCi/g): U-235	8.000E+00	0.000E+00	---
R012	Initial principal radionuclide (pCi/g): U-238	1.820E+02	0.000E+00	---
R012	Concentration in groundwater (pCi/L): Ac-227	not used	0.000E+00	---
R012	Concentration in groundwater (pCi/L): Pa-231	not used	0.000E+00	---
R012	Concentration in groundwater (pCi/L): Pb-210	not used	0.000E+00	---
R012	Concentration in groundwater (pCi/L): Ra-226	not used	0.000E+00	---
R012	Concentration in groundwater (pCi/L): Ra-228	not used	0.000E+00	---
R012	Concentration in groundwater (pCi/L): Th-228	not used	0.000E+00	---
R012	Concentration in groundwater (pCi/L): Th-230	not used	0.000E+00	---
R012	Concentration in groundwater (pCi/L): Th-232	not used	0.000E+00	---
R012	Concentration in groundwater (pCi/L): U-234	not used	0.000E+00	---
R012	Concentration in groundwater (pCi/L): U-235	not used	0.000E+00	---
R012	Concentration in groundwater (pCi/L): U-238	not used	0.000E+00	---
R013	Cover depth (m)	1.000E+00	0.000E+00	---
R013	Density of cover material (g/cm**3)	1.900E+00	1.500E+00	---
R013	Cover depth erosion rate (m/yr)	0.000E+00	1.000E-03	---
R013	Density of contaminated zone (g/cm**3)	2.800E+00	1.500E+00	---
R013	Contaminated zone erosion rate (m/yr)	4.600E-05	1.000E-03	---
R013	Contaminated zone total porosity	4.000E-01	4.000E-01	---
R013	Contaminated zone field capacity	2.000E-01	2.000E-01	---
R013	Contaminated zone hydraulic conductivity (m/yr)	2.000E+03	1.000E+01	---
R013	Contaminated zone b parameter	2.880E+00	5.300E+00	---
R013	Average annual wind speed (m/sec)	4.250E+00	2.000E+00	---
R013	Humidity in air (g/m**3)	not used	8.000E+00	---
R013	Evapotranspiration coefficient	6.250E-01	5.000E-01	---

Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESP (If different from u
R013	Precipitation (m/yr)	1.050E+00	1.000E+00	---
R013	Irrigation (m/yr)	0.000E+00	2.000E-01	---
R013	Irrigation mode	overhead	overhead	---
R013	Runoff coefficient	4.500E-01	2.000E-01	---
R013	Watershed area for nearby stream or pond (m**2)	not used	1.000E+06	---
R013	Accuracy for water/soil computations	not used	1.000E-03	---
R014	Density of saturated zone (g/cm**3)	not used	1.500E+00	---
R014	Saturated zone total porosity	not used	4.000E-01	---
R014	Saturated zone effective porosity	not used	2.000E-01	---
R014	Saturated zone field capacity	not used	2.000E-01	---
R014	Saturated zone hydraulic conductivity (m/yr)	not used	1.000E+02	---
R014	Saturated zone hydraulic gradient	not used	2.000E-02	---
R014	Saturated zone b parameter	not used	5.300E+00	---
R014	Water table drop rate (m/yr)	not used	1.000E-03	---
R014	Well pump intake depth (m below water table)	not used	1.000E+01	---
R014	Model: Nondispersion (ND) or Mass-Balance (MB)	not used	ND	---
R014	Well pumping rate (m**3/yr)	not used	2.500E+02	---
R015	Number of unsaturated zone strata	not used	1	---
R015	Onsat. zone 1, thickness (m)	not used	4.000E+00	---
R015	Unsat. zone 1, soil density (g/cm**3)	not used	1.500E+00	---
R015	Unsat. zone 1, total porosity	not used	4.000E-01	---
R015	Unsat. zone 1, effective porosity	not used	2.000E-01	---
R015	Unsat. zone 1, field capacity	not used	2.000E-01	---
R015	Unsat. zone 1, soil-specific b parameter	not used	5.300E+00	---
R015	Unsat. zone 1, hydraulic conductivity (m/yr)	not used	1.000E+01	---
R016	Distribution coefficients for Ac-227			
R016	Contaminated zone (cm**3/g)	2.000E+01	2.000E+01	---
R016	Unsaturated zone 1 (cm**3/g)	not used	2.000E+01	---
R016	Saturated zone (om**3/g)	not used	2.000E+01	---
R016	Leach rate (/yr)	0.000E+00	0.000E+00	1.376E-03
R016	Solubility constant	0.000E+00	0.000E+00	not used
R016	Distributibn coefficients for Pa-231			
R016	Contaminated zone (cm**3/g)	5.000E+01	5.000E+01	---
R016	Unsaturated zone 1 (cm**3/g)	not used	5.000E+01	---
R016	Saturated zone (cm**3/g)	not used	5.000E+01	---
R016	Leach rate (/yr)	0.000E+00	0.000E+00	5.517E-04
R016	Solubility constant	0.000E+00	0.000E+00	not used
R016	Distribution coefficients for Pb-210			
R016	Contaminated zone (cm**3/g)	1.000E+02	1.000E+02	---
R016	Unsaturated zone 1 (cm**3/g)	not used	1.000E+02	---
R016	Saturated zone (cm**3/g)	not used	1.000E+02	---
R016	Leach rate (/yr)	0.000E+00	0.000E+00	2.760E-04
R016	Solubility constant	0.000E+00	0.000E+00	not used

Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESP (If different from u
R016	Distribution coefficients for Ra-226			
R016	Contaminated zone (cm**3/g)	5.300E+01	7.000E+01	---
R016	Unsaturated zone 1 (cm**3/g)	not used	7.000E+01	---
R016	Saturated zone (cm**3/g)	not used	7.000E+01	---
R016	Leach rate (/yr)	0.000E+00	0.000E+00	5.205E-04
R016	Solubility constant	0.000E+00	0.000E+00	not used
R016	Distribution coefficients fdr Ra-228			
R016	Contaminated zone (cm**3/g)	5.300E+01	7.000E+01	---
R016	Unsaturated zone 1 (cm**3/g)	not used	7.000E+01	---
R016	Saturated zone (cm**3/g)	not used	7.000E+01	---
R016	Leach rate (/yr)	0.000E+00	0.000E+00	5.205E-04
R016	Solubility constant	0.000E+00	0.000E+00	not used
R016	Distribution coefficients for Th-228			
R016	Contaminated zone (cm**3/g)	5.201E+04	6.000E+04	---
R016	Unsaturated zone 1 (cm**3/g)	not used	6.000E+04	---
R016	Saturated zone (cm**3/g)	not used	6.000E+04	---
R016	Leach rate (/yr)	0.000E+00	0.000E+00	5.311E-07
R016	Solubility constant	0.000E+00	0.000E+00	not used
R016	Distribution coefficients for Th-230			
R016	Contaminated zone (cm**3/g)	5.201E+04	6.000E+04	---
R016	Unsaturated zone 1 (cm**3/g)	not used	6.000E+04	---
R016	Saturated zone (cm**3/g)	not used	6.000E+04	---
R016	Leach rate (/yr)	0.000E+00	0.000E+00	5.311E-07
R016	Solubility constant	0.000E+00	0.000E+00	not used
R016	Distribution coefficients for Th-232			
R016	Contaminated zone (cm**3/g)	5.201E+04	6.000E+04	---
R016	Unsaturated zone 1 (cm**3/g)	not used	6.000E+04	---
R016	Saturated zone (cm**3/g)	not used	6.000E+04	---
R016	Leach rate (/yr)	0.000E+00	0.000E+00	5.311E-07
R016	Solubility constant	0.000E+00	0.000E+00	not used
R016	Distribution coefficients for U-234			
R016	Contaminated zone (cm**3/g)	7.036E+04	5.000E+01	---
R016	Unsaturated zone 1 (cm**3/g)	not used	5.000E+01	---
R016	Saturated zone (cm**3/g)	not used	5.000E+01	---
R016	Leach rate (/yr)	0.000E+00	0.000E+00	3.926E-07
R016	Solubility constant	0.000E+00	0.000E+00	not used
R016	Distribution coefficients for U-235			
R016	Contaminated zone (cm**3/g)	7.036E+04	5.000E+01	---
R016	Unsaturated zone 1 (cm**3/g)	not used	5.000E+01	---
R016	Saturated zone (cm**3/g)	not used	5.000E+01	---
R016	Leach rate (/yr)	0.000E+00	0.000E+00	3.926E-07
R016	Solubility constant	0.000E+00	0.000E+00	not used

Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESP (If different from u
R016	Distribution coefficients for U-238			
R016	Contaminated zone (cm**3/g)	7.036E+04	5.000E+01	---
R016	Unsaturated zone 1 (cm**3/g)	not used	5.000E+01	---
R016	Saturated zone (cm**3/g)	not used	5.000E+01	---
R016	Leach rate (/yr)	0.000E+00	0.000E+00	3.926E-07
R016	Solubility constant	0.000E+00	0.000E+00	not used
R017	Inhalation rate (m**3/yr)	8.400E+03	8.400E+03	---
R017	Mass loading for inhalation (g/m**3)	3.000E-05	1.000E-04	---
R017	Exposure duration	3.000E+01	3.000E+01	---
R017	Shielding factor, inhalation	4.000E-01	4.000E-01	---
R017	Shielding factor, external gamma	2.700E-01	7.000E-01	---
R017	Fraction of time spent indoors	0.000E+00	5.000E-01	---
R017	Fraction of time spent outdoors (on site)	7.000E-03	2.500E-01	---
R017	Shape factor flag, external gamma	1.000E+00	1.000E+00	>0 shows circular
R017	Radii of shape factor array (used if FS = -1):			
R017	Outer annular radius (m), ring 1:	not used	5.000E+01	---
R017	Outer annular radius (m), ring 2:	not used	7.071E+01	---
R017	Outer annular radius (m), ring 3:	not used	0.000E+00	---
R017	Outer annular radius (m), ring 4:	not used	0.000E+00	---
R017	Outer annular radius (m), ring 5:	not used	0.000E+00	---
R017	Outer annular radius (m), ring 6:	not used	0.000E+00	---
R017	Outer annular radius (m), ring 7:	not used	0.000E+00	---
R017	Outer annular radius (m), ring 8:	not used	0.000E+00	---
R017	Outer annular radius (m), ring 9:	not used	0.000E+00	---
R017	Outer annular radius (m), ring 10:	not used	0.000E+00	---
R017	Outer annular radius (m), ring 11:	not used	0.000E+00	---
R017	Outer annular radius (m), ring 12:	not used	0.000E+00	---
R017	Fractions of annular areas within AREA:			
R017	Ring 1	not used	1.000E+00	---
R017	Ring 2	not used	2.732E-01	---
R017	Ring 3	not used	0.000E+00	---
R017	Ring 4	not used	0.000E+00	---
R017	Ring 5	not used	0.000E+00	---
R017	Ring 6	not used	0.000E+00	---
R017	Ring 7	not used	0.000E+00	---
R017	Ring 8	not used	0.000E+00	---
R017	Ring 9	not used	0.000E+00	---
R017	Ring 10	not used	0.000E+00	---
R017	Ring 11	not used	0.000E+00	---
R017	Ring 12	not used	0.000E+00	---
R018	Fruits, vegetables and grain consumption (kg/yr)	not used	1.600E+02	---
R018	Leafy vegetable consumption (kg/yr)	not used	1.400E+01	---
R018	Milk consumption (L/yr)	not used	9.200E+01	---
R018	Meat and poultry consumption (kg/yr)	not used	6.300E+01	---
R018	Fish consumption (kg/yr)	not used	5.400E+00	---
R018	Other seafood consumption (kg/yr)	not used	9.000E-01	---
R01S	Soil ingestion rate (g/yr)	1.830E+01	3.650E+01	---

Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESP (If different from u
R018	Drinking water intake (L/yr)	not used	5.100E+02	---
R018	Contamination fraction of drinking water	not used	1.000E+00	---
R018	Contamination fraction of household water	not used	1.000E+00	---
R018	Contamination fraction of livestock water	not used	1.000E+00	---
R018	Contamination fraction of irrigation water	not used	1.000E+00	---
R018	Contamination fraction of aquatic food	not used	5.000E-01	---
R018	Contamination fraction of plant food	not used	-1	---
R018	Contamination fraction of meat	not used	-1	---
R018	Contamination fraction of milk	not used	-1	---
R019	Livestock fodder intake for meat (kg/day)	not used	6.800E+01	---
R019	Livestock fodder intake for milk (kg/day)	not used	5.500E+01	---
R019	Livestock water intake for meat (L/day)	not used	5.000E+01	---
R019	Livestock water intake for milk (L/day)	not used	1.600E+02	---
R019	Livestock soil intake (kg/day)	not used	5.000E-01	---
R019	Mass loading for foliar deposition (g/m**3)	not used	1.000E-04	---
R019	Depth of soil mixing layer (m)	1.500E-01	1.500E-01	---
R019	Depth of roots (m)	not used	9.000E-01	---
R019	Drinking water fraction from ground water	not used	1.000E+00	---
R019	Household water fraction from ground water	not used	1.000E+00	---
R019	Livestock water fraction from ground water	not used	1.000E+00	---
R019	Irrigation fraction from ground water	not used	1.000E+00	---
R19B	Wet weight crop yield for Non-Leafy (kg/m**2)	not used	7.000E-01	---
R19B	Wet weight crop yield for Leafy (kg/m**2)	not used	1.500E+00	---
R19B	Wet weight crop yield for Fodder (kg/m**2)	not used	1.100E+00	---
R19B	Growing Season for Non-Leafy (years)	not used	1.700E-01	---
R19B	Growing Season for Leafy (years)	not used	2.500E-01	---
R19B	Growing Season for Fodder (years)	not used	8.000E-02	---
R19B	Translocation Factor for Non-Leafy	not used	1.000E-01	---
R19B	Translocation Factor for Leafy	not used	1.000E+00	---
R19B	Translocation Factor for Fodder	not used	1.000E+00	---
R19B	Dry Foliar Interception Fraction for Non-Leafy	not used	2.500E-01	---
R19B	Dry Foliar Interception Fraction for Leafy	not used	2.500E-01	---
R19B	Dry Foliar Interception Fraction for Fodder	not used	2.500E-01	---
R19B	Wet Foliar Interception Fraction for Non-Leafy	not used	2.500E-01	---
R19B	Wet Foliar Interception Fraction for Leafy	not used	2.500E-01	---
R19B	Wet Foliar Interception Fraction for Fodder	not used	2.500E-01	---
R19B	Weathering Removal Constant for Vegetation	not used	2.000E+01	---
C14	C-12 concentration in water (g/cm**3)	not used	2.000E-05	---
C14	C-12 concentration in contaminated soil (g/g)	not used	3.000E-02	---
C14	Fraction of vegetation carbon from soil	not used	2.000E-02	---
C14	Fraction of vegetation carbon from air	not used	9.800E-01	---
C14	C-14 evasion layer thickness in soil (m)	not used	3.000E-01	---
C14	C-14 evasion flux rate from soil (1/sec)	not used	7.000E-07	---
C14	C-12 evasion flux rate from soil (1/sec)	not used	1.000E-10	---
C14	Fraction of grain in beef cattle feed	not used	8.000E-01	---
C14	Fraction of grain in milk cow feed	not used	2.000E-01	---
C14	DCF correction factor for gaseous forms of C14	not used	8.894E+01	---

Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESP (If different from u
STOR	Storage times of contaminated foodstuffs (days):			
STOR	Fruits, non-leafy vegetables, and grain	1.400E+01	1.400E+01	---
STOR	Leafy vegetables	1.000E+00	1.000E+00	---
STOR	Milk	1.000E+00	1.000E+00	---
STOR	Meat and poultry	2.000E+01	2.000E+01	---
STOR	Fish	7.000E+00	7.000E+00	---
STOR	Crustacea and mollusks	7.000E+00	7.000E+00	---
STOR	Well water	1.000E+00	1.000E+00	---
STOR	Surface water	1.000E+00	1.000E+00	---
STOR	Livestock fodder	4.500E+01	4.500E+01	---
R021	Thickness of building foundation (m)	not used	1.500E-01	---
R021	Bulk density of building foundation (g/cm**3)	not used	2.400E+00	---
R021	Total porosity of the cover material	not used	4.000E-01	---
R021	Total porosity of the building foundation	not used	1.000E-01	---
R021	Volumetric water content of the cover material	not used	5.000E-02	---
R021	Volumetric water content of the foundation	not used	3.000E-02	---
R021	Diffusion coefficient for radon gas (m/sec):			
R021	in cover material	not used	2.000E-06	---
R021	in foundation material	not used	3.000E-07	---
R021	in contaminated zone soil	not used	2.000E-06	---
R021	Radon vertical dimension of mixing (m)	not used	2.000E+00	---
R021	Average building air exchange rate (1/hr)	not used	5.000E-01	---
R021	Height of the building (room) (m)	not used	2.500E+00	---
R021	Building interior area factor	not used	0.000E+00	---
R021	Building depth below ground surface (m)	not used	-1.000E+00	---
R021	Emanating power of Rn-222 gas	not used	2.500E-01	---
R021	Emanating power of Rn-220 gas	not used	1.500E-01	---
TITL	Number of graphical time points	32	---	---
TITL	Maximum number of integration points for dose	1	---	---
TITL	Maximum number of integration points for risk	1	---	---

Summary of Pathway Selections

Pathway	User Selection
1 -- external gamma	active
2 -- inhalation (w/o radon)	active
3 -- plant ingestion	suppressed
4 -- meat ingestion	suppressed
5 -- milk ingestion	suppressed
6 -- aquatic foods	suppressed
7 -- drinking water	suppressed
8 -- soil ingestion	active
9 -- radon	suppressed
Find peak pathway doses	active

Summary : Shieldalloy Storage Pile Maintenance Worker
File : newfield 3004001.RAD

Contaminated Zone Dimensions	
Area:	18228.00 square meters
Thickness:	2.80 meters
Cover Depth:	1.00 meters

Initial Soil Concentrations, pCi/g	
Ac-227	8.000E+00
Pa-231	8.000E+00
Pb-210	1.820E+02
Ra-226	1.820E+02
Ra-228	1.820E+02
Th-228	1.820E+02
Th-230	1.820E+02
Th-232	1.820E+02
U-234	1.820E+02
U-235	8.000E+00
U-238	1.820E+02

Total Dose TDOSE(t), mrem/yr
Basic Radiation Dose Limit = 2.500E+01 mrem/yr
Total Mixture Sum M(t) = Fraction of Basic Dose Limit Received at Time (t)

t (years):	0.000E+00	1.000E+00	1.000E+01	1.000E+02	3.000E+02	5.000E+02	7.000E+02	9.000E+02
TDOSE(t):	1.007E-05	1.007E-05	1.004E-05	9.945E-06	9.783E-06	9.649E-06	9.538E-06	9.446E-06
M(t):	4.030E-07	4.029E-07	4.018E-07	3.978E-07	3.913E-07	3.860E-07	3.815E-07	3.778E-07

Maximum TDOSE(t): 1.007E-05 mrem/yr at t = 0.000E+00 years

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Path
As mrem/yr and Fraction of Total Dose At t = 0.000E+00 years

Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Radon		Plant		Meat		
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mre
Ac-227	2.303E-11	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Pa-231	2.666E-12	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Pb-210	2.122E-17	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Ra-226	1.873E-06	0.1860	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Ra-228	3.869E-07	0.0384	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Th-228	7.809E-06	0.7752	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Th-230	4.937E-19	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Th-232	3.714E-21	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
U-234	3.634E-20	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
U-235	1.615E-13	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
U-238	4.343E-09	0.0004	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Total	1.007E-05	1.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Path
As mrem/yr and Fraction of Total Dose At t = 0.000E+00 years

Water Dependent Pathways

Radio-	Water		Fish		Radon		Plant		Meat		
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mre
Ac-227	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Pa-231	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Ra-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Th-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Th-230	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Th-232	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
U-234	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
U-235	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
U-238	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00

*Sum of all water independent and dependent pathways.

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Path
As mrem/yr and Fraction of Total Dose At t = 1.000E+00 years

Water Independent Pathways (Inhalation excludes radon)

Radio-Nuclide	Ground		Inhalation		Radon		Plant		Meat		
	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mre
Ac-227	2.227E-11	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Pa-231	3.385E-12	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Pb-210	2.056E-17	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Ra-226	1.872E-06	0.1858	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Ra-228	2.570E-06	0.2552	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Th-228	5.436E-06	0.5397	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Th-230	8.112E-10	0.0001	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Th-232	1.895E-07	0.0188	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
U-234	3.652E-15	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
U-235	1.615E-13	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
U-238	4.343E-09	0.0004	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Total	1.007E-05	1.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Path
As mrem/yr and Fraction of Total Dose At t = 1.000E+00 years

Water Dependent Pathways

Radio-Nuclide	Water		Fish		Radon		Plant		Meat		
	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mre
Ac-227	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Pa-231	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Ra-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Th-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Th-230	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Th-232	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
U-234	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
U-235	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
U-238	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00

*Sum of all water independent and dependent pathways.

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Path
As mrem/yr and Fraction of Total Dose At t = 1.000E+01 years

Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Radon		Plant		Meat		
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mre
Ac-227	1.652E-11	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Pa-231	8.869E-12	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Pb-210	1.551E-17	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Ra-226	1.856E-06	0.1847	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Ra-228	3.297E-06	0.3283	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Th-228	2.085E-07	0.0208	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Th-230	8.077E-09	0.0008	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Th-232	4.670E-06	0.4650	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
U-234	3.641E-13	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
U-235	1.627E-13	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
U-238	4.343E-09	0.0004	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Total	1.004E-05	1.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Path
As mrem/yr and Fraction of Total Dose At t = 1.000E+01 years

Water Dependent Pathways

Radio-	Water		Fish		Radon		Plant		Meat		
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mre
Ac-227	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Pa-231	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Ra-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Th-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Th-230	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Th-232	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
U-234	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
U-235	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
U-238	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00

*Sum of all water independent and dependent pathways.

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Path
As mrem/yr and Fraction of Total Dose At t = 1.000E+02 years

Water Independent Pathways (Inhalation excludes radon)

Radio-Nuclide	Ground		Inhalation		Radon		Plant		Meat		
	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mre
Ac-227	8.315E-13	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Pa-231	2.292E-11	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Pb-210	9.221E-19	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Ra-226	1.703E-06	0.1712	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Ra-228	6.690E-11	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Th-228	1.437E-21	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Th-230	7.737E-08	0.0078	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Th-232	8.161E-06	0.8205	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
U-234	3.538E-11	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
U-235	1.993E-13	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
U-238	4.343E-09	0.0004	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Total	9.945E-06	1.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Path
As mrem/yr and Fraction of Total Dose At t = 1.000E+02 years

Water Dependent Pathways

Radio-Nuclide	Water		Fish		Radon		Plant		Meat		
	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mre
Ac-227	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Pa-231	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Ra-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Th-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Th-230	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Th-232	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
U-234	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
U-235	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
U-238	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00

*Sum of all water independent and dependent pathways.

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Path
As mrem/yr and Fraction of Total Dose At t = 3.000E+02 years

Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Radon		Plant		Meat		
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mre
Ac-227	1.084E-15	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Pa-231	2.116E-11	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Pb-210	1.742E-21	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Ra-226	1.407E-06	0.1438	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Ra-228	2.040E-21	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Th-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Th-230	2.114E-07	0.0216	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Th-232	8.160E-06	0.8341	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
U-234	2.991E-10	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
U-235	2.937E-13	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
U-238	4.343E-09	0.0004	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Total	9.783E-06	1.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Path
As mrem/yr and Fraction of Total Dose At t = 3.000E+02 years

Water Dependent Pathways

Radio-	Water		Fish		Radon		Plant		Meat		
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mre
Ac-227	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Pa-231	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Ra-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Th-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Th-230	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Th-232	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
U-234	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
U-235	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
U-238	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00

*Sum of all water independent and dependent pathways.

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Path
As mrem/yr and Fraction of Total Dose At t = 5.000E+02 years

Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Radon		Plant		Meat		
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mre
Ac-227	1.414E-18	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Pa-231	1.887E-11	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Pb-210	3.290E-24	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Ra-226	1.163E-06	0.1205	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Ra-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Th-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Th-230	3.219E-07	0.0334	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Th-232	8.159E-06	0.8456	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
U-234	7.821E-10	0.0001	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
U-235	3.782E-13	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
U-238	4.343E-09	0.0005	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Total	9.649E-06	1.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Path
As mrem/yr and Fraction of Total Dose At t = 5.000E+02 years

Water Dependent Pathways

Radio-	Water		Fish		Radon		Plant		Meat		
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mre
Ac-227	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Pa-231	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Ra-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Th-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Th-230	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Th-232	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
U-234	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
U-235	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
U-238	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00

*Sum of all water independent and dependent pathways.

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Path
As mrem/yr and Fraction of Total Dose At t = 7.000E+02 years

Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Radon		Plant		Meat		
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mre
Ac-227	1.844E-21	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Pa-231	1.683E-11	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Pb-210	6.214E-27	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Ra-226	9.610E-07	0.1008	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Ra-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Th-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Th-230	4.130E-07	0.0433	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Th-232	8.158E-06	0.8553	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
U-234	1.446E-09	0.0002	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
U-235	4.536E-13	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
U-238	4.343E-09	0.0005	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Total	9.538E-06	1.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Path
As mrem/yr and Fraction of Total Dose At t = 7.000E+02 years

Water Dependent Pathways

Radio-	Water		Fish		Radon		Plant		Meat		
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mre
Ac-227	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Pa-231	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Ra-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Th-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Th-230	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Th-232	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
U-234	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
U-235	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
U-238	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00

*Sum of all water independent and dependent pathways.

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Path
As mrem/yr and Fraction of Total Dose At t = 9.000E+02 years

Water Independent Pathways (Inhalation excludes radon)

Radio-Nuclide	Ground		Inhalation		Radon		Plant		Meat		
	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mre
Ac-227	2.405E-24	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Pa-231	1.500E-11	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Ra-226	7.941E-07	0.0841	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Ra-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Th-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Th-230	4.879E-07	0.0517	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Th-232	8.157E-06	0.8636	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
U-234	2.258E-09	0.0002	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
U-235	5.209E-13	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
U-238	4.344E-09	0.0005	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Total	9.446E-06	1.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Path
As mrem/yr and Fraction of Total Dose At t = 9.000E+02 years

Water Dependent Pathways

Radio-Nuclide	Water		Fish		Radon		Plant		Meat		
	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mre
Ac-227	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Pa-231	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Ra-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Th-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Th-230	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Th-232	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
U-234	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
U-235	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
U-238	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00

*Sum of all water independent and dependent pathways.

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Path
As mrem/yr and Fraction of Total Dose At t = 1.000E+03 years

Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Radon		Plant		Meat		
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mre
Ac-227	8.684E-26	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Pa-231	1.417E-11	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Ra-226	7.219E-07	0.0767	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Ra-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Th-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Th-230	5.202E-07	0.0553	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Th-232	8.157E-06	0.8672	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
U-234	2.711E-09	0.0003	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
U-235	5.517E-13	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
U-238	4.344E-09	0.0005	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Total	9.406E-06	1.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Path
As mrem/yr and Fraction of Total Dose At t = 1.000E+03 years

Water Dependent Pathways

Radio-	Water		Fish		Radon		Plant		Meat		
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mre
Ac-227	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Pa-231	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Ra-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Th-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Th-230	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Th-232	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
U-234	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
U-235	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
U-238	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00

*Sum of all water independent and dependent pathways.

Dose/Source Ratios Summed Over All Pathways
Parent and Progeny Principal Radionuclide Contributions Indicated

Parent (i)	Product (j)	Branch Fraction*	t=	DSR(j,t) (mrem/yr)/(pCi/g) 0.000E+00	1.000E+00	1.000E+01	1.000E+02	3.000E+02	5.000E+02	7.000E+02	9.0
Ac-227	Ac-227	1.000E+00		2.878E-12	2.784E-12	2.065E-12	1.039E-13	1.355E-16	1.768E-19	2.305E-22	3.0
Pa-231	Pa-231	1.000E+00		3.332E-13	3.331E-13	3.313E-13	3.147E-13	2.806E-13	2.503E-13	2.232E-13	1.9
Pa-231	Ac-227	1.000E+00		0.000E+00	9.010E-14	7.773E-13	2.550E-12	2.364E-12	2.108E-12	1.880E-12	1.6
Pa-231	∑DSR(j)			3.332E-13	4.232E-13	1.109E-12	2.864E-12	2.645E-12	2.358E-12	2.103E-12	1.8
Pb-2i0	Pb-210	1.000E+00		1.166E-19	1.130E-19	8.520E-20	5.067E-21	9.570E-24	1.808E-26	3.415E-29	6.4
Ra-226	Ra-226	1.000E+00		1.029E-08	1.028E-08	1.020E-08	9.357E-09	7.732E-09	6.390E-09	5.280E-09	4.3
Ra-226	Pb-210	1.000E+00		0.000E+00	3.566E-21	3.095E-20	1.032E-19	8.951E-20	7.398E-20	6.113E-20	5.0
Ra-226	∑DSR(j)			1.029E-08	1.028E-08	1.020E-08	9.357E-09	7.732E-09	6.390E-09	5.280E-09	4.3
Ra-228	Ra-228	1.000E+00		2.126E-09	1.883E-09	6.334E-10	1.174E-14	3.579E-25	1.091E-35	0.000E+00	0.0
Ra-228	Th-228	1.000E+00		0.000E+00	1.224E-08	1.748E-08	3.558E-13	1.085E-23	3.308E-34	9.809E-45	0.0
Ra-228	∑DSR(j)			2.126E-09	1.412E-08	1.812E-08	3.676E-13	1.121E-23	3.418E-34	9.809E-45	0.0
Th-228	Th-228	1.000E+00		4.291E-08	2.987E-08	1.146E-09	7.895E-24	0.000E+00	0.000E+00	0.000E+00	0.0
Th-230	Th-230	1.000E+00		2.713E-21	2.713E-21	2.712E-21	2.710E-21	2.705E-21	2.700E-21	2.695E-21	2.6
Th-230	Ra-226	1.000E+00		0.000E+00	4.457E-12	4.438E-11	4.251E-10	1.162E-09	1.769E-09	2.269E-09	2.6
Th-230	Pb-210	1.000E+00		0.000E+00	7.765E-25	7.066E-23	3.348E-21	1.181E-20	1.884E-20	2.463E-20	2.9
Th-230	∑DSR(j)			2.713E-21	4.457E-12	4.438E-11	4.251E-10	1.162E-09	1.769E-09	2.269E-09	2.6
Th-232	Th-232	1.000E+00		2.041E-23	2.041E-23	2.041E-23	2.041E-23	2.040E-23	2.040E-23	2.040E-23	2.0
Th-232	Ra-228	1.000E+00		0.000E+00	2.413E-10	1.486E-09	2.116E-09	2.116E-09	2.116E-09	2.116E-09	2.1
Th-232	Th-228	1.000E+00		0.000E+00	7.999E-10	2.418E-08	4.272E-08	4.272E-08	4.271E-08	4.271E-08	4.2
Th-232	∑DSR(j)			2.041E-23	1.041E-09	2.566E-08	4.484E-08	4.483E-08	4.483E-08	4.482E-08	4.4
U-234	U-234	1.000E+00		1.997E-22	1.997E-22	1.997E-22	1.996E-22	1.995E-22	1.994E-22	1.992E-22	1.9
U-234	Th-230	1.000E+00		0.000E+00	2.442E-26	2.442E-25	2.440E-24	7.312E-24	1.217E-23	1.702E-23	2.1
U-234	Ra-226	1.000E+00		0.000E+00	2.007E-17	2.001E-15	1.944E-13	1.644E-12	4.297E-12	7.943E-12	1.2
U-234	Pb-210	1.000E+00		0.000E+00	2.336E-30	2.176E-27	1.221E-24	1.506E-23	4.284E-23	8.210E-23	1.3
U-234	∑DSR(j)			1.997E-22	2.007E-17	2.001E-15	1.944E-13	1.644E-12	4.297E-12	7.943E-12	1.2
U-235	U-235	1.000E+00		2.018E-14	2.018E-14	2.018E-14	2.018E-14	2.018E-14	2.018E-14	2.018E-14	2.0
U-235	Pa-231	1.000E+00		0.000E+00	7.049E-18	7.031E-17	6.853E-16	1.943E-15	3.065E-15	4.066E-15	4.9
U-235	Ac-227	1.000E+00		0.000E+00	9.585E-19	8.687E-17	4.049E-15	1.458E-14	2.403E-14	3.246E-14	3.9
U-235	∑DSR(j)			2.018E-14	2.019E-14	2.034E-14	2.492E-14	3.671E-14	4.728E-14	5.671E-14	6.5
U-238	U-238	1.000E+00		2.386E-11	2.386E-11	2.386E-11	2.386E-11	2.386E-11	2.386E-11	2.386E-11	2.3
U-238	U-234	1.000E+00		0.000E+00	5.661E-28	5.661E-27	5.660E-26	1.697E-25	2.828E-25	3.958E-25	5.0
U-238	Th-230	1.000E+00		0.000E+00	3.461E-32	3.461E-30	3.460E-28	3.111E-27	8.635E-27	1.691E-26	2.7
U-238	Ra-226	1.000E+00		0.000E+00	1.896E-23	1.892E-20	1.852E-17	4.770E-16	2.110E-15	5.537E-15	1.1
U-238	Pb-210	1.000E+00		0.000E+00	1.658E-36	1.567E-32	9.747E-29	3.993E-27	1.981E-26	5.474E-26	1.1
U-238	∑DSR(j)			2.386E-11	2.386E-11	2.386E-11	2.386E-11	2.386E-11	2.386E-11	2.386E-11	2.3

*Branch Fraction is the cumulative factor for the j't principal radionuclide daughter: CUMBRF(j) = BR
The DSR includes contributions from associated (half-life ≤ 0.5 yr) daughters.

Single Radionuclide Soil Guidelines G(i,t) in pCi/g
Basic Radiation Dose Limit = 2.500E+01 mrem/yr

Nuclide (i)	t= 0.000E+00	1.000E+00	1.000E+01	1.000E+02	3.000E+02	5.000E+02	7.000E+02	9.000E
Ac-227	8.686E+12	8.979E+12	1.211E+13	*7.230E+13	*7.230E+13	*7.230E+13	*7.230E+13	*7.230E
Pa-231	*4.722E+10	*4.722E+10	*4.722E+10	*4.722E+10	*4.722E+10	*4.722E+10	*4.722E+10	*4.722E
Pb-210	*7.631E+13	*7.631E+13	*7.631E+13	*7.631E+13	*7.631E+13	*7.631E+13	*7.631E+13	*7.631E
Ra-226	2.429E+09	2.431E+09	2.452E+09	2.672E+09	3.233E+09	3.913E+09	4.735E+09	5.730E
Ra-228	1.176E+10	1.770E+09	1.380E+09	6.801E+13	*2.726E+14	*2.726E+14	*2.726E+14	*2.726E
Th-228	5.826E+08	8.370E+08	2.182E+10	*8.192E+14	*8.192E+14	*8.192E+14	*8.192E+14	*8.192E
Th-230	*2.018E+10	*2.018E+10	*2.018E+10	*2.018E+10	*2.018E+10	1.413E+10	1.102E+10	9.326E
Th-232	*1.096E+05	*1.096E+05	*1.096E+05	*1.096E+05	*1.096E+05	*1.096E+05	*1.096E+05	*1.096E
U-234	*6.245E+09	*6.245E+09	*6.245E+09	*6.245E+09	*6.245E+09	*6.245E+09	*6.245E+09	*6.245E
U-235	*2.160E+06	*2.160E+06	*2.160E+06	*2.160E+06	*2.160E+06	*2.160E+06	*2.160E+06	*2.160E
U-238	*3.360E+05	*3.360E+05	*3.360E+05	*3.360E+05	*3.360E+05	*3.360E+05	*3.360E+05	*3.360E

*At specific activity limit

Summed Dose/Source Ratios DSR(i,t) in (mrem/yr)/(pCi/g)
and Single Radionuclide Soil Guidelines G(i,t) in pCi/g
at tmin = time of minimum single radionuclide soil guideline
and at tmax = time of maximum total dose = 0.000E+00 years

Nuclide (i)	Initial (pCi/g)	tmin (years)	DSR(i,tmin)	G(i,tmin) (pCi/g)	DSR(i,tmax)	G(i,tmax) (pCi/g)
Ac-227	8.000E+00	0.000E+00	2.878E-12	8.686E+12	2.878E-12	8.686E+12
Pa-231	8.000E+00	121.1 ± 0.2	2.880E-12	*4.722E+10	3.332E-13	*4.722E+10
Pb-210	1.820E+02	0.000E+00	1.166E-19	*7.631E+13	1.166E-19	*7.631E+13
Ra-226	1.820E+02	0.000E+00	1.029E-08	2.429E+09	1.029E-08	2.429E+09
Ra-228	1.820E+02	4.408 ± 0.009	2.599E-08	9.619E+08	2.126E-09	1.176E+10
Th-228	1.820E+02	0.000E+00	4.291E-08	5.826E+08	4.291E-08	5.826E+08
Th-230	1.820E+02	1.000E+03	2.858E-09	8.746E+09	2.713E-21	*2.018E+10
Th-232	1.820E+02	105.9 ± 0.2	4.484E-08	*1.096E+05	2.041E-23	*1.096E+05
U-234	1.820E+02	1.000E+03	1.489E-11	*6.245E+09	1.997E-22	*6.245E+09
U-235	8.000E+00	1.000E+03	6.896E-14	*2.160E+06	2.018E-14	*2.160E+06
U-238	1.820E+02	1.000E+03	2.387E-11	*3.360E+05	2.386E-11	*3.360E+05

*At specific activity limit

Individual Nuclide Dose Summed Over All Pathways
Parent Nuclide and Branch Fraction Indicated

Nuclide (j)	Parent (i)	BRF(i)	DOSE(j,t), mrem/yr t= 0.000E+00	1.000E+00	1.000E+01	1.000E+02	3.000E+02	5.000E+02	7.000E+02	9.0
Ac-227	Ac-227	1.000E+00	2.303E-11	2.227E-11	1.652E-11	8.315E-13	1.084E-15	1.414E-18	1.844E-21	2.4
Ac-227	Pa-231	1.000E+00	0.000E+00	7.208E-13	6.219E-12	2.040E-11	1.891E-11	1.687E-11	1.504E-11	1.3
Ac-227	U-235	1.000E+00	0.000E+00	7.668E-18	6.950E-16	3.239E-14	1.167E-13	1.923E-13	2.597E-13	3.1
Ac-227	∑DOSE(j)		2.303E-11	2.299E-11	2.274E-11	2.126E-11	1.903E-11	1.706E-11	1.530E-11	1.3
Pa-231	Pa-231	1.000E+00	2.666E-12	2.664E-12	2.651E-12	2.518E-12	2.245E-12	2.002E-12	1.785E-12	1.5
Pa-231	U-235	1.000E+00	0.000E+00	5.639E-17	5.625E-16	5.482E-15	1.555E-14	2.452E-14	3.252E-14	3.9
Pa-231	∑DOSE(j)		2.666E-12	2.664E-12	2.651E-12	2.523E-12	2.261E-12	2.027E-12	1.818E-12	1.6
Pb-210	Pb-210	1.000E+00	2.122E-17	2.056E-17	1.551E-17	9.221E-19	1.742E-21	3.290E-24	6.214E-27	0.0
Pb-210	Ra-226	1.000E+00	0.000E+00	6.490E-19	5.633E-18	1.877E-17	1.629E-17	1.346E-17	1.113E-17	9.1
Pb-210	Th-230	1.000E+00	0.000E+00	1.413E-22	1.286E-20	6.094E-19	2.149E-18	3.429E-18	4.483E-18	5.3
Pb-210	U-234	1.000E+00	0.000E+00	4.252E-28	3.961E-25	2.223E-22	2.741E-21	7.797E-21	1.494E-20	2.3
Pb-210	U-238	1.000E+00	0.000E+00	0.000E+00	0.000E+00	1.774E-26	7.267E-25	3.605E-24	9.962E-24	2.0
Pb-210	∑DOSE(j)		2.122E-17	2.121E-17	2.115E-17	2.031E-17	1.845E-17	1.690E-17	1.562E-17	1.4
Ra-226	Ra-226	1.000E+00	1.873E-06	1.872E-06	1.856E-06	1.703E-06	1.407E-06	1.163E-06	9.610E-07	7.9
Ra-226	Th-230	1.000E+00	0.000E+00	8.112E-10	8.077E-09	7.737E-08	2.114E-07	3.219E-07	4.130E-07	4.8
Ra-226	U-234	1.000E+00	0.000E+00	3.652E-15	3.641E-13	3.538E-11	2.991E-10	7.821E-10	1.446E-09	2.2
Ra-226	U-238	1.000E+00	0.000E+00	3.451E-21	3.444E-18	3.370E-15	8.682E-14	3.840E-13	1.008E-12	2.0
Ra-226	∑DOSE(j)		1.873E-06	1.872E-06	1.864E-06	1.780E-06	1.619E-06	1.486E-06	1.375E-06	1.2
Ra-228	Ra-228	1.000E+00	3.869E-07	3.427E-07	1.153E-07	2.136E-12	6.514E-23	0.000E+00	0.000E+00	0.0
Ra-228	Th-232	1.000E+00	0.000E+00	4.392E-08	2.704E-07	3.852E-07	3.851E-07	3.851E-07	3.850E-07	3.8
Ra-228	∑DOSE(j)		3.869E-07	3.867E-07	3.857E-07	3.852E-07	3.851E-07	3.851E-07	3.850E-07	3.8
Th-228	Ra-228	1.000E+00	0.000E+00	2.227E-06	3.182E-06	6.476E-11	1.975E-21	0.000E+00	0.000E+00	0.0
Th-228	Th-228	1.000E+00	7.809E-06	5.436E-06	2.085E-07	1.437E-21	0.000E+00	0.000E+00	0.000E+00	0.0
Th-228	Th-232	1.000E+00	0.000E+00	1.456E-07	4.400E-06	7.775E-06	7.775E-06	7.774E-06	7.773E-06	7.7
Th-228	∑DOSE(j)		7.809E-06	7.809E-06	7.790E-06	7.776E-06	7.775E-06	7.774E-06	7.773E-06	7.7
Th-230	Th-230	1.000E+00	4.937E-19	4.937E-19	4.937E-19	4.933E-19	4.923E-19	4.914E-19	4.904E-19	4.8
Th-230	U-234	1.000E+00	0.000E+00	4.444E-24	4.444E-23	4.442E-22	1.331E-21	2.215E-21	3.097E-21	3.9
Th-230	U-238	1.000E+00	0.000E+00	0.000E+00	6.300E-28	6.297E-26	5.662E-25	1.572E-24	3.077E-24	5.0
Th-230	∑DOSE(j)		4.937E-19	4.937E-19	4.937E-19	4.937E-19	4.936E-19	4.936E-19	4.935E-19	4.9
Th-232	Th-232	1.000E+00	3.714E-21	3.714E-21	3.714E-21	3.714E-21	3.713E-21	3.713E-21	3.713E-21	3.7
U-234	U-234	1.000E+00	3.634E-20	3.634E-20	3.634E-20	3.633E-20	3.631E-20	3.629E-20	3.626E-20	3.6
U-234	U-238	1.000E+00	0.000E+00	1.030E-25	1.030E-24	1.030E-23	3.089E-23	5.147E-23	7.203E-23	9.2
U-234	∑DOSE(j)		3.634E-20	3.634E-20	3.634E-20	3.634E-20	3.634E-20	3.634E-20	3.633E-20	3.6
U-235	U-235	1.000E+00	1.615E-13	1.615E-13	1.615E-13	1.615E-13	1.615E-13	1.614E-13	1.614E-13	1.6
U-238	U-238	1.000E+00	4.343E-09	4.343E-09	4.343E-09	4.343E-09	4.342E-09	4.342E-09	4.342E-09	4.3

BRF(i) is the branch fraction of the parent nuclide.

Individual Nuclide Soil Concentration
Parent Nuclide and Branch Fraction Indicated

Nuclide (j)	Parent (i)	BRF(i)	S(j,t), pCi/g t= 0.000E+00	1.000E+00	1.000E+01	1.000E+02	3.000E+02	5.000E+02	7.000E+02	9.0
Ac-227	Ac-227	1.000E+00	8.000E+00	7.739E+00	5.739E+00	2.889E-01	3.767E-04	4.913E-07	6.407E-10	8.3
Ac-227	Pa-231	1.000E+00	0.000E+00	2.504E-01	2.161E+00	7.087E+00	6.571E+00	5.860E+00	5.225E+00	4.6
Ac-227	U-235	1.000E+00	0.000E+00	2.664E-06	2.415E-04	1.125E-02	4.053E-02	6.680E-02	9.023E-02	1.1
Ac-227	∑S(j):		8.000E+00	7.989E+00	7.900E+00	7.387E+00	6.612E+00	5.927E+00	5.316E+00	4.7
Pa-231	Pa-231	1.000E+00	8.000E+00	7.995E+00	7.954E+00	7.555E+00	6.737E+00	6.008E+00	5.357E+00	4.7
Pa-231	U-235	1.000E+00	0.000E+00	1.692E-04	1.688E-03	1.645E-02	4.665E-02	7.358E-02	9.760E-02	1.1
Pa-231	∑S(j):		8.000E+00	7.996E+00	7.956E+00	7.571E+00	6.784E+00	6.081E+00	5.455E+00	4.8
Pb-210	Pb-210	1.000E+00	1.820E+02	1.764E+02	1.330E+02	7.910E+00	1.494E-02	2.822E-05	5.331E-08	1.0
Pb-210	Ra-226	1.000E+00	0.000E+00	5.567E+00	4.832E+01	1.610E+02	1.397E+02	1.155E+02	9.544E+01	7.8
Pb-210	Th-230	1.000E+00	0.000E+00	1.212E-03	1.103E-01	5.227E+00	1.843E+01	2.941E+01	3.846E+01	4.5
Pb-210	U-234	1.000E+00	0.000E+00	3.647E-09	3.397E-06	1.907E-03	2.352E-02	6.688E-02	1.282E-01	2.0
Pb-210	U-238	1.000E+00	0.000E+00	2.589E-15	2.446E-11	1.522E-07	6.234E-06	3.093E-05	8.545E-05	1.7
Pb-210	∑S(j):		1.820E+02	1.819E+02	1.814E+02	1.742E+02	1.582E+02	1.450E+02	1.340E+02	1.2
Ra-226	Ra-226	1.000E+00	1.820E+02	1.818E+02	1.803E+02	1.654E+02	1.367E+02	1.130E+02	9.336E+01	7.7
Ra-226	Th-230	1.000E+00	0.000E+00	7.881E-02	7.847E-01	7.517E+00	2.054E+01	3.127E+01	4.012E+01	4.7
Ra-226	U-234	1.000E+00	0.000E+00	3.548E-07	3.537E-05	3.437E-03	2.906E-02	7.598E-02	1.404E-01	2.1
Ra-226	U-238	1.000E+00	0.000E+00	3.353E-13	3.345E-10	3.274E-07	8.434E-06	3.730E-05	9.790E-05	1.9
Ra-226	∑S(j):		1.820E+02	1.819E+02	1.811E+02	1.730E+02	1.573E+02	1.443E+02	1.336E+02	1.2
Ra-228	Ra-228	1.000E+00	1.820E+02	1.612E+02	5.424E+01	1.005E-03	3.064E-14	9.344E-25	2.849E-35	0.0
Ra-228	Th-232	1.000E+00	0.000E+00	2.066E+01	1.272E+02	1.812E+02	1.812E+02	1.812E+02	1.812E+02	1.8
Ra-228	∑S(j):		1.820E+02	1.819E+02	1.815E+02	1.812E+02	1.812E+02	1.812E+02	1.812E+02	1.8
Th-228	Ra-228	1.000E+00	0.000E+00	5.191E+01	7.415E+01	1.509E-03	4.602E-14	1.403E-24	4.279E-35	0.0
Th-228	Th-228	1.000E+00	1.820E+02	1.267E+02	4.859E+00	3.349E-14	0.000E+00	0.000E+00	0.000E+00	0.0
Th-228	Th-232	1.000E+00	0.000E+00	3.393E+00	1.025E+02	1.812E+02	1.812E+02	1.812E+02	1.812E+02	1.8
Th-228	∑S(j):		1.820E+02	1.820E+02	1.816E+02	1.812E+02	1.812E+02	1.812E+02	1.812E+02	1.8
Th-230	Th-230	1.000E+00	1.820E+02	1.820E+02	1.820E+02	1.818E+02	1.815E+02	1.811E+02	1.808E+02	1.8
Th-230	U-234	1.000E+00	0.000E+00	1.638E-03	1.638E-02	1.637E-01	4.906E-01	8.166E-01	1.142E+00	1.4
Th-230	U-238	1.000E+00	0.000E+00	2.322E-09	2.322E-07	2.321E-05	2.087E-04	5.793E-04	1.134E-03	1.8
Th-230	∑S(j):		1.820E+02	1.820E+02	1.820E+02	1.820E+02	1.820E+02	1.820E+02	1.819E+02	1.8
Th-232	Th-232	1.000E+00	1.820E+02	1.820E+02	1.820E+02	1.820E+02	1.820E+02	1.820E+02	1.819E+02	1.8
U-234	U-234	1.000E+00	1.820E+02	1.820E+02	1.820E+02	1.819E+02	1.818E+02	1.817E+02	1.816E+02	1.8
U-234	U-238	1.000E+00	0.000E+00	5.160E-04	5.160E-03	5.159E-02	1.547E-01	2.577E-01	3.607E-01	4.6
U-234	∑S(j):		1.820E+02	1.820E+02	1.820E+02	1.820E+02	1.820E+02	1.820E+02	1.819E+02	1.8
U-235	U-235	1.000E+00	8.000E+00	8.000E+00	8.000E+00	8.000E+00	7.999E+00	7.998E+00	7.998E+00	7.9
U-238	U-238	1.000E+00	1.820E+02	1.820E+02	1.820E+02	1.820E+02	1.820E+02	1.820E+02	1.819E+02	1.8

BRF(i) is the branch fraction of the parent nuclide.

RESCALC.EXE execution time = 280.01 seconds
Total water/soil iteration failures = 194.

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Dose Conversion Factor (and Related) Parameter Summary
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Menu	Parameter	Current Value	Default	Paramete Name
B-1	Dose conversion factors for inhalation, mrem/pCi:			
B-1	Ac-227+D	6.720E+00	6.720E+00	DCF2(1)
B-1	Pa-231	1.280E+00	1.280E+00	DCF2(2)
B-1	Pb-210+D	2.320E-02	2.320E-02	DCF2(3)
B-1	Ra-226+D	8.600E-03	8.600E-03	DCF2(4)
B-1	Ra-228+D	5.080E-03	5.080E-03	DCF2(5)
B-1	Th-228+D	3.450E-01	3.450E-01	DCF2(6)
B-1	Th-230	3.260E-01	3.260E-01	DCF2(7)
B-1	Th-232	1.640E+00	1.640E+00	DCF2(8)
B-1	U-234	1.320E-01	1.320E-01	DCF2(9)
B-1	U-235+D	1.230E-01	1.230E-01	DCF2(10)
B-1	U-238+D	1.180E-01	1.180E-01	DCF2(11)
D-1	Dose conversion factors for ingestion, mrem/pCi:			
D-1	Ac-227+D	1.480E-02	1.480E-02	DCF3(1)
D-1	Pa-231	1.060E-02	1.060E-02	DCF3(2)
D-1	Pb-210+D	7.270E-03	7.270E-03	DCF3(3)
D-1	Ra-226+D	1.330E-03	1.330E-03	DCF3(4)
D-1	Ra-228+D	1.440E-03	1.440E-03	DCF3(5)
D-1	Th-228+D	8.080E-04	8.080E-04	DCF3(6)
D-1	Th-230	5.480E-04	5.480E-04	DCF3(7)
D-1	Th-232	2.730E-03	2.730E-03	DCF3(8)
D-1	U-234	2.830E-04	2.830E-04	DCF3(9)
D-1	U-235+D	2.670E-04	2.670E-04	DCF3(10)
D-1	U-238+D	2.690E-04	2.690E-04	DCF3(11)
D-34	Food transfer factors:			
D-34	Ac-227+D , plant/soil concentration ratio, dimensionless	2.500E-03	2.500E-03	RTF(1,1)
D-34	Ac-227+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	2.000E-05	2.000E-05	RTF(1,2)
D-34	Ac-227+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	2.000E-05	2.000E-05	RTF(1,3)
D-34				
D-34	Pa-231 , plant/soil concentration ratio, dimensionless	1.000E-02	1.000E-02	RTF(2,1)
D-34	Pa-231 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	5.000E-03	5.000E-03	RTF(2,2)
D-34	Pa-231 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	5.000E-06	5.000E-06	RTF(2,3)
D-34				
D-34	Pb-210+D , plant/soil concentration ratio, dimensionless	1.000E-02	1.000E-02	RTF(3,1)
D-34	Pb-210+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	8.000E-04	8.000E-04	RTF(3,2)
D-34	Pb-210+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	3.000E-04	3.000E-04	RTF(3,3)
D-34				
D-34	Ra-226+D , plant/soil concentration ratio, dimensionless	4.000E-02	4.000E-02	RTF(4,1)
D-34	Ra-226+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-03	1.000E-03	RTF(4,2)
D-34	Ra-226+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	1.000E-03	1.000E-03	RTF(4,3)
D-34				
D-34	Ra-228+D , plant/soil concentration ratio, dimensionless	4.000E-02	4.000E-02	RTF(5,1)
D-34	Ra-228+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-03	1.000E-03	RTF(5,2)
D-34	Ra-228+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	1.000E-03	1.000E-03	RTF(5,3)
D-34				
D-34	Th-228+D , plant/soil concentration ratio, dimensionless	1.000E-03	1.000E-03	RTF(6,1)
D-34	Th-228+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-04	1.000E-04	RTF(6,2)
D-34	Th-228+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	5.000E-06	5.000E-06	RTF(6,3)
D-34				

Dpse Conversion Factor (and Related) Parameter Summary (continued)
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Menu	Parameter	Current Value	Default	Paramete Name
D-34	Th-230 , plant/soil concentration ratio, dimensionless	1.000E-03	1.000E-03	RTF(7,1)
D-34	Th-230 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-04	1.000E-04	RTF(7,2)
D-34	Th-230 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	5.000E-06	5.000E-06	RTF(7,3)
D-34				
D-34	Th-232 , plant/soil concentration ratio, dimensionless	1.000E-03	1.000E-03	RTF(8,1)
D-34	Th-232 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-04	1.000E-04	RTF(8,2)
D-34	Th-232 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	5.000E-06	5.000E-06	RTF(8,3)
D-34				
D-34	U-234 , plant/soil concentration ratio, dimensionless	2.500E-03	2.500E-03	RTF(9,1)
D-34	U-234 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	3.400E-04	3.400E-04	RTF(9,2)
D-34	U-234 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	6.000E-04	6.000E-04	RTF(9,3)
D-34				
D-34	U-235+D , plant/soil concentration ratio, dimensionless	2.500E-03	2.500E-03	RTF(10,1)
D-34	U-235+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	3.400E-04	3.400E-04	RTF(10,2)
D-34	U-235+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	6.000E-04	6.000E-04	RTF(10,3)
D-34				
D-34	U-238+D , plant/soil concentration ratio, dimensionless	2.500E-03	2.500E-03	RTF(11,1)
D-34	U-238+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	3.400E-04	3.400E-04	RTF(11,2)
D-34	U-238+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	6.000E-04	6.000E-04	RTF(11,3)
D-5	Bioaccumulation factors, fresh water, L/kg:			
D-5	Ac-227+D , fish	1.500E+01	1.500E+01	BIOFAC(1
D-5	Ac-227+D , crustacea and mollusks	1.000E+03	1.000E+03	BIOFAC(1
D-5				
D-5	Pa-231 , fish	1.000E+01	1.000E+01	BIOFAC(2
D-5	Pa-231 , crustacea and mollusks	1.100E+02	1.100E+02	BIOFAC(2
D-5				
D-5	Pb-210+D , fish	3.000E+02	3.000E+02	BIOFAC(3
D-5	Pb-210+D , crustacea and mollusks	1.000E+02	1.000E+02	BIOFAC(3
D-5				
D-5	Ra-226+D , fish	5.000E+01	5.000E+01	BIOFAC(4
D-5	Ra-226+D , crustacea and mollusks	2.500E+02	2.500E+02	BIOFAC(4
D-5				
D-5	Ra-228+D , fish	5.000E+01	5.000E+01	BIOFAC(5
D-5	Ra-228+D , crustacea and mollusks	2.500E+02	2.500E+02	BIOFAC(5
D-5				
D-5	Th-228+D , fish	1.000E+02	1.000E+02	BIOFAC(6
D-5	Th-228+D , crustacea and mollusks	5.000E+02	5.000E+02	BIOFAC(6
D-5				
D-5	Th-230 , fish	1.000E+02	1.000E+02	BIOFAC(7
D-5	Th-230 , crustacea and mollusks	5.000E+02	5.000E+02	BIOFAC(7
D-5				
D-5	Th-232 , fish	1.000E+02	1.000E+02	BIOFAC(8
D-5	Th-232 , crustacea and mollusks	5.000E+02	5.000E+02	BIOFAC(8
D-5				
D-5	U-234 , fish	1.000E+01	1.000E+01	BIOFAC(9
D-5	U-234 , crustacea and mollusks	6.000E+01	6.000E+01	BIOFAC(9
D-5				
D-5	U-235+D , fish	1.000E+01	1.000E+01	BIOFAC(10
D-5	U-235+D , crustacea and mollusks	5.000E+01	6.000E+01	BIOFAC(10
D-5				

Dose Conversion Factor (and Related) Parameter Summary (continued)
File: FGR 13 Morbidity

Menu	Parameter	Current Value	Default	Paramete Name
D-5	U-238+D , fish	1.000E+01	1.000E+01	BIOFAC(11
D-5	U-238+D , crustacea and mollusks	6.000E+01	6.000E+01	BIOFAC(11

Site-Specific Parameter Summary

Menu	Parameter	User Input	Default	Used by RESP (If different from u
R011	Area of contaminated zone (m**2)	1.823E+04	1.000E+04	---
R011	Thickness of contaminated zone (m)	2.800E+00	2.000E+00	---
R011	Length parallel to aquifer flow (m)	not used	1.000E+02	---
R011	Basic radiation dose limit (mrem/yr)	2.500E+01	2.500E+01	---
R011	Time since placement of material (yr)	0.000E+00	0.000E+00	---
R011	Times for calculations (yr)	1.000E+00	1.000E+00	---
R011	Times for calculations (yr)	1.000E+01	3.000E+00	---
R011	Times for calculations (yr)	1.000E+02	1.000E+01	---
R011	Times for calculations (yr)	3.000E+02	3.000E+01	---
R011	Times for calculations (yr)	5.000E+02	1.000E+02	---
R011	Times for calculations (yr)	7.000E+02	3.000E+02	---
R011	Times for calculations (yr)	9.000E+02	1.000E+03	---
R011	Times for calculations (yr)	1.000E+03	0.000E+00	---
R011	Times for calculations (yr)	not used	0.000E+00	---
R012	Initial principal radionuclide (pCi/g): Ac-227	8.000E+00	0.000E+00	---
R012	Initial principal radionuclide (pCi/g): Pa-231	8.000E+00	0.000E+00	---
R012	Initial principal radionuclide (pCi/g): Pb-210	1.820E+02	0.000E+00	---
R012	Initial principal radionuclide (pCi/g): Ra-226	1.820E+02	0.000E+00	---
R012	Initial principal radionuclide (pCi/g): Ra-228	1.820E+02	0.000E+00	---
R012	Initial principal radionuclide (pCi/g): Th-228	1.820E+02	0.000E+00	---
R012	Initial principal radionuclide (pCi/g): Th-230	1.820E+02	0.000E+00	---
R012	Initial principal radionuclide (pCi/g): Th-232	1.820E+02	0.000E+00	---
R012	Initial principal radionuclide (pCi/g): U-234	1.820E+02	0.000E+00	---
R012	Initial principal radionuclide (pCi/g): U-235	8.000E+00	0.000E+00	---
R012	Initial principal radionuclide (pCi/g): U-238	1.820E+02	0.000E+00	---
R012	Concentration in groundwater (pCi/L): Ac-227	not used	0.000E+00	---
R012	Concentration in groundwater (pCi/L): Pa-231	not used	0.000E+00	---
R012	Concentration in groundwater (pCi/L): Pb-210	not used	0.000E+00	---
R012	Concentration in groundwater (pCi/L): Ra-226	not used	0.000E+00	---
R012	Concentration in groundwater (pCi/L): Ra-228	not used	0.000E+00	---
R012	Concentration in groundwater (pCi/L): Th-228	not used	0.000E+00	---
R012	Concentration in groundwater (pCi/L): Th-230	not used	0.000E+00	---
R012	Concentration in groundwater (pCi/L): Th-232	not used	0.000E+00	---
R012	Concentration in groundwater (pCi/L): U-234	not used	0.000E+00	---
R012	Concentration in groundwater (pCi/L): U-235	not used	0.000E+00	---
R012	Concentration in groundwater (pCi/L): U-238	not used	0.000E+00	---
R013	Cover depth (m)	1.000E+00	0.000E+00	---
R013	Density of cover material (g/cm**3)	1.900E+00	1.500E+00	---
R013	Cover depth erosion rate (m/yr)	0.000E+00	1.000E-03	---
R013	Density of contaminated zone (g/cm**3)	2.800E+00	1.500E+00	---
R013	Contaminated zone erosion rate (m/yr)	4.600E-05	1.000E-03	---
R013	Contaminated zone total porosity	4.000E-01	4.000E-01	---
R013	Contaminated zone field capacity	2.000E-01	2.000E-01	---
R013	Contaminated zone hydraulic conductivity (m/yr)	2.000E+03	1.000E+01	---
R013	Contaminated zone b parameter	2.880E+00	5.300E+00	---
R013	Average annual wind speed (m/sec)	4.250E+00	2.000E+00	---
R013	Humidity in air (g/m**3)	not used	8.000E+00	---
R013	Evapotranspiration coefficient	6.250E-01	5.000E-01	---
R013	Precipitation (m/yr)	1.050E+00	1.000E+00	---

Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESP (If different from u
R013	Irrigation (m/yr)	0.000E+00	2.000E-01	---
R013	Irrigation mode	overhead	overhead	---
R013	Runoff coefficient	4.500E-01	2.000E-01	---
R013	Watershed area for nearby stream or pond (m**2)	not used	1.000E+06	---
R013	Accuracy for water/soil computations	not used	1.000E-03	---
R014	Density of saturated zone (g/cm**3)	not used	1.500E+00	---
R014	Saturated zone total porosity	not used	4.000E-01	---
R014	Saturated zone effective porosity	not used	2.000E-01	---
R014	Saturated zone field capacity	not used	2.000E-01	---
R014	Saturated zone hydraulic conductivity (m/yr)	not used	1.000E+02	---
R014	Saturated zone hydraulic gradient	not used	2.000E-02	---
R014	Saturated zone b parameter	not used	5.300E+00	---
R014	Water table drop rate (m/yr)	not used	1.000E-03	---
R014	Well pump intake depth (m below water table)	not used	1.000E+01	---
R014	Model: Nondispersion (ND) or Mass-Balance (MB)	not used	ND	---
R014	Well pumping rate (m**3/yr)	not used	2.500E+02	---
R015	Number of unsaturated zone strata	not used	1	---
R015	Unsat. zone 1, thickness (m)	not used	4.000E+00	---
R015	Unsat. zone 1, soil density (g/cm**3)	not used	1.500E+00	---
R015	Unsat. zone 1, total porosity	not used	4.000E-01	---
R015	Unsat. zone 1, effective porosity	not used	2.000E-01	---
R015	Unsat. zone 1, field capacity	not used	2.000E-01	---
R015	Unsat. zone 1, soil-specific b parameter	not used	5.300E+00	---
R015	Unsat. zone 1, hydraulic conductivity (m/yr)	not used	1.000E+01	---
R016	Distribution coefficients for Ac-227			
R016	Contaminated zone (cm**3/g)	2.000E+01	2.000E+01	---
R016	Unsaturated zone 1 (cm**3/g)	not used	2.000E+01	---
R016	Saturated zone (cm**3/g)	not used	2.000E+01	---
R016	Leach rate (/yr)	0.000E+00	0.000E+00	1.376E-03
R016	Solubility constant	0.000E+00	0.000E+00	not used
R016	Distribution coefficients for Pa-231			
R016	Contaminated zone (cm**3/g)	5.000E+01	5.000E+01	---
R016	Unsaturated zone 1 (cm**3/g)	not used	5.000E+01	---
R016	Saturated zone (cm**3/g)	not used	5.000E+01	---
R016	Leach rate (/yr)	0.000E+00	0.000E+00	5.517E-04
R016	Solubility constant	0.000E+00	0.000E+00	not used
R016	Distribution coefficients fof Pb-210			
R016	Contaminated zone (cm**3/g)	1.000E+02	1.000E+02	---
R016	Unsaturated zone 1 (cm**3/g)	not used	1.000E+02	---
R016	Saturated zone (cm**3/g)	not used	1.000E+02	---
R016	Leach rate (/yr)	0.000E+00	0.000E+00	2.760E-04
R016	Sblubility constant	0.000E+00	0.000E+00	not used

Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESP (If different from u
R016	Distribution coefficients for Ra-226			
R016	Contaminated zone (cm**3/g)	5.300E+01	7.000E+01	---
R016	Unsaturated zone 1 (cm**3/g)	not used	7.000E+01	---
R016	Saturated zone (cm**3/g)	not used	7.000E+01	---
R016	Leach rate (/yr)	0.000E+00	0.000E+00	5.205E-04
R016	Solubility constant	0.000E+00	0.000E+00	not used
R016	Distribution coefficients for Ra-228			
R016	Contaminated zone (cm**3/g)	5.300E+01	7.000E+01	---
R016	Unsaturated zone 1 (cm**3/g)	not used	7.000E+01	---
R016	Saturated zone (cm**3/g)	not used	7.000E+01	---
R016	Leach rate (/yr)	0.000E+00	0.000E+00	5.205E-04
R016	Solubility constant	0.000E+00	0.000E+00	not used
R016	Distribution coefficients for Th-228			
R016	Contaminated zone (cm**3/g)	5.201E+04	6.000E+04	---
R016	Unsaturated zone 1 (cm**3/g)	not used	6.000E+04	---
R016	Saturated zone (cm**3/g)	not used	6.000E+04	---
R016	Leach rate (/yr)	0.000E+00	0.000E+00	5.311E-07
R016	Solubility constant	0.000E+00	0.000E+00	not used
R016	Distribution coefficients for Th-230			
R016	Contaminated zone (cm**3/g)	5.201E+04	6.000E+04	---
R016	Unsaturated zone 1 (cm**3/g)	not used	6.000E+04	---
R016	Saturated zone (cm**3/g)	not used	6.000E+04	---
R016	Leach rate (/yr)	0.000E+00	0.000E+00	5.311E-07
R016	Solubility constant	0.000E+00	0.000E+00	not used
R016	Distribution coefficients for Th-232			
R016	Contaminated zone (cm**3/g)	5.201E+04	6.000E+04	---
R016	Unsaturated zone 1 (cm**3/g)	not used	6.000E+04	---
R016	Saturated zone (cm**3/g)	not used	6.000E+04	---
R016	Leach rate (/yr)	0.000E+00	0.000E+00	5.311E-07
R016	Solubility constant	0.000E+00	0.000E+00	not used
R016	Distribution coefficients for U-234			
R016	Contaminated zone (cm**3/g)	7.036E+04	5.000E+01	---
R016	Unsaturated zone 1 (cm**3/g)	not used	5.000E+01	---
R016	Saturated zone (cm**3/g)	not used	5.000E+01	---
R016	Leach rate (/yr)	0.000E+00	0.000E+00	3.926E-07
R016	Solubility constant	0.000E+00	0.000E+00	not used
R016	Distribution coefficients for U-235			
R016	Contaminated zone (cm**3/g)	7.036E+04	5.000E+01	---
R016	Unsaturated zone 1 (cm**3/g)	not used	5.000E+01	---
R016	Saturated zone (cm**3/g)	not used	5.000E+01	---
R016	Leach rate (/yr)	0.000E+00	0.000E+00	3.926E-07
R016	Solubility constant	0.000E+00	0.000E+00	not used

Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESP (If different from u
R016	Distribution coefficients for U-238			
R016	Contaminated zone (cm**3/g)	7.036E+04	5.000E+01	---
R016	Unsaturated zone 1 (cm**3/g)	not used	5.000E+01	---
R016	Saturated zone (cm**3/g)	not used	5.000E+01	---
R016	Leach rate (/yr)	0.000E+00	0.000E+00	3.926E-07
R016	Solubility constant	0.000E+00	0.000E+00	not used
R017	Inhalation rate (m**3/yr)	8.400E+03	8.400E+03	---
R017	Mass loading for inhalation (g/m**3)	3.000E-05	1.000E-04	---
R017	Exposure duration	3.000E+01	3.000E+01	---
R017	Shielding factor, inhalation	4.000E-01	4.000E-01	---
R017	Shielding factor, external gamma	2.700E-01	7.000E-01	---
R017	Fraction of time spent indoors	0.000E+00	5.000E-01	---
R017	Fraction of time spent outdoors (on site)	1.000E-03	2.500E-01	---
R017	Shape factor flag, external gamma	1.000E+00	1.000E+00	>0 shows circular
R017	Radii of shape factor array (used if FS = -1):			
R017	Outer annular radius (m), ring 1:	not used	5.000E+01	---
R017	Outer annular radius (m), ring 2:	not used	7.071E+01	---
R017	Outer annular radius (m), ring 3:	not used	0.000E+00	---
R017	Outer annular radius (m), ring 4:	not used	0.000E+00	---
R017	Outer annular radius (m), ring 5:	not used	0.000E+00	---
R017	Outer annular radius (m), ring 6:	not used	0.000E+00	---
R017	Outer annular radius (m), ring 7:	not used	0.000E+00	---
R017	Outer annular radius (m), ring 8:	not used	0.000E+00	---
R017	Outer annular radius (m), ring 9:	not used	0.000E+00	---
R017	Outer annular radius (m), ring 10:	not used	0.000E+00	---
R017	Outer annular radius (m), ring 11:	not used	0.000E+00	---
R017	Outer annular radius (m), ring 12:	not used	0.000E+00	---
R017	Fractions of annular areas within AREA:			
R017	Ring 1	not used	1.000E+00	---
R017	Ring 2	not used	2.732E-01	---
R017	Ring 3	not used	0.000E+00	---
R017	Ring 4	not used	0.000E+00	---
R017	Ring 5	not used	0.000E+00	---
R017	Ring 6	not used	0.000E+00	---
R017	Ring 7	not used	0.000E+00	---
R017	Ring 8	not used	0.000E+00	---
R017	Ring 9	not used	0.000E+00	---
R017	Ring 10	not used	0.000E+00	---
R017	Ring 11	not used	0.000E+00	---
R017	Ring 12	not used	0.000E+00	---
R018	Fruits, vegetables and grain consumption (kg/yr)	not used	1.600E+02	---
R018	Leafy vegetable consumption (kg/yr)	not used	1.400E+01	---
R018	Milk consumption (L/yr)	not used	9.200E+01	---
R018	Meat and poultry consumption (kg/yr)	not used	6.300E+01	---
R018	Fish consumption (kg/yr)	not used	5.400E+00	---
R018	Other seafood consumption (kg/yr)	not used	9.000E-01	---
R018	Soil ingestion rate (g/yr)	1.830E+01	3.650E+01	---
R018	Drinking water intake (L/yr)	not used	5.100E+02	---

Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESP (If different from u
R018	Contamination fraction of drinking water	not used	1.000E+00	---
R018	Contamination fraction of household water	not used	1.000E+00	---
R018	Contamination fraction of livestock water	not used	1.000E+00	---
R018	Contamination fraction of irrigation water	not used	1.000E+00	---
R018	Contamination fraction of aquatic food	not used	5.000E-01	---
R018	Contamination fraction of plant food	not used	-1	---
R018	Contamination fraction of meat	not used	-1	---
R018	Contamination fraction of milk	not used	-1	---
R019	Livestock fodder intake for meat (kg/day)	not used	6.800E+01	---
R019	Livestock fodder intake for milk (kg/day)	not used	5.500E+01	---
R019	Livestock water intake for meat (L/day)	not used	5.000E+01	---
R019	Livestock water intake for milk (L/day)	not used	1.600E+02	---
R019	Livestock soil intake (kg/day)	not used	5.000E-01	---
R019	Mass loading for foliar deposition (g/m**3)	not used	1.000E-04	---
R019	Depth of soil mixing layer (m)	1.500E-01	1.500E-01	---
R019	Depth of roots (m)	not used	9.000E-01	---
R019	Drinking water fraction from ground water	not used	1.000E+00	---
R019	Household water fraction from ground water	not used	1.000E+00	---
R019	Livestock water fraction from ground water	not used	1.000E+00	---
R019	Irrigation fraction from ground water	not used	1.000E+00	---
R19B	Wet weight crop yield for Non-Leafy (kg/m**2)	not used	7.000E-01	---
R19B	Wet weight crop yield for Leafy (kg/m**2)	not used	1.500E+00	---
R19B	Wet weight crop yield for Fodder (kg/m**2)	not used	1.100E+00	---
R19B	Growing Season for Non-Leafy (years)	not used	1.700E-01	---
R19B	Growing Season for Leafy (years)	not used	2.500E-01	---
R19B	Growing Season for Fodder (years)	not used	8.000E-02	---
R19B	Translocation Factor for Non-Leafy	not used	1.000E-01	---
R19B	Translocation Factor for Leafy	not used	1.000E+00	---
R19B	Translocation Factor for Fodder	not used	1.000E+00	---
R19B	Dry Foliar Interception Fraction for Non-Leafy	not used	2.500E-01	---
R19B	Dry Foliar Interception Fraction for Leafy	not used	2.500E-01	---
R19B	Dry Foliar Interception Fraction for Fodder	not used	2.500E-01	---
R19B	Wet Foliar Interception Fraction for Non-Leafy	not used	2.500E-01	---
R19B	Wet Foliar Interception Fraction for Leafy	not used	2.500E-01	---
R19B	Wet Foliar Interception Fraction for Fodder	not used	2.500E-01	---
R19B	Weathering Removal Constant for Vegetation	not used	2.000E+01	---
C14	C-12 concentration in water (g/cm**3)	not used	2.000E-05	---
C14	C-12 concentration in contaminated soil (g/g)	not used	3.000E-02	---
C14	Fraction of vegetation carbon from soil	not used	2.000E-02	---
C14	Fraction of vegetation carbon from air	not used	9.800E-01	---
C14	C-14 evasion layer thickness in soil (m)	not used	3.000E-01	---
C14	C-14 evasion flux rate from soil (1/sec)	not used	7.000E-07	---
C14	C-12 evasion flux rate from soil (1/sec)	not used	1.000E-10	---
C14	Fraction of grain in beef cattle feed	not used	8.000E-01	---
C14	Fraction of grain in milk cow feed	not used	2.000E-01	---
C14	DCF correction factor for gaseous forms of C14	not used	8.894E+01	---
STOR	Storage times of contaminated foodstuffs (days):			

Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESP (If different from u
STOR	Fruits, non-leafy vegetables, and grain	1.400E+01	1.400E+01	---
STOR	Leafy vegetables	1.000E+00	1.000E+00	---
STOR	Milk	1.000E+00	1.000E+00	---
STOR	Meat and poultry	2.000E+01	2.000E+01	---
STOR	Fish	7.000E+00	7.000E+00	---
STOR	Crustacea and mollusks	7.000E+00	7.000E+00	---
STOR	Well water	1.000E+00	1.000E+00	---
STOR	Surface water	1.000E+00	1.000E+00	---
STOR	Livestock fodder	4.500E+01	4.500E+01	---
R021	Thickness of building foundation (m)	not used	1.500E-01	---
R021	Bulk density of building foundation (g/cm**3)	not used	2.400E+00	---
R021	Total porosity of the cover material	not used	4.000E-01	---
R021	Total porosity of the building foundation	not used	1.000E-01	---
R021	Volumetric water content of the cover material	not used	5.000E-02	---
R021	Volumetric water content of the foundation	not used	3.000E-02	---
R021	Diffusion coefficient for radon gas (m/sec):			
R021	in cover material	not used	2.000E-06	---
R021	in foundation material	not used	3.000E-07	---
R021	in contaminated zone soil	not used	2.000E-06	---
R021	Radon vertical dimension of mixing (m)	not used	2.000E+00	---
R021	Average building air exchange rate (1/hr)	not used	5.000E-01	---
R021	Height of the building (room) (m)	not used	2.500E+00	---
R021	Building interior area factor	not used	0.000E+00	---
R021	Building depth below ground surface (m)	not used	-1.000E+00	---
R021	Emanating power of Rn-222 gas	not used	2.500E-01	---
R021	Emanating power of Rn-220 gas	not used	1.500E-01	---
TITL	Number of graphical time points	32	---	---
TITL	Maximum number of integration points for dose	1	---	---
TITL	Maximum number of integration points for risk	1	---	---

Summary of Pathway Selections

Pathway	User Selection
1 -- external gamma	active
2 -- inhalation (w/o radon)	active
3 -- plant ingestion	suppressed
4 -- meat ingestion	suppressed
5 -- milk ingestion	suppressed
6 -- aquatic foods	suppressed
7 -- drinking water	suppressed
8 -- soil ingestion	active
9 -- radon	suppressed
Find peak pathway doses	active

Contaminated Zone Dimensions	
Area:	18228.00 square meters
Thickness:	2.80 meters
Cover Depth:	1.00 meters

Initial Soil Concentrations, pCi/g	
Ac-227	8.000E+00
Pa-231	8.000E+00
Pb-210	1.820E+02
Ra-226	1.820E+02
Ra-228	1.820E+02
Th-228	1.820E+02
Th-230	1.820E+02
Th-232	1.820E+02
U-234	1.820E+02
U-235	8.000E+00
U-238	1.820E+02

Total Dose TDOSE(t), mrem/yr
Basic Radiation Dose Limit = 2.500E+01 mrem/yr
Total Mixture Sum M(t) = Fraction of Basic Dose Limit Received at Time (t)

t (years):	0.000E+00	1.000E+00	1.000E+01	1.000E+02	3.000E+02	5.000E+02	7.000E+02	9.000E+02
TDOSE(t):	1.439E-06	1.439E-06	1.435E-06	1.421E-06	1.398E-06	1.378E-06	1.363E-06	1.349E-06
M(t):	5.757E-08	5.756E-08	5.740E-08	5.683E-08	5.590E-08	5.514E-08	5.450E-08	5.398E-08

Maximum TDOSE(t): 1.439E-06 mrem/yr at t = 0.000E+00 years

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Path
As mrem/yr and Fraction of Total Dose At t = 0.000E+00 years

Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Radon		Plant		Meat		
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mre
Ac-227	3.289E-12	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Pa-231	3.809E-13	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Pb-210	3.031E-18	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Ra-226	2.676E-07	0.1860	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Ra-228	5.526E-08	0.0384	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Th-228	1.116E-06	0.7752	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Th-230	7.053E-20	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Th-232	5.306E-22	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
U-234	5.192E-21	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
U-235	2.307E-14	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
U-238	6.204E-10	0.0004	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Total	1.439E-06	1.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Path
As mrem/yr and Fraction of Total Dose At t = 0.000E+00 years

Water Dependent Pathways

Radio-	Water		Fish		Radon		Plant		Meat		
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mre
Ac-227	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Pa-231	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Ra-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Th-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Th-230	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Th-232	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
U-234	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
U-235	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
U-238	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00

*Sum of all water independent and dependent pathways.

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Path
As mrem/yr and Fraction of Total Dose At t = 1.000E+00 years

Water Independent Pathways (Inhalation excludes radon)

Radio-Nuclide	Ground		Inhalation		Radon		Plant		Meat		
	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mre
Ac-227	3.182E-12	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Pa-231	4.836E-13	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Pb-210	2.937E-18	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Ra-226	2.674E-07	0.1858	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Ra-228	3.672E-07	0.2552	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Th-228	7.766E-07	0.5397	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Th-230	1.159E-10	0.0001	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Th-232	2.707E-08	0.0188	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
U-234	5.217E-16	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
U-235	2.308E-14	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
U-238	6.204E-10	0.0004	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Total	1.439E-06	1.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Path
As mrem/yr and Fraction of Total Dose At t = 1.000E+00 years

Water Dependent Pathways

Radio-Nuclide	Water		Fish		Radon		Plant		Meat		
	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mre
Ac-227	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Pa-231	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Ra-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Th-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Th-230	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Th-232	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
U-234	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
U-235	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
U-238	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00

*Sum of all water independent and dependent pathways.

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Path
As mrem/yr and Fraction of Total Dose At t = 1.000E+01 years

Water Independent Pathways (Inhalation excludes radon)

Radio-Nuclide	Ground		Ihhalation		Radon		Plant		Meat		
	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mre
Ac-227	2.360E-12	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Pa-231	1.267E-12	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Pb-210	2.215E-18	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Ra-226	2.651E-07	0.1847	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Ra-228	4.710E-07	0.3283	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Th-228	2.979E-08	0.0208	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Th-230	1.154E-09	0.0008	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Th-232	6.672E-07	0.4650	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
U-234	5.202E-14	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
U-235	2.325E-14	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
U-238	6.204E-10	0.0004	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Total	1.435E-06	1.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Path
As mrem/yr and Fraction of Total Dose At t = 1.000E+01 years

Water Dependent Pathways

Radio-Nuclide	Water		Fish		Radon		Plant		Meat		
	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mre
Ac-227	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Pa-231	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Ra-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Th-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Th-230	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Th-232	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
U-234	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
U-235	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
U-238	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00

*Sum of all water independent and dependent pathways.

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Path
As mrem/yr and Fraction of Total Dose At t = 1.000E+02 years

Water Independent Pathways (Inhalation excludes radon)

Radio-Nuclide	Ground		Inhalation		Radon		Plant		Meat		
	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mre
Ac-227	1.188E-13	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Pa-231	3.274E-12	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Pb-210	1.317E-19	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Ra-226	2.433E-07	0.1712	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Ra-228	9.557E-12	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Th-228	2.053E-22	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Th-230	1.105E-08	0.0078	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Th-232	1.166E-06	0.8205	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
U-234	5.054E-12	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
U-235	2.848E-14	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
U-238	6.204E-10	0.0004	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Total	1.421E-06	1.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Path
As mrem/yr and Fraction of Total Dose At t = 1.000E+02 years

Water Dependent Pathways

Radio-Nuclide	Water		Fish		Radon		Plant		Meat		
	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mre
Ac-227	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Pa-231	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Ra-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Th-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Th-230	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Th-232	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
U-234	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
U-235	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
U-238	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00

*Sum of all water independent and dependent pathways.

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Path
As mrem/yr and Fraction of Total Dose At t = 3.000E+02 years

Water Independent Pathways (Inhalation excludes radon)

Radio-Nuclide	Ground		Inhalation		Radon		Plant		Meat		
	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mre
Ac-227	1.549E-16	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Pa-231	3.022E-12	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Pb-210	2.488E-22	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Ra-226	2.010E-07	0.1438	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Ra-228	2.914E-22	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Th-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Th-230	3.020E-08	0.0216	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Th-232	1.166E-06	0.8341	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
U-234	4.274E-11	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
U-235	4.195E-14	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
U-238	6.204E-10	0.0004	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Total	1.398E-06	1.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Path
As mrem/yr and Fraction of Total Dose At t = 3.000E+02 years

Water Dependent Pathways

Radio-Nuclide	Water		Fish		Radon		Plant		Meat		
	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mre
Ac-227	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Pa-231	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Ra-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Th-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Th-230	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Th-232	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
U-234	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
0-235	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
U-238	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00

*Sum of all water independent and dependent pathways.

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Path
As mrem/yr and Fraction of Total Dose At t = 5.000E+02 years

Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Radon		Plant		Meat		
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mre
Ac-227	2.020E-19	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Pa-231	2.695E-12	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Pb-210	4.700E-25	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Ra-226	1.661E-07	0.1205	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Ra-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Th-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Th-230	4.599E-08	0.0334	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Th-232	1.166E-06	0.8456	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
U-234	1.117E-10	0.0001	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
U-235	5.403E-14	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
U-238	6.204E-10	0.0005	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Total	1.378E-06	1.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Path
As mrem/yr and Fraction of Total Dose At t = 5.000E+02 years

Water Dependent Pathways

Radio-	Water		Fish		Radon		Plant		Meat		
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mre
Ac-227	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Pa-231	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Ra-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Th-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Th-230	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Th-232	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
U-234	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
U-235	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
U-238	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00

*Sum of all water independent and dependent pathways.

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Path
As mrem/yr and Fraction of Total Dose At t = 7.000E+02 years

Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Radon		Plant		Meat		
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mre
Ac-227	2.634E-22	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Pa-231	2.404E-12	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Pb-210	8.878E-28	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Ra-226	1.373E-07	0.1008	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Ra-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Th-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Th-230	5.899E-08	0.0433	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Th-232	1.165E-06	0.8553	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
U-234	2.065E-10	0.0002	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
U-235	6.481E-14	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
U-238	6.204E-10	0.0005	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Total	1.363E-06	1.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Path
As mrem/yr and Fraction of Total Dose At t = 7.000E+02 years

Water Dependent Pathways

Radio-	Water		Fish		Radon		Plant		Meat		
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mre
Ac-227	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Pa-231	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Ra-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Th-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Th-230	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Th-232	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
U-234	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
U-235	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
U-238	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00

*Sum of all water independent and dependent pathways.

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Path
As mrem/yr and Fraction of Total Dose At t = 9.000E+02 years

Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Radon		Plant		Meat		
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mre
Ac-227	3.435E-25	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Pa-231	2.143E-12	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Ra-226	1.134E-07	0.0841	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Ra-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Th-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Th-230	6.970E-08	0.0517	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Th-232	1.165E-06	0.8636	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
U-234	3.225E-10	0.0002	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
U-235	7.441E-14	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
U-238	6.205E-10	0.0005	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Total	1.349E-06	1.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Path
As mrem/yr and Fraction of Total Dose At t = 9.000E+02 years

Water Dependent Pathways

Radio-	Water		Fish		Radon		Plant		Meat		
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mre
Ac-227	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Pa-231	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Ra-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Th-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Th-230	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Th-232	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
0-234	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
U-235	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
U-238	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00

*Sum of all water independent and dependent pathways.

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Path
As mrem/yr and Fraction of Total Dose At t = 1.000E+03 years

Water Independent Pathways (Inhalation excludes radon)

Radio-Nuclide	Ground		Inhalation		Radon		Plant		Meat		
	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mre
Ac-227	1.241E-26	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Pa-231	2.024E-12	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Ra-226	1.031E-07	0.0767	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Ra-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Th-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Th-230	7.432E-08	0.0553	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Th-232	1.165E-06	0.8672	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
U-234	3.873E-10	0.0003	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
U-235	7.882E-14	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
U-238	6.206E-10	0.0005	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Total	1.344E-06	1.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Path
As mrem/yr and Fraction of Total Dose At t = 1.000E+03 years

Water Dependent Pathways

Radio-Nuclide	Water		Fish		Radon		Plant		Meat		
	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mre
Ac-227	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Pa-231	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Ra-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Th-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Th-230	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Th-232	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
U-234	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
U-235	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
U-238	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00

*Sum of all water independent and dependent pathways.

Dose/Source Ratios Summed Over All Pathways
Parent and Progeny Principal Radionuclide Contributions Indicated

Parent (i)	Product (j)	Branch Fraction*	t=	DSR(j,t) (mrem/yr)/(pCi/g) 0.000E+00	1.000E+00	1.000E+01	1.000E+02	3.000E+02	5.000E+02	7.000E+02	9.0
Ac-227	Ac-227	1.000E+00		4.112E-13	3.977E-13	2.950E-13	1.485E-14	1.936E-17	2.525E-20	3.293E-23	4.2
Pa-231	Pa-231	1.000E+00		4.761E-14	4.758E-14	4.733E-14	4.496E-14	4.009E-14	3.575E-14	3.188E-14	2.8
Pa-231	Ac-227	1.000E+00		0.000E+00	1.287E-14	1.110E-13	3.642E-13	3.377E-13	3.012E-13	2.686E-13	2.3
Pa-231	∑DSR(j)			4.761E-14	6.045E-14	1.584E-13	4.092E-13	3.778E-13	3.369E-13	3.005E-13	2.6
Pb-210	Pb-210	1.000E+00		1.665E-20	1.614E-20	1.217E-20	7.238E-22	1.367E-24	2.582E-27	4.878E-30	9.2
Ra-226	Ra-226	1.000E+00		1.471E-09	1.469E-09	1.457E-09	1.337E-09	1.105E-09	9.128E-10	7.543E-10	6.2
Ra-226	Pb-210	1.000E+00		0.000E+00	5.094E-22	4.421E-21	1.474E-20	1.279E-20	1.057E-20	8.733E-21	7.2
Ra-226	∑DSR(j)			1.471E-09	1.469E-09	1.457E-09	1.337E-09	1.105E-09	9.128E-10	7.543E-10	6.2
Ra-228	Ra-228	1.000E+00		3.037E-10	2.690E-10	9.049E-11	1.677E-15	5.113E-26	1.559E-36	0.000E+00	0.0
Ra-228	Th-228	1.000E+00		0.000E+00	1.748E-09	2.498E-09	5.084E-14	1.550E-24	4.726E-35	1.401E-45	0.0
Ra-228	∑DSR(j)			3.037E-10	2.017E-09	2.588E-09	5.251E-14	1.601E-24	4.882E-35	1.401E-45	0.0
Th-228	Th-228	1.000E+00		6.130E-09	4.267E-09	1.637E-10	1.128E-24	0.000E+00	0.000E+00	0.000E+00	0.0
Th-230	Th-230	1.000E+00		3.875E-22	3.875E-22	3.875E-22	3.872E-22	3.864E-22	3.857E-22	3.850E-22	3.8
Th-230	Ra-226	1.000E+00		0.000E+00	6.368E-13	6.340E-12	6.073E-11	1.660E-10	2.527E-10	3.241E-10	3.8
Th-230	Pb-210	1.000E+00		0.000E+00	1.109E-25	1.009E-23	4.783E-22	1.687E-21	2.691E-21	3.519E-21	4.2
Th-230	∑DSR(j)			3.875E-22	6.368E-13	6.340E-12	6.073E-11	1.660E-10	2.527E-10	3.241E-10	3.8
Th-232	Th-232	1.000E+00		2.915E-24	2.915E-24	2.915E-24	2.915E-24	2.915E-24	2.914E-24	2.914E-24	2.9
Th-232	Ra-228	1.000E+00		0.000E+00	3.448E-11	2.122E-10	3.023E-10	3.023E-10	3.023E-10	3.022E-10	3.0
Th-232	Th-228	1.000E+00		0.000E+00	1.143E-10	3.4S4E-09	6.103E-09	6.103E-09	6.102E-09	6.101E-09	6.1
Th-232	∑DSR(j)			2.915E-24	1.487E-10	3.666E-09	6.406E-09	6.405E-09	6.404E-09	6.404E-09	6.4
U-234	U-234	1.000E+00		2.853E-23	2.853E-23	2.853E-23	2.852E-23	2.850E-23	2.848E-23	2.846E-23	2.8
U-234	Th-230	1.000E+00		0.000E+00	3.489E-27	3.488E-26	3.486E-25	1.045E-24	1.739E-24	2.431E-24	3.1
U-234	Ra-226	1.000E+00		0.000E+00	2.866E-18	2.858E-16	2.777E-14	2.348E-13	6.139E-13	1.135E-12	1.7
U-234	Pb-210	1.000E+00		0.000E+00	3.338E-31	3.109E-28	1.745E-25	2.152E-24	6.120E-24	1.173E-23	1.8
U-234	∑DSR(j)			2.853E-23	2.866E-18	2.858E-16	2.777E-14	2.348E-13	6.139E-13	1.135E-12	1.7
U-235	U-235	1.000E+00		2.883E-15	2.883E-15	2.883E-15	2.883E-15	2.883E-15	2.883E-15	2.883E-15	2.8
U-235	Pa-231	1.000E+00		0.000E+00	1.007E-18	1.004E-17	9.789E-17	2.776E-16	4.379E-16	5.808E-16	7.0
U-235	Ac-227	1.000E+00		0.000E+00	1.369E-19	1.241E-17	5.784E-16	2.083E-15	3.434E-15	4.637E-15	5.7
U-235	∑DSR(j)			2.883E-15	2.885E-15	2.906E-15	3.560E-15	5.244E-15	6.754E-15	8.101E-15	9.3
U-238	U-238	1.000E+00		3.409E-12	3.409E-12	3.409E-12	3.409E-12	3.409E-12	3.408E-12	3.408E-12	3.4
U-238	U-234	1.000E+00		0.000E+00	8.088E-29	8.087E-28	8.086E-27	2.425E-26	4.040E-26	5.654E-26	7.2
U-238	Th-230	1.000E+00		0.000E+00	4.945E-33	4.945E-31	4.943E-29	4.445E-28	1.234E-27	2.416E-27	3.9
U-238	Ra-226	1.000E+00		0.000E+00	2.709E-24	2.703E-21	2.645E-18	6.814E-17	3.014E-16	7.910E-16	1.6
U-238	Pb-210	1.000E+00		0.000E+00	2.369E-37	2.238E-33	1.392E-29	5.704E-28	2.830E-27	7.819E-27	1.6
U-238	∑DSR(j)			3.409E-12	3.409E-12	3.409E-12	3.409E-12	3.409E-12	3.409E-12	3.409E-12	3.4

*Branch Fraction is the cumulative factor for the j't principal radionuclide daughter: CUMBRF(j) = BB
The DSR includes contributions from associated (half-life ≤ 0.5 yr) daughters.

Single Radionuclide Soil Guidelines G(i,t) in pCi/g
Basic Radiation Dose Limit = 2.500E+01 mrem/yr

Nuclide (i)	t= 0.000E+00	1.000E+00	1.000E+01	1.000E+02	3.000E+02	5.000E+02	7.000E+02	9.000E
Ac-227	6.080E+13	6.285E+13	*7.230E+13	*7.230E+13	*7.230E+13	*7.230E+13	*7.230E+13	*7.230E
Pa-231	*4.722E+10	*4.722E+10	*4.722E+10	*4.722E+10	*4.722E+10	*4.722E+10	*4.722E+10	*4.722E
Pb-210	*7.631E+13	*7.631E+13	*7.631E+13	*7.631E+13	*7.631E+13	*7.631E+13	*7.631E+13	*7.631E
Ra-226	1.700E+10	1.702E+10	1.716E+10	1.870E+10	2.263E+10	2.739E+10	3.314E+10	4.011E
Ra-228	8.233E+10	1.239E+10	9.660E+09	*2.726E+14	*2.726E+14	*2.726E+14	*2.726E+14	*2.726E
Th-228	4.078E+09	5.859E+09	1.528E+11	*8.192E+14	*8.192E+14	*8.192E+14	*8.192E+14	*8.192E
Th-230	*2.018E+10	*2.018E+10	*2.018E+10	*2.018E+10	*2.018E+10	*2.018E+10	*2.018E+10	*2.018E
Th-232	*1.096E+05	*1.096E+05	*1.096E+05	*1.096E+05	*1.096E+05	*1.096E+05	*1.096E+05	*1.096E
U-234	*6.245E+09	*6.245E+09	*6.245E+09	*6.245E+09	*6.245E+09	*6.245E+09	*6.245E+09	*6.245E
U-235	*2.160E+06	*2.160E+06	*2.160E+06	*2.160E+06	*2.160E+06	*2.160E+06	*2.160E+06	*2.160E
U-238	*3.360E+05	*3.360E+05	*3.360E+05	*3.360E+05	*3.360E+05	*3.360E+05	*3.360E+05	*3.360E

*At specific activity limit

Summed Dose/Source Ratios DSR(i,t) in (mrem/yr)/(pCi/g)
and Single Radionuclide Soil Guidelines G(i,t) in pCi/g
at tmin = time of minimum single radionuclide soil guideline
and at tmax = time of maximum total dose = 0.000E+00 years

Nuclide (i)	Initial (pCi/g)	tmin (years)	DSR(i,tmin)	G(i,tmin) (pCi/g)	DSR(i,tmax)	G(i,tmax) (pCi/g)
Ac-227	8.000E+00	0.000E+00	4.112E-13	6.080E+13	4.112E-13	6.080E+13
Pa-231	8.000E+00	120.9 ± 0.2	4.114E-13	*4.722E+10	4.761E-14	*4.722E+10
Pb-210	1.820E+02	0.000E+00	1.665E-20	*7.631E+13	1.665E-20	*7.631E+13
Ra-226	1.820E+02	0.000E+00	1.471E-09	1.700E+10	1.471E-09	1.700E+10
Ra-228	1.820E+02	4.408 ± 0.009	3.713E-09	6.733E+09	3.037E-10	8.233E+10
Th-228	1.820E+02	0.000E+00	6.130E-09	4.078E+09	6.130E-09	4.078E+09
Th-230	1.820E+02	1.000E+03	4.083E-10	*2.018E+10	3.875E-22	*2.018E+10
Th-232	1.820E+02	105.3 ± 0.2	6.406E-09	*1.096E+05	2.915E-24	*1.096E+05
U-234	1.820E+02	1.000E+03	2.128E-12	*6.245E+09	2.853E-23	*6.245E+09
U-235	8.000E+00	1.000E+03	9.852E-15	*2.160E+06	2.883E-15	*2.160E+06
U-238	1.820E+02	1.000E+03	3.410E-12	*3.360E+05	3.409E-12	*3.360E+05

*At specific activity limit

Individual Nuclide Dose Summed Over All Pathways
Parent Nuclide and Branch Fraction Indicated

Nuclide (j)	Parent (i)	BRF(i)	DOSE(j,t), mrem/yr t= 0.000E+00	1.000E+00	1.000E+01	1.000E+02	3.000E+02	5.000E+02	7.000E+02	9.0
Ac-227	Ac-227	1.000E+00	3.289E-12	3.182E-12	2.360E-12	1.188E-13	1.549E-16	2.020E-19	2.634E-22	3.4
Ac-227	Pa-231	1.000E+00	0.000E+00	1.030E-13	8.884E-13	2.914E-12	2.702E-12	2.409E-12	2.149E-12	1.9
Ac-227	U-235	1.000E+00	0.000E+00	1.095E-18	9.928E-17	4.627E-15	1.667E-14	2.747E-14	3.710E-14	4.5
Ac-227	∑DOSE(j)		3.289E-12	3.285E-12	3.248E-12	3.037E-12	2.719E-12	2.437E-12	2.186E-12	1.9
Pa-231	Pa-231	1.000E+00	3.809E-13	3.806E-13	3.787E-13	3.596E-13	3.207E-13	2.860E-13	2.550E-13	2.2
Pa-231	U-235	1.000E+00	0.000E+00	8.056E-18	8.035E-17	7.832E-16	2.221E-15	3.503E-15	4.646E-15	5.6
Pa-231	∑DOSE(j)		3.809E-13	3.806E-13	3.788E-13	3.604E-13	3.229E-13	2.895E-13	2.597E-13	2.3
Pb-210	Pb-210	1.000E+00	3.031E-18	2.937E-18	2.215E-18	1.317E-19	2.488E-22	4.700E-25	8.878E-28	0.0
Pb-210	Ra-226	1.000E+00	0.000E+00	9.271E-20	8.047E-19	2.682E-18	2.327E-18	1.923E-18	1.589E-18	1.3
Pb-210	Th-230	1.000E+00	0.000E+00	2.019E-23	1.837E-21	8.705E-20	3.070E-19	4.898E-19	6.405E-19	7.6
Pb-210	U-234	1.000E+00	0.000E+00	0.000E+00	5.658E-26	3.175E-23	3.916E-22	1.114E-21	2.135E-21	3.4
Pb-210	U-238	1.000E+00	0.000E+00	0.000E+00	0.000E+00	2.534E-27	1.038E-25	5.151E-25	1.423E-24	2.9
Pb-210	∑DOSE(j)		3.031E-18	3.030E-18	3.022E-18	2.901E-18	2.635E-18	2.414E-18	2.232E-18	2.0
Ra-226	Ra-226	1.000E+00	2.676E-07	2.674E-07	2.651E-07	2.433E-07	2.010E-07	1.661E-07	1.373E-07	1.1
Ra-226	Th-230	1.000E+00	0.000E+00	1.159E-10	1.154E-09	1.105E-08	3.020E-08	4.599E-08	5.899E-08	6.9
Ra-226	U-234	1.000E+00	0.000E+00	5.217E-16	5.202E-14	5.054E-12	4.274E-11	1.117E-10	2.065E-10	3.2
Ra-226	U-238	1.000E+00	0.000E+00	4.930E-22	4.920E-19	4.815E-16	1.240E-14	5.485E-14	1.440E-13	2.9
Ra-226	∑DOSE(j)		2.676E-07	2.675E-07	2.663E-07	2.543E-07	2.313E-07	2.122E-07	1.965E-07	1.8
Ra-228	Ra-228	1.000E+00	5.526E-08	4.896E-08	1.647E-08	3.052E-13	9.305E-24	0.000E+00	0.000E+00	0.0
Ra-228	Th-232	1.000E+00	0.000E+00	6.275E-09	3.863E-08	5.502E-08	5.502E-08	5.501E-08	5.501E-08	5.5
Ra-228	∑DOSE(j)		5.526E-08	5.524E-08	5.510E-08	5.502E-08	5.502E-08	5.501E-08	5.501E-08	5.5
Th-228	Ra-228	1.000E+00	0.000E+00	3.182E-07	4.546E-07	9.252E-12	2.821E-22	0.000E+00	0.000E+00	0.0
Th-228	Th-228	1.000E+00	1.116E-06	7.766E-07	2.979E-08	2.053E-22	0.000E+00	0.000E+00	0.000E+00	0.0
Th-228	Th-232	1.000E+00	0.000E+00	2.080E-08	6.286E-07	1.111E-06	1.111E-06	1.111E-06	1.110E-06	1.1
Th-228	∑DOSE(j)		1.116E-06	1.116E-06	1.113E-06	1.111E-06	1.111E-06	1.111E-06	1.110E-06	1.1
Th-230	Th-230	1.000E+00	7.053E-20	7.053E-20	7.052E-20	7.046E-20	7.033E-20	7.020E-20	7.006E-20	6.9
Th-230	U-234	1.000E+00	0.000E+00	6.349E-25	6.349E-24	6.345E-23	1.901E-22	3.164E-22	4.425E-22	5.6
Th-230	U-238	1.000E+00	0.000E+00	0.000E+00	0.000E+00	8.996E-27	8.089E-26	2.245E-25	4.396E-25	7.2
Th-230	∑DOSE(j)		7.053E-20	7.053E-20	7.053E-20	7.053E-20	7.052E-20	7.051E-20	7.051E-20	7.0
Th-232	Th-232	1.000E+00	5.306E-22	5.306E-22	5.306E-22	5.305E-22	5.305E-22	5.304E-22	5.304E-22	5.3
U-234	U-234	1.000E+00	5.192E-21	5.192E-21	5.192E-21	5.190E-21	5.187E-21	5.184E-21	5.180E-21	5.1
U-234	U-238	1.000E+00	0.000E+00	1.472E-26	1.472E-25	1.472E-24	4.413E-24	7.353E-24	1.029E-23	1.3
U-234	∑DOSE(j)		5.192E-21	5.192E-21	5.192E-21	5.192E-21	5.191E-21	5.191E-21	5.191E-21	5.1
U-235	U-235	1.000E+00	2.307E-14	2.307E-14	2.307E-14	2.307E-14	2.306E-14	2.306E-14	2.306E-14	2.3
U-238	U-238	1.000E+00	6.204E-10	6.204E-10	6.204E-10	6.204E-10	6.204E-10	6.203E-10	6.203E-10	6.2

BRF(i) is the branch fraction of the parent nuclide.

Individual Nuclide Soil Concentration
Parent Nuclide and Branch Fraction Indicated

Nuclide (j)	Parent (i)	BRF(i)	S(j,t), pCi/g t= 0.000E+00	1.000E+00	1.000E+01	1.000E+02	3.000E+02	5.000E+02	7.000E+02	9.0
Ac-227	Ac-227	1.000E+00	8.000E+00	7.739E+00	5.739E+00	2.889E-01	3.767E-04	4.913E-07	6.407E-10	8.3
Ac-227	Pa-231	1.000E+00	0.000E+00	2.504E-01	2.161E+00	7.087E+00	6.571E+00	5.860E+00	5.225E+00	4.6
Ac-227	U-235	1.000E+00	0.000E+00	2.664E-06	2.415E-04	1.125E-02	4.053E-02	6.680E-02	9.023E-02	1.1
Ac-227	∑S(j):		8.000E+00	7.989E+00	7.900E+00	7.387E+00	6.612E+00	5.927E+00	5.316E+00	4.7
Pa-231	Pa-231	1.000E+00	8.000E+00	7.995E+00	7.954E+00	7.555E+00	6.737E+00	6.008E+00	5.357E+00	4.7
Pa-231	U-235	1.000E+00	0.000E+00	1.692E-04	1.688E-03	1.645E-02	4.665E-02	7.358E-02	9.760E-02	1.1
Pa-231	∑S(j):		8.000E+00	7.996E+00	7.956E+00	7.571E+00	6.784E+00	6.081E+00	5.455E+00	4.8
Pb-210	Pb-210	1.000E+00	1.820E+02	1.764E+02	1.330E+02	7.910E+00	1.494E-02	2.822E-05	5.331E-08	1.0
Pb-210	Ra-226	1.000E+00	0.000E+00	5.567E+00	4.832E+01	1.610E+02	1.397E+02	1.155E+02	9.544E+01	7.8
Pb-210	Th-230	1.000E+00	0.000E+00	1.212E-03	1.103E-01	5.227E+00	1.843E+01	2.941E+01	3.846E+01	4.5
Pb-210	U-234	1.000E+00	0.000E+00	3.647E-09	3.397E-06	1.907E-03	2.352E-02	6.688E-02	1.282E-01	2.0
Pb-210	U-238	1.000E+00	0.000E+00	2.589E-15	2.446E-11	1.522E-07	6.234E-06	3.093E-05	8.545E-05	1.7
Pb-210	∑S(j):		1.820E+02	1.819E+02	1.814E+02	1.742E+02	1.582E+02	1.450E+02	1.340E+02	1.2
Ra-226	Ra-226	1.000E+00	1.820E+02	1.818E+02	1.803E+02	1.654E+02	1.367E+02	1.130E+02	9.336E+01	7.7
Ra-226	Th-230	1.000E+00	0.000E+00	7.881E-02	7.847E-01	7.517E+00	2.054E+01	3.127E+01	4.012E+01	4.7
Ra-226	U-234	1.000E+00	0.000E+00	3.548E-07	3.537E-05	3.437E-03	2.906E-02	7.598E-02	1.404E-01	2.1
Ra-226	U-238	1.000E+00	0.000E+00	3.353E-13	3.345E-10	3.274E-07	8.434E-06	3.730E-05	9.790E-05	1.9
Ra-226	∑S(j):		1.820E+02	1.819E+02	1.811E+02	1.730E+02	1.573E+02	1.443E+02	1.336E+02	1.2
Ra-228	Ra-228	1.000E+00	1.820E+02	1.612E+02	5.424E+01	1.005E-03	3.064E-14	9.344E-25	2.849E-35	0.0
Ra-228	Th-232	1.000E+00	0.000E+00	2.066E+01	1.272E+02	1.812E+02	1.812E+02	1.812E+02	1.812E+02	1.8
Ra-228	∑S(j):		1.820E+02	1.819E+02	1.815E+02	1.812E+02	1.812E+02	1.812E+02	1.812E+02	1.8
Th-228	Ra-228	1.000E+00	0.000E+00	5.191E+01	7.415E+01	1.509E-03	4.602E-14	1.403E-24	4.279E-35	0.0
Th-228	Th-228	1.000E+00	1.820E+02	1.267E+02	4.859E+00	3.349E-14	0.000E+00	0.000E+00	0.000E+00	0.0
Th-228	Th-232	1.000E+00	0.000E+00	3.393E+00	1.025E+02	1.812E+02	1.812E+02	1.812E+02	1.812E+02	1.8
Th-228	∑S(j):		1.820E+02	1.820E+02	1.816E+02	1.812E+02	1.812E+02	1.812E+02	1.812E+02	1.8
Th-230	Th-230	1.000E+00	1.820E+02	1.820E+02	1.820E+02	1.818E+02	1.815E+02	1.811E+02	1.808E+02	1.8
Th-230	U-234	1.000E+00	0.000E+00	1.638E-03	1.638E-02	1.637E-01	4.906E-01	8.166E-01	1.142E+00	1.4
Th-230	U-238	1.000E+00	0.000E+00	2.322E-09	2.322E-07	2.321E-05	2.087E-04	5.793E-04	1.134E-03	1.8
Th-230	∑S(j):		1.820E+02	1.820E+02	1.820E+02	1.820E+02	1.820E+02	1.820E+02	1.819E+02	1.8
Th-232	Th-232	1.000E+00	1.820E+02	1.820E+02	1.820E+02	1.820E+02	1.820E+02	1.820E+02	1.819E+02	1.8
U-234	U-234	1.000E+00	1.820E+02	1.820E+02	1.820E+02	1.819E+02	1.818E+02	1.817E+02	1.816E+02	1.8
U-234	U-238	1.000E+00	0.000E+00	5.160E-04	5.160E-03	5.159E-02	1.547E-01	2.577E-01	3.607E-01	4.6
U-234	∑S(j):		1.820E+02	1.820E+02	1.820E+02	1.820E+02	1.820E+02	1.820E+02	1.819E+02	1.8
U-235	U-235	1.000E+00	8.000E+00	8.000E+00	8.000E+00	8.000E+00	7.999E+00	7.998E+00	7.998E+00	7.9
U-238	U-238	1.000E+00	1.820E+02	1.820E+02	1.820E+02	1.820E+02	1.820E+02	1.820E+02	1.819E+02	1.8

BRF(i) is the branch fraction of the parent nuclide.

RESCALC.EXE execution time = 150.91 seconds
Total water/soil iteration failures = 194.

Summary : Shieldalloy Storage Pile Recreational Hunter
File : newfield 3004008.RAD

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Dose Conversion Factor (and Related) Parameter Summary
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Menu	Parameter	Current Value	Default	Paramete Name
B-1	Dose conversion factors for inhalation, mrem/pCi:			
B-1	Ac-227+D	6.720E+00	6.720E+00	DCF2(1)
B-1	Pa-231	1.280E+00	1.280E+00	DCF2(2)
B-1	Pb-210+D	2.320E-02	2.320E-02	DCF2(3)
B-1	Ra-226+D	8.600E-03	8.600E-03	DCF2(4)
B-1	Ra-228+D	5.080E-03	5.080E-03	DCF2(5)
B-1	Th-228+D	3.450E-01	3.450E-01	DCF2(6)
B-1	Th-230	3.260E-01	3.260E-01	DCF2(7)
B-1	Th-232	1.640E+00	1.640E+00	DCF2(8)
B-1	U-234	1.320E-01	1.320E-01	DCF2(9)
B-1	U-235+D	1.230E-01	1.230E-01	DCF2(10)
B-1	U-238+D	1.180E-01	1.180E-01	DCF2(11)
D-1	Dose conversion factors for ingestion, mrem/pCi:			
D-1	Ac-227+D	1.480E-02	1.480E-02	DCF3(1)
D-1	Pa-231	1.060E-02	1.060E-02	DCF3(2)
D-1	Pb-210+D	7.270E-03	7.270E-03	DCF3(3)
D-1	Ra-226+D	1.330E-03	1.330E-03	DCF3(4)
D-1	Ra-228+D	1.440E-03	1.440E-03	DCF3(5)
D-1	Th-228+D	8.080E-04	8.080E-04	DCF3(6)
D-1	Th-230	5.480E-04	5.480E-04	DCF3(7)
D-1	Th-232	2.730E-03	2.730E-03	DCF3(8)
D-1	U-234	2.830E-04	2.830E-04	DCF3(9)
D-1	U-235+D	2.670E-04	2.670E-04	DCF3(10)
D-1	U-238+D	2.690E-04	2.690E-04	DCF3(11)
D-34	Food transfer factors:			
D-34	Ac-227+D , plant/soil concentration ratio, dimensionless	2.500E-03	2.500E-03	RTF(1,1)
D-34	Ac-227+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	2.000E-05	2.000E-05	RTF(1,2)
D-34	Ac-227+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	2.000E-05	2.000E-05	RTF(1,3)
D-34				
D-34	Pa-231 , plant/soil concentration ratio, dimensionless	1.000E-02	1.000E-02	RTF(2,1)
D-34	Pa-231 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	5.000E-03	5.000E-03	RTF(2,2)
D-34	Pa-231 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	5.000E-06	5.000E-06	RTF(2,3)
D-34				
D-34	Pb-210+D , plant/soil concentration ratio, dimensionless	1.000E-02	1.000E-02	RTF(3,1)
D-34	Pb-210+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	8.000E-04	8.000E-04	RTF(3,2)
D-34	Pb-210+D , milk/livestook-intake ratio, (pCi/L)/(pCi/d)	3.000E-04	3.000E-04	RTF(3,3)
D-34				
D-34	Ra-226+D , plant/soil concentration ratio, dimensionless	4.000E-02	4.000E-02	RTF(4,1)
D-34	Ra-226+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-03	1.000E-03	RTF(4,2)
D-34	Ra-226+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	1.000E-03	1.000E-03	RTF(4,3)
D-34				
D-34	Ra-228+D , plant/soil concentration ratio, dimensionless	4.000E-02	4.000E-02	RTF(5,1)
D-34	Ra-228+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-03	1.000E-03	RTF(5,2)
D-34	Ra-228+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	1.000E-03	1.000E-03	RTF(5,3)
D-34				
D-34	Th-228+D , plant/soil concentration ratio, dimensionless	1.000E-03	1.000E-03	RTF(6,1)
D-34	Th-228+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-04	1.000E-04	RTF(6,2)
D-34	Th-228+D , milk/livestock-intake ratio, (p[illegible])/(pCi/d)	5.000E-06	5.000E-06	RTF(6,3)

Dose Conversibn Factor (and Related) Parameter Summary (continued)
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Menu	Parameter	Current Value	Default	Paramete Name
D-34	Th-230 , plant/soil concentration ratio, dimensionless	1.000E-03	1.000E-03	RTF(7,1)
D-34	Th-230 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-04	1.000E-04	RTF(7,2)
D-34	Th-230 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	5.000E-06	5.000E-06	RTF(7,3)
D-34				
D-34	Th-232 , plant/soil concentration ratio, dimensionless	1.000E-03	1.000E-03	RTF(8,1)
D-34	Th-232 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-04	1.000E-04	RTF(8,2)
D-34	Th-232 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	5.000E-06	5.000E-06	RTF(8,3)
D-34				
D-34	U-234 , plant/soil concentration ratio, dimensionless	2.500E-03	2.500E-03	RTF(9,1)
D-34	U-234 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	3.400E-04	3.400E-04	RTF(9,2)
D-34	U-234 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	6.000E-04	6.000E-04	RTF(9,3)
D-34				
D-34	U-235+D , plant/soil concentration ratio, dimensionless	2.500E-03	2.500E-03	RTF(10,1)
D-34	U-235+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	3.400E-04	3.400E-04	RTF(10,2)
D-34	U-235+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	6.000E-04	6.000E-04	RTF(10,3)
D-34				
D-34	U-238+D , plant/soil concentration ratio, dimensionless	2.500E-03	2.500E-03	RTF(11,1)
D-34	U-238+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	3.400E-04	3.400E-04	RTF(11,2)
D-34	U-238+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	6.000E-04	6.000E-04	RTF(11,3)
D-5	Bioaccumulation factors, fresh water, L/kg:			
D-5	Ac-227+D , fish	1.500E+01	1.500E+01	BIOFAC(1
D-5	Ac-227+D , crustacea and mollusks	1.000E+03	1.000E+03	BIOFAC(1
D-5				
D-5	Pa-231 , fish	1.000E+01	1.000E+01	BIOFAC(2
D-5	Pa-231 , crustacea and mollusks	1.100E+02	1.100E+02	BIOFAC(2
D-5				
D-5	Pb-210+D , fish	3.000E+02	3.000E+02	BIOFAC(3
D-5	Pb-210+D , crustacea and mollusks	1.000E+02	1.000E+02	BIOFAC(3
D-5				
D-5	Ra-226+D , fish	5.000E+01	5.000E+0i	BIOFAC(4
D-5	Ra-226+D , crustacea and mollusks	2.500E+02	2.500E+02	BIOFAC(4
D-5				
D-5	Ra-228+D , fish	5.000E+01	5.000E+01	BIOFAC(5
D-5	Ra-228+D , crustacea and mollusks	2.500E+02	2.500E+02	BIOFAC(5
D-5				
D-5	Th-228+D , fish	1.000E+02	1.000E+02	BIOFAC(6
D-5	Th-228+D , crustacea and mollusks	5.000E+02	5.000E+02	BIOFAC(6
D-5				
D-5	Th-230 , fish	1.000E+02	1.000E+02	BIOFAC(7
D-5	Th-230 , crustacea and mollusks	5.000E+02	5.000E+02	BIOFAC(7
D-5				
D-5	Th-232 , fish	1.000E+02	1.000E+02	BIOFAC(8
D-5	Th-232 , crustacea and mollusks	5.000E+02	5.000E+02	BIOFAC(8
D-5				
D-5	U-234 , fish	1.000E+01	1.000E+01	BIOFAC(9
D-5	U-234 , crustacea and mollusks	6.000E+01	6.000E+01	BIOFAC(9
D-5				
D-5	U-235+D , fish	1.000E+01	1.000E+01	BIOFAC(10
D-5	U-235+D , crustacea and mollusks	6.000E+01	6.000E+01	BIOFAC(10

Dose Conversion Factor (and Related) Parameter Summary (continued)
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Menu	Parameter	Current Value	Default	Paramete Name
D-5	U-238+D , fish	1.000E+01	1.000E+01	BIOFAC(11
D-5	U-238+D , crustacea and mollusks	6.000E+01	6.000E+01	BIOFAC(11

Site-Specific Parameter Summary

Menu	Parameter	Usef Input	Default	Used by RESP (If different from u
R011	Area of contaminated zone (m**2)	1.823E+04	1.000E+04	---
R011	Thickness of contaminated zone (m)	2.800E+00	2.000E+00	---
R011	Length parallel to aquifer flow (m)	1.350E+02	1.000E+02	---
R011	Basic radiation dose limit (mrem/yr)	2.500E+01	2.500E+01	---
R011	Time since placement of material (yr)	0.000E+00	0.000E+00	---
R011	Times for calculations (yr)	1.000E+00	1.000E+00	---
R011	Times for calculations (yr)	1.000E+01	3.000E+00	---
R011	Times for calculations (yr)	1.000E+02	1.000E+01	---
R011	Times for calculations (yr)	3.000E+02	3.000E+01	---
R011	Times for calculations (yr)	5.000E+02	1.000E+02	---
R011	Times for calculations (yr)	7.000E+02	3.000E+02	---
R011	Times for calculations (yr)	9.000E+02	1.000E+03	---
R011	Times for calculations (yr)	1.000E+03	0.000E+00	---
R011	Times for calculations (yr)	not used	0.000E+00	---
R012	Initial principal radionuclide (pCi/g): Ac-227	8.000E+00	0.000E+00	---
R012	Initial principal radionuclide (pCi/g): Pa-231	8.000E+00	0.000E+00	---
R012	Initial principal radionuclide (pCi/g): Pb-210	1.820E+02	0.000E+00	---
R012	Initial principal radionuclide (pCi/g): Ra-226	1.820E+02	0.000E+00	---
R012	Initial principal radionuclide (pCi/g): Ra-228	1.820E+02	0.000E+00	---
R012	Initial principal radionuclide (pCi/g): Th-228	1.820E+02	0.000E+00	---
R012	Initial principal radionuclide (pCi/g): Th-230	1.820E+02	0.000E+00	---
R012	Initial principal radionuclide (pCi/g): Th-232	1.820E+02	0.000E+00	---
R012	Initial principal radionuclide (pCi/g): U-234	1.820E+02	0.000E+00	---
R012	Initial principal radionuclide (pCi/g): U-235	8.000E+00	0.000E+00	---
R012	Initial principal radionuclide (pCi/g): U-238	1.820E+02	0.000E+00	---
R012	Concentration in groundwater (pCi/L): Ac-227	not used	0.000E+00	---
R012	Concentration in groundwater (pCi/L): Pa-231	not used	0.000E+00	---
R012	Concentration in groundwater (pCi/L): Pb-210	not used	0.000E+00	---
R012	Concentration in groundwater (pCi/L): Ra-226	not used	0.000E+00	---
R012	Concentration in groundwater (pCi/L): Ra-228	not used	0.000E+00	---
R012	Concentration in groundwater (pCi/L): Th-228	not used	0.000E+00	---
R012	Concentration in groundwater (pCi/L): Th-230	not used	0.000E+00	---
R012	Concentration in groundwater (pCi/L): Th-232	not used	0.000E+00	---
R012	Concentration in groundwater (pCi/L): U-234	not used	0.000E+00	---
R012	Concentration in groundwater (pCi/L): U-235	not used	0.000E+00	---
R012	Concentration in groundwater (pCi/L): U-238	not used	0.000E+00	---
R013	Cover depth (m)	1.000E+00	0.000E+00	---
R013	Density of cover material (g/cm**3)	1.900E+00	1.500E+00	---
R013	Cover depth erosion rate (m/yr)	4.600E-04	1.000E-03	---
R013	Density of contaminated zone (g/cm**3)	2.800E+00	1.500E+00	---
R013	Contaminated zone erosion rate (m/yr)	4.600E-05	1.000E-03	---
R013	Contaminated zone total porosity	4.000E-01	4.000E-01	---
R013	Contaminated zone field capacity	2.000E-01	2.000E-01	---
R013	Contaminated zone hydraulic conductivity (m/yr)	2.000E+03	1.000E+01	---
R013	Contaminated zone b parameter	2.880E+00	5.300E+00	---
R013	Average annual wind speed (m/sec)	4.250E+00	2.000E+00	---
R013	Humidity in air (g/m**3)	not used	8.000E+00	---
R013	Evapotranspiration coefficient	6.250E-01	5.000E-01	---

Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESP (If different from u
R013	Precipitation (m/yr)	1.050E+00	1.000E+00	---
R013	Irrigation (m/yr)	0.000E+00	2.000E-01	---
R013	Irrigation mode	overhead	overhead	---
R013	Runoff coefficient	4.500E-01	2.000E-01	---
R013	Watershed area for nearby stream or pond (m**2)	2.730E+05	1.000E+06	---
R013	Accuracy for water/soil computations	1.000E-03	1.000E-03	---
R0I4	Density of saturated zone (g/cm**3)	1.520E+00	1.500E+00	---
R014	Saturated zone total porosity	4.000E-01	4.000E-01	---
R014	Saturated zone effective porosity	2.000E-01	2.000E-01	---
R014	Saturated zone field capacity	2.000E-01	2.000E-01	---
R014	Saturated zone hydraulic conductivity (m/yr)	1.600E+04	1.000E+02	---
R014	Saturated zone hydraulic gradient	4.000E-03	2.000E-02	---
R014	Saturated zone b parameter	not used	5.300E+00	---
R014	Water table drop rate (m/yr)	0.000E+00	1.000E-03	---
R014	Well pump intake depth (m below water table)	1.000E+01	1.000E+01	---
R014	Model: Nondispersion (ND) or Mass-Balance (MB)	MB	ND	---
R014	Well pumping rate (m**3/yr)	not used	2.500E+02	---
R015	Number of unsaturated zone strata	1	1	---
R015	Unsat. zone 1, thickness (m)	2.500E+00	4.000E+00	---
R015	Unsat. zone 1, soil density (g/cm**3)	1.650E+00	1.500E+00	---
R015	Unsat. zone 1, total porosity	4.000E-01	4.000E-01	---
R015	Unsat. zone 1, effective porosity	2.000E-01	2.000E-01	---
R015	Unsat. zone 1, field capacity	2.000E-01	2.000E-01	---
R0I5	Unsat. zone 1, soil-specific b parameter	5.300E+00	5.300E+00	---
R015	Unsat. zone 1, hydraulic conductivity (m/yr)	1.700E-02	1.000E+01	---
R016	Distribution coefficients for Ac-227			
R016	Contaminated zone (cm**3/g)	2.000E+01	2.000E+01	---
R016	Unsaturated zone 1 (cm**3/g)	2.000E+01	2.000E+01	---
R016	Saturated zone (cm**3/g)	2.000E+01	2.000E+01	---
R016	Leach rate (/yr)	0.000E+00	0.000E+00	1.376E-03
R016	Solubility constant	0.000E+00	0.000E+00	not used
R016	Distribution coefficients for Pa-231			
R016	Contaminated zone (cm**3/g)	5.000E+01	5.000E+01	---
R016	Unsaturated zone 1 (cm**3/g)	5.000E+01	5.000E+01	---
R016	Saturated zone (cm**3/g)	5.000E+01	5.000E+01	---
R016	Leach rate (/yr)	0.000E+00	0.000E+00	5.517E-04
R016	Solubility constant	0.000E+00	0.000E+00	not used
R0I6	Distribution coefficients for Pb-210			
R0I6	Contaminated zone (cm**3/g)	1.000E+02	1.000E+02	---
R016	Unsaturated zone 1 (cm**3/g)	1.000E+02	1.000E+02	---
R016	Saturated zone (cm**3/g)	1.000E+02	1.000E+02	---
R016	Leach rate (/yr)	0.000E+00	0.000E+00	2.760E-04
R016	Solubility constant	0.000E+00	0.000E+00	not used

Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESP (If different from u
R016	Distribution coefficients for Ra-226			
R016	Contaminated zone (cm**3/g)	5.300E+01	7.000E+01	---
R016	Unsaturated zone 1 (cm**3/g)	5.300E+01	7.000E+01	---
R016	Saturated zone (cm**3/g)	5.300E+01	7.000E+01	---
R016	Leach rate (/yr)	0.000E+00	0.000E+00	5.205E-04
R016	Solubility constant	0.000E+00	0.000E+00	not used
R016	Distribution coefficients for Ra-228			
R016	Contaminated zone (cm**3/g)	5.300E+01	7.000E+01	---
R016	Unsaturated zone 1 (cm**3/g)	5.300E+01	7.000E+01	---
R016	Saturated zone (cm**3/g)	5.300E+01	7.000E+01	---
R016	Leach rate (/yr)	0.000E+00	0.000E+00	5.205E-04
R016	Solubility constant	0.000E+00	0.000E+00	not used
R016	Distribution coefficients for Th-228			
R016	Contaminated zone (cm**3/g)	5.201E+04	6.000E+04	---
R016	Unsaturated zone 1 (cm**3/g)	5.201E+04	6.000E+04	---
R016	Saturated zone (cm**3/g)	5.201E+04	6.000E+04	---
R016	Leach rate (/yr)	0.000E+00	0.000E+00	5.311E-07
R016	Solubility constant	0.000E+00	0.000E+00	not used
R016	Distribution coefficients for Th-230			
R016	Contaminated zone (cm**3/g)	5.201E+04	6.000E+04	---
R016	Unsaturated zone 1 (cm**3/g)	5.201E+04	6.000E+04	---
R016	Saturated zone (cm**3/g)	5.201E+04	6.000E+04	---
R016	Leach rate (/yr)	0.000E+00	0.000E+00	5.311E-07
R016	Solubility constant	0.000E+00	0.000E+00	not used
R016	Distribution coefficients for Th-232			
R016	Contaminated zone (cm**3/g)	5.201E+04	6.000E+04	---
R016	Unsaturated zone 1 (cm**3/g)	5.201E+04	6.000E+04	---
R016	Saturated zone (cm**3/g)	5.201E+04	6.000E+04	---
R016	Leach rate (/yr)	0.000E+00	0.000E+00	5.311E-07
R016	Solubility constant	0.000E+00	0.000E+00	not used
R016	Distribution coefficients for U-234			
R016	Contaminated zone (cm**3/g)	7.036E+04	5.000E+01	---
R016	Unsaturated zone 1 (cm**3/g)	7.036E+04	5.000E+01	---
R016	Saturated zone (cm**3/g)	7.036E+04	5.000E+01	---
R016	Leach rate (/yr)	0.000E+00	0.000E+00	3.926E-07
R016	Solubility constant	0.000E+00	0.000E+00	not used
R016	Distribution coefficients for U-235			
R016	Contaminated zone (cm**3/g)	7.036E+04	5.000E+01	---
R016	Unsaturated zone 1 (cm**3/g)	7.036E+04	5.000E+01	---
R016	Saturated zone (cm**3/g)	7.036E+04	5.000E+01	---
R016	Leach rate (/yr)	0.000E+00	0.000E+00	3.926E-07
R016	Solubility constant	0.000E+00	0.000E+00	not used

Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESP (If different from u
R016	Distribution coefficients for U-238			
R016	Contaminated zone (cm**3/g)	7.036E+04	5.000E+01	---
R016	Unsaturated zone 1 (cm**3/g)	7.036E+04	5.000E+01	---
R016	Saturated zone (cm**3/g)	7.036E+04	5.000E+01	---
R016	Leach rate (/yr)	0.000E+00	0.000E+00	3.926E-07
R016	Solubility constant	0.000E+00	0.000E+00	not used
R017	Inhalation rate (m**3/yr)	8.400E+03	8.400E+03	---
R017	Mass loading for inhalation (g/m**3)	3.000E-05	1.000E-04	---
R017	Exposure duration	3.000E+01	3.000E+01	---
R017	Shielding factor, inhalation	4.000E-01	4.000E-01	---
R017	Shielding factor, external gamma	2.700E-01	7.000E-01	---
R017	Fraction of time spent indoors	0.000E+00	5.000E-01	---
R017	Fraction of time spent outdoors (on site)	9.000E-03	2.500E-01	---
R017	Shape factor flag, external gamma	1.000E+00	1.000E+00	>0 shows circular
R017	Radii of shape factor array (used if FS = -1):			
R017	Outer annular radius (m), ring 1:	not used	5.000E+01	---
R017	Outer annular radius (m), ring 2:	not used	7.071E+01	---
R017	Outer annular radius (m), ring 3:	not used	0.000E+00	---
R017	Outer annular radius (m), ring 4:	not used	0.000E+00	---
R017	Outer annular radius (m), ring 5:	not used	0.000E+00	---
R017	Outer annular radius (m), ring 6:	not used	0.000E+00	---
R017	Outer annular radius (m), ring 7:	not used	0.000E+00	---
R017	Outer annular radius (m), ring 8:	not used	0.000E+00	---
R017	Outer annular radius (m), ring 9:	not used	0.000E+00	---
R017	Outer annular radius (m), ring 10:	not used	0.000E+00	---
R017	Outer annular radius (m), ring 11:	not used	0.000E+00	---
R017	Outer annular radius (m), ring 12:	not used	0.000E+00	---
R017	Fractions of annular areas within AREA:			
R017	Ring 1	not used	1.000E+00	---
R017	Ring 2	not used	2.732E-01	---
R017	Ring 3	not used	0.000E+00	---
R017	Ring 4	not used	0.000E+00	---
R017	Ring 5	not used	0.000E+00	---
R017	Ring 6	not used	0.000E+00	---
R017	Ring 7	not used	0.000E+00	---
R017	Ring 8	not used	0.000E+00	---
R017	Ring 9	not used	0.000E+00	---
R017	Ring 10	not used	0.000E+00	---
R017	Ring 11	not used	0.000E+00	---
R017	Ring 12	not used	0.000E+00	---
R018	Fruits, vegetables and grain consumption (kg/yr)	not used	1.600E+02	---
R018	Leafy vegetable consumption (kg/yr)	not used	1.400E+01	---
R018	Milk consumption (L/yr)	not used	9.200E+01	---
R018	Meat and poultry consumption (kg/yr)	3.000E-01	6.300E+01	---
R018	Fish consumption (kg/yr)	not used	5.400E+00	---
R018	Other seafood consumption (kg/yr)	not used	9.000E-01	---
R018	Soil ingestion rate (g/yr)	1.830E+01	3.650E+01	---

Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESP (If different from u
R018	Drinking water intake (L/yr)	not used	5.100E+02	---
R018	Contamination fraction of drinking water	not used	1.000E+00	---
R018	Contamination fraction of household water	not used	1.000E+00	---
R018	Contamination fraction of livestock water	1.000E+00	1.000E+00	---
R018	Contamination fraction of irrigation water	1.000E+00	1.000E+00	---
R018	Contamination fraction of aquatic food	not used	5.000E-01	---
R018	Contamination fraction of plant food	not used	-1	---
R018	Contamination fraction of meat	-1	-1	0.911E+00
R018	Contamination fraction of milk	not used	-1	---
R019	Livestock fodder intake for meat (kg/day)	4.400E+01	6.800E+01	---
R019	Livestock fodder intake for milk (kg/day)	not used	5.500E+01	---
R019	Livestock water intake for meat (L/day)	5.000E+01	5.000E+01	---
R019	Livestock water intake for milk (L/day)	not used	1.600E+02	---
R019	Livestock soil intake (kg/day)	1.110E+00	5.000E-01	---
R019	Mass loading for foliar deposition (g/m**3)	1.000E-04	1.000E-04	---
R019	Depth of soil mixing layer (m)	1.500E-01	1.500E-01	---
R019	Depth of roots (m)	1.500E-01	9.000E-01	---
R019	Drinking water fraction from ground water	not used	1.000E+00	---
R019	Household watef fraction from ground water	not used	1.000E+00	---
R019	Livestock water fraction from ground water	1.000E+00	1.000E+00	---
R019	Irrigation fraction from ground water	1.000E+00	1.000E+00	---
R19B	Wet weight crop yield for Non-Leafy (kg/m**2)	not used	7.000E-01	---
R19B	Wet weight crop yield for Leafy (kg/m**2)	not used	1.500E+00	---
R19B	Wet weight crop yield for Fodder (kg/m**2)	1.910E+00	1.100E+00	---
R19B	Growing Season for Non-Leafy (years)	not used	1.700E-01	---
R19B	Growing Season for Leafy (years)	not used	2.500E-01	---
R19B	Growing Season for Fodder (years)	8.000E-02	8.000E-02	---
R19B	Translocation Factor for Non-Leafy	not used	1.000E-01	---
R19B	Translocation Factor for Leafy	not used	1.000E+00	---
R19B	Translocation Factor for Fodder	1.000E+00	1.000E+00	---
R19B	Dry Foliar Interception Fraction for Non-Leafy	not used	2.500E-01	---
R19B	Dry Foliar Interception Fraction for Leafy	not used	2.500E-01	---
R19B	Dry Foliar Interception Ffaction for Fodder	3.500E-01	2.500E-01	---
R19B	Wet Foliar Interception Fraction for Non-Leafy	not used	2.500E-01	---
R19B	Wet Foliar Interception Ffaction for Leafy	not used	2.500E-01	---
R19B	Wet Foliar Interception Fraction for Fodder	3.500E-01	2.500E-01	---
R19B	Weathering Removal Constant for Vegetation	3.600E+01	2.000E+01	---
C14	C-12 concentration in water (g/cm**3)	not used	2.000E-05	---
C14	C-12 concentration in contaminated soil (g/g)	not used	3.000E-02	---
C14	Fraction of vegetation carbon from soil	not used	2.000E-02	---
C14	Fraction of vegetation carbon from air	not used	9.800E-01	---
C14	C-14 evasion layer thickness in soil (m)	not used	3.000E-01	---
C14	C-14 evasion flux rate from soil (1/sec)	not used	7.000E-07	---
C14	C-12 evasion flux rate from soil (1/sec)	not used	1.000E-10	---
C14	Fraction of grain in beef cattle feed	not used	8.000E-01	---
C14	Fraction of grain in milk cow feed	not used	2.000E-01	---
C14	DCF correction factor for gaseous forms of C14	not used	8.894E+01	---

Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESP (If different from u
STOR	Storage times of contaminated foodstuffs (days):			
STOR	Fruits, non-leafy vegetables, and grain	1.400E+01	1.400E+01	---
STOR	Leafy vegetables	1.000E+00	1.000E+00	---
STOR	Milk	1.000E+00	1.000E+00	---
STOR	Meat and poultry	2.000E+01	2.000E+01	---
STOR	Fish	7.000E+00	7.000E+00	---
STOR	Crustacea and mollusks	7.000E+00	7.000E+00	---
STOR	Well water	1.000E+00	1.000E+00	---
STOR	Surface water	1.000E+00	1.000E+00	---
STOR	Livestock fodder	4.500E+01	4.500E+01	---
R021	Thickness of building foundation (m)	not used	1.500E-01	---
R021	Bulk density of building foundation (g/cm**3)	not used	2.400E+00	---
R021	Total porosity of the cover material	not used	4.000E-01	---
R021	Total porosity of the building foundation	not used	1.000E-01	---
R021	Volumetric water content of the cover material	not used	5.000E-02	---
R021	Volumetric water content of the foundation	not used	3.000E-02	---
R021	Diffusion coefficient for radon gas (m/sec):			
R021	in cover material	not used	2.000E-06	---
R021	in foundation material	not used	3.000E-07	---
R021	in contaminated zone soil	not used	2.000E-06	---
R021	Radon vertical dimension of mixing (m)	not used	2.000E+00	---
R021	Average building air exchange rate (1/hr)	not used	5.000E-01	---
R021	Height of the building (room) (m)	not used	2.500E+00	---
R021	Building interior area factor	not used	0.000E+00	---
R021	Building depth below ground surface (m)	not used	-1.000E+00	---
R021	Emanating power of Rn-222 gas	not used	2.500E-01	---
R021	Emanating power of Rn-220 gas	not used	1.500E-01	---
TITL	Number of graphical time points	32	---	---
TITL	Maximum number of integration points for dose	1	---	---
TITL	Maximum number of integration points for risk	1	---	---

Summary of Pathway Selections

Pathway	User Selection
1 -- external gamma	active
2 -- inhalation (w/o radon)	active
3 -- plant ingestion	suppressed
4 -- meat ingestion	active
5 -- milk ingestion	suppressed
6 -- aquatic foods	suppressed
7 -- drinking water	suppressed
8 -- soil ingestion	active
9 -- radon	suppressed
Find peak pathway doses	active

Contaminated Zone Dimensions

Area:	18228.00 square meters
Thickness:	2.80 meters
Cover Depth:	1.00 meters

Initial Soil Concentrations, pCi/g

Ac-227	8.000E+00
Pa-231	8.000E+00
Pb-210	1.820E+02
Ra-226	1.820E+02
Ra-228	1.820E+02
Th-228	1.820E+02
Th-230	1.820E+02
Th-232	1.820E+02
U-234	1.820E+02
U-235	8.000E+00
U-238	1.820E+02

Total Dose TDOSE(t), mrem/yr
Basic Radiation Dose Limit = 2.500E+01 mrem/yr
Total Mixture Sum M(t) = Fraction of Basic Dose Limit Received at Time (t)

t (years):	0.000E+00	1.000E+00	1.000E+01	1.000E+02	3.000E+02	5.000E+02	7.000E+02	9.000E+02
TDOSE(t):	1.295E-05	1.304E-05	1.381E-05	2.507E-05	1.283E-04	1.152E-01	2.447E-01	2.254E-01
M(t):	5.181E-07	5.215E-07	5.525E-07	1.003E-06	5.131E-06	4.610E-03	9.786E-03	9.018E-03

Maximum TDOSE(t): 2.648E-01 mrem/yr at t = 558 ± 1 years

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Path
As mrem/yr and Fraction of Total Dose At t = 5.578E+02 years

Water Independent Pathways (Inhalation excludes radon)

Radio-Nuclide Nuclide	Ground mrem/yr	Ground fract.	Inhalation mrem/yr	Inhalation fract.	Radon mrem/yr	Radon fract.	Plant mrem/yr	Plant fract.	Meat mrem/yr	Meat fract.	mre
Ac-227	8.005E-17	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Pa-231	7.004E-09	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Pb-210	3.504E-21	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Ra-226	8.091E-05	0.0003	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Ra-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Th-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Th-230	2.574E-05	0.0001	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Th-232	4.231E-04	0.0016	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
U-234	7.034E-08	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
U-235	2.652E-10	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
U-238	4.927E-07	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Total	5.303E-04	0.0020	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Path
As mrem/yr and Fraction of Total Dose At t = 5.578E+02 years

Water Dependent Pathways

Radio-Nuclide	Water		Fish		Radon		Plant		Meat		
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mre
Ac-227	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.896E-11	0.0000	0.00
Pa-231	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.111E-01	0.4196	0.00
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.502E-01	0.5674	0.00
Ra-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Th-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Th-230	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.718E-03	0.0103	0.00
Th-232	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
U-234	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	5.441E-07	0.0000	0.00
U-235	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.920E-04	0.0007	0.00
U-238	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.092E-10	0.0000	0.00
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.642E-01	0.9980	0.00

*Sum of all water independent and dependent pathways.

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Path
As mrem/yr and Fraction of Total Dose At t = 0.000E+00 years

Water Independent Pathways (Inhalation excludes radon)

Radio-Nuclide	Ground		Inhalation		Radon		Plant		Meat		
	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mre
Ac-227	2.960E-11	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Pa-231	3.428E-12	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Pb-210	2.728E-17	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Ra-226	2.409E-06	0.1860	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Ra-228	4.974E-07	0.0384	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Th-228	1.004E-05	0.7752	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Th-230	6.348E-19	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Th-232	4.775E-21	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
U-234	4.673E-20	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
U-235	2.076E-13	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
U-238	5.584E-09	0.0004	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Total	1.295E-05	1.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Path
As mrem/yr and Fraction of Total Dose At t = 0.000E+00 years

Water Dependent Pathways

Radio-Nuclide	Water		Fish		Radon		Plant		Meat		
	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mre
Ac-227	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Pa-231	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Ra-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Th-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Th-230	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Th-232	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
U-234	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
U-235	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
U-238	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00

*Sum of all water independent and dependent pathways.

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Path
As mrem/yr and Fraction of Total Dose At t = 1.000E+00 years

Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Radon		Plant		Meat		
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mre
Ac-227	2.893E-11	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Pa-231	4.397E-12	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Pb-210	2.684E-17	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Ra-226	2.424E-06	0.1859	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Ra-228	3.327E-06	0.2552	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Th-228	7.035E-06	0.5396	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Th-230	1.051E-09	0.0001	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Th-232	2.453E-07	0.0188	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
U-234	4.729E-15	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
U-235	2.102E-13	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
U-238	5.629E-09	0.0004	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Total	1.304E-05	1.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Path
As mrem/yr and Fraction of Total Dose At t = 1.000E+00 years

Water Dependent Pathways

Radio-	Water		Fish		Radon		Plant		Meat		
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mre
Ac-227	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Pa-231	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Ra-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Th-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Th-230	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Th-232	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
U-234	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
U-235	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
U-238	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00

*Sum of all water independent and dependent pathways.

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Path
As mrem/yr and Fraction of Total Dose At t = 1.000E+01 years

Water Independent Pathways (Ihhalation excludes radon)

Radio-Nuclide	Ground		Inhalation		Radon		Plant		Meat		
	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mre
Ac-227	2.353E-11	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Pa-231	1.263E-11	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Pb-210	2.323E-17	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Ra-226	2.565E-06	0.1857	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Ra-228	4.528E-06	0.3278	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Th-228	2.862E-07	0.0207	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Th-230	1.117E-08	0.0008	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Th-232	6.416E-06	0.4645	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
U-234	5.034E-13	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
U-235	2.360E-13	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
U-238	6.051E-09	0.0004	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Total	1.381E-05	1.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Path
As mrem/yr and Fraction of Total Dose At t = 1.000E+01 years

Water Dependent Pathways

Radio-Nuclide	Water		Fish		Radon		Plant		Meat		
	mrem/yr	fract.	mrem/yr	fract.	mfem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mre
Ac-227	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Pa-231	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Ra-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Th-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Th-230	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Th-232	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
U-234	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
U-235	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
U-238	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00

*Sum of all water independent and dependent pathways.

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Path
As mrem/yr and Fraction of Total Dose At t = 1.000E+02 years

Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Radon		Plant		Meat		
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mre
Ac-227	2.972E-12	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Pa-231	8.184E-11	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Pb-210	5.473E-18	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Ra-226	4.523E-06	0.1804	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Ra-228	1.663E-10	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Th-228	3.558E-21	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Th-230	2.055E-07	0.0082	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Th-232	2.032E-05	0.8108	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
U-234	9.396E-11	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
U-235	8.287E-13	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
U-238	1.247E-08	0.0005	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Total	2.507E-05	1.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Path
As mrem/yr and Fraction of Total Dose At t = 1.000E+02 years

Water Dependent Pathways

Radio-	Water		Fish		Radon		Plant		Meat		
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mre
Ac-227	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Pa-231	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Ra-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Th-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Th-230	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Th-232	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
U-234	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
U-235	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
U-238	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00

*Sum of all water independent and dependent pathways.

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Path
As mrem/yr and Fraction of Total Dose At t = 3.000E+02 years

Water Independent Pathways (Inhalation excludes radon)

Radio-Nuclide	Ground		Inhalation		Radon		Plant		Meat		
	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mre
Ac-227	2.996E-14	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Pa-231	5.831E-10	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Pb-210	2.202E-19	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Ra-226	1.595E-05	0.1243	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Ra-228	1.898E-20	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Th-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Th-230	2.396E-06	0.0187	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Th-232	7.640E-05	0.5956	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
U-234	3.390E-09	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
U-235	1.138E-11	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
U-238	6.214E-08	0.0005	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Total	9.481E-05	0.7392	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Path
As mrem/yr and Fraction of Total Dose At t = 3.000E+02 years

Water Dependent Pathways

Radio-Nuclide	Water		Fish		Radon		Plant		Meat		
	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mre
Ac-227	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	9.905E-08	0.0008	0.00
Pa-231	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.333E-05	0.2599	0.00
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Ra-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Th-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Th-230	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Th-232	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
U-234	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
U-235	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.740E-08	0.0002	0.00
U-238	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.346E-05	0.2608	0.00

*Sum of all water independent and dependent pathways.

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Path
As mrem/yr and Fraction of Total Dose At t = 5.000E+02 years

Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Radon		Plant		Meat		
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mre
Ac-227	3.021E-16	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Pa-231	4.012E-09	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Pb-210	8.864E-21	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Ra-226	5.622E-05	0.0005	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Ra-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Th-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Th-230	1.556E-05	0.0001	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Th-232	2.881E-04	0.0025	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
U-234	3.781E-08	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
U-235	1.324E-10	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
U-238	3.098E-07	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Total	3.603E-04	0.0031	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Path
As mrem/yr and Fraction of Total Dose At t = 5.000E+02 years

Water Dependent Pathways

Radio-	Water		Fish		Radon		Plant		Meat		
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mre
Ac-227	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.292E-10	0.0000	0.00
Pa-231	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.148E-01	0.9964	0.00
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Ra-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Th-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Th-230	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Th-232	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
U-234	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
U-235	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	5.386E-05	0.0005	0.00
U-238	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.149E-01	0.9969	0.00

*Sum of all water independent and dependent pathways.

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Path
As mrem/yr and Fraction of Total Dose At t = 7.000E+02 years

Water Independent Pathways (Inhalation excludes radon)

Radio-Nuclide	Ground mrem/yr	Ground fract.	Inhalation mrem/yr	Inhalation fract.	Radon mrem/yr	Radon fract.	Plant mrem/yr	Plant fract.	Meat mrem/yr	Meat fract.	mre
Ac-227	3.045E-18	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Pa-231	2.761E-08	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Pb-210	3.567E-22	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Ra-226	1.982E-04	0.0008	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Ra-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Th-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Th-230	8.519E-05	0.0003	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Th-232	1.091E-03	0.0045	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
U-234	2.982E-07	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
U-235	1.443E-09	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
U-238	1.544E-06	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Total	1.376E-03	0.0056	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Path
As mrem/yr and Fraction of Total Dose At t = 7.000E+02 years

Water Dependent Pathways

Radio-Nuclide	Water mrem/yr	Water fract.	Fish mrem/yr	Fish fract.	Radon mrem/yr	Radon fract.	Plant mrem/yr	Plant fract.	Meat mrem/yr	Meat fract.	mre
Ac-227	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.684E-13	0.0000	0.00
Pa-231	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.024E-01	0.4185	0.00
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.293E-01	0.5284	0.00
Ra-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Th-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Th-230	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.108E-02	0.0453	0.00
Th-232	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
U-234	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	9.379E-06	0.0000	0.00
U-235	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	5.133E-04	0.0021	0.00
U-238	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.701E-09	0.0000	0.00
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.433E-01	0.9944	0.00

*Sum of all water independent and dependent pathways.

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Path
As mrem/yr and Fraction of Total Dose At t = 9.000E+02 years

Water Independent Pathways (Inhalation excludes radon)

Radio-Nuclide	Ground		Inhalation		Radon		Plant		Meat		
	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	ffact.	mre
Ac-227	3.070E-20	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Pa-231	1.900E-07	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Pb-210	1.436E-23	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Ra-226	6.989E-04	0.0031	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Ra-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Th-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Th-230	4.294E-04	0.0019	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Th-232	4.148E-03	0.0184	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
U-234	1.987E-06	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
U-235	1.530E-08	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
U-238	7.697E-06	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Total	5.286E-03	0.0234	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Path
As mrem/yr and Fraction of Total Dose At t = 9.000E+02 years

Water Dependent Pathways

Radio-Nuclide	Water		Fish		Radon		Plant		Meat		
	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mre
Ac-227	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.196E-16	0.0000	0.00
Pa-231	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	9.132E-02	0.4051	0.00
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Ra-226	0.000E+00	0.00D0	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.067E-01	0.4731	0.00
Ra-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Th-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Th-230	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.122E-02	0.0941	0.00
Th-232	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
U-234	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.875E-05	0.0002	0.00
U-235	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	9.230E-04	0.0041	0.00
U-238	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.336E-08	0.0000	0.00
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.202E-01	0.9766	0.00

*Sum of all water independent and dependent pathways.

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Path
As mrem/yr and Fraction of Total Dose At t = 1.000E+03 years

Water Independent Pathways (Inhalation excludes radon)

Radio-Nuclide	Ground		Inhalation		Radon		Plant		Meat		
	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mre
Ac-227	3.082E-21	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Pa-231	4.984E-07	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Pb-210	2.880E-24	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Ra-226	1.312E-03	0.0060	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Ra-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Th-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Th-230	9.458E-04	0.0043	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Th-232	8.106E-03	0.0370	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
U-234	4.928E-06	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
U-235	4.963E-08	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
U-238	1.719E-05	0.0001	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Total	1.039E-02	0.0475	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Path
As mrem/yr and Fraction of Total Dose At t = 1.000E+03 years

Water Dependent Pathways

Radio-Nuclide	Water		Fish		Radon		Plant		Meat		
	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mre
Ac-227	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	7.930E-18	0.0000	0.00
Pa-231	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	8.626E-02	0.3943	0.00
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.524E-15	0.0000	0.00
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	9.569E-02	0.4374	0.00
Ra-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Th-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Th-230	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.527E-02	0.1155	0.00
Th-232	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
U-234	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	5.906E-05	0.0003	0.00
U-235	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.111E-03	0.0051	0.00
U-238	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.744E-08	0.0000	0.00
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.084E-01	0.9525	0.00

*Sum of all water independent and dependent pathways.

Dose/Source Ratios Summed Over All Pathways
Parent and Progeny Principal Radionuclide Contributions Indicated

Parent (i)	Product (j)	Branch Fraction*	t=	DSR(j,t) (mrem/yr)/(pCi/g) 0.000E+00	1.000E+00	1.000E+01	1.000E+02	3.000E+02	5.000E+02	7.000E+02	9.0
Ac-227	Ac-227	1.000E+00		3.701E-12	3.617E-12	2.941E-12	3.716E-13	1.238E-08	1.615E-11	2.106E-14	2.7
Pa-231	Pa-231	1.000E+00		4.285E-13	4.326E-13	4.715E-13	1.115E-12	7.554E-12	1.415E-02	1.262E-02	1.1
Pa-231	Ac-227	1.000E+00		0.000E+00	1.170E-13	1.107E-12	9.115E-12	4.167E-06	2.029E-04	1.809E-04	1.6
Pa-231	∑DSR(j)			4.285E-13	5.496E-13	1.578E-12	1.023E-11	4.167E-06	1.435E-02	1.280E-02	1.1
Pb-210	Pb-210	1.000E+00		1.499E-19	1.475E-19	1.276E-19	3.007E-20	1.210E-21	4.870E-23	1.960E-24	7.8
Ra-226	Ra-226	1.000E+00		1.323E-08	1.332E-08	1.410E-08	2.485E-08	8.762E-08	3.089E-07	2.299E-04	1.9
Ra-226	Pb-210	1.000E+00		0.000E+00	4.655E-21	4.637E-20	6.122E-19	1.132E-17	1.993E-16	4.815E-04	3.9
Ra-226	∑DSR(j)			1.323E-0S	1.332E-08	1.410E-08	2.485E-08	8.762E-08	3.089E-07	7.114E-04	5.8
Ra-228	Ra-228	1.000E+00		2.733E-09	2.440E-09	8.795E-10	3.256E-14	4.623E-24	6.564E-34	9.389E-44	0.0
Ra-228	Th-228	1.000E+00		0.000E+00	1.584E-08	2.400E-08	8.812E-13	9.969E-23	1.128E-32	1.275E-42	0.0
Ra-228	∑DSR(j)			2.733E-09	1.828E-08	2.488E-08	9.138E-13	1.043E-22	1.193E-32	1.369E-42	0.0
Th-228	Th-228	1.000E+00		5.517E-08	3.865E-08	1.573E-09	1.955E-23	0.000E+00	0.000E+00	0.000E+00	0.0
Th-230	Th-230	1.000E+00		3.488E-21	3.545E-21	4.107E-21	1.786E-20	4.685E-19	1.229E-17	3.223E-16	8.4
Th-230	Ra-226	1.000E+00		0.000E+00	5.772E-12	6.135E-11	1.129E-09	1.316E-08	8.552E-08	2.146E-05	4.1
Th-230	Pb-210	1.000E+00		0.000E+00	1.014E-24	1.059E-22	1.987E-20	1.493E-18	5.076E-17	3.988E-05	7.7
Th-230	∑DSR(j)			3.488E-21	5.772E-12	6.135E-11	1.129E-09	1.316E-08	8.552E-08	6.134E-05	1.1
Th-232	Th-232	1.000E+00		2.624E-23	2.672E-23	3.147E-23	1.616E-22	6.129E-21	2.325E-19	8.818E-18	3.3
Th-232	Ra-228	1.000E+00		0.000E+00	3.127E-10	2.063E-09	5.872E-09	2.734E-08	1.273E-07	5.926E-07	2.7
Th-232	Th-228	1.000E+00		0.000E+00	1.035E-09	3.319E-08	1.058E-07	3.925E-07	1.456E-06	5.400E-06	2.0
Th-232	∑DSR(j)			2.624E-23	1.348E-09	3.525E-08	1.117E-07	4.198E-07	1.S83E-06	5.993E-06	2.2
U-234	U-234	1.000E+00		2.568E-22	2.611E-22	3.042E-22	1.399E-21	4.152E-20	1.232E-18	3.657E-17	1.0
U-234	Th-230	1.000E+00		0.000E+00	3.191E-26	3.697E-25	1.608E-23	1.266E-21	5.540E-20	2.035E-18	6.8
U-234	Ra-226	1.000E+00		0.000E+00	2.599E-17	2.766E-15	5.163E-13	1.862E-11	2.078E-10	2.044E-08	8.4
U-234	Pb-210	1.000E+00		0.000E+00	3.050E-30	3.260E-27	7.248E-24	1.905E-21	1.154E-19	3.273E-08	1.3
U-234	∑DSR(j)			2.568E-22	2.599E-17	2.766E-15	5.163E-13	1.862E-11	2.078E-10	5.317E-08	2.2
U-235	U-235	1.000E+00		2.595E-14	2.627E-14	2.928E-14	8.669E-14	9.672E-13	1.079E-11	1.204E-10	1.3
U-235	Pa-231	1.000E+00		0.000E+00	9.155E-18	1.000E-16	2.428E-15	5.231E-14	6.449E-06	6.307E-05	1.1
U-235	Ac-227	1.000E+00		0.000E+00	1.245E-18	1.237E-16	1.447E-14	3.425E-09	2.826E-07	1.094E-06	1.8
0-235	∑DSR(j)			2.595E-14	2.628E-14	2.950E-14	1.036E-13	3.426E-09	6.732E-06	6.416E-05	1.1
U-238	U-238	1.000E+00		3.068E-11	3.093E-11	3.325E-11	6.850E-11	3.414E-10	1.702E-09	8.483E-09	4.2
U-238	U-234	1.000E+00		0.000E+00	7.403E-28	8.624E-27	3.966E-25	3.532E-23	1.748E-21	7.265E-20	2.7
U-238	Th-230	1.000E+00		0.000E+00	4.524E-32	5.240E-30	2.280E-27	5.389E-25	3.930E-23	2.022E-21	8.7
U-238	Ra-226	1.000E+00		0.000E+00	2.456E-23	2.616E-20	4.918E-17	5.405E-15	1.020E-13	4.240E-12	3.8
U-238	Pb-210	1.000E+00		0.000E+00	2.165E-36	2.347E-32	5.784E-28	5.049E-25	5.337E-23	6.248E-12	4.5
U-238	∑DSR(j)			3.068E-11	3.093E-11	3.325E-11	6.850E-11	3.414E-10	1.702E-09	8.493E-09	4.2

*Branch Fraction is the cumulative factor for the j't principal radionuclide daughter: CUMBRF(j) = BP
The DSR includes contributions from associated (half-life ≤ 0.5 yr) daughters.

Single Radionuclide Soil Guidelines G(i,t) in pCi/g
Basic Radiation Dose Limit = 2.500E+01 mrem/yr

Nuclide (i)	t= 0.000E+00	1.000E+00	1.000E+01	1.000E+02	3.000E+02	5.000E+02	7.000E+02	9.000E
Ac-227	6.756E+12	6.913E+12	8.501E+12	6.728E+13	2.019E+09	1.548E+12	*7.230E+13	*7.230E
Pa-231	*4.722E+10	*4.722E+10	*4.722E+10	*4.722E+10	6.000E+06	1.742E+03	1.953E+03	2.190E
Pb-210	*7.631E+13	*7.631E+13	*7.631E+13	*7.631E+13	*7.631E+13	*7.631E+13	*7.631E+13	*7.631E
Ra-226	1.889E+09	1.877E+09	1.774E+09	1.006E+09	2.853E+08	8.093E+07	3.514E+04	4.238E
Ra-228	9.148E+09	1.368E+09	1.005E+09	2.736E+13	*2.726E+14	*2.726E+14	*2.726E+14	*2.726E
Th-228	4.532E+08	6.468E+08	1.590E+10	*8.192E+14	*8.192E+14	*8.192E+14	*8.192E+14	*8.192E
Th-230	*2.018E+10	*2.018E+10	*2.018E+10	*2.018E+10	1.899E+09	2.923E+08	4.076E+05	2.101E
Th-232	*1.096E+05	*1.096E+05	*1.096E+05	*1.096E+05	*1.096E+05	*1.096E+05	*1.096E+05	*1.096E
U-234	*6.245E+09	*6.245E+09	*6.245E+09	*6.245E+09	*6.245E+09	*5.245E+09	4.702E+08	1.117E
U-235	*2.160E+06	*2.160E+06	*2.160E+06	*2.160E+06	*2.160E+06	*2.160E+06	3.896E+05	2.167E
U-238	*3.360E+05	*3.360E+05	*3.360E+05	*3.360E+05	*3.360E+05	*3.360E+05	*3.360E+05	*3.360E

*At specific activity limit

Summed Dose/Source Ratios DSR(i,t) in (mrem/yr)/(pCi/g)
and Single Radionuclide Soil Guidelines G(i,t) in pCi/g
at tmin = time of minimum single radionuclide soil guideline
and at tmax = time of maximum total dose = 558 ± 1 years

Nuclide (i)	Initial (pCi/g)	tmin (years)	DSR(i,tmin)	G(i,tmin) (pCi/g)	DSR(i,tmax)	G(i,tmax) (pCi/g)
Ac-227	8.000E+00	193.0 ± 0.4	4.324E-07	5.782E+07	2.370E-12	1.055E+13
Pa-231	8.000E+00	478.8 ± 1.0	1.453E-02	1.721E+03	1.389E-02	1.800E+03
Pb-210	1.820E+02	1.000E+03	2.486E-17	*7.631E+13	1.925E-23	*7.631E+13
Ra-226	1.820E+02	558 ± 1	8.259E-04	3.027E+04	8.259E-04	3.027E+04
Ra-228	1.820E+02	4.563 ± 0.009	3.442E-08	7.263E+08	0.000E+00	*2.726E+14
Th-228	1.820E+02	0.000E+00	5.517E-08	4.532E+08	0.000E+00	*8.192E+14
Th-230	1.820E+02	1.000E+03	1.441E-04	1.735E+05	1.508E-05	1.658E+06
Th-232	1.820E+02	1.000E+03	4.454E-05	*1.096E+05	2.324E-06	*1.096E+05
U-234	1.820E+02	1.000E+03	3.516E-07	7.111E+07	3.376E-09	*6.245E+09
U-235	8.000E+00	1.000E+03	1.389E-04	1.800E+05	2.400E-05	1.042E+06
U-238	1.820E+02	1.000E+03	9.458E-08	*3.360E+05	2.709E-09	*3.360E+05

*At specific activity limit

Individual Nuclide Dose Summed Over All Pathways
Parent Nuclide and Branch Fraction Indicated

Nuclide (j)	Parent (i)	BRF(i)	DOSE(j,t), mrem/yr t= 0.000E+00	1.000E+00	1.000E+01	1.000E+02	3.000E+02	5.000E+02	7.000E+02	9.0
Ac-227	Ac-227	1.000E+00	2.960E-11	2.893E-11	2.353E-11	2.972E-12	9.905E-08	1.292E-10	1.684E-13	2.1
Ac-227	Pa-231	1.000E+00	0.000E+00	9.363E-13	8.856E-12	7.292E-11	3.333E-05	1.623E-03	1.447E-03	1.2
Ac-227	U-235	1.000E+00	0.000E+00	9.961E-18	9.897E-16	1.158E-13	2.740E-08	2.261E-06	8.756E-06	1.4
Ac-227	∑DOSE(j)		2.960E-11	2.987E-11	3.238E-11	7.601E-11	3.346E-05	1.625E-03	1.456E-03	1.3
Pa-231	Pa-231	1.000E+00	3.428E-12	3.461E-12	3.772E-12	8.921E-12	6.043E-11	1.132E-01	1.010E-01	9.0
Pa-231	U-235	1.000E+00	0.000E+00	7.324E-17	8.003E-16	1.943E-14	4.185E-13	5.160E-05	5.046E-04	9.0
Pa-231	∑DOSE(j)		3.428E-12	3.461E-12	3.773E-12	8.941E-12	6.085E-11	1.133E-01	1.015E-01	9.0
Pb-210	Pb-210	1.000E+00	2.728E-17	2.684E-17	2.323E-17	5.473E-18	2.202E-19	8.864E-21	3.567E-22	1.4
Pb-210	Ra-226	1.000E+00	0.000E+00	8.472E-19	8.439E-18	1.114E-16	2.060E-15	3.627E-14	8.763E-02	7.2
Pb-210	Th-230	1.000E+00	0.000E+00	1.845E-22	1.927E-20	3.616E-18	2.717E-16	9.238E-15	7.258E-03	1.4
Pb-210	U-234	1.000E+00	0.000E+00	5.551E-28	5.934E-25	1.319E-21	3.466E-19	2.100E-17	5.956E-06	2.5
Pb-210	U-238	1.000E+00	0.000E+00	0.000E+00	0.000E+00	1.053E-25	9.189E-23	9.713E-21	1.137E-09	8.2
Pb-210	∑DOSE(j)		2.728E-17	2.769E-17	3.169E-17	1.205E-16	2.332E-15	4.553E-14	9.490E-02	8.6
Ra-226	Ra-226	1.000E+00	2.409E-06	2.424E-06	2.565E-06	4.523E-06	1.595E-05	5.622E-05	4.185E-02	3.5
Ra-226	Th-230	1.000E+00	0.000E+00	1.051E-09	1.117E-08	2.055E-07	2.396E-06	1.556E-05	3.905E-03	7.5
Ra-226	U-234	1.000E+00	0.000E+00	4.729E-15	5.034E-13	9.396E-11	3.390E-09	3.781E-08	3.721E-06	1.5
Ra-226	U-238	1.000E+00	0.000E+00	4.470E-21	4.761E-18	8.950E-15	9.837E-13	1.856E-11	7.717E-10	6.9
Ra-226	∑DOSE(j)		2.409E-06	2.425E-06	2.577E-06	4.728E-06	1.835E-05	7.183E-05	4.576E-02	4.2
Ra-228	Ra-228	1.000E+00	4.974E-07	4.441E-07	1.601E-07	5.927E-12	8.415E-22	0.000E+00	0.000E+00	0.0
Ra-228	Th-232	1.000E+00	0.000E+00	5.691E-08	3.755E-07	1.069E-06	4.975E-06	2.316E-05	1.079E-04	5.0
Ra-228	∑DOSE(j)		4.974E-07	5.010E-07	5.355E-07	1.069E-06	4.975E-06	2.316E-05	1.079E-04	5.0
Th-228	Ra-228	1.000E+00	0.000E+00	2.883E-06	4.368E-06	1.604E-10	1.814E-20	0.000E+00	0.000E+00	0.0
Th-228	Th-228	1.000E+00	1.004E-05	7.035E-06	2.862E-07	3.558E-21	0.000E+00	0.000E+00	0.000E+00	0.0
Th-228	Th-232	1.000E+00	0.000E+00	1.884E-07	6.040E-06	1.926E-05	7.143E-05	2.650E-04	9.829E-04	3.6
Th-228	∑DOSE(j)		1.004E-05	1.011E-05	1.069E-05	1.926E-05	7.143E-05	2.650E-04	9.829E-04	3.6
Th-230	Th-230	1.000E+00	6.348E-19	6.452E-19	7.474E-19	3.251E-18	8.527E-17	2.236E-15	5.866E-14	1.5
Th-230	U-234	1.000E+00	0.000E+00	5.808E-24	6.728E-23	2.927E-21	2.305E-19	1.008E-17	3.705E-16	1.2
Th-230	U-238	1.000E+00	0.000E+00	0.000E+00	9.538E-28	4.150E-25	9.807E-23	7.153E-21	3.681E-19	1.5
Th-230	∑DOSE(j)		6.348E-19	6.452E-19	7.475E-19	3.254E-18	8.550E-17	2.247E-15	5.903E-14	1.5
Th-232	Th-232	1.000E+00	4.775E-21	4.863E-21	5.727E-21	2.941E-20	1.115E-18	4.231E-17	1.605E-15	6.0
U-234	U-234	1.000E+00	4.673E-20	4.753E-20	5.536E-20	2.546E-19	7.556E-18	2.243E-16	6.656E-15	1.9
U-234	U-238	1.000E+00	0.000E+00	1.347E-25	1.569E-24	7.218E-23	6.429E-21	3.181E-19	1.322E-17	5.0
U-234	∑DOSE(j)		4.673E-20	4.753E-20	5.536E-20	2.546E-19	7.562E-18	2.246E-16	6.669E-15	1.9
U-235	U-235	1.000E+00	2.076E-13	2.101E-13	2.342E-13	6.935E-13	7.738E-12	8.634E-11	9.634E-10	1.0
U-238	U-238	1.000E+00	5.584E-09	5.629E-09	6.051E-09	1.247E-08	6.214E-08	3.097E-07	1.544E-06	7.6

BRF(i) is the branch fraction of the parent nuclide.

Individual Nuclide Soil Concentration
Parent Nuclide and Branch Fraction Indicated

Nuclide (j)	Parent (i)	BRF(i)	S(j,t), pCi/g t= 0.000E+00	1.000E+00	1.000E+01	1.000E+02	3.000E+02	5.000E+02	7.000E+02	9.0
Ac-227	Ac-227	1.000E+00	8.000E+00	7.739E+00	5.739E+00	2.889E-01	3.767E-04	4.913E-07	6.407E-10	8.3
Ac-227	Pa-231	1.000E+00	0.000E+00	2.504E-01	2.161E+00	7.087E+00	6.571E+00	5.860E+00	5.225E+00	4.6
Ac-227	U-235	1.000E+00	0.000E+00	2.664E-06	2.415E-04	1.125E-02	4.053E-02	6.680E-02	9.023E-02	1.1
Ac-227	∑S(j):		8.000E+00	7.989E+00	7.900E+00	7.387E+00	6.612E+00	5.927E+00	5.316E+00	4.7
Pa-231	Pa-231	1.000E+00	8.000E+00	7.995E+00	7.954E+00	7.555E+00	6.737E+00	6.008E+00	5.357E+00	4.7
Pa-231	U-235	1.000E+00	0.000E+00	1.692E-04	1.688E-03	1.645E-02	4.665E-02	7.358E-02	9.760E-02	1.1
Pa-231	∑S(j):		8.000E+00	7.996E+00	7.956E+00	7.571E+00	6.784E+00	6.081E+00	5.455E+00	4.8
Pb-210	Pb-210	1.000E+00	1.820E+02	1.764E+02	1.330E+02	7.910E+00	1.494E-02	2.822E-05	5.331E-08	1.0
Pb-210	Ra-226	1.000E+00	0.000E+00	5.567E+00	4.832E+01	1.510E+02	1.397E+02	1.155E+02	9.544E+01	7.8
Pb-210	Th-230	1.000E+00	0.000E+00	1.212E-03	1.103E-01	5.227E+00	1.843E+01	2.941E+01	3.846E+01	4.5
Pb-210	U-234	1.000E+00	0.000E+00	3.647E-09	3.397E-06	1.907E-03	2.352E-02	6.688E-02	1.282E-01	2.0
Pb-210	U-238	1.000E+00	0.000E+00	2.589E-15	2.446E-11	1.522E-07	6.234E-06	3.093E-05	8.545E-05	1.7
Pb-210	∑S(j):		1.820E+02	1.819E+02	1.814E+02	1.742E+02	1.582E+02	1.450E+02	1.340E+02	1.2
Ra-226	Ra-226	1.000E+00	1.820E+02	1.818E+02	1.803E+02	1.654E+02	1.367E+02	1.130E+02	9.336E+01	7.7
Ra-226	Th-230	1.000E+00	0.000E+00	7.881E-02	7.847E-01	7.517E+00	2.054E+01	3.127E+01	4.012E+01	4.7
Ra-226	U-234	1.000E+00	0.000E+00	3.548E-07	3.537E-05	3.437E-03	2.906E-02	7.598E-02	1.404E-01	2.1
Ra-226	U-238	1.000E+00	0.000E+00	3.353E-13	3.345E-10	3.274E-07	8.434E-06	3.730E-05	9.790E-05	1.9
Ra-226	∑S(j):		1.820E+02	1.819E+02	1.811E+02	1.730E+02	1.573E+02	1.443E+02	1.336E+02	1.2
Ra-228	Ra-228	1.000E+00	1.820E+02	1.612E+02	5.424E+01	1.005E-03	3.064E-14	9.344E-25	2.849E-35	0.0
Ra-228	Th-232	1.000E+00	0.000E+00	2.066E+01	1.272E+02	1.812E+02	1.812E+02	1.812E+02	1.812E+02	1.8
Ra-228	∑S(j):		1.820E+02	1.819E+02	1.815E+02	1.812E+02	1.812E+02	1.812E+02	1.812E+02	1.8
Th-228	Ra-228	1.000E+00	0.000E+00	5.191E+01	7.415E+01	1.509E-03	4.602E-14	1.403E-24	4.279E-35	0.0
Th-228	Th-228	1.000E+00	1.820E+02	1.267E+02	4.859E+00	3.349E-14	0.000E+00	0.000E+00	0.000E+00	0.0
Th-228	Th-232	1.000E+00	0.000E+00	3.393E+00	1.025E+02	1.812E+02	1.812E+02	1.812E+02	1.812E+02	1.8
Th-228	∑S(j):		1.820E+02	1.820E+02	1.816E+02	1.812E+02	1.812E+02	1.812E+02	1.812E+02	1.8
Th-230	Th-230	1.000E+00	1.820E+02	1.820E+02	1.820E+02	1.818E+02	1.815E+02	1.811E+02	1.808E+02	1.8
Th-230	U-234	1.000E+00	0.000E+00	1.638E-03	1.638E-02	1.637E-01	4.906E-01	8.166E-01	1.142E+00	1.4
Th-230	U-238	1.000E+00	0.000E+00	2.322E-09	2.322E-07	2.321E-05	2.087E-04	5.793E-04	1.134E-03	1.8
Th-230	∑S(j):		1.820E+02	1.820E+02	1.820E+02	1.820E+02	1.820E+02	1.820E+02	1.819E+02	1.8
Th-232	Th-232	1.000E+00	1.820E+02	1.820E+02	1.820E+02	1.820E+02	1.820E+02	1.820E+02	1.819E+02	1.8
U-234	U-234	1.000E+00	1.820E+02	1.820E+02	1.820E+02	1.819E+02	1.818E+02	1.817E+02	1.816E+02	1.8
U-234	U-238	1.000E+00	0.000E+00	5.160E-04	5.160E-03	5.159E-02	1.547E-01	2.577E-01	3.607E-01	4.6
U-234	∑S(j):		1.820E+02	1.820E+02	1.820E+02	1.820E+02	1.820E+02	1.820E+02	1.819E+02	1.8
U-235	U-235	1.000E+00	8.000E+00	8.000E+00	8.000E+00	8.000E+00	7.999E+00	7.998E+00	7.998E+00	7.9
U-238	U-238	1.000E+00	1.820E+02	1.820E+02	1.820E+02	1.820E+02	1.820E+02	1.820E+02	1.819E+02	1.8

BRF(i) is the branch fraction of the parent nuclide.

RESCALC.EXE execution time = 767.03 seconds
Total water/soil iteration failures = 558.

Summary : Shieldalloy Storage Pile Industrial Worker Controls Fail
File : newfield 3004004.RAD

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Dose Conversion Factor (and Related) Parameter Summary
File: FGR 13 Morbidity

Menu	Parameter	Current Value	Default	Paramete Name
B-1	Dose conversion factors for inhalation, mrem/pCi:			
B-1	Ac-227+D	6.720E+00	6.720E+00	DCF2(1)
B-1	Pa-231	1.280E+00	1.280E+00	DCF2(2)
B-1	Pb-210+D	2.320E-02	2.320E-02	DCF2(3)
B-1	Ra-226+D	8.600E-03	8.600E-03	DCF2(4)
B-1	Ra-228+D	5.080E-03	5.080E-03	DCF2(5)
B-1	Th-228+D	3.450E-01	3.450E-01	DCF2(6)
B-1	Th-230	3.260E-01	3.260E-01	DCF2(7)
B-1	Th-232	1.640E+00	1.640E+00	DCF2(8)
B-1	U-234	1.320E-01	1.320E-01	DCF2(9)
B-1	U-235+D	1.230E-01	1.230E-01	DCF2(10)
B-1	U-238+D	1.180E-01	1.180E-01	DCF2(11)
D-1	Dose conversion factors for ingestion, mrem/pCi:			
D-1	Ac-227+D	1.480E-02	1.480E-02	DCF3(1)
D-1	Pa-231	1.060E-02	1.060E-02	DCF3(2)
D-1	Pb-210+D	7.270E-03	7.270E-03	DCF3(3)
D-1	Ra-226+D	1.330E-03	1.330E-03	DCF3(4)
D-1	Ra-228+D	1.440E-03	1.440E-03	DCF3(5)
D-1	Th-228+D	8.080E-04	8.080E-04	DCF3(6)
D-1	Th-230	5.480E-04	5.480E-04	DCF3(7)
D-1	Th-232	2.730E-03	2.730E-03	DCF3(8)
D-1	U-234	2.830E-04	2.830E-04	DCF3(9)
D-1	U-235+D	2.670E-04	2.670E-04	DCF3(10)
D-1	U-238+D	2.690E-04	2.690E-04	DCF3(11)
D-34	Food transfer factors:			
D-34	Ac-227+D , plant/soil concentration ratio, dimensionless	2.500E-03	2.500E-03	RTF(1,1)
D-34	Ac-227+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	2.000E-05	2.000E-05	RTF(1,2)
D-34	Ac-227+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	2.000E-05	2.000E-05	RTF(1,3)
D-34				
D-34	Pa-231 , plant/soil concentration ratio, dimensionless	1.000E-02	1.000E-02	RTF(2,1)
D-34	Pa-231 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	5.000E-03	5.000E-03	RTF(2,2)
D-34	Pa-231 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	5.000E-06	5.000E-06	RTF(2,3)
D-34				
D-34	Pb-210+D , plant/soil concentration ratio, dimensionless	1.000E-02	1.000E-02	RTF(3,1)
D-34	Pb-210+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	8.000E-04	8.000E-04	RTF(3,2)
D-34	Pb-210+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	3.000E-04	3.000E-04	RTF(3,3)
D-34				
D-34	Ra-226+D , plant/soil concentration ratio, dimensionless	4.000E-02	4.000E-02	RTF(4,1)
D-34	Ra-226+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-03	1.000E-03	RTF(4,2)
D-34	Ra-226+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	1.000E-03	1.000E-03	RTF(4,3)
D-34				
D-34	Ra-228+D , plant/soil concentration ratio, dimensionless	4.000E-02	4.000E-02	RTF(5,1)
D-34	Ra-228+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-03	1.000E-03	RTF(5,2)
D-34	Ra-228+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	1.000E-03	1.000E-03	RTF(5,3)
D-34				
D-34	Th-228+D , plant/soil concentration ratio, dimensionless	1.000E-03	1.000E-03	RTF(6,1)
D-34	Th-228+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-04	1.000E-04	RTF(6,2)
D-34	Th-228+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	5.000E-06	5.000E-06	RTF(6,3)

Dose Conversion Factor (and Related) Parameter Summary (continued)
File: FGR 13 Morbidity

Menu	Parameter	Current Value	Default	Paramete Name
D-34	Th-230 , plant/soil concentration ratio, dimensionless	1.000E-03	1.000E-03	RTF(7,1)
D-34	Th-230 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-04	1.000E-04	RTF(7,2)
D-34	Th-230 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	5.000E-06	5.000E-06	RTF(7,3)
D-34				
D-34	Th-232 , plant/soil concentration ratio, dimensionless	1.000E-03	1.000E-03	RTF(8,1)
D-34	Th-232 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-04	1.000E-04	RTF(8,2)
D-34	Th-232 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	5.000E-06	5.000E-06	RTF(8,3)
D-34				
D-34	U-234 , plant/soil concentration ratio, dimensionless	2.500E-03	2.500E-03	RTF(9,1)
D-34	U-234 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	3.400E-04	3.400E-04	RTF(9,2)
D-34	U-234 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	6.000E-04	6.000E-04	RTF(9,3)
D-34				
D-34	U-235+D , plant/soil concentration ratio, dimensionless	2.500E-03	2.500E-03	RTF(10,1)
D-34	U-235+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	3.400E-04	3.400E-04	RTF(10,2)
D-34	U-235+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	6.000E-04	6.000E-04	RTF(10,3)
D-34				
D-34	U-238+D , plant/soil concentration ratio, dimensionless	2.500E-03	2.500E-03	RTF(11,1)
D-34	U-238+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	3.400E-04	3.400E-04	RTF(11,2)
D-34	U-238+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	6.000E-04	6.000E-04	RTF(11,3)
D-5	Bioaccumulation factors, fresh water, L/kg:			
D-5	Ac-227+D , fish	1.500E+01	1.500E+01	BIOFAC(1
D-5	Ac-227+D , crustacea and mollusks	1.000E+03	1.000E+03	BIOFAC(1
D-5				
D-5	Pa-231 , fish	1.000E+01	1.000E+01	BIOFAC(2
D-5	Pa-231 , crustacea and mollusks	1.100E+02	1.100E+02	BIOFAC(2
D-5				
D-5	Pb-210+D , fish	3.000E+02	3.000E+02	BIOFAC(3
D-5	Pb-210+D , crustacea and mollusks	1.000E+02	1.000E+02	BIOFAC(3
D-5				
D-5	Ra-226+D , fish	5.000E+01	5.000E+01	BIOFAC(4
D-5	Ra-226+D , crustacea and mollusks	2.500E+02	2.500E+02	BIOFAC(4
D-5				
D-5	Ra-228+D , fish	5.000E+01	5.000E+01	BIOFAC(5
D-5	Ra-228+D , crustacea and mollusks	2.500E+02	2.500E+02	BIOFAC(5
D-5				
D-5	Th-228+D , fish	1.000E+02	1.000E+02	BIOFAC(6
D-5	Th-228+D , crustacea and mollusks	5.000E+02	5.000E+02	BIOFAC(6
D-5				
D-5	Th-230 , fish	1.000E+02	1.000E+02	BIOFAC(7
D-5	Th-230 , crustacea and mollusks	5.000E+02	5.000E+02	BIOFAC(7
D-5				
D-5	Th-232 , fish	1.000E+02	1.000E+02	BIOFAC(8
D-5	Th-232 , crustacea and mollusks	5.000E+02	5.000E+02	BIOFAC(8
D-5				
D-5	U-234 , fish	1.000E+01	1.000E+01	BIOFAC(9
D-5	U-234 , crustacea and mollusks	6.000E+01	6.000E+01	BIOFAC(9
D-5				
D-5	U-235+D , fish	1.000E+01	1.000E+01	BIOFAC(10
D-5	U-235+D , crustacea and mollusks	6.000E+01	6.000E+01	BIOFAC(10

Dose Conversion Factor (and Related) Parameter Summary (continued)
File: FGR 13 Morbidity

Menu	Parameter	Current Value	Default	Paramete Name
D-5	U-238+D , fish	1.000E+01	1.000E+01	BIOFAC(11
D-5	U-238+D , crustacea and mollusks	6.000E+01	6.000E+01	BIOFAC(11

Site-Specific Parameter Summary

Menu	Parameter	User Input	Default	Used by RESP (If different from u
R011	Area of contaminated zone (m**2)	1.823E+04	1.000E+04	---
R011	Thickness of contaminated zone (m)	2.800E+00	2.000E+00	---
R011	Length parallel to aquifer flow (m)	not used	1.000E+02	---
R011	Basic radiation dose limit (mrem/yr)	2.500E+01	2.500E+01	---
R011	Time since placement of material (yr)	0.000E+00	0.000E+00	---
R011	Times for calculations (yr)	1.000E+00	1.000E+00	---
R011	Times for calculations (yr)	1.000E+01	3.000E+00	---
R011	Times for calculations (yr)	1.000E+02	1.000E+01	---
R011	Times for calculations (yr)	3.000E+02	3.000E+01	---
R011	Times for calculations (yr)	5.000E+02	1.000E+02	---
R011	Times for calculations (yr)	7.000E+02	3.000E+02	---
R011	Times for calculations (yr)	9.000E+02	1.000E+03	---
R011	Times for calculations (yr)	1.000E+03	0.000E+00	---
R011	Times for calculations (yr)	not used	0.000E+00	---
R012	Initial principal radionuclide (pCi/g): Ac-227	8.000E+00	0.000E+00	---
R012	Initial principal radionuclide (pCi/g): Pa-231	8.000E+00	0.000E+00	---
R012	Initial principal radionuclide (pCi/g): Pb-210	1.820E+02	0.000E+00	---
R012	Initial principal radionuclide (pCi/g): Ra-226	1.820E+02	0.000E+00	---
R012	Initial principal radionuclide (pCi/g): Ra-228	1.820E+02	0.000E+00	---
R012	Initial principal radionuclide (pCi/g): Th-228	1.820E+02	0.000E+00	---
R012	Initial principal radionuclide (pCi/g): Th-230	1.820E+02	0.000E+00	---
R012	Initial principal radionuclide (pCi/g): Th-232	1.820E+02	0.000E+00	---
R012	Initial principal radionuclide (pCi/g): U-234	1.820E+02	0.000E+00	---
R012	Initial principal radionuclide (pCi/g): U-235	8.000E+00	0.000E+00	---
R012	Initial principal radionuclide (pCi/g): U-238	1.820E+02	0.000E+00	---
R012	Concentration in groundwater (pCi/L): Ac-227	not used	0.000E+00	---
R012	Concentration in groundwater (pCi/L): Pa-231	not used	0.000E+00	---
R012	Concentration in groundwater (pCi/L): Pb-210	not used	0.000E+00	---
R012	Concentration in groundwater (pCi/L): Ra-226	not used	0.000E+00	---
R012	Concentration in groundwater (pCi/L): Ra-228	not used	0.000E+00	---
R012	Concentration in groundwater (pCi/L): Th-228	not used	0.000E+00	---
R012	Concentration in groundwater (pCi/L): Th-230	not used	0.000E+00	---
R012	Concentration in groundwater (pCi/L): Th-232	not used	0.000E+00	---
R012	Concentration in groundwater (pCi/L): U-234	not used	0.000E+00	---
R012	Concentration in groundwater (pCi/L): U-235	not used	0.000E+00	---
R012	Concentration in groundwater (pCi/L): U-238	not used	0.000E+00	---
R013	Cover depth (m)	1.000E+00	0.000E+00	---
R013	Density of cover material (g/cm**3)	not used	1.500E+00	---
R013	Cover depth erosion rate (m/yr)	4.600E-04	1.000E-03	---
R013	Density of contaminated zone (g/cm**3)	2.800E+00	1.500E+00	---
R013	Contaminated zone erosion rate (m/yr)	4.600E-05	1.000E-03	---
R013	Contaminated zone total porosity	4.000E-01	4.000E-01	---
R013	Contaminated zone field capacity	2.000E-01	2.000E-01	---
R013	Contaminated zone hydraulic conductivity (m/yr)	2.000E+03	1.000E+01	---
R013	Contaminated zone b parameter	2.880E+00	5.300E+00	---
R013	Average annual wind speed (m/sec)	4.250E+00	2.000E+00	---
R013	Humidity in air (g/m**3)	npt used	8.000E+00	---
R013	Evapotranspiration coefficient	6.250E-01	5.000E-01	---

Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESP (If different from u
R013	Precipitation (m/yr)	1.050E+00	1.000E+00	---
R013	Irrigation (m/yr)	0.000E+00	2.000E-01	---
R013	Irrigation mode	overhead	overhead	---
R013	Runoff coefficient	4.500E-01	2.000E-01	---
R013	Watershed area for nearby stream or pond (m**2)	not used	1.000E+06	---
R013	Accuracy for water/soil computations	not used	1.000E-03	---
R014	Density of saturated zone (g/cm**3)	not used	1.500E+00	---
R014	Saturated zone total porosity	not used	4.000E-01	---
R014	Saturated zone effective porosity	not used	2.000E-01	---
R014	Saturated zone field capacity	not used	2.000E-01	---
R014	Saturated zone hydraulic conductivity (m/yr)	not used	1.000E+02	---
R014	Saturated zone hydraulic gradient	not used	2.000E-02	---
R014	Saturated zone b parameter	not used	5.300E+00	---
R014	Water table drop rate (m/yr)	not used	1.000E-03	---
R014	Well pump intake depth (m below water table)	not used	1.000E+01	---
R014	Model: Nondispersion (ND) or Mass-Balance (MB)	not used	ND	---
R014	Well pumping rate (m**3/yr)	not used	2.500E+02	---
R015	Number of unsaturated zone strata	not used	1	---
R015	Unsat. zone 1, thickness (m)	not used	4.000E+00	---
R015	Unsat. zone 1, soil density (g/cm**3)	not used	1.500E+00	---
R015	Unsat. zone 1, total porosity	not used	4.000E-01	---
R015	Unsat. zone 1, effective porosity	not used	2.000E-01	---
R015	Unsat. zone 1, field capacity	not used	2.000E-01	---
R015	Unsat. zone 1, soil-specific b parameter	not used	5.300E+00	---
R015	Unsat. zone 1, hydraulic conductivity (m/yr)	not used	1.000E+01	---
R016	Distribution coefficients for Ac-227			
R016	Contaminated zone (cm**3/g)	2.000E+01	2.000E+01	---
R016	Unsaturated zone 1 (cm**3/g)	not used	2.000E+01	---
R016	Saturated zone (cm**3/g)	not used	2.000E+01	---
R016	Leach rate (/yr)	0.000E+00	0.000E+00	1.376E-03
R016	Solubility constant	0.000E+00	0.000E+00	not used
R016	Distribution coefficients for Pa-231			
R016	Contaminated zone (cm**3/g)	5.000E+01	5.000E+01	---
R016	Unsaturated zone 1 (cm**3/g)	not used	5.000E+01	---
R016	Saturated zone (cm**3/g)	not used	5.000E+01	---
R016	Leach rate (/yr)	0.000E+00	0.000E+00	5.517E-04
R016	Solubility constant	0.000E+00	0.000E+00	not used
R016	Distribution coefficients for Pb-210			
R016	Contaminated zone (cm**3/g)	1.000E+02	1.000E+02	---
R016	Unsaturated zone 1 (cm**3/g)	not used	1.000E+02	---
R016	Saturated zone (cm**3/g)	not used	1.000E+02	---
R016	Leach rate (/yr)	0.000E+00	0.000E+00	2.760E-04
R016	Solubility constant	0.000E+00	0.000E+00	not used

Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESP (If different from u
R016	Distribution coefficients for Ra-226			
R016	Contaminated zone (cm**3/g)	5.300E+01	7.000E+01	---
R016	Unsaturated zone 1 (cm**3/g)	not used	7.000E+01	---
R016	Saturated zone (cm**3/g)	not used	7.000E+01	---
R016	Leach rate (/yr)	0.000E+00	0.000E+00	5.205E-04
R016	Solubility constant	0.000E+00	0.000E+00	not used
R016	Distribution coefficients for Ra-228			
R016	Contaminated zone (cm**3/g)	5.300E+01	7.000E+01	---
R016	Unsaturated zone 1 (cm**3/g)	not used	7.000E+01	---
R016	Saturated zone (cm**3/g)	not used	7.000E+01	---
R016	Leach rate (/yr)	0.000E+00	0.000E+00	5.205E-04
R016	Solubility constant	0.000E+00	0.000E+00	not used
R016	Distribution coefficients for Th-228			
R016	Contaminated zone (cm**3/g)	5.201E+04	6.000E+04	---
R016	Unsaturated zone 1 (cm**3/g)	not used	6.000E+04	---
R016	Saturated zone (cm**3/g)	not used	6.000E+04	---
R016	Leach rate (/yr)	0.000E+00	0.000E+00	5.311E-07
R016	Solubility constant	0.000E+00	0.000E+00	not used
R016	Distribution coefficients for Th-230			
R016	Contaminated zone (cm**3/g)	5.201E+04	6.000E+04	---
R016	Unsaturated zone 1 (cm**3/g)	not used	6.000E+04	---
R016	Saturated zone (cm**3/g)	not used	6.000E+04	---
R016	Leach rate (/yr)	0.000E+00	0.000E+00	5.311E-07
R016	Solubility constant	0.000E+00	0.000E+00	not used
R016	Distribution coefficients for Th-232			
R016	Contaminated zone (cm**3/g)	5.201E+04	6.000E+04	---
R016	Unsaturated zone 1 (cm**3/g)	not used	6.000E+04	---
R016	Saturated zone (cm**3/g)	not used	6.000E+04	---
R016	Leach rate (/yr)	0.000E+00	0.000E+00	5.311E-07
R016	Solubility constant	0.000E+00	0.000E+00	not used
R016	Distribution coefficients for U-234			
R016	Contaminated zone (cm**3/g)	7.036E+04	5.000E+01	---
R016	Unsaturated zone 1 (cm**3/g)	not used	5.000E+01	---
R016	Saturated zone (cm**3/g)	not used	5.000E+01	---
R016	Leach rate (/yr)	0.000E+00	0.000E+00	3.926E-07
R016	Solubility constant	0.000E+00	0.000E+00	not used
R016	Distribution coefficients for U-235			
R016	Contaminated zone (cm**3/g)	7.036E+04	5.000E+01	---
R016	Unsaturated zone 1 (cm**3/g)	not used	5.000E+01	---
R016	Saturated zone (cm**3/g)	not used	5.000E+01	---
R016	Leach rate (/yr)	0.000E+00	0.000E+00	3.926E-07
R016	Solubility constant	0.000E+00	0.000E+00	not used

Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESP (If different from u
R016	Distribution coefficients for U-238			
R016	Contaminated zone (cm**3/g)	7.036E+04	5.000E+01	---
R016	Unsaturated zone 1 (cm**3/g)	not used	5.000E+01	---
R016	Saturated zone (cm**3/g)	not used	5.000E+01	---
R016	Leach rate (/yr)	0.000E+00	0.000E+00	3.926E-07
R016	Solubility constant	0.000E+00	0.000E+00	not used
R017	Inhalation rate (m**3/yr)	8.400E+03	8.400E+03	---
R017	Mass loading for inhalation (g/m**3)	3.000E-05	1.000E-04	---
R017	Exposure duration	3.000E+01	3.000E+01	---
R017	Shielding factor, inhalation	4.000E-01	4.000E-01	---
R017	Shielding factor, external gamma	not used	7.000E-01	---
R017	Fraction of time spent indoors	0.000E+00	5.000E-01	---
R017	Fraction of time spent outdoors (on site)	2.190E-01	2.500E-01	---
R017	Shape factor flag, external gamma	not used	1.000E+00	>0 shows circular
R017	Radii of shape factor array (used if FS = -1):			
R017	Outer annular radius (m), ring 1:	not used	5.000E+01	---
R017	Outer annular radius (m), ring 2:	not used	7.071E+01	---
R017	Outer annular radius (m), ring 3:	not used	0.000E+00	---
R017	Outer annular radius (m), ring 4:	not used	0.000E+00	---
R017	Outer annular radius (m), ring 5:	not used	0.000E+00	---
R017	Outer annular radius (m), ring 6:	not used	0.000E+00	---
R017	Outer annular radius (m), ring 7:	not used	0.000E+00	---
R017	Outer annular radius (m), ring 8:	not used	0.000E+00	---
R017	Outef annular radius (m), ring 9:	not used	0.000E+00	---
R017	Outer annular radius (m), ring 10:	not used	0.000E+00	---
R017	Outer annular radius (m), ring 11:	not used	0.000E+00	---
R017	Outer annular radius (m), ring 12:	not used	0.000E+00	---
R017	Fractions of annular areas within AREA:			
R017	Ring 1	not used	1.000E+00	---
R017	Ring 2	not used	2.732E-01	---
R017	Ring 3	not used	0.000E+00	---
R017	Ring 4	not used	0.000E+00	---
R017	Ring 5	not used	0.000E+00	---
R017	Ring 6	not used	0.000E+00	---
R017	Ring 7	not used	0.000E+00	---
R017	Ring 8	not used	0.000E+00	---
R017	Ring 9	not used	0.000E+00	---
R017	Ring 10	not used	0.000E+00	---
R017	Ring 11	not used	0.000E+00	---
R017	Ring 12	not used	0.000E+00	---
R018	Fruits, vegetables and grain consumption (kg/yr)	not used	1.600E+02	---
R018	Leafy vegetable consumption (kg/yr)	not used	1.400E+01	---
R018	Milk consumption (L/yr)	not used	9.200E+01	---
R018	Meat and poultry consumption (kg/yr)	not used	6.300E+01	---
R018	Fish consumption (kg/yr)	not used	5.400E+00	---
R018	Other seafood consumption (kg/yr)	not used	9.000E-01	---
R018	Soil ingestion rate (g/yr)	not used	3.650E+01	---

Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESP (If different from u
R018	Drinking water intake (L/yr)	not used	5.100E+02	---
R018	Contamination fraction of drinking water	not used	1.000E+00	---
R018	Contamination fraction of household water	not used	1.000E+00	---
R018	Contamination fraction of livestock water	not used	1.000E+00	---
R018	Contamination fraction of irrigation water	not used	1.000E+00	---
R018	Contamination fraction of aquatic food	not used	5.000E-01	---
R018	Contamination fraction of plant food	not used	-1	---
R018	Contamination fraction of meat	not used	-1	---
R018	Contamination fraction of milk	not used	-1	---
R019	Livestock fodder intake for meat (kg/day)	not used	6.800E+01	---
R019	Livestock fodder intake for milk (kg/day)	not used	5.500E+01	---
R019	Livestock water intake for meat (L/day)	not used	5.000E+01	---
R019	Livestock water intake for milk (L/day)	not used	1.600E+02	---
R019	Livestock soil intake (kg/day)	not used	5.000E-01	---
R019	Mass loading for foliar deposition (g/m**3)	not used	1.000E-04	---
R019	Depth of soil mixing layer (m)	1.500E-01	1.500E-01	---
R019	Depth of roots (m)	not used	9.000E-01	---
R019	Drinking water fraction from ground water	not used	1.000E+00	---
R019	Household water fraction from ground water	not used	1.000E+00	---
R019	Livestock water fraction from ground water	not used	1.000E+00	---
R0i9	Irrigation fraction from ground water	not used	1.000E+00	---
R19B	Wet weight crop yield for Non-Leafy (kg/m**2)	not used	7.000E-01	---
R19B	Wet weight crop yield for Leafy (kg/m**2)	not used	1.500E+00	---
R19B	Wet weight crop yield for Fodder (kg/m**2)	not used	1.100E+00	---
R19B	Growing Season for Non-Leafy (years)	not used	1.700E-01	---
R19B	Growing Season for Leafy (years)	not used	2.500E-01	---
R19B	Growing Season for Fodder (years)	not used	8.000E-02	---
R19B	Translocation Factor for Non-Leafy	not used	1.000E-01	---
R19B	Translocation Factor for Leafy	not used	1.000E+00	---
R19B	Translocation Factor for Fodder	not used	1.000E+00	---
R19B	Dry Foliar Interception Fraction for Non-Leafy	not used	2.500E-01	---
R19B	Dry Foliar Interception Fraction for Leafy	not used	2.500E-01	---
R19B	Dry Foliar Interception Fraction for Fodder	not used	2.500E-01	---
R19B	Wet Foliar Interception Fraction for Non-Leafy	not used	2.500E-01	---
R19B	Wet Foliar Interception Fraction for Leafy	not used	2.500E-01	---
R19B	Wet Foliar Interception Fraction for Fodder	not used	2.500E-01	---
R19B	Weathering Removal Constant for Vegetation	not used	2.000E+01	---
C14	C-12 concentration in water (g/cm**3)	not used	2.000E-05	---
C14	C-12 concentration in contaminated soil (g/g)	not used	3.000E-02	---
C14	Fraction of vegetation carbon from soil	not used	2.000E-02	---
C14	Fraction of vegetation carbon from air	not used	9.800E-01	---
C14	C-14 evasion layer thickness in soil (m)	not used	3.000E-01	---
C14	C-14 evasion flux rate from soil (1/sec)	not used	7.000E-07	---
C14	C-12 evasion flux rate from soil (1/sec)	not used	1.000E-10	---
C14	Fraction of grain in beef cattle feed	not used	8.000E-01	---
C14	Fraction of grain in milk cow feed	not used	2.000E-01	---
C14	DCF correction factor for gaseous forms of C14	not used	8.894E+01	---

Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESP (If different from u
STOR	Storage times of contaminated foodstuffs (days):			
STOR	Fruits, non-leafy vegetables, and grain	1.400E+01	1.400E+01	---
STOR	Leafy vegetables	1.000E+00	1.000E+00	---
STOR	Milk	1.000E+00	1.000E+00	---
STOR	Meat and poultry	2.000E+01	2.000E+01	---
STOR	Fish	7.000E+00	7.000E+00	---
STOR	Crustacea and mollusks	7.000E+00	7.000E+00	---
STOR	Well water	1.000E+00	1.000E+00	---
STOR	Surface water	1.000E+00	1.000E+00	---
STOR	Livestock fodder	4.500E+01	4.500E+01	---
R021	Thickness of building foundation (m)	not used	1.500E-01	---
R021	Bulk density of building foundation (g/cm**3)	not used	2.400E+00	---
R021	Total porosity of the cover material	not used	4.000E-01	---
R021	Total porosity of the building foundation	not used	1.000E-01	---
R021	Volumetric water content of the cover material	not used	5.000E-02	---
R021	Volumetric water content of the foundation	not used	3.000E-02	---
R021	Diffusion coefficient for radon gas (m/sec):			
R021	in cover material	not used	2.000E-06	---
R021	in foundation material	not used	3.000E-07	---
R021	in contaminated zone soil	not used	2.000E-06	---
R021	Radon vertical dimension of mixing (m)	not used	2.000E+00	---
R021	Average building air exchange rate (1/hr)	not used	5.000E-01	---
R021	Height of the building (room) (m)	not used	2.500E+00	---
R021	Building interior area factor	not used	0.000E+00	---
R021	Building depth below ground surface (m)	not used	-1.000E+00	---
R021	Emanating power of Rn-222 gas	not used	2.500E-01	---
R021	Emanating power of Rn-220 gas	not used	1.500E-01	---
TITL	Number of graphical time points	32	---	---
TITL	Maximum number of integration points for dose	1	---	---
TITL	Maximum number of integration points for risk	1	---	---

Summary of Pathway Selections

Pathway	User Selection
1 -- external gamma	suppressed
2 -- inhalation (w/o radon)	active
3 -- plant ingestion	suppressed
4 -- meat ingestion	suppressed
5 -- milk ingestion	suppressed
6 -- aquatic foods	suppressed
7 -- drinking water	suppressed
8 -- soil ingestion	suppressed
9 -- radon	suppressed
Find peak pathway doses	active

Contaminated Zone Dimensions	
Area:	18228.00 square meters
Thickness:	2.80 meters
Cover Depth:	1.00 meters

Initial Soil Concentrations, pCi/g	
Ac-227	8.000E+00
Pa-231	8.000E+00
Pb-210	1.820E+02
Ra-226	1.820E+02
Ra-228	1.820E+02
Th-228	1.820E+02
Th-230	1.820E+02
Th-232	1.820E+02
U-234	1.820E+02
U-235	8.000E+00
U-238	1.820E+02

Total Dose TDOSE(t), mrem/yr
Basic Radiation Dose Limit = 2.500E+01 mrem/yr
Total Mixture Sum M(t) = Fraction of Basic Dose Limit Received at Time (t)

t (years):	0.000E+00	1.000E+00	1.000E+01	1.000E+02	3.000E+02	5.000E+02	7.000E+02	9.000E+02
TDOSE(t):	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
M(t):	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00

Maximum TDOSE(t): 0.000E+00 mrem/yr at t = 0.000E+00 years

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Path
As mrem/yr and Fraction of Total Dose At t = 0.000E+00 years

Water Independent Pathways (Inhalation excludes radon)

Radio-Nuclide	Ground		Inhalation		Radon		Plant		Meat		
	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mre
Ac-227	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Pa-231	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Ra-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Th-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Th-230	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Th-232	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
U-234	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
U-235	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
U-238	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Path
As mrem/yr and Fraction of Total Dose At t = 0.000E+00 years

Water Dependent Pathways

Radio-Nuclide	Water		Fish		Radon		Plant		Meat		
	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mre
Ac-227	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Pa-231	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Ra-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Th-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Th-230	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Th-232	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
U-234	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
U-235	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
U-238	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00

*Sum of all water independent and dependent pathways.

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Path
As mrem/yr and Fraction of Total Dose At t = 1.000E+00 years

Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Radon		Plant		Meat		
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mre
Ao-227	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Pa-231	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Ra-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Th-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Th-230	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Th-232	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
U-234	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
U-235	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
U-238	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Path
As mrem/yr and Fraction of Total Dose At t = 1.000E+00 years

Water Dependent Pathways

Radio-	Water		Fish		Radon		Plant		Meat		
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mre
Ac-227	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Pa-231	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Ra-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Th-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Th-230	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Th-232	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
U-234	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
U-235	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
U-238	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00

*Sum of all water independent and dependent pathways.

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Path
As mrem/yr and Fraction of Total Dose At t = 1.000E+01 years

Water Independent Pathways (Inhalation excludes radon)

Radio-Nuclide	Ground		Inhalation		Radon		Plant		Meat		
	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mre
Ac-227	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Pa-231	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Ra-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Th-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Th-230	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Th-232	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
U-234	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
U-235	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
U-238	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Path
As mrem/yr and Fraction of Total Dose At t = 1.000E+01 years

Water Dependent Pathways

Radio-Nuclide	Water		Fish		Radon		Plant		Meat		
	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mre
Ac-227	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Pa-231	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Ra-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Th-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Th-230	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Th-232	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
U-234	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
U-235	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
U-238	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00

*Sum of all water independent and dependent pathways.

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Path
As mrem/yr and Fraction of Total Dose At t = 1.000E+02 years

Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Radon		Plant		Meat		
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mre
Ac-227	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Pa-231	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Ra-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Th-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Th-230	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Th-232	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
U-234	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
U-235	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
U-238	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Path
As mrem/yr and Fraction of Total Dose At t = 1.000E+02 years

Water Dependent Pathways

Radio-	Water		Fish		Radon		Plant		Meat		
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mre
Ac-227	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Pa-231	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Ra-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Th-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Th-230	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Th-232	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
U-234	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
U-235	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
U-238	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00

*Sum of all water independent and dependent pathways.

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Path
As mrem/yr and Fraction of Total Dose At t = 3.000E+02 years

Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Radon		Plant		Meat		
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mre
Ac-227	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Pa-231	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Ra-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Th-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Th-230	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Th-232	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
U-234	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
U-235	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
U-238	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Path
As mrem/yr and Fraction of Total Dose At t = 3.000E+02 years

Water Dependent Pathways

Radio-	Water		Fish		Radon		Plant		Meat		
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mre
Ac-227	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Pa-231	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Ra-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Th-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Th-230	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Th-232	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
U-234	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
U-235	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
U-238	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00

*Sum of all water independent and dependent pathways.

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Path
As mrem/yr and Fraction of Total Dose At t = 5.000E+02 years

Water Independent Pathways (Inhalation excludes radon)

Radio-Nuclide	Ground		Inhalation		Radon		Plant		Meat		
	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mre
Ac-227	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Pa-231	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Ra-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Th-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Th-230	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Th-232	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
U-234	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
U-235	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
U-238	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Path
As mrem/yr and Fraction of Total Dose At t = 5.000E+02 years

Water Dependent Pathways

Radio-Nuclide	Water		Fish		Radon		Plant		Meat		
	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mre
Ac-227	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Pa-231	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Ra-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Th-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Th-230	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Th-232	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
U-234	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
U-235	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
U-238	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00

*Sum of all water independent and dependent pathways.

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Path
As mrem/yr and Fraction of Total Dose At t = 7.000E+02 years

Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Radon		Plant		Meat		
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mre
Ac-227	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Pa-231	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Ra-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Th-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Th-230	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Th-232	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
U-234	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
U-235	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
0-238	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Path
As mrem/yr and Fraction of Total Dose At t = 7.000E+02 years

Water Dependent Pathways

Radio-	Water		Fish		Radon		Plant		Meat		
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mre
Ac-227	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Pa-231	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Ra-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Th-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Th-230	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Th-232	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
U-234	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
U-235	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
U-238	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00

*Sum of all water independent and dependent pathways.

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Path
As mrem/yr and Fraction of Total Dose At t = 9.000E+02 years

Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Radon		Plant		Meat		
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mre
Ac-227	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Pa-231	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Ra-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Th-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Th-230	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Th-232	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
U-234	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
U-235	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
U-238	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Path
As mrem/yr and Fraction of Total Dose At t = 9.000E+02 years

Water Dependent Pathways

Radio-	Water		Fish		Radon		Plant		Meat		
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mre
Ac-227	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Pa-231	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Ra-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Th-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Th-230	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Th-232	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
U-234	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
U-235	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
U-238	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00

*Sum of all water independent and dependent pathways.

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Path
As mrem/yr and Fraction of Total Dose At t = 1.000E+03 years

Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Radon		Plant		Meat		
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mre
Ac-227	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Pa-231	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Ra-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Th-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Th-230	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Th-232	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
U-234	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
U-235	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
U-238	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Path
As mrem/yr and Fraction of Total Dose At t = 1.000E+03 years

Water Dependent Pathways

Radio-	Water		Fish		Radon		Plant		Meat		
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mre
Ac-227	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Pa-231	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Ra-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Th-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Th-230	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Th-232	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
U-234	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
U-235	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
U-238	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00

*Sum of all water independent and dependent pathways.

Dose/Source Ratios Summed Over All Pathways
Parent and Progeny Principal Radionuclide Contributions Indicated

Parent (i)	Product (j)	Branch Fraction*	DSR(j,t) (mrem/yr)/(pCi/g) t= 0.000E+00	1.000E+00	1.000E+01	1.000E+02	3.000E+02	5.000E+02	7.000E+02	9.0
Ac-227	Ac-227	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.0
Pa-231	Pa-231	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.0
Pa-231	Ac-227	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.0
Pa-231	∑DSR(j)		0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.0
Pb-210	Pb-210	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.0
Ra-226	Ra-226	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.0
Ra-226	Pb-210	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.0
Ra-226	∑DSR(j)		0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.0
Ra-228	Ra-228	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.0
Ra-228	Th-228	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.0
Ra-228	∑DSR(j)		0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.0
Th-228	Th-228	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.0
Th-230	Th-230	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.0
Th-230	Ra-226	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.0
Th-230	Pb-210	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.0
Th-230	∑DSR(j)		0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.0
Th-232	Th-232	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.0
Th-232	Ra-228	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.0
Th-232	Th-228	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.0
Th-232	∑DSR(j)		0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.0
U-234	U-234	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.0
U-234	Th-230	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.0
U-234	Ra-226	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.0
U-234	Pb-210	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.0
U-234	∑DSR(j)		0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.0
U-235	U-235	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.0
U-235	Pa-231	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.0
U-235	Ac-227	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.0
U-235	∑DSR(j)		0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.0
U-238	U-238	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.0
U-238	U-234	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.0
U-238	Th-230	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.0
U-238	Ra-226	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.0
U-238	Pb-210	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.0
U-238	∑DSR(j)		0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.0

*Branch Fraction is the cumulative factor for the j't principal radionuclide daughter: CUMBRF(j) = BP
The DSR includes contributions from associated (half-life ≤ 0.5 yr) daughters.

Single Radionuclide Soil Guidelines G(i,t) in pCi/g
Basic Radiation Dose Limit = 2.500E+01 mrem/yr

Nuclide (i)	t= 0.000E+00	1.000E+00	1.000E+01	1.000E+02	3.000E+02	5.000E+02	7.000E+02	9.000E
Ac-227	*7.230E+13	*7.230E+13	*7.230E+13	*7.230E+13	*7.230E+13	*7.230E+13	*7.230E+13	*7.230E
Pa-231	*4.722E+10	*4.722E+10	*4.722E+10	*4.722E+10	*4.722E+10	*4.722E+10	*4.722E+10	*4.722E
Pb-210	*7.631E+13	*7.631E+13	*7.631E+13	*7.631E+13	*7.631E+13	*7.631E+13	*7.631E+13	*7.631E
Ra-226	*9.882E+11	*9.882E+11	*9.882E+11	*9.882E+11	*9.882E+11	*9.882E+11	*9.882E+11	*9.882E
Ra-228	*2.726E+14	*2.726E+14	*2.726E+14	*2.726E+14	*2.726E+14	*2.726E+14	*2.726E+14	*2.726E
Th-228	*8.192E+14	*8.192E+14	*8.192E+14	*8.192E+14	*8.192E+14	*8.192E+14	*8.192E+14	*8.192E
Th-230	*2.018E+10	*2.018E+10	*2.018E+10	*2.018E+10	*2.018E+10	*2.018E+10	*2.018E+10	*2.018E
Th-232	*1.096E+05	*1.096E+05	*1.096E+05	*1.096E+05	*1.096E+05	*1.096E+05	*1.096E+05	*1.096E
U-234	*6.245E+09	*6.245E+09	*6.245E+09	*6.245E+09	*6.245E+09	*6.245E+09	*6.245E+09	*6.245E
U-235	*2.160E+06	*2.160E+06	*2.160E+06	*2.160E+06	*2.160E+06	*2.160E+06	*2.160E+06	*2.160E
U-238	*3.360E+05	*3.360E+05	*3.360E+05	*3.360E+05	*3.360E+05	*3.360E+05	*3.360E+05	*3.360E

*At specific activity limit

Summed Dose/Source Ratios DSR(i,t) in (mrem/yr)/(pCi/g)
and Single Radionuclide Soil Guidelines G(i,t) in pCi/g
at tmin = time of minimum single radionuclide soil guideline
and at tmax = time of maximum total dose = 0.000E+00 years

Nuclide (i)	Initial (pCi/g)	tmin (years)	DSR(i,tmin)	G(i,tmin) (pCi/g)	DSR(i,tmax)	G(i,tmax) (pCi/g)
Ac-227	8.000E+00	0.000E+00	0.000E+00	*7.230E+13	0.000E+00	*7.230E+13
Pa-231	8.000E+00	0.000E+00	0.000E+00	*4.722E+10	0.000E+00	*4.722E+10
Pb-210	1.820E+02	0.000E+00	0.000E+00	*7.631E+13	0.000E+00	*7.631E+13
Ra-226	1.820E+02	0.000E+00	0.000E+00	*9.882E+11	0.000E+00	*9.882E+11
Ra-228	1.820E+02	0.000E+00	0.000E+00	*2.726E+14	0.000E+00	*2.726E+14
Th-228	1.820E+02	0.000E+00	0.000E+00	*8.192E+14	0.000E+00	*8.192E+14
Th-230	1.820E+02	0.000E+00	0.000E+00	*2.018E+10	0.000E+00	*2.018E+10
Th-232	1.820E+02	0.000E+00	0.000E+00	*1.096E+05	0.000E+00	*1.096E+05
U-234	1.820E+02	0.000E+00	0.000E+00	*6.245E+09	0.000E+00	*6.245E+09
U-235	8.000E+00	0.000E+00	0.000E+00	*2.160E+06	0.000E+00	*2.160E+06
U-238	1.820E+02	0.000E+00	0.000E+00	*3.360E+05	0.000E+00	*3.360E+05

*At specific activity limit

Individual Nuclide Dose Summed Over All Pathways
Parent Nuclide and Branch Fraction Indicated

Nuclide (j)	Parent (i)	BRF(i)	DOSE(j,t), mrem/yr							
		t=	0.000E+00	1.000E+00	1.000E+01	1.000E+02	3.000E+02	5.000E+02	7.000E+02	9.0
Ac-227	Ac-227	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.0
Ac-227	Pa-231	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.0
Ac-227	U-235	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.0
Ac-227	∑DOSE(j)		0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.0
Pa-231	Pa-231	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.0
Pa-231	U-235	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.0
Pa-231	∑DOSE(j)		0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.0
Pb-210	Pb-210	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.0
Pb-210	Ra-226	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.0
Pb-210	Th-230	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.0
Pb-210	U-234	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.0
Pb-210	U-238	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.0
Pb-210	∑DOSE(j)		0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.0
Ra-226	Ra-226	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.0
Ra-226	Th-230	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.0
Ra-226	U-234	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.0
Ra-226	U-238	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.0
Ra-226	∑DOSE(j)		0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.0
Ra-228	Ra-228	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.0
Ra-228	Th-232	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.0
Ra-228	∑DOSE(j)		0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.0
Th-228	Ra-228	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.0
Th-228	Th-228	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.0
Th-228	Th-232	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.0
Th-228	∑DOSE(j)		0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.0
Th-230	Th-230	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.0
Th-230	U-234	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.0
Th-230	U-238	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.0
Th-230	∑DOSE(j)		0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.0
Th-232	Th-232	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.0
U-234	U-234	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.0
U-234	U-238	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.0
U-234	∑DOSE(j)		0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.0
U-235	U-235	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.0
U-238	U-238	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.0

BRF(i) is the branch fraction of the parent nuclide.

Individual Nuclide Soil Concentration
Parent Nuclide and Branch Fraction Indicated

Nuclide (j)	Parent (i)	BRF(i)	S(j,t), pCi/g t= 0.000E+00	1.000E+00	1.000E+01	1.000E+02	3.000E+02	5.000E+02	7.000E+02	9.0
Ac-227	Ac-227	1.000E+00	8.000E+00	7.739E+00	5.739E+00	2.889E-01	3.767E-04	4.913E-07	6.407E-10	8.3
Ac-227	Pa-231	1.000E+00	0.000E+00	2.504E-01	2.161E+00	7.087E+00	6.571E+00	5.860E+00	5.225E+00	4.6
Ac-227	U-235	1.000E+00	0.000E+00	2.664E-06	2.415E-04	1.125E-02	4.053E-02	6.680E-02	9.023E-02	1.1
Ac-227	∑S(j):		8.000E+00	7.989E+00	7.900E+00	7.387E+00	6.612E+00	5.927E+00	5.316E+00	4.7
Pa-231	Pa-231	1.000E+00	8.000E+00	7.995E+00	7.954E+00	7.555E+00	6.737E+00	6.008E+00	5.357E+00	4.7
Pa-231	U-235	1.000E+00	0.000E+00	1.692E-04	1.688E-03	1.645E-02	4.665E-02	7.358E-02	9.760E-02	1.1
Pa-231	∑S(j):		8.000E+00	7.996E+00	7.956E+00	7.571E+00	6.784E+00	6.081E+00	5.455E+00	4.8
Pb-210	Pb-210	1.000E+00	1.820E+02	1.764E+02	1.330E+02	7.910E+00	1.494E-02	2.822E-05	5.331E-08	1.0
Pb-210	Ra-226	1.000E+00	0.000E+00	5.567E+00	4.832E+01	1.610E+02	1.397E+02	1.155E+02	9.544E+01	7.8
Pb-210	Th-230	1.000E+00	0.000E+00	1.212E-03	1.103E-01	5.227E+00	1.843E+01	2.941E+01	3.846E+01	4.5
Pb-210	U-234	1.000E+00	0.000E+00	3.647E-09	3.397E-06	1.907E-03	2.352E-02	6.688E-02	1.282E-01	2.0
Pb-210	U-238	1.000E+00	0.000E+00	2.589E-15	2.446E-11	1.522E-07	6.234E-06	3.093E-05	8.545E-05	1.7
Pb-210	∑S(j):		1.820E+02	1.819E+02	1.814E+02	1.742E+02	1.582E+02	1.450E+02	1.340E+02	1.2
Ra-226	Ra-226	1.000E+00	1.820E+02	1.818E+02	1.803E+02	1.654E+02	1.367E+02	1.130E+02	9.336E+01	7.7
Ra-226	Th-230	1.000E+00	0.000E+00	7.881E-02	7.847E-01	7.517E+00	2.054E+01	3.127E+01	4.012E+01	4.7
Ra-226	U-234	1.000E+00	0.000E+00	3.548E-07	3.537E-05	3.437E-03	2.906E-02	7.598E-02	1.404E-01	2.1
Ra-226	U-238	1.000E+00	0.000E+00	3.353E-13	3.345E-10	3.274E-07	8.434E-06	3.730E-05	9.790E-05	1.9
Ra-226	∑S(j):		1.820E+02	1.819E+02	1.811E+02	1.730E+02	1.573E+02	1.443E+02	1.336E+02	1.2
Ra-228	Ra-228	1.000E+00	1.820E+02	1.612E+02	5.424E+01	1.005E-03	3.064E-14	9.344E-25	2.849E-35	0.0
Ra-228	Th-232	1.000E+00	0.000E+00	2.066E+01	1.272E+02	1.812E+02	1.812E+02	1.812E+02	1.812E+02	1.8
Ra-228	∑S(j):		1.820E+02	1.819E+02	1.815E+02	1.812E+02	1.812E+02	1.812E+02	1.812E+02	1.8
Th-228	Ra-228	1.000E+00	0.000E+00	5.191E+01	7.415E+01	1.509E-03	4.602E-14	1.403E-24	4.279E-35	0.0
Th-228	Th-228	1.000E+00	1.820E+02	1.267E+02	4.859E+00	3.349E-14	0.000E+00	0.000E+00	0.000E+00	0.0
Th-228	Th-232	1.000E+00	0.000E+00	3.393E+00	1.025E+02	1.812E+02	1.812E+02	1.812E+02	1.812E+02	1.8
Th-228	∑S(j):		1.820E+02	1.820E+02	1.816E+02	1.812E+02	1.812E+02	1.812E+02	1.812E+02	1.8
Th-230	Th-230	1.000E+00	1.820E+02	1.820E+02	1.820E+02	1.818E+02	1.815E+02	1.811E+02	1.808E+02	1.8
Th-230	U-234	1.000E+00	0.000E+00	1.638E-03	1.638E-02	1.637E-01	4.906E-01	8.166E-01	1.142E+00	1.4
Th-230	U-238	1.000E+00	0.000E+00	2.322E-09	2.322E-07	2.321E-05	2.087E-04	5.793E-04	1.134E-03	1.8
Th-230	∑S(j):		1.820E+02	1.820E+02	1.820E+02	1.820E+02	1.820E+02	1.820E+02	1.819E+02	1.8
Th-232	Th-232	1.000E+00	1.820E+02	1.820E+02	1.820E+02	1.820E+02	1.820E+02	1.820E+02	1.819E+02	1.8
U-234	U-234	1.000E+00	1.820E+02	1.820E+02	1.820E+02	1.819E+02	1.818E+02	1.817E+02	1.816E+02	1.8
U-234	U-238	1.000E+00	0.000E+00	5.160E-04	5.160E-03	5.159E-02	1.547E-01	2.577E-01	3.607E-01	4.6
U-234	∑S(j):		1.820E+02	1.820E+02	1.820E+02	1.820E+02	1.820E+02	1.820E+02	1.819E+02	1.8
U-235	U-235	1.000E+00	8.000E+00	8.000E+00	8.000E+00	8.000E+00	7.999E+00	7.998E+00	7.998E+00	7.9
U-238	U-238	1.000E+00	1.820E+02	1.820E+02	1.820E+02	1.820E+02	1.820E+02	1.820E+02	1.819E+02	1.8

BRF(i) is the branch fraction of the parent nuclide.

RESCALC.EXE execution time = 158.15 seconds
Total water/soil iteration failures = 174.

Summary : Shieldalloy Unrestricted Area Trespasser DCGLs
File : newfield 3005007.RAD

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Dose Conversion Factor (and Related) Parameter Summary
File: FGR 13 Morbidity

Menu	Parameter	Current Value	Default	Paramete Name
B-1	Dose conversion factors for inhalation, mrem/pCi:			
B-1	Ac-227+D	6.720E+00	6.720E+00	DCF2(1)
B-1	Pa-231	1.280E+00	1.280E+00	DCF2(2)
B-1	Pb-210+D	2.320E-02	2.320E-02	DCF2(3)
B-1	Ra-226+D	8.600E-03	8.600E-03	DCF2(4)
B-1	Ra-228+D	5.080E-03	5.080E-03	DCF2(5)
B-1	Th-228+D	3.450E-01	3.450E-01	DCF2(6)
B-1	Th-230	3.260E-01	3.260E-01	DCF2(7)
B-1	Th-232	1.640E+00	1.640E+00	DCF2(8)
B-1	U-234	1.320E-01	1.320E-01	DCF2(9)
B-1	U-235+D	1.230E-01	1.230E-01	DCF2(10)
B-1	U-238+D	1.180E-01	1.180E-01	DCF2(11)
D-1	Dose conversion factors for ingestion, mrem/pCi:			
D-1	Ac-227+D	1.480E-02	1.480E-02	DCF3(1)
D-1	Pa-231	1.060E-02	1.060E-02	DCF3(2)
D-1	Pb-210+D	7.270E-03	7.270E-03	DCF3(3)
D-1	Ra-226+D	1.330E-03	1.330E-03	DCF3(4)
D-1	Ra-228+D	1.440E-03	1.440E-03	DCF3(5)
D-1	Th-228+D	8.080E-04	8.080E-04	DCF3(6)
D-1	Th-230	5.480E-04	5.480E-04	DCF3(7)
D-1	Th-232	2.730E-03	2.730E-03	DCF3(8)
D-1	U-234	2.830E-04	2.830E-04	DCF3(9)
D-1	U-235+D	2.670E-04	2.670E-04	DCF3(10)
D-1	U-238+D	2.690E-04	2.690E-04	DCF3(11)
D-34	Food transfer factors:			
D-34	Ac-227+D , plant/soil concentration ratio, dimensionless	2.500E-03	2.500E-03	RTF(1,1)
D-34	Ac-227+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	2.000E-05	2.000E-05	RTF(1,2)
D-34	Ac-227+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	2.000E-05	2.000E-05	RTF(1,3)
D-34				
D-34	Ps-231 , plant/soil concentfation ratio, dimensionless	1.000E-02	1.000E-02	RTF(2,1)
D-34	Pa-231 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	5.000E-03	5.000E-03	RTF(2,2)
D-34	Pa-231 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	5.000E-06	5.000E-06	RTF(2,3)
D-34				
D-34	Pb-210+D , plant/soil concentration ratio, dimensionless	1.000E-02	1.000E-02	RTF(3,1)
D-34	Pb-210+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	8.000E-04	8.000E-04	RTF(3,2)
D-34	Pb-210+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	3.000E-04	3.000E-04	RTF(3,3)
D-34				
D-34	Ra-226+D , plant/soil concentration ratio, dimensionless	4.000E-02	4.000E-02	RTF(4,1)
D-34	Ra-226+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-03	1.000E-03	RTF(4,2)
D-34	Ra-226+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	1.000E-03	1.000E-03	RTF(4,3)
D-34				
D-34	Ra-228+D , plant/soil concentration ratio, dimensionless	4.000E-02	4.000E-02	RTF(5,1)
D-34	Ra-228+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-03	1.000E-03	RTF(5,2)
D-34	Ra-228+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	1.000E-03	1.000E-03	RTF(5,3)
D-34				
D-34	Th-228+D , plant/soil concentration ratio, dimensionless	1.000E-03	1.000E-03	RTF(6,1)
D-34	Th-228+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-04	1.000E-04	RTF(6,2)
D-34	Th-228+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	5.000E-06	5.000E-06	RTF(6,3)

Dose Conversion Factor (and Related) Parameter Summary (continued)
File: FGR 13 Morbidity

Menu	Parameter	Current Value	Default	Paramete Name
D-34	Th-230 , plant/soil concentration ratio, dimensionless	1.000E-03	1.000E-03	RTF(7,1)
D-34	Th-230 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-04	1.000E-04	RTF(7,2)
D-34	Th-230 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	5.000E-06	5.000E-06	RTF(7,3)
D-34				
D-34	Th-232 , plant/soil concentration ratio, dimensionless	1.000E-03	1.000E-03	RTF(8,1)
D-34	Th-232 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-04	1.000E-04	RTF(8,2)
D-34	Th-232 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	5.000E-06	5.000E-06	RTF(8,3)
D-34				
D-34	U-234 , plant/soil concentration ratio, dimensionless	2.500E-03	2.500E-03	RTF(9,1)
D-34	U-234 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	3.400E-04	3.400E-04	RTF(9,2)
D-34	U-234 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	6.000E-04	6.000E-04	RTF(9,3)
D-34				
D-34	U-235+D , plant/soil concentration ratio, dimensionless	2.500E-03	2.500E-03	RTF(10,1)
D-34	U-235+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	3.400E-04	3.400E-04	RTF(10,2)
D-34	U-235+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	6.000E-04	6.000E-04	RTF(10,3)
D-34				
D-34	U-238+D , plant/soil concentration ratio, dimensionless	2.500E-03	2.500E-03	RTF(11,1)
D-34	U-238+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	3.400E-04	3.400E-04	RTF(11,2)
D-34	U-238+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	6.000E-04	6.000E-04	RTF(11,3)
D-5	Bioaccumulation factors, fresh water, L/kg:			
D-5	Ac-227+D , fish	1.500E+01	1.500E+01	BIOFAC(1
D-5	Ac-227+D , crustacea and mollusks	1.000E+03	1.000E+03	BIOFAC(1
D-5				
D-5	Pa-231 , fish	1.000E+01	1.000E+01	BIOFAC(2
D-5	Pa-231 , crustacea and mollusks	1.100E+02	1.100E+02	BIOFAC(2
D-5				
D-5	Pb-210+D , fish	3.000E+02	3.000E+02	BIOFAC(3
D-5	Pb-210+D , crustacea and mollusks	1.000E+02	1.000E+02	BIOFAC(3
D-5				
D-5	Ra-226+D , fish	5.000E+01	5.000E+01	BIOFAC(4
D-5	Ra-226+D , crustacea and mollusks	2.500E+02	2.500E+02	BIOFAC(4
D-5				
D-5	Ra-228+D , fish	5.000E+01	5.000E+01	BIOFAC(5
D-5	Ra-228+D , crustacea and mollusks	2.500E+02	2.500E+02	BIOFAC(5
D-5				
D-5	Th-228+D , fish	1.000E+02	1.000E+02	BIOFAC(6
D-5	Th-228+D , crustacea and mollusks	5.000E+02	5.000E+02	BIOFAC(6
D-5				
D-5	Th-230 , fish	1.000E+02	1.000E+02	BIOFAC(7
D-5	Th-230 , crustacea and mollusks	5.000E+02	5.000E+02	BIOFAC(7
D-5				
D-5	Th-232 , fish	1.000E+02	1.000E+02	BIOFAC(8
D-5	Th-232 , crustacea and mollusks	5.000E+02	5.000E+02	BIOFAC(8
D-5				
D-5	U-234 , fish	1.000E+01	1.000E+01	BIOFAC(9
D-5	U-234 , crustacea and mollusks	6.000E+01	6.000E+01	BIOFAC(9
D-5				
D-5	U-235+D , fish	1.000E+01	1.000E+01	BIOFAC(10
D-5	U-235+D , crustacea and mollusks	6.000E+01	6.000E+01	BIOFAC(10

Dose Conversion Factor (and Related) Parameter Summary (continued)
File: FGR 13 Morbidity

Menu	Parameter	Current Value	Default	Paramete Name
D-5	U-238+D , fish	1.000E+01	1.000E+01	BIOFAC(11
D-5	U-238+D , crustacea and mollusks	6.000E+01	6.000E+01	BIOFAC(11

Site-Specific Parameter Summary

Menu	Parameter	User Input	Default	Used by RESP (If different from u
R011	Area of contaminated zone (m**2)	2.440E+05	1.000E+04	---
R011	Thickness of contaminated zone (m)	1.500E-01	2.000E+00	---
R011	Length parallel to aquifer flow (m)	not used	1.000E+02	---
R011	Basic radiation dose limit (mrem/yr)	2.500E+01	2.500E+01	---
R011	Time since placement of material (yr)	0.000E+00	0.000E+00	---
R011	Times for calculations (yr)	1.000E+00	1.000E+00	---
R011	Times for calculations (yr)	1.000E+01	3.000E+00	---
R011	Times for calculations (yr)	1.000E+02	1.000E+01	---
R011	Times for calculations (yr)	3.000E+02	3.000E+01	---
R011	Times for calculations (yr)	5.000E+02	1.000E+02	---
R011	Times for calculations (yr)	7.000E+02	3.000E+02	---
R011	Times for calculations (yr)	9.000E+02	1.000E+03	---
R011	Times for calculations (yr)	1.000E+03	0.000E+00	---
R011	Times for calculations (yr)	not used	0.000E+00	---
R012	Initial principal radionuclide (pCi/g): Pb-210	9.800E+00	0.000E+00	---
R012	Initial principal radionuclide (pCi/g): Ra-226	9.800E+00	0.000E+00	---
R012	Initial principal fadionuclide (pCi/g): Ra-228	7.000E+00	0.000E+00	---
R012	Initial principal radionuclide (pCi/g): Th-228	7.000E+00	0.000E+00	---
R012	Initial principal radionuclide (pCi/g): Th-230	9.800E+00	0.000E+00	---
R012	Initial principal radionuclide (pCi/g): Th-232	7.000E+00	0.000E+00	---
R012	Initial principal radionuclide (pCi/g): U-234	1.010E+01	0.000E+00	---
R012	Initial principal radionuclide (pCi/g): U-235	9.000E-01	0.000E+00	---
R012	Initial principal radionuclide (pCi/g): U-238	9.800E+00	0.000E+00	---
R012	Concentration in groundwater (pCi/L): Pb-210	not used	0.000E+00	---
R012	Concentration in groundwater (pCi/L): Ra-226	not used	0.000E+00	---
R012	Concentration in groundwater (pCi/L): Ra-228	not used	0.000E+00	---
R012	Concentration in groundwater (pCi/L): Th-228	not used	0.000E+00	---
R012	Concentration in groundwater (pCi/L): Th-230	not used	0.000E+00	---
R012	Concentration in groundwater (pCi/L): Th-232	not used	0.000E+00	---
R012	Concentration in groundwater (pCi/L): U-234	not used	0.000E+00	---
R012	Concentration in groundwater (pCi/L): U-235	not used	0.000E+00	---
R012	Concentration in groundwater (pCi/L): U-238	not used	0.000E+00	---
R013	Cover depth (m)	0.000E+00	0.000E+00	---
R013	Density of cover material (g/cm**3)	not used	1.500E+00	---
R013	Cover depth erosion rate (m/yr)	not used	1.000E-03	---
R013	Density of contaminated zone (g/cm**3)	2.800E+00	1.500E+00	---
R013	Contaminated zone erosion rate (m/yr)	4.600E-05	1.000E-03	---
R013	Contaminated zone total porosity	4.000E-01	4.000E-01	---
R013	Contaminated zone field capacity	2.000E-01	2.000E-01	---
R013	Contaminated zone hydraulic conductivity (m/yr)	2.000E+03	1.000E+01	---
R013	Contaminated zone b parameter	2.880E+00	5.300E+00	---
R013	Average annual wind speed (m/sec)	4.250E+00	2.000E+00	---
R013	Humidity in air (g/m**3)	not used	8.000E+00	---
R013	Evapotranspiration coefficient	6.250E-01	5.000E-01	---
R013	Precipitation (m/yr)	1.050E+00	1.000E+00	---
R013	Irrigation (m/yr)	2.000E-01	2.000E-01	---
R013	Irrigation mode	overhead	overhead	---
R013	Runoff coefficient	4.500E-01	2.000E-01	---

Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESP (If different from u
R013	Watershed area for nearby stream or pond (m**2)	not used	1.000E+06	---
R013	Accuracy for water/soil computations	not used	1.000E-03	---
R014	Density of saturated zone (g/cm**3)	not used	1.500E+00	---
R014	Saturated zone total porosity	not used	4.000E-01	---
R014	Saturated zone effective porosity	not used	2.000E-01	---
R014	Saturated zone field capacity	not used	2.000E-01	---
R014	Saturated zone hydraulic conductivity (m/yr)	not used	1.000E+02	---
R014	Saturated zone hydraulic gradient	not used	2.000E-02	---
R014	Saturated zone b parameter	not used	5.300E+00	---
R014	Water table drop rate (m/yr)	not used	1.000E-03	---
R014	Well pump intake depth (m below water table)	not used	1.000E+01	---
R014	Model: Nondispersion (ND) or Mass-Balance (MB)	not used	ND	---
R014	Well pumping rate (m**3/yr)	not used	2.500E+02	---
R015	Number of unsaturated zone strata	not used	1	---
R015	Unsat. zone 1, thickness (m)	not used	4.000E+00	---
R015	Unsat. zone 1, soil density (g/cm**3)	not used	1.500E+00	---
R015	Unsat. zone 1, total porosity	not used	4.000E-01	---
R015	Unsat. zone 1, effective porosity	not used	2.000E-01	---
R015	Unsat. zone 1, field capacity	not used	2.000E-01	---
R015	Unsat. zone 1, soil-specific b parameter	not used	5.300E+00	---
R015	Unsat. zone 1, hydraulic conductivity (m/yr)	not used	1.000E+01	---
R016	Distribution coefficients for Pb-210			
R016	Contaminated zone (cm**3/g)	1.000E+02	1.000E+02	---
R016	Unsaturated zone 1 (cm**3/g)	not used	1.000E+02	---
R016	Saturated zone (cm**3/g)	not used	1.000E+02	---
R016	Leach rate (/yr)	0.000E+00	0.000E+00	6.937E-03
R016	Solubility constant	0.000E+00	0.000E+00	not used
R016	Distribution coefficients for Ra-226			
R016	Contaminated zone (cm**3/g)	5.300E+01	7.000E+01	---
R016	Unsaturated zone 1 (cm**3/g)	not used	7.000E+01	---
R016	Saturated zone (cm**3/g)	not used	7.000E+01	---
R016	Leach rate (/yr)	0.000E+00	0.000E+00	1.308E-02
R016	Solubility constant	0.000E+00	0.000E+00	not used
R016	Distribution coefficients for Ra-228			
R016	Contaminated zone (cm**3/g)	5.300E+01	7.000E+01	---
R016	Unsaturated zone 1 (cm**3/g)	not used	7.000E+01	---
R016	Saturated zone (cm**3/g)	not used	7.000E+01	---
R016	Leach rate (/yr)	0.000E+00	0.000E+00	1.308E-02
R016	Solubility constant	0.000E+00	0.000E+00	not used
R016	Distribution coefficients for Th-228			
R016	Contaminated zone (cm**3/g)	5.201E+04	6.000E+04	---
R016	Unsaturated zone 1 (cm**3/g)	not used	6.000E+04	---
R016	Saturated zone (cm**3/g)	not used	6.000E+04	---
R016	Leach rate (/yr)	0.000E+00	0.000E+00	1.335E-05
R016	Solubility constant	0.000E+00	0.000E+00	not used

Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESP (If different from u
R016	Distribution coefficients for Th-230			
R016	Contaminated zone (cm**3/g)	5.201E+04	6.000E+04	---
R016	Unsaturated zone 1 (cm**3/g)	not used	6.000E+04	---
R016	Saturated zone (cm**3/g)	not used	6.000E+04	---
R016	Leach rate (/yr)	0.000E+00	0.000E+00	1.335E-05
R016	Solubility constant	0.000E+00	0.000E+00	not used
R016	Distribution coefficients for Th-232			
R016	Contaminated zone (cm**3/g)	5.201E+04	6.000E+04	---
R016	Unsaturated zone 1 (cm**3/g)	not used	6.000E+04	---
R016	Saturated zone (cm**3/g)	not used	6.000E+04	---
R016	Leach rate (/yr)	0.000E+00	0.000E+00	1.335E-05
R016	Solubility constant	0.000E+00	0.000E+00	not used
R016	Distribution coefficients for U-234			
R016	Contaminated zone (cm**3/g)	7.036E+04	5.000E+01	---
R016	Unsaturated zone 1 (cm**3/g)	not used	5.000E+01	---
R016	Saturated zone (cm**3/g)	not used	5.000E+01	---
R016	Leach rate (/yr)	0.000E+00	0.000E+00	9.867E-06
R016	Solubility constant	0.000E+00	0.000E+00	not used
R016	Distribution coefficients for U-235			
R016	Contaminated zone (cm**3/g)	7.036E+04	5.000E+01	---
R016	Unsaturated zone 1 (cm**3/g)	not used	5.000E+01	---
R016	Saturated zone (cm**3/g)	not used	5.000E+01	---
R016	Leach rate (/yr)	0.000E+00	0.000E+00	9.867E-06
R016	Solubility constant	0.000E+00	0.000E+00	not used
R016	Distribution coefficients for U-238			
R016	Contaminated zone (cm**3/g)	7.036E+04	5.000E+01	---
R016	Unsaturated zone 1 (cm**3/g)	not used	5.000E+01	---
R016	Saturated zone (cm**3/g)	not used	5.000E+01	---
R016	Leach rate (/yr)	0.000E+00	0.000E+00	9.867E-06
R016	Solubility constant	0.000E+00	0.000E+00	not used
R016	Distribution coefficients for daughter Ac-227			
R016	Contaminated zone (cm**3/g)	2.000E+01	2.000E+01	---
R016	Unsaturated zone 1 (cm**3/g)	not used	2.000E+01	---
R016	Saturated zone (cm**3/g)	not used	2.000E+01	---
R016	Leach rate (/yr)	0.000E+00	0.000E+00	3.459E-02
R016	Solubility constant	0.000E+00	0.000E+00	not used
R016	Distribution coefficients for daughter Pa-231			
R016	Contaminated zone (cm**3/g)	5.000E+01	5.000E+01	---
R016	Unsaturated zone 1 (cm**3/g)	not used	5.000E+01	---
R016	Saturated zone (cm**3/g)	not used	5.000E+01	---
R016	Leach rate (/yr)	0.000E+00	0.000E+00	1.386E-02
R016	Solubility constant	0.000E+00	0.000E+00	not used
R017	Inhalation rate (m**3/yr)	8.400E+03	8.400E+03	---

Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESP (If different from u
R017	Mass loading for inhalation (g/m**3)	3.000E-05	1.000E-04	---
R017	Exposure duration	3.000E+01	3.000E+01	---
R017	Shielding factor, inhalation	4.000E-01	4.000E-01	---
R017	Shielding factor, external gamma	2.700E-01	7.000E-01	---
R017	Fraction of time spent indoors	0.000E+00	5.000E-01	---
R017	Fraction of time spent outdoors (on site)	1.000E-03	2.500E-01	---
R017	Shape factor flag, external gamma	1.000E+00	1.000E+00	>0 shows circular
R017	Radii of shape factor array (used if FS = -1):			
R017	Outer annular radius (m), ring 1:	not used	5.000E+01	---
R017	Outer annular radius (m), ring 2:	not used	7.071E+01	---
R017	Outer annular radius (m), ring 3:	not used	0.000E+00	---
R017	Outer annular radius (m), ring 4:	not used	0.000E+00	---
R017	Outer annular radius (m), ring 5:	not used	0.000E+00	---
R017	Outer annular radius (m), ring 6:	not used	0.000E+00	---
R017	Outer annular radius (m), ring 7:	not used	0.000E+00	---
R017	Outer annular radius (m), ring 8:	not used	0.000E+00	---
R017	Outer annular radius (m), ring 9:	not used	0.000E+00	---
R017	Outer annular radius (m), ring 10:	not used	0.000E+00	---
R017	Outer annular radius (m), ring 11:	not used	0.000E+00	---
R017	Outer annular radius (m), ring 12:	not used	0.000E+00	---
R017	Fractions of annular areas within AREA:			
R017	Ring 1	not used	1.000E+00	---
R017	Ring 2	not used	2.732E-01	---
R017	Ring 3	not used	0.000E+00	---
R017	Ring 4	not used	0.000E+00	---
R017	Ring 5	not used	0.000E+00	---
R017	Ring 6	not used	0.000E+00	---
R017	Ring 7	not used	0.000E+00	---
R017	Ring 8	not used	0.000E+00	---
R017	Ring 9	not used	0.000E+00	---
R017	Ring 10	not used	0.000E+00	---
R017	Ring 11	not used	0.000E+00	---
R017	Ring 12	not used	0.000E+00	---
R018	Fruits, vegetables and grain consumption (kg/yr)	not used	1.600E+02	---
R018	Leafy vegetable consumption (kg/yr)	not used	1.400E+01	---
R018	Milk consumption (L/yr)	not used	9.200E+01	---
R018	Meat and poultry consumption (kg/yr)	not used	6.300E+01	---
R018	Fish consumption (kg/yr)	not used	5.400E+00	---
R018	Other seafood consumption (kg/yr)	not used	9.000E-01	---
R018	Soil ingestion rate (g/yr)	1.830E+01	3.650E+01	---
R018	Drinking water intake (L/yr)	not used	5.100E+02	---
R018	Contamination fraction of drinking water	not used	1.000E+00	---
R018	Contamination fraction of household water	not used	1.000E+00	---
R018	Contamination fraction of livestock water	not used	1.000E+00	---
R018	Contamination fraction of irrigation water	not used	1.000E+00	---
R018	Contamination fraction of aquatic food	not used	5.000E-01	---
R018	Contamination fraction of plant food	not used	-1	---
R018	Contamination fraction of meat	not used	-1	---

Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESP (If different from u
R018	Contamination fraction of milk	not used	-1	---
R019	Livestock fodder intake for meat (kg/day)	not used	6.800E+01	---
R019	Livestock fodder intake for milk (kg/day)	not used	5.500E+01	---
R019	Livestock water intake for meat (L/day)	not used	5.000E+01	---
R019	Livestock water intake for milk (L/day)	not used	1.600E+02	---
R019	Livestock soil intake (kg/day)	not used	5.000E-01	---
R019	Mass loading for foliar deposition (g/m**3)	not used	1.000E-04	---
R019	Depth of soil mixing layer (m)	1.500E-01	1.500E-01	---
R019	Depth of roots (m)	not used	9.000E-01	---
R019	Drinking water fraction from ground water	not used	1.000E+00	---
R019	Household water fraction from ground water	not used	1.000E+00	---
R019	Livestock water fraction from ground water	not used	1.000E+00	---
R019	Irrigation fraction from ground water	not used	1.000E+00	---
R19B	Wet weight crop yield for Non-Leafy (kg/m**2)	not used	7.000E-01	---
R19B	Wet weight crop yield for Leafy (kg/m**2)	not used	1.500E+00	---
R19B	Wet weight crop yield for Fodder (kg/m**2)	not used	1.100E+00	---
R19B	Growing Season for Non-Leafy (years)	not used	1.700E-01	---
R19B	Growing Season for Leafy (years)	not used	2.500E-01	---
R19B	Growing Season for Fodder (years)	not used	8.000E-02	---
R19B	Translocation Factor for Non-Leafy	not used	1.000E-01	---
R19B	Translocation Factor for Leafy	not used	1.000E+00	---
R19B	Translocation Factor for Fodder	not used	1.000E+00	---
R19B	Dry Foliar Interception Fraction for Non-Leafy	not used	2.500E-01	---
R19B	Dry Foliar Interception Fraction for Leafy	not used	2.500E-01	---
R19B	Dry Foliar Interception Fraction for Fodder	not used	2.500E-01	---
R19B	Wet Foliar Interception Fraction for Non-Leafy	not used	2.500E-01	---
R19B	Wet Foliar Interception Fraction for Leafy	not used	2.500E-01	---
R19B	Wet Foliar Interception Fraction for Fodder	not used	2.500E-01	---
R19B	Weathering Removal Constant for Vegetation	not used	2.000E+01	---
C14	C-12 concentration in water (g/cm**3)	not used	2.000E-05	---
C14	C-12 concentration in contaminated soil (g/g)	not used	3.000E-02	---
C14	Fraction of vegetation carbon from soil	not used	2.000E-02	---
C14	Fraction of vegetation carbon from air	not used	9.800E-01	---
C14	C-14 evasion layer thickness in soil (m)	not used	3.000E-01	---
C14	C-14 evasion flux rate from soil (1/sec)	not used	7.000E-07	---
C14	C-12 evasion flux rate from soil (1/sec)	not used	1.000E-10	---
C14	Fraction of grain in beef cattle feed	not used	8.000E-01	---
C14	Fraction of grain in milk cow feed	not used	2.000E-01	---
C14	DCF correction factor for gaseous forms of C14	not used	8.894E+01	---
STOR	Storage times of contaminated foodstuffs (days):			
STOR	Fruits, non-leafy vegetables, and grain	1.400E+01	1.400E+01	---
STOR	Leafy vegetables	1.000E+00	1.000E+00	---
STOR	Milk	1.000E+00	1.000E+00	---
STOR	Meat and poultry	2.000E+01	2.000E+01	---
STOR	Fish	7.000E+00	7.000E+00	---
STOR	Crustacea and mollusks	7.000E+00	7.000E+00	---

Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESP (If different from u
STOR	Well water	1.000E+00	1.000E+00	---
STOR	Surface water	1.000E+00	1.000E+00	---
STOR	Livestock fodder	4.500E+01	4.500E+01	---
R021	Thickness of building foundation (m)	not used	1.500E-01	---
R021	Bulk density of building foundation (g/cm**3)	not used	2.400E+00	---
R021	Total porosity of the cover material	not used	4.000E-01	---
R021	Total porosity of the building foundation	not used	1.000E-01	---
R021	Volumetric water content of the cover material	not used	5.000E-02	---
R021	Volumetric water content of the foundation	not used	3.000E-02	---
R021	Diffusion coefficient for radon gas (m/sec):			
R021	in cover material	not used	2.000E-06	---
R021	in foundation material	not used	3.000E-07	---
R021	in contaminated zone soil	not used	2.000E-06	---
R021	Radon vertical dimension of mixing (m)	not used	2.000E+00	---
R021	Average building air exchange rate (1/hr)	not used	5.000E-01	---
R021	Height of the building (room) (m)	not used	2.500E+00	---
R021	Building interior area factor	not used	0.000E+00	---
R021	Building depth below ground surface (m)	not used	-1.000E+00	---
R021	Emanating power of Rn-222 gas	not used	2.500E-01	---
R021	Emanating power of Rn-220 gas	not used	1.500E-01	---
TITL	Number of graphical time points	32	---	---
TITL	Maximum number of integration points for dose	1	---	---
TITL	Maximum number of integration points for risk	1	---	---

Summary of Pathway Selections

Pathway	User Selection
1 -- external gamma	active
2 -- inhalation (w/o radon)	active
3 -- plant ingestion	suppressed
4 -- meat ingestion	suppressed
5 -- milk ingestion	suppressed
6 -- aquatic foods	suppressed
7 -- drinking water	suppressed
8 -- soil ingestion	active
9 -- radon	suppressed
Find peak pathway doses	active

Summary : Shieldalloy Unrestricted Area Trespasser DCGLs
File : newfield 3005007.RAD

Contaminated Zone Dimensions	
Area:	244000.00 square meters
Thickness:	0.15 meters
Cover Depth:	0.00 meters

Initial Soil Concentrations, pCi/g	
Pb-210	9.800E+00
Ra-226	9.800E+00
Ra-228	7.000E+00
Th-228	7.000E+00
Th-230	9.800E+00
Th-232	7.000E+00
U-234	1.010E+01
U-235	9.000E-01
U-238	9.800E+00

Total Dose TDOSE(t), mrem/yr
Basic Radiation Dose Limit = 2.500E+01 mrem/yr
Total Mixture Sum M(t) = Fraction of Basic Dose Limit Received at Time (t)

t (years):	0.000E+00	1.000E+00	1.000E+01	1.000E+02	3.000E+02	5.000E+02	7.000E+02	9.000E+02
TDOSE(t):	2.199E-01	2.179E-01	1.998E-01	1.315E-01	1.051E-01	1.021E-01	1.003E-01	9.838E-02
M(t):	8.797E-03	8.716E-03	7.992E-03	5.260E-03	4.206E-03	4.083E-03	4.013E-03	3.935E-03

Maximum TDOSE(t): 2.199E-01 mrem/yr at t = 0.000E+00 years

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Path
As mrem/yr and Fraction of Total Dose At t = 0.000E+00 years

Water Independent Pathways (Inhalation excludes radon)

Radio-Nuclide	Ground		Inhalation		Radon		Plant		Meat		
	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mre
Pb-210	5.994E-05	0.0003	6.504E-06	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Ra-226	1.060E-01	0.4819	2.411E-06	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Ra-228	4.066E-02	0.1849	1.017E-06	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Th-228	6.811E-02	0.3097	6.908E-05	0.0003	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Th-230	1.183E-05	0.0001	9.139E-05	0.0004	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Th-232	3.641E-06	0.0000	3.284E-04	0.0015	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
U-234	4.054E-06	0.0000	3.814E-05	0.0002	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
U-235	6.769E-04	0.0031	3.167E-06	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
U-238	1.456E-03	0.0066	3.308E-05	0.0002	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Total	2.170E-01	0.9866	5.732E-04	0.0026	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Path
As mrem/yr and Fraction of Total Dose At t = 0.000E+00 years

Water Dependent Pathways

Radio-Nuclide	Water		Fish		Radon		Plant		Meat		
	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mre
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Ra-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Th-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Th-230	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Th-232	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
U-234	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
U-235	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
U-238	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00

*Sum of all water independent and dependent pathways.

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Path
As mrem/yr and Fraction of Total Dose At t = 1.000E+00 years

Water Independent Pathways (Inhalation excludes radon)

Radio-Nuclide	Ground		Inhalation		Radon		Plant		Meat		
	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mre
Pb-210	5.770E-05	0.0003	6.259E-06	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Ra-226	1.046E-01	0.4799	2.575E-06	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Ra-228	5.488E-02	0.2518	2.046E-05	0.0001	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Th-228	4.741E-02	0.2176	4.807E-05	0.0002	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Th-230	5.743E-05	0.0003	9.136E-05	0.0004	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Th-232	5.856E-03	0.0269	3.297E-04	0.0015	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
U-234	4.054E-06	0.0000	3.813E-05	0.0002	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
U-235	6.769E-04	0.0031	3.166E-06	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
U-238	1.456E-03	0.0067	3.307E-05	0.0002	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Total	2.150E-01	0.9865	5.728E-04	0.0026	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Path
As mrem/yr and Fraction of Total Dose At t = 1.000E+00 years

Water Dependent Pathways

Radio-Nuclide	Water		Fish		Radon		Plant		Meat		
	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mre
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Ra-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Th-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Th-230	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Th-232	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
U-234	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
U-235	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
U-238	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00

*Sum of all water independent and dependent pathways.

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Path
As mrem/yr and Fraction of Total Dose At t = 1.000E+01 years

Water Independent Pathways (Inhalation excludes radon)

Radio-Nuclide	Ground		Inhalation		Radon		Plant		Meat		
	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mre
Pb-210	4.098E-05	0.0002	4.433E-06	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Ra-226	9.258E-02	0.4634	3.661E-06	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Ra-228	3.615E-02	0.1809	2.603E-05	0.0001	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Th-228	1.817E-03	0.0091	1.838E-06	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Th-230	4.412E-04	0.0022	9.110E-05	0.0005	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Th-232	6.384E-02	0.3195	3.652E-04	0.0018	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
U-234	4.075E-06	0.0000	3.802E-05	0.0002	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
U-235	6.768E-04	0.0034	3.168E-06	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
U-238	1.455E-03	0.0073	3.298E-05	0.0002	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Total	1.970E-01	0.9860	5.665E-04	0.0028	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Path
As mrem/yr and Fraction of Total Dose At t = 1.000E+01 years

Water Dependent Pathways

Radio-Nuclide	Water		Fish		Radon		Plant		Meat		
	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mre
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Ra-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Th-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Th-230	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Th-232	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
U-234	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
U-235	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
U-238	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00

*Sum of all water independent and dependent pathways.

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Path
As mrem/yr and Fraction of Total Dose At t = 1.000E+02 years

Water Independent Pathways (Inhalation excludes radon)

Radio-Nuclide	Ground		Inhalation		Radon		Plant		Meat		
	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mre
Pb-210	1.338E-06	0.0000	1.408E-07	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Ra-226	2.737E-02	0.2081	2.497E-06	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Ra-228	2.328E-07	0.0000	1.684E-10	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Th-228	1.246E-17	0.0000	1.230E-20	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Th-230	2.520E-03	0.0192	8.854E-05	0.0007	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Th-232	9.766E-02	0.7426	3.791E-04	0.0029	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
U-234	5.477E-06	0.0000	3.700E-05	0.0003	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
U-235	6.770E-04	0.0051	3.187E-06	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
U-238	1.451E-03	0.0110	3.204E-05	0.0002	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Total	1.297E-01	0.9861	5.425E-04	0.0041	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Path
As mrem/yr and Fraction of Total Dose At t = 1.000E+02 years

Water Dependent Pathways

Radio-Nuclide	Water		Fish		Radon		Plant		Meat		
	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mre
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Ra-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Th-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Th-230	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Th-232	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
U-234	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
U-235	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
U-238	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00

*Sum of all water independent and dependent pathways.

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Path
As mrem/yr and Fraction of Total Dose At t = 3.000E+02 years

Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Radon		Plant		Meat		
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mre
Pb-210	6.667E-10	0.0000	6.572E-11	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Ra-226	1.821E-03	0.0173	1.679E-07	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Ra-228	5.707E-19	0.0000	3.901E-22	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Th-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Th-230	3.300E-03	0.0314	8.265E-05	0.0008	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Th-232	9.659E-02	0.9186	3.542E-04	0.0034	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
U-234	1.113E-05	0.0001	3.473E-05	0.0003	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
U-235	6.752E-04	0.0064	3.024E-06	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
U-238	1.441E-03	0.0137	2.998E-05	0.0003	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Total	1.038E-01	0.9876	5.047E-04	0.0048	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Path
As mrem/yr and Fraction of Total Dose At t = 3.000E+02 years

Water Dependent Pathways

Radio-	Water		Fish		Radon		Plant		Meat		
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mre
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Ra-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Th-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Th-230	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Th-232	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
U-234	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
U-235	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
U-238	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00

*Sum of all water independent and dependent pathways.

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Path
As mrem/yr and Fraction of Total Dose At t = 5.000E+02 years

Water Independent Pathways (Inhalation excludes radon)

Radio-Nuclide	Ground		Inhalation		Radon		Plant		Meat		
	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mre
Pb-210	3.322E-13	0.0000	3.055E-14	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Ra-226	1.209E-04	0.0012	1.050E-08	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Ra-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Th-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Th-230	3.308E-03	0.0324	7.672E-05	0.0008	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Th-232	9.533E-02	0.9340	3.294E-04	0.0032	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
U-234	1.715E-05	0.0002	3.244E-05	0.0003	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
U-235	6.726E-04	0.0066	2.817E-06	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
U-238	1.428E-03	0.0140	2.791E-05	0.0003	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Total	1.009E-01	0.9883	4.693E-04	0.0046	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Path
As mrem/yr and Fraction of Total Dose At t = 5.000E+02 years

Water Dependent Pathways

Radio-Nuclide	Water		Fish		Radon		Plant		Meat		
	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mre
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Ra-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Th-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Th-230	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Th-232	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
U-234	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
U-235	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
U-238	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00

*Sum of all water independent and dependent pathways.

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Path
As mrem/yr and Fraction of Total Dose At t = 7.000E+02 years

Water Independent Pathways (Inhalation excludes radon)

Radio-Nuclide	Ground		Inhalation		Radon		Plant		Meat		
	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mre
Pb-210	1.654E-16	0.0000	1.412E-17	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Ra-226	8.006E-06	0.0001	6.525E-10	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Ra-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Th-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Th-230	3.258E-03	0.0325	7.085E-05	0.0007	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Th-232	9.384E-02	0.9355	3.047E-04	0.0030	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
U-234	2.300E-05	0.0002	3.015E-05	0.0003	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
U-235	6.694E-04	0.0067	2.608E-06	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
U-238	1.412E-03	0.0141	2.586E-05	0.0003	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Total	9.922E-02	0.9890	4.342E-04	0.0043	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Path
As mrem/yr and Fraction of Total Dose At t = 7.000E+02 years

Water Dependent Pathways

Radio-Nuclide	Water		Fish		Radon		Plant		Meat		
	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mre
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Ra-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Th-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Th-230	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Th-232	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
U-234	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
U-235	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
U-238	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00

*Sum of all water independent and dependent pathways.

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Path
As mrem/yr and Fraction of Total Dose At t = 9.000E+02 years

Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Radon		Plant		Meat		
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mre
Pb-210	8.235E-20	0.0000	6.490E-21	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Ra-226	5.286E-07	0.0000	4.032E-11	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Ra-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Th-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Th-230	3.195E-03	0.0325	6.502E-05	0.0007	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Th-232	9.208E-02	0.9360	2.802E-04	0.0028	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
U-234	2.859E-05	0.0003	2.784E-05	0.0003	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
U-235	6.653E-04	0.0068	2.399E-06	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
U-238	1.394E-03	0.0142	2.381E-05	0.0002	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Total	9.737E-02	0.9897	3.992E-04	0.0041	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Path
As mrem/yr and Fraction of Total Dose At t = 9.000E+02 years

Water Dependent Pathways

Radio-	Water		Fish		Radon		Plant		Meat		
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mre
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Ra-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Th-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Th-230	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Th-232	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
U-234	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
U-235	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
U-238	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00

*Sum of all water independent and dependent pathways.

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Path
As mrem/yr and Fraction of Total Dose At t = 1.000E+03 years

Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Radon		Plant		Meat		
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mre
Pb-210	1.837E-21	0.0000	1.388E-22	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Ra-226	1.356E-07	0.0000	9.995E-12	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Ra-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Th-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Th-230	3.160E-03	0.0325	6.213E-05	0.0006	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Th-232	9.108E-02	0.9362	2.679E-04	0.0028	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
U-234	3.127E-05	0.0003	2.669E-05	0.0003	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
U-235	6.629E-04	0.0068	2.295E-06	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
U-238	1.383E-03	0.0142	2.278E-05	0.0002	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Total	9.632E-02	0.9901	3.818E-04	0.0039	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Path
As mrem/yr and Fraction of Total Dose At t = 1.000E+03 years

Water Dependent Pathways

Radio-	Water		Fish		Radon		Plant		Meat		
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mre
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Ra-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Th-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Th-230	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Th-232	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
U-234	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
U-235	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
U-238	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.00

*Sum of all water independent and dependent pathways.

Dose/Source Ratios Summed Over All Pathways
Parent and Progeny Principal Radionuclide Contributions Indicated

Parent (i)	Product (j)	Branch Fraction*	t=	0.000E+00	1.000E+00	1.000E+01	DSR(j,t) (mrem/yr)/(pCi/g) 1.000E+02	3.000E+02	5.000E+02	7.000E+02	9.0
Pb-210	Pb-210	1.000E+00		1.398E-04	1.346E-04	9.532E-05	3.030E-06	1.419E-09	6.619E-13	3.072E-16	1.4
Ra-226	Ra-226	1.000E+00		1.084E-02	1.069E-02	9.467E-03	2.797E-03	1.861E-04	1.235E-05	8.179E-07	5.3
Ra-226	Pb-210	1.000E+00		0.000E+00	4.234E-06	3.357E-05	4.072E-05	2.805E-06	1.760E-07	1.098E-08	6.8
Ra-226	∑DSR(j)			1.084E-02	1.070E-02	9.500E-03	2.838E-03	1.889E-04	1.253E-05	8.288E-07	5.4
Ra-228	Ra-228	1.000E+00		5.836E-03	5.106E-03	1.533E-03	9.151E-09	2.248E-20	5.512E-32	1.345E-43	0.0
Ra-228	Th-228	1.000E+00		0.000E+00	2.764E-03	3.648E-03	2.420E-08	5.928E-20	1.449E-31	3.517E-43	0.0
Ra-228	∑DSR(j)			5.836E-03	7.869E-03	5.181E-03	3.335E-08	8.176E-20	2.000E-31	4.863E-43	0.0
Th-228	Th-228	1.000E+00		9.755E-03	6.790E-03	2.603E-04	1.785E-18	0.000E+00	0.000E+00	0.000E+00	0.0
Th-230	Th-230	1.000E+00		2.056E-05	2.055E-05	2.050E-05	1.992E-05	1.865E-05	1.740E-05	1.615E-05	1.4
Th-230	Ra-226	1.000E+00		0.000E+00	4.664E-06	4.391E-05	2.564E-04	3.360E-04	3.368E-04	3.317E-04	3.2
Th-230	Pb-210	1.000E+00		0.000E+00	9.251E-10	7.928E-08	2.170E-06	3.237E-06	3.094E-06	2.873E-06	2.6
Th-230	∑DSR(j)			2.056E-05	2.522E-05	6.448E-05	2.785E-04	3.579E-04	3.573E-04	3.507E-04	3.4
Th-232	Th-232	1.000E+00		9.739E-05	9.736E-05	9.708E-05	9.430E-05	8.813E-05	8.199E-05	7.588E-05	6.9
Th-232	Ra-228	1.000E+00		0.000E+00	6.585E-04	3.879E-03	5.243E-03	5.194E-03	5.136E-03	5.067E-03	4.9
Th-232	Th-228	1.000E+00		0.000E+00	1.811E-04	5.270E-03	8.753E-03	8.645E-03	8.521E-03	8.374E-03	8.2
Th-232	∑DSR(j)			9.739E-05	9.369E-04	9.247E-03	1.409E-02	1.393E-02	1.374E-02	1.352E-02	1.3
U-234	U-234	1.000E+00		9.356E-06	9.353E-06	9.328E-06	9.070E-06	8.500E-06	7.932E-06	7.368E-06	6.8
U-234	Th-230	1.000E+00		0.000E+00	1.850E-10	1.845E-09	1.794E-08	5.045E-08	7.849E-08	1.021E-07	1.2
U-234	Ra-226	1.000E+00		0.000E+00	2.104E-11	2.021E-09	1.406E-07	7.003E-07	1.296E-06	1.875E-06	2.4
U-234	Pb-210	1.000E+00		0.000E+00	2.788E-15	2.482E-12	9.307E-10	6.044E-09	1.117E-08	1.555E-08	1.9
U-234	∑DSR(j)			9.356E-06	9.354E-06	9.331E-06	9.230E-06	9.257E-06	9.318E-06	9.360E-06	9.3
U-235	U-235	1.000E+00		7.605E-04	7.605E-04	7.603E-04	7.591E-04	7.561E-04	7.527E-04	7.486E-04	7.4
U-235	Pa-231	1.000E+00		0.000E+00	8.814E-09	8.273E-08	4.712E-07	5.951E-07	5.802E-07	5.567E-07	5.3
U-235	Ac-227	1.000E+00		0.000E+00	8.038E-10	6.376E-08	1.218E-06	1.716E-06	1.719E-06	1.690E-06	1.6
U-235	∑DSR(j)			7.605E-04	7.605E-04	7.605E-04	7.608E-04	7.584E-04	7.550E-04	7.508E-04	7.4
U-238	U-238	1.000E+00		1.569E-04	1.569E-04	1.568E-04	1.561E-04	1.545E-04	1.527E-04	1.506E-04	1.4
U-238	U-234	1.000E+00		0.000E+00	2.652E-11	2.644E-10	2.572E-09	7.232E-09	1.125E-08	1.464E-08	1.7
U-238	Th-230	1.000E+00		0.000E+00	2.623E-16	2.616E-14	2.544E-12	2.147E-11	5.570E-11	1.015E-10	1.5
U-238	Ra-226	1.000E+00		0.000E+00	1.991E-17	1.931E-14	1.464E-11	2.463E-10	8.067E-10	1.689E-09	2.8
U-238	Pb-210	1.000E+00		0.000E+00	1.981E-21	1.804E-17	8.098E-14	1.944E-12	6.578E-12	1.347E-11	2.1
U-238	∑DSR(j)			1.569E-04	1.569E-04	1.568E-04	1.561E-04	1.545E-04	1.527E-04	1.506E-04	1.4

*Branch Fraction is the cumulative factor for the j't principal radionuclide daughter: CUMBRF(j) = BR
The DSR includes contributions from associated (half-life ≤ 0.5 yr) daughters.

Single Radionuclide Soil Guidelines G(i,t) in pCi/g
Basic Radiation Dose Limit = 2.500E+01 mrem/yr

Nuclide (i)	t= 0.000E+00	1.000E+00	1.000E+01	1.000E+02	3.000E+02	5.000E+02	7.000E+02	9.000E
Pb-210	1.788E+05	1.858E+05	2.623E+05	8.250E+06	1.762E+10	3.777E+13	*7.631E+13	*7.631E
Ra-226	2.306E+03	2.337E+03	2.631E+03	8.809E+03	1.324E+05	1.996E+06	3.016E+07	4.573E
Ra-228	4.284E+03	3.177E+03	4.825E+03	7.495E+08	*2.726E+14	*2.726E+14	*2.726E+14	*2.726E
Th-228	2.563E+03	3.682E+03	9.605E+04	*8.192E+14	*8.192E+14	*8.192E+14	*8.192E+14	*8.192E
Th-230	1.216E+06	9.913E+05	3.877E+05	8.978E+04	6.985E+04	6.996E+04	7.128E+04	7.292E
Th-232	*1.096E+05	2.668E+04	2.704E+03	1.774E+03	1.795E+03	1.820E+03	1.849E+03	1.886E
U-234	2.672E+06	2.673E+06	2.679E+06	2.709E+06	2.701E+06	2.683E+06	2.671E+06	2.667E
U-235	3.287E+04	3.287E+04	3.287E+04	3.286E+04	3.296E+04	3.311E+04	3.330E+04	3.352E
U-238	1.594E+05	1.594E+05	1.595E+05	1.601E+05	1.618E+05	1.637E+05	1.660E+05	1.687E

*At specific activity limit

Summed Dose/Source Ratios DSR(i,t) in (mrem/yr)/(pCi/g)
and Single Radionuclide Soil Guidelines G(i,t) in pCi/g
at tmin = time of minimum single radionuclide soil guideline
and at tmax = time of maximum total dose = 0.000E+00 years

Nuclide (i)	Initial (pCi/g)	tmin (years)	DSR(i,tmin)	G(i,tmin) (pCi/g)	DSR(i,tmax)	G(i,tmax) (pCi/g)
Pb-210	9.800E+00	0.000E+00	1.398E-04	1.788E+05	1.398E-04	1.788E+05
Ra-226	9.800E+00	0.000E+00	1.084E-02	2.306E+03	1.084E-02	2.306E+03
Ra-228	7.000E+00	2.962 ± 0.006	9.046E-03	2.764E+03	5.836E-03	4.284E+03
Th-228	7.000E+00	0.000E+00	9.755E-03	2.563E+03	9.755E-03	2.563E+03
Th-230	9.800E+00	372.6 ± 0.7	3.595E-04	6.953E+04	2.056E-05	1.216E+06
Th-232	7.000E+00	61.1 ± 0.1	1.411E-02	1.771E+03	9.739E-05	*1.096E+05
U-234	1.010E+01	888 ± 2	9.374E-06	2.667E+06	9.356E-06	2.672E+06
U-235	9.000E-01	74.8 ± 0.1	7.609E-04	3.286E+04	7.605E-04	3.287E+04
U-238	9.800E+00	0.000E+00	1.569E-04	1.594E+05	1.569E-04	1.594E+05

*At specific activity limit

Individual Nuclide Dose Summed Over All Pathways
Parent Nuclide and Branch Fraction Indicated

Nuclide (j)	Parent (i)	BRF(i)	DOSE(j,t), mrem/yr t= 0.000E+00	1.000E+00	1.000E+01	1.000E+02	3.000E+02	5.000E+02	7.000E+02	9.0
Pb-210	Pb-210	1.000E+00	1.370E-03	1.319E-03	9.341E-04	2.970E-05	1.391E-08	6.486E-12	3.011E-15	1.3
Pb-210	Ra-226	1.000E+00	0.000E+00	4.150E-05	3.290E-04	3.991E-04	2.748E-05	1.725E-06	1.076E-07	6.6
Pb-210	Th-230	1.000E+00	0.000E+00	9.066E-09	7.770E-07	2.126E-05	3.172E-05	3.032E-05	2.815E-05	2.5
Pb-210	U-234	1.000E+00	0.000E+00	2.816E-14	2.507E-11	9.400E-09	6.104E-08	1.129E-07	1.571E-07	1.9
Pb-210	U-238	1.000E+00	0.000E+00	1.941E-20	1.768E-16	7.936E-13	1.905E-11	6.446E-11	1.320E-10	2.1
Pb-210	∑DOSE(j)		1.370E-03	1.360E-03	1.264E-03	4.500E-04	5.928E-05	3.215E-05	2.842E-05	2.6
Ra-226	Ra-226	1.000E+00	1.062E-01	1.048E-01	9.278E-02	2.741E-02	1.823E-03	1.210E-04	8.015E-06	5.2
Ra-226	Th-230	1.000E+00	0.000E+00	4.571E-05	4.303E-04	2.512E-03	3.293E-03	3.301E-03	3.251E-03	3.1
Ra-226	U-234	1.000E+00	0.000E+00	2.125E-10	2.041E-08	1.420E-06	7.073E-06	1.309E-05	1.893E-05	2.4
Ra-226	U-238	1.000E+00	0.000E+00	1.951E-16	1.892E-13	1.435E-10	2.413E-09	7.906E-09	1.655E-08	2.8
Ra-226	∑DOSE(j)		1.062E-01	1.048E-01	9.321E-02	2.993E-02	5.124E-03	3.435E-03	3.277E-03	3.2
Ra-228	Ra-228	1.000E+00	4.085E-02	3.574E-02	1.073E-02	6.406E-08	1.574E-19	0.000E+00	0.000E+00	0.0
Ra-228	Th-232	1.000E+00	0.000E+00	4.609E-03	2.716E-02	3.670E-02	3.636E-02	3.595E-02	3.547E-02	3.4
Ra-228	∑DOSE(j)		4.085E-02	4.035E-02	3.789E-02	3.670E-02	3.636E-02	3.595E-02	3.547E-02	3.4
Th-228	Ra-228	1.000E+00	0.000E+00	1.935E-02	2.553E-02	1.694E-07	4.150E-19	0.000E+00	0.000E+00	0.0
Th-228	Th-228	1.000E+00	6.828E-02	4.753E-02	1.822E-03	1.250E-17	0.000E+00	0.000E+00	0.000E+00	0.0
Th-228	Th-232	1.000E+00	0.000E+00	1.267E-03	3.689E-02	6.127E-02	6.052E-02	5.964E-02	5.862E-02	5.7
Th-228	∑DOSE(j)		6.828E-02	6.814E-02	6.425E-02	6.127E-02	6.052E-02	5.964E-02	5.862E-02	5.7
Th-230	Th-230	1.000E+00	2.015E-04	2.014E-04	2.009E-04	1.952E-04	1.828E-04	1.705E-04	1.583E-04	1.4
Th-230	U-234	1.000E+00	0.000E+00	1.869E-09	1.864E-08	1.812E-07	5.096E-07	7.928E-07	1.031E-06	1.2
Th-230	U-238	1.000E+00	0.000E+00	2.570E-15	2.563E-13	2.493E-11	2.104E-10	5.459E-10	9.947E-10	1.5
Th-230	∑DOSE(j)		2.015E-04	2.014E-04	2.009E-04	1.954E-04	1.833E-04	1.713E-04	1.593E-04	1.4
Th-232	Th-232	1.000E+00	6.817E-04	6.815E-04	6.796E-04	6.601E-04	6.169E-04	5.739E-04	5.312E-04	4.8
U-234	U-234	1.000E+00	9.450E-05	9.447E-05	9.421E-05	9.161E-05	8.585E-05	8.012E-05	7.441E-05	6.8
U-234	U-238	1.000E+00	0.000E+00	2.599E-10	2.591E-09	2.520E-08	7.087E-08	1.103E-07	1.434E-07	1.7
U-234	∑DOSE(j)		9.450E-05	9.447E-05	9.421E-05	9.163E-05	8.592E-05	8.023E-05	7.456E-05	6.8
U-235	U-235	1.000E+00	6.844E-04	6.844E-04	6.843E-04	6.832E-04	6.805E-04	6.774E-04	6.737E-04	6.6
Pa-231	U-235	1.000E+00	0.000E+00	7.932E-09	7.446E-08	4.241E-07	5.356E-07	5.222E-07	5.010E-07	4.7
Ac-227	U-235	1.000E+00	0.000E+00	7.234E-10	5.738E-08	1.096E-06	1.544E-06	1.547E-06	1.521E-06	1.4
U-238	U-238	1.000E+00	1.537E-03	1.537E-03	1.537E-03	1.530E-03	1.514E-03	1.496E-03	1.476E-03	1.4

BRF(i) is the branch fraction of the parent nuclide.

Individual Nuclide Soil Concentration
Parent Nuclide and Branch Fraction Indicated

Nuclide (j)	Parent (i)	BRF(i)	S(j,t), pCi/g t= 0.000E+00	1.000E+00	1.000E+01	1.000E+02	3.000E+02	5.000E+02	7.000E+02	9.0
Pb-210	Pb-210	1.000E+00	9.800E+00	9.434E+00	6.701E+00	2.188E-01	1.091E-04	5.437E-08	2.710E-11	1.3
Pb-210	Ra-226	1.000E+00	0.000E+00	2.969E-01	2.360E+00	2.940E+00	2.155E-01	1.446E-02	9.688E-04	6.4
Pb-210	Th-230	1.000E+00	0.000E+00	6.486E-05	5.573E-03	1.567E-01	2.488E-01	2.541E-01	2.534E-01	2.5
Pb-210	U-234	1.000E+00	0.000E+00	2.014E-10	1.798E-07	6.926E-05	4.787E-04	9.458E-04	1.414E-03	1.8
Pb-210	U-238	1.000E+00	0.000E+00	1.389E-16	1.268E-12	5.848E-09	1.494E-07	5.403E-07	1.188E-06	2.0
Pb-210	∑S(j):		9.800E+00	9.731E+00	9.066E+00	3.316E+00	4.649E-01	2.695E-01	2.558E-01	2.5
Ra-226	Ra-226	1.000E+00	9.800E+00	9.668E+00	8.561E+00	2.537E+00	1.700E-01	1.140E-02	7.638E-04	5.1
Ra-226	Th-230	1.000E+00	0.000E+00	4.217E-03	3.971E-02	2.325E-01	3.071E-01	3.108E-01	3.098E-01	3.0
Ra-226	U-234	1.000E+00	0.000E+00	1.961E-08	1.883E-06	1.315E-04	6.596E-04	1.232E-03	1.804E-03	2.3
Ra-226	U-238	1.000E+00	0.000E+00	1.800E-14	1.746E-11	1.328E-08	2.251E-07	7.444E-07	1.578E-06	2.7
Ra-226	∑S(j):		9.800E+00	9.673E+00	8.601E+00	2.770E+00	4.778E-01	3.235E-01	3.123E-01	3.1
Ra-228	Ra-228	1.000E+00	7.000E+00	6.124E+00	1.840E+00	1.101E-05	2.722E-17	6.733E-29	1.665E-40	0.0
Ra-228	Th-232	1.000E+00	0.000E+00	7.899E-01	4.655E+00	6.307E+00	6.290E+00	6.273E+00	6.257E+00	6.2
Ra-228	∑S(j):		7.000E+00	6.914E+00	6.495E+00	6.307E+00	6.290E+00	6.273E+00	6.257E+00	6.2
Th-228	Ra-228	1.000E+00	0.000E+00	1.984E+00	2.619E+00	1.744E-05	4.313E-17	1.067E-28	2.638E-40	0.0
Th-228	Th-228	1.000E+00	7.000E+00	4.872E+00	1.869E-01	1.286E-15	0.000E+00	0.000E+00	0.000E+00	0.0
Th-228	Th-232	1.000E+00	0.000E+00	1.299E-01	3.784E+00	6.307E+00	6.290E+00	6.273E+00	6.257E+00	6.2
Th-228	∑S(j):		7.000E+00	6.986E+00	6.589E+00	6.307E+00	6.290E+00	6.273E+00	6.257E+00	6.2
Th-230	Th-230	1.000E+00	9.800E+00	9.800E+00	9.798E+00	9.778E+00	9.735E+00	9.691E+00	9.648E+00	9.6
Th-230	U-234	1.000E+00	0.000E+00	9.092E-05	9.090E-04	9.076E-03	2.713E-02	4.506E-02	6.287E-02	8.0
Th-230	U-238	1.000E+00	0.000E+00	1.250E-10	1.250E-08	1.249E-06	1.120E-05	3.103E-05	6.063E-05	9.9
Th-230	∑S(j):		9.800E+00	9.800E+00	9.799E+00	9.787E+00	9.762E+00	9.736E+00	9.711E+00	9.6
Th-232	Th-232	1.000E+00	7.000E+00	7.000E+00	6.999E+00	6.991E+00	6.972E+00	6.953E+00	6.935E+00	6.9
U-234	U-234	1.000E+00	1.010E+01	1.010E+01	1.010E+01	1.009E+01	1.006E+01	1.004E+01	1.001E+01	9.9
U-234	U-238	1.000E+00	0.000E+00	2.778E-05	2.778E-04	2.775E-03	8.307E-03	1.381E-02	1.929E-02	2.4
U-234	∑S(j):		1.010E+01	1.010E+01	1.010E+01	1.009E+01	1.007E+01	1.005E+01	1.003E+01	1.0
U-235	U-235	1.000E+00	9.000E-01	9.000E-01	8.999E-01	8.991E-01	8.973E-01	8.956E-01	8.938E-01	8.9
Pa-231	U-235	1.000E+00	0.000E+00	1.891E-05	1.778E-04	1.029E-03	1.347E-03	1.364E-03	1.363E-03	1.3
Ac-227	U-235	1.000E+00	0.000E+00	2.951E-07	2.342E-05	4.500E-04	6.430E-04	6.538E-04	6.533E-04	6.5
U-238	U-238	1.000E+00	9.800E+00	9.800E+00	9.799E+00	9.790E+00	9.771E+00	9.752E+00	9.733E+00	9.7

BRF(i) is the branch fraction of the parent nuclide.

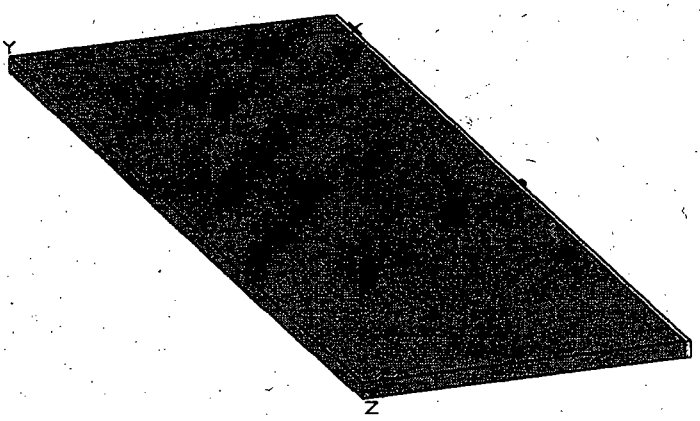
RESCALC.EXE execution time = 232.05 seconds
Total water/soil iteration failures = 50.

MicroShield v5.01 (5.01-00996)
Integrated Environmental Management, Inc.

'age : 1
)OS File : 82303.MS5
!un Date: October 3, 2005
!un Time: 3:15:08 PM
!uration : 00:00:12

File Ref: _____
Date: _____
By: _____
Checked: _____

Case Title: Shieldalloy
Description: Dose Adjacent to Storage Pile 5 feet
Geometry: 13 - Rectangular Volume



Source Dimensions

Length	6.1e+3 cm	200 ft
Width	1.8e+4 cm	600 ft
Height	304.8 cm	10 ft 0.0 in

Dose Points

	X	Y	Z
# 1	6348.984 cm	152.4 cm	9144 cm
	208 ft 3.6 in	5 ft 0.0 in	300 ft

Shields

Shield Name	Dimension	Material	Density
Source	1.20e+06 ft³	Concrete	2.14
Shield 1	3.3 ft	Carbon	1.31
Air Gap		Air	0.00122

Source Input
Grouping Method : Standard Indices
Number of Groups : 25
Lower Energy Cutoff : 0.015
Photons < 0.015 : Excluded
Library : Grove

Nuclide	curies	becquerels	µCi/cm³	Bq/cm³
Ac-227	5.7766e-001	2.1374e+010	1.7000e-005	6.2900e-001
Pa-231	5.7766e-001	2.1374e+010	1.7000e-005	6.2900e-001
Pb-210	1.3252e+001	4.9033e+011	3.9000e-004	1.4430e+001
Ra-226	1.3252e+001	4.9033e+011	3.9000e-004	1.4430e+001
Ra-228	1.3252e+001	4.9033e+011	3.9000e-004	1.4430e+001
Th-228	1.3252e+001	4.9033e+011	3.9000e-004	1.4430e+001
Th-230	1.3252e+001	4.9033e+011	3.9000e-004	1.4430e+001
Th-232	1.3252e+001	4.9033e+011	3.9000e-004	1.4430e+001
U-234	1.3252e+001	4.9033e+011	3.9000e-004	1.4430e+001
U-235	1.3252e+001	4.9033e+011	3.9000e-004	1.4430e+001
U-238	1.3252e+001	4.9033e+011	3.9000e-004	1.4430e+001

Buildup
The material reference is : ~~Shield 1~~ Soil 1M thick

Integration Parameters

X Direction	10
Y Direction	20
Z Direction	20

Results

rgy eV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm³/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.015	7.742e+06	0.000e+00	2.557e-29	0.000e+00	2.193e-30

age : 2
OS File : 82303.MS5
un Date : October 3, 2005
un Time: 3:15:08 PM
uration : 00:00:12

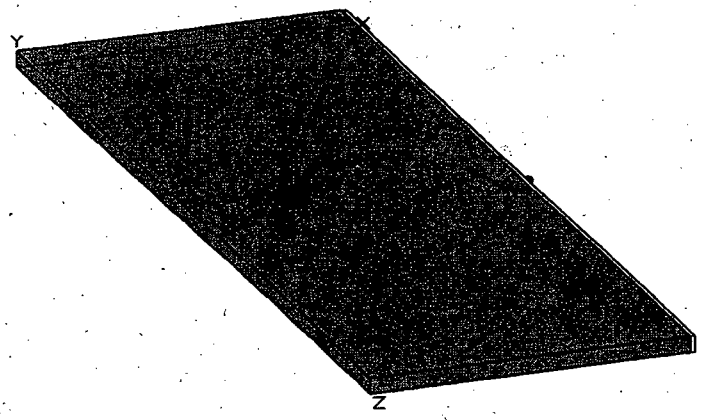
Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.02	7.481e+07	6.810e-305	1.572e-27	2.359e-306	5.447e-29
0.03	1.988e+09	6.192e-107	2.148e-24	6.137e-109	2.129e-26
0.04	3.185e+07	6.230e-61	1.030e-24	2.755e-63	4.554e-27
0.05	2.048e+10	5.776e-41	6.743e-21	1.539e-43	1.796e-23
0.06	3.236e+09	5.780e-34	4.894e-21	1.148e-36	9.720e-24
0.08	2.234e+10	2.272e-26	1.048e-19	3.595e-29	1.659e-22
0.1	4.127e+10	4.080e-23	2.324e-17	6.242e-26	3.556e-20
0.15	7.763e+10	2.711e-19	3.773e-14	4.465e-22	6.212e-17
0.2	3.198e+11	1.138e-16	4.890e-12	2.008e-19	8.631e-15
0.3	1.730e+09	2.280e-16	1.565e-12	4.325e-19	2.968e-15
0.4	3.698e+07	2.553e-16	5.178e-13	4.974e-19	1.009e-15
TOTALS:	4.887e+11	5.973e-16	7.010e-12	1.131e-18	1.267e-14

MicroShield v5.01 (5.01-00996)
Integrated Environmental Management, Inc.

age : 1
OS File : 82303.MS5
ur e: October 3, 2005
un ne: 3:18:47 PM
uration : 00:00:12

File Ref: _____
Date: _____
By: _____
Checked: _____

Case Title: Shieldalloy
Description: Dose Adjacent to Storage Pile 5 feet
Geometry: 13 - Rectangular Volume



Source Dimensions

Length	6.1e+3 cm	200 ft
Width	1.8e+4 cm	600 ft
Height	304.8 cm	10 ft 0.0 in

Dose Points

	X	Y	Z
# 1	6333.744 cm	152.4 cm	9144 cm
	207 ft 9.6 in	5 ft 0.0 in	300 ft

Shields

Shield Name	Dimension	Material	Density
Source	1.20e+06 ft³	Concrete	2.14
Shield 1	2.789 ft	Carbon	1.31
Air Gap		Air	0.00122

Source Input
Grouping Method : Standard Indices
Number of Groups : 25
Lower Energy Cutoff : 0.015
Photons < 0.015 : Excluded
Library : Grove

Nuclide	curies	becquerels	µCi/cm³	Bq/cm³
Ac-227	5.7766e-001	2.1374e+010	1.7000e-005	6.2900e-001
Pa-231	5.7766e-001	2.1374e+010	1.7000e-005	6.2900e-001
Pb-210	1.3252e+001	4.9033e+011	3.9000e-004	1.4430e+001
Ra-226	1.3252e+001	4.9033e+011	3.9000e-004	1.4430e+001
Ra-228	1.3252e+001	4.9033e+011	3.9000e-004	1.4430e+001
Th-228	1.3252e+001	4.9033e+011	3.9000e-004	1.4430e+001
Th-230	1.3252e+001	4.9033e+011	3.9000e-004	1.4430e+001
Th-232	1.3252e+001	4.9033e+011	3.9000e-004	1.4430e+001
U-234	1.3252e+001	4.9033e+011	3.9000e-004	1.4430e+001
U-235	1.3252e+001	4.9033e+011	3.9000e-004	1.4430e+001
U-238	1.3252e+001	4.9033e+011	3.9000e-004	1.4430e+001

Buildup
The material reference is : Shield 1

Integration Parameters

X Direction	10
Y Direction	20
Z Direction	20

Results

rgy V	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.015	7.742e+06	0.000e+00	2.610e-29	0.000e+00	2.239e-30

DOS File : 82303.MS5
Run Date : October 3, 2005
Run Time : 3:18:47 PM
Duration : 00:00:12

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.02	7.481e+07	9.887e-303	1.605e-27	3.425e-304	5.559e-29
0.03	1.988e+09	2.978e-105	2.192e-24	2.951e-107	2.173e-26
0.04	3.185e+07	2.283e-59	1.051e-24	1.010e-61	4.648e-27
0.05	2.048e+10	1.843e-39	6.882e-21	4.911e-42	1.833e-23
0.06	3.236e+09	1.658e-32	4.994e-21	3.293e-35	9.920e-24
0.08	2.234e+10	5.484e-25	4.639e-19	8.678e-28	7.342e-22
0.1	4.127e+10	8.507e-22	3.732e-16	1.302e-24	5.709e-19
0.15	7.763e+10	4.216e-18	4.617e-13	6.943e-21	7.603e-16
0.2	3.198e+11	1.411e-15	4.623e-11	2.490e-18	8.160e-14
0.3	1.730e+09	2.057e-15	1.167e-11	3.902e-18	2.214e-14
0.4	3.698e+07	1.848e-15	3.216e-12	3.601e-18	6.267e-15
TOTALS:	4.887e+11	5.320e-15	6.159e-11	9.999e-18	1.108e-13

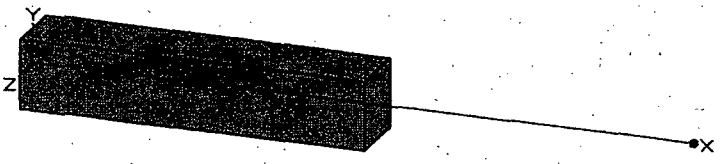
DOS File : 82305.MS5
Run Date : October 3, 2005
Run Time : 4:19:55 PM
Duration : 00:00:00

MicroShield v5.01 (5.01-00996)
Integrated Environmental Management, Inc.

File Ref: _____
Date: _____
By: _____
Checked: _____

3'

Case Title: Shieldalloy
Description: Excavate cover from slag Expose 1 m2
Geometry: 16 - Infinite Slab



Source Dimensions

Thickness	100.0 cm	3 ft 3.4 in

Dose Points

	X	Y	Z
# 1	191.4144 cm	0 cm	0 cm
	6 ft 3.4 in	0.0 in	0.0 in

Shields

Shield Name	Dimension	Material	Density
Source	Infinite	Concrete	2.8
Air Gap		Air	0.00122

Source Input
Grouping Method : Standard Indices
Number of Groups : 25
Lower Energy Cutoff : 0.015
Photons < 0.015 : Excluded
Library : Grove

Nuclide	µCi/cm³	Bq/cm³
Pb-210	1.0000e-003	3.7000e+001
Ra-226	1.0000e-003	3.7000e+001
Ra-228	1.0000e-003	3.7000e+001
Th-228	1.0000e-003	3.7000e+001
Th-230	1.0000e-003	3.7000e+001
Th-232	1.0000e-003	3.7000e+001
U-234	1.0000e-003	3.7000e+001
U-235	1.0000e-003	3.7000e+001
U-238	1.0000e-003	3.7000e+001

Buildup
The material reference is : Air Gap

Results

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.05	1.542e+00	3.422e-02	2.193e-01	9.115e-05	5.841e-04
0.06	2.442e-01	8.701e-03	8.216e-02	1.728e-05	1.632e-04
0.08	1.676e+00	1.100e-01	1.350e+00	1.741e-04	2.137e-03
0.1	3.089e+00	2.994e-01	3.887e+00	4.581e-04	5.947e-03
0.15	5.835e+00	1.041e+00	1.192e+01	1.715e-03	1.963e-02
0.2	2.413e+01	6.456e+00	5.671e+01	1.139e-02	1.001e-01
0.3	2.468e-03	1.162e-03	8.277e-03	2.205e-06	1.570e-05
TOTALS:	3.652e+01	7.951e+00	7.418e+01	1.385e-02	1.286e-01

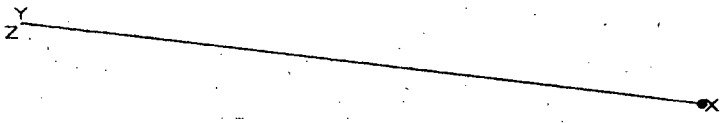
MicroShield v5.01 (5.01-00996)
Integrated Environmental Management, Inc.

Page : 1
DOS File : 82305.MS5
Run Date : October 3, 2005
Run Time : 4:22:26 PM
Duration : 00:00:00

File Ref: _____
Date: _____
By: _____
Checked: _____

1000'

Case Title: Shieldalloy
Description: Excavate cover from slag Expose 1 m2
Geometry: 16 - Infinite Slab



Source Dimensions

Thickness	100.0 cm	3 ft 3.4 in

Dose Points

	X	Y	Z
# 1	3.06e+04 cm	0 cm	0 cm
	1003 ft 3.4 in	0.0 in	0.0 in

Shields

Shield Name	Dimension	Material	Density
Source	Infinite	Concrete	2.8
Air Gap		Air	0.00122

Source input
Grouping Method : Standard Indices
Number of Groups : 25
Lower Energy Cutoff : 0.015
Photons < 0.015 : Excluded
Library : Grove

Nuclide	µCi/cm³	Bq/cm³
Pb-210	1.0000e-003	3.7000e+001
Ra-226	1.0000e-003	3.7000e+001
Ra-228	1.0000e-003	3.7000e+001
Th-228	1.0000e-003	3.7000e+001
Th-230	1.0000e-003	3.7000e+001
Th-232	1.0000e-003	3.7000e+001
U-234	1.0000e-003	3.7000e+001
U-235	1.0000e-003	3.7000e+001
U-238	1.0000e-003	3.7000e+001

Buildup
The material reference is : Air Gap

Results

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.05	1.542e+00	2.786e-06	1.861e-04	7.423e-09	4.957e-07
0.06	2.442e-01	1.442e-06	1.592e-04	2.865e-09	3.162e-07
0.08	1.676e+00	3.799e-05	5.886e-03	6.013e-08	9.314e-06
0.1	3.089e+00	1.603e-04	2.572e-02	2.453e-07	3.934e-05
0.15	5.835e+00	1.132e-03	1.380e-01	1.864e-06	2.273e-04
0.2	2.413e+01	1.151e-02	9.180e-01	2.031e-05	1.620e-03
0.3	2.468e-03	4.171e-06	2.048e-04	7.911e-09	3.884e-07
TOTALS:	3.652e+01	1.285e-02	1.088e+00	2.250e-05	1.897e-03

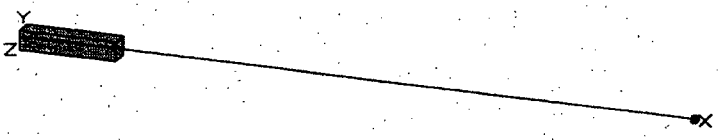
MicroShield v5.01 (5.01-00996)
Integrated Environmental Management, Inc.

Page : 1
DOS File : 82305.MS5
Run Date : October 3, 2005
Run Time : 4:27:48 PM
Duration : 00:00:00

File Ref: _____
Date: _____
By: _____
Checked: _____

Case Title: Shieldalloy
Description: Excavate cover from slag Expose 1 m2
Geometry: 16 - Infinite Slab

20'



Source Dimensions

Thickness	100.0 cm	3 ft 3.4 in

Dbse Points

	X	Y	Z
# 1	709.5744 cm	0 cm	0 cm
	23 ft 3.4 in	0.0 in	0.0 in

Shields

Shield Name	Dimension	Material	Density
Source	Infinite	Concrete	2.8
Air Gap		Air	0.00122

Source Input
Grouping Method : Standard Indices
Number of Groups : 25
Lower Energy Cutoff : 0.015
Photons < 0.015 : Excluded
Library : Grove

Nuclide	µCi/cm³	Bq/cm³
Pb-210	1.0000e-003	3.7000e+001
Ra-226	1.0000e-003	3.7000e+001
Ra-228	1.0000e-003	3.7000e+001
Th-228	1.0000e-003	3.7000e+001
Th-230	1.0000e-003	3.7000e+001
Th-232	1.0000e-003	3.7000e+001
U-234	1.0000e-003	3.7000e+001
U-235	1.0000e-003	3.7000e+001
U-238	1.0000e-003	3.7000e+001

Buildup
The material reference is : Air Gap

Results

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.05	1.542e+00	2.441e-02	1.889e-01	6.502e-05	5.031e-04
0.06	2.442e-01	6.350e-03	7.250e-02	1.261e-05	1.440e-04
0.08	1.676e+00	8.227e-02	1.214e+00	1.302e-04	1.921e-03
0.1	3.089e+00	2.271e-01	3.525e+00	3.475e-04	5.392e-03
0.15	5.835e+00	8.089e-01	1.091e+01	1.332e-03	1.796e-02
0.2	2.413e+01	5.101e+00	5.203e+01	9.003e-03	9.183e-02
0.3	2.468e-03	9.409e-04	7.636e-03	1.785e-06	1.448e-05
TALS:	3.652e+01	6.251e+00	6.795e+01	1.089e-02	1.178e-01

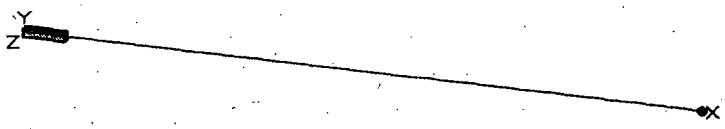
MicroShield v5.01 (5.01-00996)
Integrated Environmental Management, Inc.

age : 1
OS File : 82305.MS5
un Date : October 3, 2005
un Time : 4:25:14 PM
uration : 00:00:00

File Ref: _____
Date: _____
By: _____
Checked: _____

50'

Case Title: Shieldalloy
Description: Excavate cover from slag Expose 1 m2
Geometry: 16 - Infinite Slab



Source Dimensions

Thickness	100.0 cm	3 ft 3.4 in

Dose Points

	X	Y	Z
# 1	1.62e+03 cm	0 cm	0 cm
	53 ft 3.4 in	0.0 in	0.0 in

Shields

Shield Name	Dimension	Material	Density
Source	Infinite	Concrete	2.8
Air Gap		Air	0.00122

Source Input
Grouping Method : Standard Indices
Number of Groups : 25
Lower Energy Cutoff : 0.015
Photons < 0.015 : Excluded
Library : Grove

Nuclide	pCi/cm³	Bq/cm³
Pb-210	1.0000e-003	3.7000e+001
Ra-226	1.0000e-003	3.7000e+001
Ra-228	1.0000e-003	3.7000e+001
Th-228	1.0000e-003	3.7000e+001
Th-230	1.0000e-003	3.7000e+001
Th-232	1.0000e-003	3.7000e+001
U-234	1.0000e-003	3.7000e+001
U-235	1.0000e-003	3.7000e+001
U-238	1.0000e-003	3.7000e+001

Buildup
The material reference is : Air Gap

Results

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.05	1.542e+00	1.566e-02	1.492e-01	4.171e-05	3.975e-04
0.06	2.442e-01	4.197e-03	5.917e-02	8.337e-06	1.175e-04
0.08	1.676e+00	5.611e-02	1.019e+00	8.879e-05	1.613e-03
0.1	3.089e+00	1.579e-01	2.999e+00	2.415e-04	4.589e-03
0.15	5.835e+00	5.800e-01	9.432e+00	9.551e-04	1.553e-02
0.2	2.413e+01	3.739e+00	4.533e+01	6.599e-03	8.000e-02
0.3	2.468e-03	7.117e-04	6.725e-03	1.350e-06	1.276e-05
TOTALS:	3.652e+01	4.553e+00	5.899e+01	7.935e-03	1.023e-01

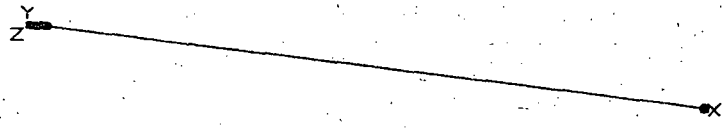
MicroShield y5.01 (5.01-00996)
Integrated Environmental Management, Inc.

Page : 1
DOS File : 82305.MS5
Run Date : October 3, 2005
Run Time : 4:21:34 PM
Duration : 00:00:00

File Ref: _____
Date: _____
By: _____
Checked: _____

100'

Case Title: Shieldalloy
Description: Excavate cover from slag Expose 1 m2
Geometry: 16 - Infinite Slab



Source Dimensions

Thickness	100.0 cm	3 ft 3.4 in

Dose Points

	X	Y	Z
# 1	3.15e+03 cm	0 cm	0 cm
	103 ft 3.4 in	0.0 in	0.0 in

Shields

Shield Name	Dimension	Material	Density
Source	Infinite	Concrete	2.8
Air Gap		Air	0.00122

Source Input
Grouping Method : Standard Indices
Number of Groups : 25
Lower Energy Cutoff : 0.015
Photons < 0.015 : Excluded
Library : Grove

Nuclide	μCi/cm³	Bq/cm³
Pb-210	1.0000e-003	3.7000e+001
Ra-226	1.0000e-003	3.7000e+001
Ra-228	1.0000e-003	3.7000e+001
Th-228	1.0000e-003	3.7000e+001
Th-230	1.0000e-003	3.7000e+001
Th-232	1.0000e-003	3.7000e+001
U-234	1.0000e-003	3.7000e+001
U-235	1.0000e-003	3.7000e+001
U-238	1.0000e-003	3.7000e+001

Buildup
The material reference is : Air Gap

Results

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.05	1.542e+00	8.450e-03	1.028e-01	2.251e-05	2.740e-04
0.06	2.442e-01	2.364e-03	4.275e-02	4.695e-06	8.492e-05
0.08	1.676e+00	3.303e-02	7.693e-01	5.227e-05	1.217e-03
0.1	3.089e+00	9.545e-02	2.313e+00	1.460e-04	3.538e-03
0.15	5.835e+00	3.663e-01	7.473e+00	6.032e-04	1.231e-02
0.2	2.413e+01	2.435e+00	3.644e+01	4.297e-03	6.431e-02
0.3	2.468e-03	4.843e-04	5.512e-03	9.187e-07	1.046e-05
TOTALS:	3.652e+01	2.941e+00	4.714e+01	5.127e-03	8.174e-02

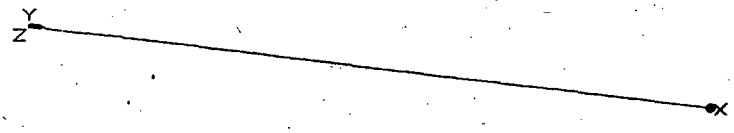
MicroShield v5.01 (5.01-00996)
Integrated Environmental Management, Inc.

Page : 1
DOS File : 82305.MS5
Run Date : October 3, 2005
Run Time : 4:23:27 PM
Duration : 00:00:00

File Ref: _____
Date: _____
By: _____
Checked: _____

Case Title: Shieldalloy
Description: Excavate cover from slag Expose 1 m2
Geometry: 16 - Infinite Slab

200'



Source Dimensions

Thickness	100.0 cm	3 ft 3.4 in

Dose Points

	X	Y	Z
# 1	6.20e+03 cm	0 cm	0 cm
	203 ft 3.4 in	0.0 in	0.0 in

Shields

Shield Name	Dimension	Material	Density
Source	Infinite	Concrete	2.8
Air Gap		Air	0.00122

Source Input
Grouping Method : Standard Indices
Number of Groups : 25
Lower Energy Cutoff : 0.015
Photons < 0.015 : **Excluded**
Library : Grove

Nuclide	µCi/cm³	Bq/cm³
Pb-210	1.0000e-003	3.7000e+001
Ra-226	1.0000e-003	3.7000e+001
Ra-228	1.0000e-003	3.7000e+001
Th-228	1.0000e-003	3.7000e+001
Th-230	1.0000e-003	3.7000e+001
Th-232	1.0000e-003	3.7000e+001
U-234	1.0000e-003	3.7000e+001
U-235	1.0000e-003	3.7000e+001
U-238	1.0000e-003	3.7000e+001

Buildup
The material reference is : **Air Gap**

Results

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.05	1.542e+00	2.911e-03	5.007e-02	7.756e-06	1.334e-04
0.06	2.442e-01	8.787e-04	2.268e-02	1.745e-06	4.505e-05
0.08	1.676e+00	1.328e-02	4.434e-01	2.102e-05	7.017e-04
0.1	3.089e+00	4.025e-02	1.391e+00	6.158e-05	2.127e-03
0.15	5.835e+00	1.668e-01	4.748e+00	2.747e-04	7.819e-03
0.2	2.413e+01	1.170e+00	2.390e+01	2.065e-03	4.218e-02
0.3	2.468e-03	2.514e-04	3.766e-03	4.768e-07	7.144e-06
TOTALS:	3.652e+01	1.395e+00	3.056e+01	2.432e-03	5.301e-02

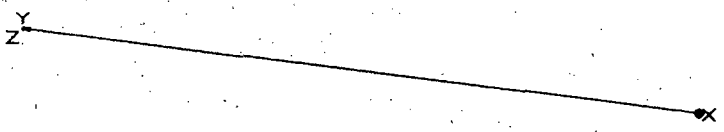
MicroShield yS.01 (5.01-00996)
Integrated Environmental Management, Inc.

Page : 1
DOS File : 82305.MS5
Run Date : October 3, 2005
Run Time : 4:25:51 PM
Duration : 00:00:00

File Ref: _____
Date: _____
By: _____
Checked: _____

300'

Case Title: Shieldalloy
Description: Excavate cover from slag Expose 1 m2
Geometry: 16 - Infinite Slab



Source Dimensions

Thickness	100.0 cm	3 ft 3.4 in

Dose Points

	X	Y	Z
# 1	9.24e+03 cm	0 cm	0 cm
	303 ft 3.4 in	0.0 in	0.0 in

Shields

Shield Name	Dimension	Material	Density
Source	Infinite	Concrete	2.8
Air Gap		Air	0.00122

Source Input
Grouping Method : Standard Indices
Number of Groups : 25
Lower Energy Cutoff : 0.015
Photons < 0.015 : Excluded
Library : Grove

Nuclide	µCi/cm³	Bq/cm³
Pb-210	1.0000e-003	3.7000e+001
Ra-226	1.0000e-003	3.7000e+001
Ra-228	1.0000e-003	3.7000e+001
Th-228	1.0000e-003	3.7000e+001
Th-230	1.0000e-003	3.7000e+001
Th-232	1.0000e-003	3.7000e+001
U-234	1.0000e-003	3.7000e+001
U-235	1.0000e-003	3.7000e+001
U-238	1.0000e-003	3.7000e+001

Buildup
The material reference is : Air Gap

Results

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.05	1.542e+00	1.106e-03	2.467e-02	2.947e-06	6.572e-05
0.06	2.442e-01	3.586e-04	1.213e-02	7.122e-07	2.409e-05
0.08	1.676e+00	5.835e-03	2.571e-01	9.234e-06	4.069e-04
0.1	3.089e+00	1.848e-02	8.408e-01	2.827e-05	1.286e-03
0.15	5.835e+00	8.223e-02	3.036e+00	1.354e-04	4.999e-03
0.2	2.413e+01	6.064e-01	1.580e+01	1.070e-03	2.789e-02
0.3	2.468e-03	1.398e-04	2.597e-03	2.652e-07	4.926e-06
TALS:	3.652e+01	7.146e-01	1.997e+01	1.247e-03	3.467e-02

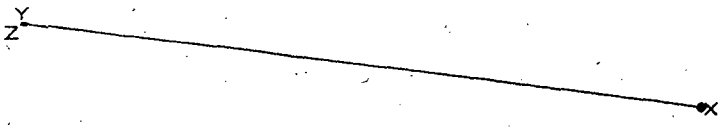
MicroShield v5.01 (5.01-00996)
Integrated Environmental Management, Inc.

Page : 1
DOS File : 82305.MS5
Run Date : October 3, 2005
Run Time : 4:26:24 PM
Duration : 00:00:00

File Ref: _____
Date: _____
By: _____
Checked: _____

400'

Case Title: Shieldalloy
Description: Excavate cover from slag Expose 1 m2
Geometry: 16 - Infinite Slab



Source Dimensions

Thickness	100.0 cm	3 ft 3.4 in

Dose Points

	X	Y	Z
# 1	1.23e+04 cm	0 cm	0 cm
	403 ft 3.4 in	0.0 in	0.0 in

Shields

Shield Name	Dimension	Material	Density
Source	Infinite	Concrete	2.8
Air Gap		Air	0.00122

Source Input
Grouping Method : Standard Indices
Number of Groups : 25
Lower Energy Cutoff : 0.015
Photons < 0.015 : Excluded
Library : Grove

Nuclide	µCi/cm³	Ba/cm³
Pb-210	1.0000e-003	3.7000e+001
Ra-226	1.0000e-003	3.7000e+001
Ra-228	1.0000e-003	3.7000e+001
Th-228	1.0000e-003	3.7000e+001
Th-230	1.0000e-003	3.7000e+001
Th-232	1.0000e-003	3.7000e+001
U-234	1.0000e-003	3.7000e+001
U-235	1.0000e-003	3.7000e+001
U-238	1.0000e-003	3.7000e+001

Buildup
The material reference is : Air Gap

Results

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.05	1.542e+00	4.423e-04	1.222e-02	1.178e-06	3.254e-05
0.06	2.442e-01	1.536e-04	6.509e-03	3.051e-07	1.293e-05
0.08	1.676e+00	2.684e-03	1.495e-01	4.248e-06	2.366e-04
0.1	3.089e+00	8.871e-03	5.097e-01	1.357e-05	7.797e-04
0.15	5.835e+00	4.229e-02	1.946e+00	6.963e-05	3.205e-03
0.2	2.413e+01	3.272e-01	1.048e+01	5.774e-04	1.850e-02
0.3	2.468e-03	8.072e-05	1.798e-03	1.531e-07	3.411e-06
TOTALS:	3.652e+01	3.817e-01	1.311e+01	6.665e-04	2.277e-02

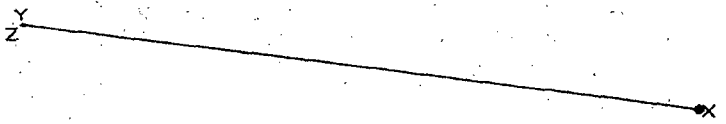
MicroShield vS.01 (5.01-00996)
Integrated Environmental Management, Inc.

Page : 1
DOS File : 82305.MS5
Run Date: October 3, 2005
Run Time: 4:24:01 PM
Duration : 00:00:00

File Ref: _____
Date: _____
By: _____
Checked: _____

500'

Case Title: Shieldalloy
Description: Excavate coyer from slag Expose 1 m2
Geometry: 16 - Infinite Slab



Source Dimensions

Thickness	100.0 cm	3 ft 3.4 in

Dose Points

	X	Y	Z
# 1	1.53e+04 cm	0 cm	0 cm
	503 ft 3:4 in	0.0 in	0.0 in

Shields

Shield Name	Dimension	Material	Density
Source	Infinite	Concrete	2.8
Air Gap		Air	0.00122

Source Input
Grouping Method : Standard Indices
Number of Groups : 25
Lower Energy Cutoff : 0.015
Photons < 0.015 : Excluded
Library : Grove

Nuclide	μCi/cm³	Bq/cm³
Pb-210	1.0000e-003	3.7000e+001
Ra-226	1.0000e-003	3.7000e+001
Ra-228	1.0000e-003	3.7000e+001
Th-228	1.0000e-003	3.7000e+001
Th-230	1.0000e-003	3.7000e+001
Th-232	1.0000e-003	3.7000e+001
U-234	1.0000e-003	3.7000e+001
U-235	1.0000e-003	3.7000e+001
U-238	1.0000e-003	3.7000e+001

Buildup
The material reference is : Air Gap

Results

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.05	1.542e+00	1.826e-04	6.065e-03	4.863e-07	1.616e-05
0.06	2.442e-01	6.785e-05	3.500e-03	1.348e-07	6.951e-06
0.08	1.676e+00	1.272e-03	8.706e-02	2.012e-06	1.378e-04
0.1	3.089e+00	4.381e-03	3.094e-01	6.703e-06	4.733e-04
0.15	5.835e+00	2.234e-02	1.250e+00	3.678e-05	2.058e-03
0.2	2.413e+01	1.811e-01	6.970e+00	3.196e-04	1.230e-02
0.3	2.468e-03	4.774e-05	1.249e-03	9.055e-08	2.368e-06
TOTALS:	3.652e+01	2.094e-01	8.628e+00	3.658e-04	1.500e-02

MicroShield v5.01 (5.01-00996)
Integrated Environmental Management, Inc.

Page : 1
DOS File : 82305.MS5
Run Date : October 3, 2005
Run Time : 4:26:54 PM
Duration : 00:00:00

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Date: _____
By: _____
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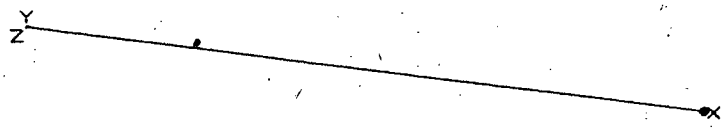
700'

Case Title: Shieidalloy
Description: Excavate cover from slag Expose 1 m2
Geometry: 16 - Infinite Slab



Source Dimensions

Thickness	100.0 cm	3 ft 3.4 in

Dose Points

	X	Y	Z
# 1	2.14e+04 cm	0 cm	0 cm
	703 ft 3.4 in	0.0 in	0.0 in

Shields

Shield Name	Dimension	Material	Density
Source	Infinite	Concrete	2.8
Air Gap		Air	0.00122

Source Input
Grouping Method : Standard Indices
Number of Groups : 25
Lower Energy Cutoff : 0.015
Photons < 0.015 : **Excluded**
Library : Grove

Nuclide	pCi/cm³	Bq/cm³
Pb-210	1.0000e-003	3.7000e+001
Ra-226	1.0000e-003	3.7000e+001
Ra-228	1.0000e-003	3.7000e+001
Th-228	1.0000e-003	3.7000e+001
Th-230	1.0000e-003	3.7000e+001
Th-232	1.0000e-003	3.7000e+001
U-234	1.0000e-003	3.7000e+001
U-235	1.0000e-003	3.7000e+001
U-238	1.0000e-003	3.7000e+001

Buildup
The material reference is : Air Gap

Results

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.05	1.542e+00	3.304e-05	1.502e-03	8.802e-08	4.000e-06
0.06	2.442e-01	1.404e-05	1.015e-03	2.788e-08	2.016e-06
0.08	1.676e+00	3.018e-04	2.960e-02	4.776e-07	4.684e-05
0.1	3.089e+00	1.129e-03	1.142e-01	1.727e-06	1.748e-04
0.15	5.835e+00	6.565e-03	5.170e-01	1.081e-05	8.514e-04
0.2	2.413e+01	5.833e-02	3.092e+00	1.030e-04	5.458e-03
0.3	2.468e-03	1.749e-05	6.044e-04	3.318e-08	1.147e-06
TOTALS:	3.652e+01	6.639e-02	3.756e+00	1.161e-04	6.538e-03

Appendix 19.6 - Radionuclide Concentrations in Soil

APPENDIX K
Analytical Results For Soil, Sediment and Water Sampling

Grid Location	Sample Type: Soil/Sediment or Water	U-238 (pCi/g)[a]	Th-232 (pCi/g)	Ra-226 (pCi/g)	Ra-228 (pCi/g)	Pb-214 (pCi/g)	Bi-214 (pCi/g)	Th-228/A (pCi/g)	Pb-212 (pCi/g)	Ti-208 (pCi/g)	Cross Alpha (pCi/L)	Gross Beta (pCi/L)
-h0	S	5.79	4.3	24	31	26	24					
-h2	S	3.36	6.45	8.8	8.9	9.9	8.8					
-g1	S	11.2	1.31	28	28							
-b32	S	3.92	4.94	77	83							
-b60	S	1.80	2.35	2.2		0.93	0.79	1.7	1.8	1.5		
-b60 (DUP 1)	S	1.58	1.48	1.4		0.67	0.53	0.85	0.80	0.64		
-b60 (DUP 2)	S	1.58	2.00	1.6		0.69	0.74	1.1	0.99	0.97		
-a4	S	0.84	1.66	0.3	0.4	0.4	0.3					
-a6	S	1.17	2.58	6.4	9.7	4.0	<3.9					
-a6 (DUP)	S	0.94	2.55	0.3	<0.6	0.5	<0.3					
-a8	S	8.00	10.8	5.3	10	6.5	5.3					
-a9	S	10.4	1.74	37	47	40	37					
-a33	S	2.29	6.0	1.8	6.7	2.7	1.8					
A-33	W										4.2	6.0
A7	S	1.14	2.39	0.5	<0.7	1.0	<0.4					
A11	W	0.61	1.02	1.04	<3.6	<7	<7.3				15	15
A26	S	0.87	1.70	0.3	<1.0	0.6	< 0.4					
A33 (QC)	S	1.37	1.91	0.4	0.3	0.4	<0.3					
A39	S	1.19	1.6	0.7	0.7	0.6	<0.4					
A46	S	0.75	1.58	0.5	<0.6	0.5	0.5					
A51	S	0.87	1.45	0.7	0.6	0.8	<0.4					
A70	S	0.79	1.29	0.9	0.8	1.0	0.9					
B10	S	1.41	4.92	0.7	1.1	0.6	0.7					

APPENDIX K
(Continued)

Grid Location	Sample Type: Soil/Sediment or Water	U-238 (pCi/g)*	Th-232 (pCi/g)	Ra-226 (pCi/g)	Ra-228 (pCi/g)	Pb-214 (pCi/g)	Bi-214 (pCi/g)	Th-228/A (pCi/g)	Pb-212 (pCi/g)	TI-208 (pCi/g)	Gross Alpha (pCi/L)	Cross Beta (pCi/L)
B61	S	0.79	0.81	0.4	0.3	0.4	0.4					
B64	S	1.71	.63	1.5	4.1	2.2	1.5					
B70	S	0.81	1.40	0.6	0.3	0.5	0.6					
C17	S	1.30	3.56	0.6	1.4	1.1	0.6					
C30	S	1.69	4.71	1.0	1.5	1.4	1.0					
C32	S	1.15	4.23	3.4	1.5	3.5	3.4					
C45	S	1.77	6.32	0.5	<0.5	0.7	0.5	1.8	1.7	1.7		
D11	S	1.20	3.00	0.5	1.0	0.7	<0.4					
D25	S	1.26	3.43	<0.3	<0.5	<0.2	<0.3					
D61	S	0.76	1.11	0.6	0.2	0.5	<0.3					
D66	S	0.82	1.57	0.6	0.3	0.5	<0.3					
E22	S	1.26	2.53	0.5	<0.5	0.4	0.5					
E30 (QC)	S	1.32	3.02	1.2	1.0	1.4	1.2					
E32	S	1.26	3.13	1.6	1.9	1.8	1.6					
E42	S	1.18	2.1	0.85			0.51	0.56	0.58	0.41		
E54	S	0.51	1.06	<0.6		0.43	0.38	0.60	0.47	0.42		
F43	S	1.15	1.80	0.74		0.44	0.40	0.56	0.46	.043		
F50	S	0.94	2.33	0.91		0.44	0.35	0.68	0.50	0.47		
F55	S	0.95	1.75	0.6	<0.8	1.0	0.6	0.47	0.50	0.32		
G14	S	3.31	8.61	1.6	2.9	1.4	<0.6					
G23	S	0.95	1.68	<0.3	<0.5	<0.2	<0.3					
G25	S	0.92	1.95	0.5	<0.5	0.4	0.5					

APPENDIX K
(Continued)

Grid Location	Sample Type: Soil/Sediment or Water	U-238 (pCi/g)*	Th-232 (pCi/g)	Ra-226 (pCi/g)	Ra-228 (pCi/g)	Pb-214 (pCi/g)	Bi-214 (pCi/g)	Th-228/A (pCi/g)	Pb-212 (pCi/g)	Tl-208 (pCi/g)	Gross Alpha (pCi/L)	Gross Beta (pCi/L)
G30	S	3.49	10.16	3.5	9.0	3.3	3.5					
G38	S	1.12	1.81	1.1		0.81	0.66	0.52	0.55	0.47		
G38 (DUP)	S	1.52	2.43	1.4		0.72	0.59	0.60	0.53	0.67		
G39	W	0.48	1.71	1.38	<3.8	<8	<9.8				16	16
G39	S	1.77	1.85	2.3		1.5	1.3	0.93	0.97	0.10		
G48	S	0.81	2.15	1.6	<0.6	0.7	0.5	0.64	0.56	0.54		
G50	S			2.0		1.3	1.2	4.9	4.0	4.0		
G50	S	2.17	13.3	1.9	5.2	1.7	1.9					
G57	S	1.1	4.21	<0.2	<0.6	<0.3	<0.2	2.4	2.0	2.0		
G61	S	0.63	1.35	1.8		0.58	0.43	0.54	0.45	0.46		
H49	W	17.4	48.4	19.55	66	44	34				1220	888
H49 (QC)	W	8.1	15.6	10.07	21.1	15	14				488	353
H9	S	1.73	2.75	0.7	1.1	0.8	0.7					
I18	S	0.95	1.98	1.1	<1.7	0.9	1.1					
D1	S	0.83	3.06	0.6	<0.6	0.6	0.6					
D5 (QC)	S	1.02	2.99	0.4	0.7	0.6	0.4					
D5	S	1.02	2.99									
I76.5	S		1.38	<0.5		0.40	0.31	0.36	0.36	0.33		
J76.5 (DUP 1)	S			1.3		0.52	0.40	0.46	0.36	0.39		
J76.5 (DUP 2)	S			1.1		0.64	0.52	0.61	0.64	0.68		
L18	S	1.03	1.90	0.6	0.8	0.5	0.6					
N17	S	1.60	35.3	4.4	12	5.2	4.4					

APPENDIX K
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Grid Location	Sample Type: Soil/Sediment or Water	U-238 (pCi/g)[a]	Th-232 (pCi/g)	Ra-226 (pCi/g)	Ra-228 (pCi/g)	Pb-214 (pCi/g)	Bi-214 (pCi/g)	Th-228/A (pCi/g)	Pb-212 (pCi/g)	Tl-208 (pCi/g)	Gross Alpha (pCi/L)	Gross Beta (pCi/L)
O15	S	2.36	4.43	0.7	1.5	1.0	0.7					
U67	S	1.43	2.53	1.1		0.61	0.48	0.74	0.77	0.54		
U73	S	1.21	1.47	0.5	0.6	0.4	0.5					
W60	S	1.23	2.42	<0.5		0.55	0.48	0.72	0.62	0.54		
X56	S	1.68	3.32	0.6	0.7	0.6	0.9					
X57	S	1.47	3.00	0.6	0.9	0.8	0.6					
X61	S	1.15	2.12	<.6		0.55	0.49	0.53	0.52	0.50		
Y50	S	1.66		0.7	1.0	0.6	0.7					
Y56	S	1.38	2.76	0.5	0.5	0.5	0.5					
Z53	S	1.78	2.15	1.1	0.9	1.0	0.9					
Z60	S	1.14	1.79	0.4	0.3	0.3	<0.2					
AA44	S	1.62	4.17	0.8	0.9	1.0	0.8					
AA45	S	1.44	4.17	0.7	1.4	1.0	0.7					
AA49	S	1.3	41.2	0.4	0.9	0.6	0.4					
BB53	S	1.03	1.47	0.70		0.46	0.46	0.53	0.43	0.39		
BB55	S	0.58	1.34	0.11		0.53	0.44	0.56	0.59	0.46		
BB60	S	0.93	1.31	0.3	0.3	0.3	0.3					
CC43	S	1.1	5.04	0.14		0.70	0.65	0.12	1.1	0.93		
DD39	S	1.28	3.50	<0.9		0.70	.064	1.1	.094	.093		
DD41	S											
DD45 (QC)	S	1.21	4.58	.090	3.6	0.90	<0.39					
DD45	S	1.43	7.54	1.1		0.73	0.63	2.6	2.1	2.2		

APPENDIX K
(Continued)

Grid Location	Sample Type: Soil/Sediment or Water	U-238 (pCi/g)*	Th-232 (pCi/g)	Ra-226 (pCi/g)	Ra-228 (pCi/g)	Pb-214 (pCi/g)	Bi-214 (pCi/g)	Th-228/A (pCi/g)	Pb-212 (pCi/g)	Tl-208 (pCi/g)	Gross Alpha (pCi/L)	Gross Beta (pCi/L)
DD47	S	1.01	1.84	<0.6		0.50	0.44	0.54	0.47	0.48		
DD50	S	1.00	2.43	0.84		0.49	0.47	0.50	0.44	0.54		
EE36	S	1.51	4.41	0.75		0.87	0.77	0.99	0.86	0.80		
EE38	S	1.38	2.11	0.6	0.3	0.6						
EE47	S	1.03	3.00	<0.6		0.69	0.62	1.0	0.99	0.81		
EE47 (DUP)	S					0.92	0.82	3.2	2.5	2.6		
EE54	S	0.86	1.24	0.2	0.2	0.2	0.2					
FF53	S	0.90	1.50	0.89		0.44	0.42	0.S6	0.53	0.47		
FF56	S	1.14	1.31	0.94	0.5	0.5	0.5					
FF56 (QC)	S	1.11	1.47	0.5	0.4	0.5	0.4					
GG43	S	0.76	1.66	<0.7		0.54	0.45	0.46	0.47	0.45		
GG45	S	0.95	1.77	0.98		0.52	0.45	0.70	0.62	0.59		
HH50	S	1.13	1.58	<0.7		0.51	0.44	0.56		.04		
HH53	S	1.06	2.57	1.1		0.57	0.616	0.69	0.65	0.72		
Settling Pond, SE	S	1.26	2.19	1.3	0.7	1.1	1.3					
Settling Pond, E	S	2.77	2.59	4.4	4.0	4.9	4.4					
Settling Pond, SW	S	5.15	1.67	1.4	1.0	1.7	1.4					
Settling Pond, W	S	1.93	4.03	2.2	0.6	2.2	2.2					
Settling Pond, N	S	3.06	2.89	0.6	<0.6	0.5	0.6					
0+10, 10L	S	5.65	5.1	21	22	24	21					
-0+10, 10L	S	5.65		21	22	24	21					
-0+20	S	1.75	3.17	0.8	1	0.8	0.8					

APPENDIX K
(Continued)

Grid Location	Sample Type: Soil/Sediment or Water	U-238 (pCi/g)*	Th-232 (pCi/g)	Ra-226 (pCi/g)	Ra-228 (pCi/g)	Pb-214 (pCi/g)	Bi-214 (pCi/g)	Th-228/A (pCi/g)	Pb-212 (pCi/g)	Tl-208 (pCi/g)	Gross Alpha (pCi/L)	Cross Beta (pCi/L)
-0+30	S	4.20		3.1	8.2	4.2	3.1					
-0+50	S	1.36	1.94	1.6	<1.1	1.3	1.6					
-0+50 (QC)	S	1.63	9.56	14	<11	14	<7.6					
-0+60	S	3.14	3.41	19	18	21	19					
-0+90	S	2.10	2.61	17	14	18	17					
-3+50 (QC)	S	1.63		14	<11	14	14					
0+20	S	2.57	1.38	2.4	1.6	2.6	2.4					
0+60, R	W	0.17	<0.079	0.71	<3.9	<9.2	<11				1.3	2.6
0+30, 10L	S	0.96	1.11	0.7	<0.7	0.8	<0.8					
0+60, L	W	1.98	1.48	15.2	9.9	10.4	9.0				86	65
0+100, 10L	S	5.71	8.86	34	30	36	34					
1+10	W	0.47	0.53	1.63	<3.9	9.0	10.0				9.9	10
1+10R	W										0	1.7
1+10L	W	0.42	<0.06	0.8	3.3	6.0	<5.6				1.5	1.8
1+10, 10R	S	1.92	2.34	4.7	.54	6.4	4.7					
1+20	S		2.63	7.0	4.2	7.4	7.0					
1+50, 10R	S	1.27	1.56	2.1	4.2	4.3	4.2					
1+60	W	0.18	0	0.69	0						7800	3600
1+80, 10R	S	0.89	1.62	1.9	2.8	4.4	3.8					
1+80, 10L	S	1.18	1.97	0.6	1.0	0.9	1.0					
1+100, 10L	S	2.55		12	8.1	13	12					
2+20	W	6.3	6.0	10.32	30.9	<2.1	<3.2				323	221

APPENDIX K
(Continued)

Grid Location	Sample Type: Soil/Sediment or Water	U-238 (pCi/g)*	Th-232 (pCi/g)	Ra-226 (pCi/g)	Ra-228 (pCi/g)	Pb-214 (pCi/g)	Bi-214 (pCi/g)	Th-228/A (pCi/g)	Pb-212 (pCi/g)	Tl-208 (pCi/g)	Gross Alpha (pCi/L)	Gross Beta (pCi/L)
2+20R	W	1.52	0.81	9.67	7.8	<8.8	<8.7				23	22
2+20L	W	6.1	5.72	33.11	36.3	59.9	46.0				247	239
2+20, 10R	S	2.67	2.93	<1.4	<1.0	<0.8	<1.0					
2+30, 10R	S	2.37	4.11	12	6.2	14	12					
2+60, 10L	S	1.10	1.31	0.5	0.3	20.7	0.5					
2+70	S	2.25	3.73	11	4.6	12	11					
2+80, 10L	S	1.03	1.11	0.4	0.3	0.5	<0.3					
2+90, 10L	S	0.77	1.68	0.6	0.8	0.8	0.6					
3+80, 10R,(QC)	S	1.38	1.51	8.1	3.8	8.2	8.1					
LOC-6	S			1.2		0.53	0.47	0.50	0.65	0.47		
BACKGROUND 1	S	0.83	1.48	^0.6	0.5	0.7	0.0					
BACKGROUND 2	S	1.38	0.28	1.0		0.51	0.47	0.55	0.47	0.44		
BACKGROUND 3	S	1.37	1.91	0.82		0.20	0.19	0.21	0.33	0.29		
BACKGROUND 4	S	0.92	1.68	<0.5		0.30	0.28	0.44	0.34	0.32		
BACKGROUND 5	S	1.04	1.19	0.85		0.32	0.31	0.43	0.42	0.27		
BACKGROUND 6	S	0.42	1.35	0.81		0.38	0.31	0.37	0.37	0.26		
J76.5 (BACKGROUND)	S	0.86	1.71									
176.5 (BACKGROUND)	S	0.99	1.87									

* pCi/L for water samples

Appendix 19.7 - SSAB Meeting Minutes and Transcript

SITE SPECIFIC ADVISORY BOARD
Shieldalloy Metallurgical Corporation

Minutes from August 15, 2003 Meeting

Attendance: (see attached sign-in sheet)

David R. Smith - SMC
C. Lee Harp, Esq. - Arter and Hadden (facilitator)
Carol D. Berger, C.H.P. - IEM (technical consultant to SMC)
Loretta Williams - Newfield resident
Donna L. Gaffigan - NJDEP representative
Nancy W. Stanley - NJDEP representative
Rick Westergaard - Mayor
(see attached sign-in sheet)

Discussion: (see attached agenda)
Welcome, introductions, sign-in, and a brief discussion on the purpose of meeting was delivered by Lee Harp.

David Smith provided a brief introduction to SMC, including its history, its licensing status and the current decommissioning activities, followed by a brief walking tour and visit to the Storage Yard. *The following handout was provided and attached to these minutes: Background information on SMC*

Carol Berger gave an introduction to the concepts of radiation and radioactivity, with emphasis on definitions, units (i.e., the "millirem"), typical background radiation exposures (U. S. Average is 360 millirem), the regulatory dose limits for license termination for unrestricted use (25 millirem) and restricted use (100 millirem), and radiation-related risks (no demonstrable risks below 10,000 millirem). *The following handouts were provided and attached to these minutes: Presentation Outline ("Introduction to Radiation and Radioactivity"), a brochure on "Radioactivity Basics", and a wehcard showing the address of a web site where more information on radiation and radioactivity can be found.*

The regulations associated with decommissioning in general and public involvement in particular was provided and summarized by Carol Berger, with emphasis on those pertaining to stakeholder and public involvement. *The following handouts were provided and attached to these minutes: Presentation Outline ("Purpose of the Site Specific Advisory Board") and USNRC decommissioning regulations.*

Lee Harp discussed the role of the SSAB during decommissioning of the Newfield site. *The following handout was provided and attached to these minutes: "Requirements of 10 CFR §20.1403(d)".*

David Smith presented the three decommissioning options currently being evaluated with respect to radiological and economic impacts (ALARA analysis). These are: "No Action", packaging and shipping all residual radioactivity to the Envirocare disposal site in Utah, and "in-situ" disposal of the residual radioactivity within the Storage Yard under an engineered cap.

Donna Gaffigan asked about "intermediate" options, such as sale of the baghouse dust in concert with off-site disposal. David Smith stated that there are no feasible intermediate options, and then presented SMC's parallel effort to identify recycle/reuse possibilities for the slag and baghouse dust, what has been done to date (slag fluidizers, shielding, shielding constituents, high-strength concrete, dry cask storage for spent nuclear fuel, concrete admixtures), and what is currently being pursued (slag fluidizers, artificial reefs). Additional information on the use of the slag in the construction of artificial reefs and as an amendment to steel manufacture was provided. *The following handout was provided and attached to these minutes: N.J Reef News, 2001 Edition.*

A number of preliminary key issues (summarized below) were discussed. However, there was insufficient time to prepare a complete listing of SSAB interests in the Newfield decommissioning process. Therefore, first meeting of the SSAB was closed with a mutual agreement to hold a follow-up meeting in September of 2003.

Key Issues and Questions to be Addressed:
o(This is a preliminary listing. A more definitive listing will be prepared at the next meeting of the SSAB. SMC will respond to each item, and the item and SMC's response will be incorporated into the decommissioning plan.)

What is the time frame associated with any beneficial reuse options and why has there been no beneficial re-use yet found for the radioactive slag within the past 5 years?

No one knows what future deyelopment issues in the Newfield area might arise over the next 1,000 years, thus it is difficult to make decisions on decommissioning.

Is SMC committed to in-situ disposal of the residual radioactivity or are alternatives still under consideration?

A waste broker (American Ecology) provided a preliminary disposal cost for the slag and baghouse dust at Newfield to a member of the SSAB.

Has an environmental impact stateinent been prepared? If not, is it necessary to prepare one?

How does the SSAB role fit into the typical public involvement role and opportunities for comment under CERCLA?

The recent drop in worker population and the reduction in commercial activities at SMC and the previous bankruptcy filing raises the question about how long SMC will remain a business entity in Newfield over the long term, thus it is not clear how they can possibly remain responsible for the site, and what would happen to the residual radioactivity (and remaining decommissioning funds) at that time.

Is SMC in favor of finding a useful purpose for the subject material if one can be found?

It is doubtful that anyone other than SMC would build a business at the Newfield site for fear of lawsuits.

No one really knows whether there are health risks associated with the radioactivity at the Newfield facility, therefore it is best to simply ship it off for disposal.

It is difficult to accept institutional controls that are supposed to last for 1,000 years.

Has SMC posted enough financial assurance to assure "unrestricted release" of the site if the institutional controls should fail over time or if SMC defaults on decommissioning commitments?

Can the make-up of the SSAB be made broader? (It is, and that others did not accept invitations to attend.)

The SSAB would like more time to develop the list of key issues and concerns, but does not want to be the justification for delaying any submissions (i.e., the August 29, 2003 ALARA analysis) to the USNRC.

It is unclear whether the use of the Newfield slag in the construction of artificial reefs would be acceptable to the State of New Jersey. The SSAB ~~appeared to favor~~ that decommissioning option. delete (D S [illegible])

The health effects on fish and vertebrates if the slag is used as an artificial reef might need to be investigated.

The SSAB wants to receive a copy of the pending ALARA analysis as well as the draft decommissioning plan.

The SSAB would like to receive sections of the August 28, 2002 decommissioning plan that describe the current radiological and physical conditions of the site.

The SSAB would like to learn more about the use of Newfield slag in the steel manufacturing process.

Action Items and Responsible Individuals:
Distribute minutes (Carol Berger)

Schedule next meeting of the SSAB (David Smith)

Distribute information on the radiological environment at the Newfield facility as described in the most recent version of the decommissioning plan (Carol Berger)

Determine whether there are State (NJ) regulations that would ban the use of Newfield slag in the construction of artificial reefs (Donna Gaffigan)

Distribute information on the use of slag in steel manufacturing (David Smith)

PARTICIPANT SIGN-IN SHEET

Shieldalloy Metaliurgical Corporation SSAB: Kick-off Meeting at the SMC Newfield Facility				
Date: August 15, 2003		Facilitator: Charles L. Harp, Esq.		
Your Name (Print)	Your Signature	Your Address	Your Telephone Number (with area code)	Your e-Mail Address
Charles L. Harp IV		[redacted]	[redacted]	[redacted]
CAROL D BERGER		[redacted] Gaithersburg MD	[redacted]	[redacted].com
Rick Westergaard		[redacted] Newfield, NJ 08344	[redacted]	[redacted]
Nancy Stanley		[redacted] Trenton NJ 08625-0415	[redacted]	[redacted].nj.us
Donna L Goffigan		[redacted] Trenton NJ 08625-0035	[redacted]	[redacted].nj.u
David R Smith		SMC Newfield NJ	[redacted]	[redacted]
Loretta Williams		[redacted] Newfield NJ 08344	[redacted]	

SITE SPECIFIC ADVISORY BOARD
Shieldalloy Metallurgical Corporation

Kick-off Meeting
August 15, 2003, 11:00 a.m. to 1:00 p.m.

Welcome, introductions and sign-in and brief purpose of meeting	C. L. Harp
Introduction to SMC	D. R. Smith
Brief facility tour	D. R. Smith
Introduction to Radiation and Radioactivity	C. D. Berger
Purpose of SSAB	C. D. Berger
How the SSAB process works	C. L. Harp
How the SSAB interests and issues will be addressed as part of the decommissioning process	C. L. Harp
Decommissioning the Newfield Facility	D. R. Smith and C. D. Berger
Listing of SSAB input, interests, and concerns	C. L. Harp
Discussion and clarification of issues	C. L. Harp
SSAB determination as to whether listing is final	C. L. Harp
Summary and review of action items	C. D. Berger
Adjourn	

COPIES OF HANDOUTS

Shieldalloy Metallurgical Corporation

Site Specific Advisory Board Meeting
August 15, 2003

Newfield, New Jersey

Background

Shieldalloy Metallurgical Corporation (SMC) purchased the original property in 1952. The property had previously been owned and operated by South Jersey Specialty Glass Company. SMC's initial production was grinding of metal and metal alloys into powders. One of the primary customers of the metal powders was the welding rods industry. They used the metal powders to coat and shield the welding rod and hence SMC's name [shield alloy] comes from this original application of our first products.

In the late 1950's and early 1960's SMC was beginning to manufacture some of its own metal and metal alloys at the Newfield plant. The manufacturing process used various metal ores, limestone, aluminum powder and a variety of other raw materials in the smelting or manufacturing process.

In 1963 SMC applied for and received a license from the Atomic Energy Commission (AEC) to use ores that contained low levels naturally occurring uranium and thorium (classified as 'source material') to manufacture ferro columbium (an iron and niobium alloy). This original AEC license was later reissued by the U.S. Nuclear Regulatory Commission (U.S. NRC) and is the current license that SMC uses to receive, handle, possess, process, store and ship source materials – SMB-743.

In 1990 SMC discontinued the smelting of chromium metal which had been one of SMC primary smelting operations. The company continued its smelting of ferro columbium and ferro vanadium alloy and also manufactured other ferro alloys through a melting process versus the sinelting of ores.

Because of a variety of economic reasons SMC has been transferring the smelting and melting operations to sister companies outside of the U.S. over the last several years. The company has also been purchasing metals and metal alloys from other manufacturer (primarily from outside of the U.S. also). SMC Newfield's current manufacturing and production processes are grinding of metals and metal alloys into powders and also the manufacturing of compacted metal products – briquettes and Altabs.

Because SMC has discontinued of all the furnace operations including the smelting of ferro columbium, SMC is required by NRC and our license to the decommission plant and terminate the operating license. SMC is planning to decommission a portion of the plant for restricted release/use and obtain a possession only license from NRC as the provisions for institutional controls are maintained.

INTRODUCTION TO RADIATION AND RADIOACTIVITY

Carbl D. Berger, C.H.P.

August 15, 2003

1. Atoms - The building block of life
2. Definition of radiation and radioactivity
3. Where radiation and radioactivity are found
4. Assessing the risks of radiation exposure
5. Questions?

ITS A QUESTION OF . . .

Integrated Environmental Management, Inc.
Vol. 1 No. 1
September, 1995

Radiation and Radioactivity

What is an Atom?

Everything in the world, and everybody in the word, is composed of different types of matter (chemical elements). The smallest part of each element is called the "Atom". An atom is so small that it can be seen only with the most powerful microscope. But the atom is the core of every substance in the universe.

Are there different types of atoms?

The type of atom is unique for each element, such as gold, silver, lead, tin, radium, carbon, and thorium. Our bodies are made mostly of hydrogen, carbon, oxygen, and calcium atoms. The light fixtures in this room are made of some type of metal atom. The air, as you know, is made of oxygen, hydrogen, nitrogen, and other atoms. Water is hydrogen and oxygen.

What is radioactivity?

Sometimes the center of an atom (its nucleus) has too much energy in it. An atom cannot hold this energy forever. Sooner or later, the atom must get rid of the excess energy and return to its normal (stable) state. Atoms with too much energy in their nuclei are called "radioactive". They get rid of their excess energy by emitting radiation. Some radioactive atoms exist naturally; others are made artificially.

What is radiation?

A radioactive atom gives off radiation to get rid of excess energy. The radiation can be in the form of particles moving at high speeds, or pure energy.

Radiation is a broad term which includes such things as heat, light, radiowaves, microwaves and other familiar forms of energy. When radiations are emitted from an atom they are traveling at very high speeds. This means that they have a lot of "energy". When the radiations collide with something, they deposit some or all of that energy in the thing with which they have collided.

You can compare the radiations from an atom with rays from the sun. When the rays from the sun reach our bodies they deposit their energy and the warmth we feel is the sun's rays' energy. When radiation from a radioactive atom penetrates an object, it deposits its energy in that object just like the sun's rays' deposit energy in our bodies.

What is a "unit"?

A unit is a way in which we express measurements. For example, an "inch" is a unit of length. A "second" is a unit of time. A "pound" is a unit of weight.

What is a "rem"?

A "rem" is a unit of radiation dose. It is typically used to describe how much radiation "energy" is deposited in someone or something. If our body absorbs radiation energy equivalent to about two-millionths of a calorie, we say we have received a "rem" of radiation dose.

Is a rem a large radiation dose?

When compared to the types of radiation doses people commonly receive every day of their lives from natural background radiation, a rem is a large dose . . . just like a "ton" is a large weight when we're talking about toothpicks, and a "mile" is a large length when we're talking about hot dogs.

Are there smaller units than a rem?

Yes. That unit is the "millirem". A millirem is one thousandth (1/1,000) of a rem. An even smaller, but frequently

more practical unit is the "microrem", which is one millionth (1/1,000,000) of a rem.

What does the term "rate" mean?

A rate is the amount of a particular unit of measurement that occurs over some specific time period. For example, "miles per hour" is a rate of speed, or the distance traveled in one hour. Likewise, "millirems per hour" is a dose rate, or the amount of radiation energy deposited in a one hour period of time.

What is a "curie"?

A "curie" is a unit of radioactivity. It tells us how many radioactive atoms in particular collection of atoms are giving off radiation. Just like a "ream" of paper in a drawer tells us that there are 500 sheets in the drawer, a curie of radium in a container tells us that there are 37,000,000,000 radium atoms giving off radiation.

Is a curie a lot of radioactivity?

Yes. Compared to the amount of naturally-occurring radioactivity in our bodies, it is a very large amount -- about ten million times larger. Therefore, it is sometimes more convenient to use units like "picocuries". A picocurie is one trillionth of a curie.

Is there an easy way to distinguish "millirems" from "picocuries"?

Yes there is. A fireplace with a nice fire burning in it is a good way to explain the difference between these two terms. In a fireplace, the burning wood or coals radiate heat. In this case, the amount of burning wood (fuel) in the fireplace is analogous to the number of picocuries of radioactivity. The amount of heat (energy) given off by the fireplace is analogous to the number of millirems of radiation energy.

Is there another example that is an analog to the term "picocurie"?

Yes. This time, picture yourself sitting in a stadium watching a sporting event. When something exciting happens, you are likely to see a lot of flashes coming from the stands where people are taking pictures. If you could somehow count the number of flashes over a particular time period - say 10 minutes - you would know the "flash rate" from all the cameras that are in the stadium. This measurement is similar to how the amount of radioactivity in a particular collection of atoms is determined. In this case we count the bursts of radiation (flashes) being given off by the atoms (cameras) per unit time (10 minutes). When we see 22 bursts in 10 minutes, we know we have measured a picocurie of radioactivity.

How does the term "millirems" fit into this analogy?

Let's say that while you are in the stadium, you take out your light meter and measure how much light is coming from the flashes in the stand over a one hour period. The amount of light measured by the meter is a measurement of the amount of "energy" coming from the cameras in the stadium. This measurement is similar to the radiation dose (energy) from a collection of atoms (cameras) per unit time (one hour). The units of this measurement would be "millirems per hour".

What does the term "picocurie per gram" mean?

This refers to the amount of radioactivity in a particular solid substance. Picture a one-ton batch of concrete that contains 1,000 pounds of gravel, 500 pounds of cement, and 500 pounds of water. To describe this particular mix of concrete, one might say it contains "500 pounds per ton" of cement. This means that for every pound of concrete, there will also be a quarter of a pound of cement present. Similarly, if you wished to describe the amount of radioactivity that typically exists in soil throughout the United States, you would say that it contains about "one picocurie per gram" of radium, one picocurie per gram of thorium, and a host of other radioactive elements. This means that for every gram (about 0.002 pounds) of soil, there will also be one picocurie of radium and one picocurie per gram

of thorium present, along with the rest of the radioactive elements commonly found in soil.

What does the term "picocurie per liter" mean?

This refers to the amount of radioactivity in a liter (about a quart) of liquid substance, such as water.

Water direcdy out of the tap contains about 0.01 "picocuries per liter" each of uranium, radium, and radioactive lead. It may also contain between 100 and 400 picocuries per liter of radioactive hydrogen, between 100 and 500 picocuries per liter of radioactive carbon, between 10 and 30 picocuries per liter of radioactive beryllium, and a variety of other radioactive elements such as aluminum, chlorine, silicon, lead, bismuth, polonium, and argon.

It can contain several hundred to several thousand picocuries per liter of radon gas, particularly if you get your drinking water from a well.

Is there radioactivity in the world around us?

Yes. The earth has always been radioactive. Everyone and everything that has ever lived has been radioactive. In fact, the natural radioactivity in the environment is just about the same today as it was at the beginning of the Neolithic Age, more than 10,000 years ago.

Is there radioactivity in dur bodies?

Yes. During our lifetime, our bodies harbor measurable amounts (billions) of radioactive atoms. About half of the radioactivity in our bodies comes from Potassium-40, a naturally-radioactive form of potassium. Potassium is a vital nutrient and is especially important for the brain and muscles. Most of the rest of our bodies' radioactivity is from radioactive carbon and hydrogen.

We have about 120,000 picocuries of radioactivity in our bodies. These naturally-occurring radioactive substances expose our bodies to about 25 "millirem" per year, abbreviated as "mrem/yr".

Most radioactive substances enter our bodies as part of food, water or air. Our bodies use the radioactive as well as the nonradioactive forms of vital elements such as iodine and sodium. Radioactivity can be found in all foods. As we said before, it is even in our drinking water. In a few areas of the United States, the naturally-occurring radioactivity in the drinking water can result in a dose of more than 1,000 millirem in one year.

Are there other sources of natural radiation?

Another type of natural radiation is cosmic radiation given off by the sun and stars in outer space. Because the earth's atmosphere absorbs some of this radiation, people living at higher altitudes receive a greater dose than those at lower altitudes. In Ohio, for example, the average resident receives a dose of about 40 millirem in one year from cosmic radiation. In Colorado, it is about 180 millirem in one year. Generally, for each 100-foot increase in altitude, there is an increased dose of one (1) millirem per year.

Flying in an airplane increases our exposure to cosmic radiation. A coast-to-coast round trip gives us a dose of about four millirem.

In Ohio, radiation in soil and rocks contributes about 60 millirem in one year to our exposure. In Colorado, it is about 105 millirem per year. In Kerala, India, this radioactivity from soil and rocks can be 3,000 millirem per year, and at a beach in Guarapari, Brazil, it is over 5 millirem in a single hour. Some of the residents who use that beach receive doses approaching 1,000 millirem per year.

If you live in a wood house, the natural radioactivity in the building materials gives you a dose of 30 to 50 millirem per year. In a brick house, the dose is 50 to 100 millirem per year. And, if your home is so tightly sealed that the leakage of outside air into the home is small, natural radioactive gases (radon) can be trapped for a longer period of time and thus increase your dose.

Is there anything else?

Yes. Typical members of the US population may receive the following types of radiation exposures:

1300 millirem per year for the average cigarette smoker

650 millirem per nuclear medicine examination of the brain

509 millirem per nuclear medicine examination of the thyroid

405 millirem per barium enema

245 millirem per upper gastrointestinal tract series

150 millirem per nuclear medicine examination of the lung

110 millirem per computerized tomography of the head and body

7.5 millirem per year to spouses of recipients of certain cardiac pacemakers

6 millirem per dental x-ray

5 millirem per year from foods grown on lands in which phosphate fertilizers are used.

4 millirem per year from highway and road construction materials

2 millirem per year from the use of gas mantles

1.5 millirem from each cross-country airline trip (one way)

1 to 6 millirem per year from domestic water supplies

1 millirem per year from television receivers

0.5 millirem from eating one-half pound of Brazil nuts.

0.3 millirem per year from combustible fuels, (i.e., coal, natural gas, and liquefied petroleum)

0.2 millirem from drinking a quart of Gatorade each week

0.1 millirem per year from sleeping with one's spouse (or "significant other")

So, almost everything is radioactive, right?

Yes, radiation is everywhere. Our bodies and the world around us are radioactive. But there is no cause for alarm. These very small but detectable levels of radioactivity are natural . . . as natural as life itself. We are exposed to a constant stream of radiation from the sun and outer space. Radioactivity is in the ground, the air, the buildings we live in, the food we eat, the water we drink, and the products we use. The average person in the United States receives a dose of about 360 millirem per year from these natural sources of radioactivity as well as from typical medical radiation exposures such as x-rays.

Is a radiation dose of 360 millirem in a year harmful?

No. No effects have ever been observed at doses below 5,000 millirem delivered over a one year period. In fact, effects seen when humans are exposed to 100,000 millirem over a short time period are temporary and reversible. It takes a short-term dose of well over 500,000 millirem to cause a fatality.

Where can I obtain more Information about Radiation and Radioactivity?

There are a number of organizations and agencies that can provide you with additional information on this topic. The following is just a short listing:

Health Physics Society - (703) 790-1745

American National Standards Institute - (212) 642-4900

The American Academy of Health Physics - (703) 790-1745

Conference on Radiation Control Program Directors - (502) 227-4543

American Nuclear Society - (708) 579-8265

Nadonal Council on Radiation Protection and Measurements - (301) 657-2652

United Nations Scientific Committee on the Effects of Atomic Radiation - (800) 274-4888

In addition, Integrated Environmental Management, Inc. (IEM) has been providing information on radiation and radioactivity to businesses, government agencies, students, regulators, public officials and members of various communities for many years. Please feel free to contact IEM at 302 Westfield Road, Knoxville, Tennessee 37919, (865) 588-9180, at 8 Brookes Avenue, Suite 205, Gaithersburg, Maryland 20877, (240) 631-8990, or at 2705 N. Main St., Suite 202, Findlay, OH 45840, (419)423-4701.

Or visit our web site at http://www.iem-inc.com for even more interesting and useful information about the fascinating world of radiation and radioactivity.

PURPOSE OF THE SITE SPECIFIC ADVISORY BOARD

Carol D. Berger, C.H.P.

August 15, 2003

1. USNRC reguiations require the licensee to engage the public on a variety of regulatory matters.

2. Definitions:

   "Public" = individuals, organizations, companies, agencies and governments.

   "Stakeholders" = members of the public that are affected or perceive themselves as being affected by a decision.

3. Characteristics of the SSAB

   Requires formal membership that is representative of the broad range of public interests.

   Local and state government is crucial to ensure a broad regulatory perspective.

   The licensee (Shieldalloy) considers the SSAB to be a resource.

   Membership is fixed and should stay intact in order to conduct joint learning, review proposed actions, and provide periodic input.

   SSAB needs to focus on specific goals.

   If consensus is sought among SSAB members, there should be an allowance for minority opinions if consensus is not achieved.

   If consensus is not required, SSAB activities should produce a range of recommendations and input.

   Licensee may be at the table in either a collaborative process or simply as a resource.

4. Shieldalloy's objectives:

   Identify the public and determine how they would like to be involved in the decommissioning of the Newfield site.

   Identify public concerns and interests (i.e., what are the main concerns about the decommissioning; what issues does the public feel it is most important to be involved).

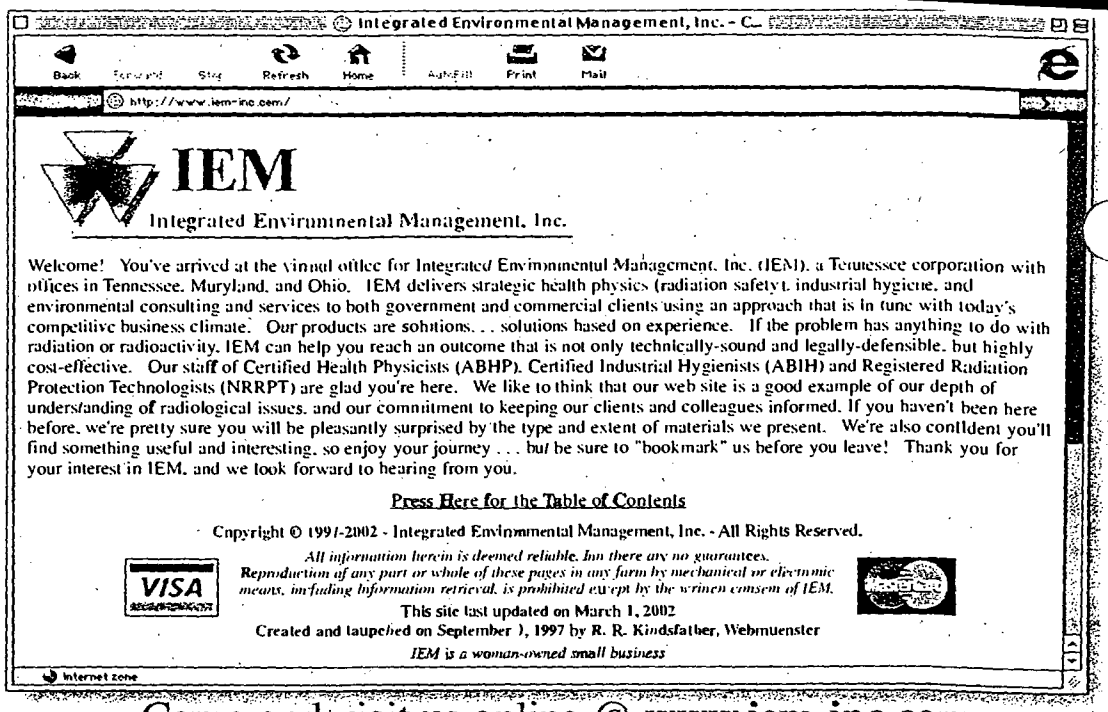
   Gather information

   Select the appropriate level of public involvement

   Include the public in planning for its involvement.

   Prepare a written public involvement plan.

   Implement an evaluation program (to be sure why the plan "is" or "is not" working, and institute corrective actions a necessary).



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Why be a regular visitor to the IEM web site?

- Because of the "Important News" section that contains new radiation-related regulations and press pieces.
- Because of the "Tool Box" section that contains a glossary, bibliography, listings of quantities and factors, position papers and more.
- Because of the "Radioactivity Basics" section that describes the concepts of radiation and radioactivity in layman's terms.
- Because of the "Links" section with its extensive but organized listing of other important radiation-related sites on the web.
- Because you can pose a technical question to a Certified Health Physicist and read some of our answers.
- Because you can subscribe to a free monthly e-Newsletter on recent developments in the radiological field.

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10 CFR 20.1401 General Provisions And Scope.

(a) The criteria in this subpart apply to the decommissioning of facilities licensed under parts 30, 40, 50, 60, 61, 63, 70, and 72 of this chapter, as well as other facilities subject to the Commission's jurisdiction under the Atomic Energy Act of 1954, as amended, and the Energy Reorganization Act of 1974, as amended. For high-level and low-level waste disposal facilities (10 CFR parts 60, 61, and 63), the criteria apply only to ancillary surface facilities that support radioactive waste disposal activities. The criteria do not apply to uranium and thorium recovery facilities already subject to Appendix A to 10 CFR part 40 or to uranium solution extraction facilities.

(b) The criteria in this subpart do not apply to sites which:

(b)(1) Have been decommissioned prior to the effective date of the rule in accordance with criteria identified in the Site Decommissioning Management Plan (SDMP) Action Plan of April 16, 1992 (57 FR 13389);

(b)(2) Have previously submitted and received Commission approval on a license termination plan (LTP) or decommissioning plan that is compatible with the SDMP Action Plan criteria; or

(b)(3) Submit a sufficient LTP or decommissioning plan before August 20, 1998 and such LTP or decommissioning plan is approved by the Commission before August 20, 1999 and in accordance with the criteria identified in the SDMP Action Plan, except that if an EIS is required in the submittal, there will be a provision for day-for-day extension.

(c) After a site has been decommissioned and the license terminated in accordance with the criteria in this subpart, the Commission will require additional cleanup only if, based on new information, it determines that the criteria of this subpart were not met and residual radioactivity remaining at the site could result in significant threat to public health and safety.

(d) When calculating TEDE to the average member of the critical group the licensee shall determine the peak annual TEDE dose expected within the first 1000 years after decommissioning.

[62 FR 39058, July 21, 1997; 66 FR 55732, Nov. 2, 2001]

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10 CFR 20.1402 Radiological Criteria For Unrestricted Use.

A site will be considered acceptable for unrestricted use if the residual radioactivity that is distinguishable from background radiation results in a TEDE to an average member of the critical group that does not exceed 25 mrem (0.25 mSv) per year, including that from groundwater sources of drinking water, and the residual radioactivity has been reduced to levels that are as low as reasonably achievable (ALARA). Determination of the levels which are ALARA must take into account consideration of any detriments, such as deaths from transportation accidents, expected to potentially result from decontamination and waste disposal.

[62 FR 39058, July 21, 1997]

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10 CFR 20.1403 Criteria For License Termination Under Restricted Conditions.

A site will be considered acceptable for license termination under restricted conditions if:

(a) The licensee can demonstrate that further reductions in residual radioactivity necessary to comply with the provisions of §20.1402 would result in net public or environmental harm or were riot being made because the residual levels associated with restricted conditions are ALARA. Determination of the levels which are ALARA must take into account consideration of any detriments, such as traffic accidents, expected to potentially result from decontamination and waste disposal;

(b) The licensee has made provisions for legally enforceable institutional confrols that provide reasonable assurance that the TEDE from residual radioactivity distinguishable from background to the average member of the critical group will not exceed 25 mrem (0.25 mSv) per year;

(c) The licensee has provided sufficient financial assurance to enable an independent third party, including a govemmental custodian of a site, to assume and carry out responsibilities for any necessary control and maintenance of the site. Acceptable financial assurance mechanisms are--

(c)(1) Funds placed into an account segregated from the licensee's assets and outside the licensee's administrative control as described in §30.35(f)(1) of this chapter;

(c)(2) Surety method, insurance, or other guarantee method as described in §30.35(f)(2) of this chapter;

(c)(3) A statement of intent in the case of Federal, State, or local Goyernment licensees, as described in §30.35(f)(4) of this chapter; or

(c)(4) When a governmental entity is assuming custody and ownership of a site, an arrangement that is deemed acceptable by such govemmental entity.

(d) The licensee has submitted a decommissioning plan or License Termination Plan (LTP) to the Commission indicating the licensee's intent to decommission in accordance with §§30.36(d), 40.42(d), 50.82(a) and (b), 70.38(d), or 72.54 of this chapter, and specifying that the licensee intends to decommission by restricting use of the site. The licensee shall document in the LTP or decommissioning plan how the advice of individuals and institutions in the community who may be affected by the decommissioning has been sought and incorporated, as appropriate, following analysis of that advice.

(d)(1) Licensees proposing to decornmission by restricting use of the site shall seek advice from such affected parties regarding the following matters concerning the proposed decommissioning--

(d)(1)(i) Whether provisions for institutional controls proposed by the licensee;

(d)(1)(i)(A) Will provide reasonable assurance that the TEDE from residual radioactivity distinguishable from background to the average member of the critical group will not exceed 25 mrem (0.25 mSv) TEDE per year;

(d)(1)(i)(B) Will be enforceable; and

(d)(1)(i)(C) Will not impose undue burdens on the local community or other affected parties.

(d)(1)(ii) Whether the licensee has provided sufficient financial assurance to enable an independent third party, including a governmental custodian of a site, to assume and carry out responsibilities for any necessary control and maintenance of the site;

(d)(2) In seeking advice on the issues identified in §20.1403(d)(1), the licensee shall provide for:

(d)(2)(i) Participation by representatives of a broad cross section of community interests who may be affected by the decommissioning;

(d)(2)(ii) An opportunity for a comprehensive, collective discussion on the issues by the participants represented; and

(d)(2)(iii) A publicly available summary of the results of all such discussions, including a description of the individual viewpoints of the participants on the issues and the extent of agreement and disagreement among the participants on the issues; and

(e) Residual radioactivity at the site has been reduced so that if the institutional controls were no longer in effect, there is reasonable assurance that the TEDE from residual radioactivity distinguishable from background to the average member of the critical group is as low as reasonably achievable and would not exceed either--

(e)(1) 100 mrem (1 mSv) per year; or

(e)(2) 500 mrem (5 mSv) per year provided the licensee--

(e)(2)(i) Demonstrates that further reductions in residual radioactivity necessary to comply with the 100 mrem/y (1 mSv/y) value of paragraph (e)(1) of this section are not technically achievable, would be prohibitively expensive, or would result in net public or environmental harm;

(e)(2)(ii) Makes provisions for durable institutional controls;

(e)(2)(iii) Provides sufficient financial assurance to enable a responsible government entity or independent third party, including a governmental custodian of a site, both to carry out periodic rechecks of the site no less frequently than every 5 years to assure that the institutional controls remain in place as necessary to meet the criteria of §20.1403(b) and to assume and carry out responsibilities for any necessary control and maintenance of those controls. Acceptable financial assurance mechanisms are those in paragraph (c) of this

section.

[62 FR 39058, July 21, 1997]

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10 CFR 20.1404 Alternate Criteria For License Termination.

(a) The Commission may terminate a license using alternate criteria greater than the dose criterion of §§20.1402, 20.1403(b), and 20.1403(d)(1)(i)(A), if the licensee--

(a)(1) Provides assurance that public health and safety would continue to be protected, and that it is unlikely that the dose from all man-made sources combined, other than medical, would be more than the 1 mSv/y (100 mrem/y) limit of subpart D, by submitting an analysis of possible sources of exposure;

(a)(2) Has employed to the extent practical restrictions on site use according to the provisions of §20.1403 in minimizing exposures at the site; and

(a)(3) Reduces doses to ALARA levels, taking into consideration any detriments such as traffic accidents expected to potentially result from decontamination and waste disposal.

(a)(4) Has submitted a decommissioning plan or License Termination Plan (LTP) to the Commission indicating the licensee's intent to decommission in accordance with §§30.36(d), 40.42(d), 50.82(a) and (b), 70.38(d), or 72.54 of this chapter, and specifying that the licensee proposes to decommission by use of alternate criteria. The licensee shall document in the decommissioning plan or LTP how the advice of individuals and institutions in the community who may be affected by the decommissioning has been sought and addressed, as appropriate, following analysis of that advice. In seeking such advice, the licensee shall provide for:

(a)(4)(i) Participation by representatives of a broad cross section of community interests who may be affected by the decommissioning;

(a)(4)(ii) An opportunity for a comprehensive, collective discussion on the issues by the participants represented; and

(a)(4)(iii) A publicly available summary of the results of all such discussions, including a description of the individual viewpoints of the participants on the issues and the extent of agreement and disagreement among the participants on the issues.

(b) The use of alternate criteria to terminate a license requires the approval of the Commission after consideration of the NRC staff s recommendations that will address any comments provided by the Environmental Protection Agency and any public comments submitted pursuant to §20.1405.

[62 FR 39058, July 21, 1997]

10 CFR 20.1405 Public Notification And Public Participation.

Upon the receipt of an LTP or decommissioning plan from the licensee, or a proposal by the licensee for release of a site pursuant to §§20.1403 or 20.1404, or whenever the Commission deems such ndtice to be in the public interest, the Commission shall:

(a) Notify and solicit comments from:

(a)(1) local and State governments in the vicinity of the site and any Indian Nation or other indigenous people that have treaty or statutory nghts that could be affected by the decommissioning; and

(a)(2) the Environmental Protection Agency for cases where the licensee proposes to release a site pursuant to §20.1404.

(b) Publish a notice in the Federal Register and in a forum, such as local newspapers, letters to State or local organizations, or other appropnate forum, that is readily accessible to individuals in the vicinity of the site, and solicit comments from affected parties.

[62 FR 39058, July 21, 1997]

(2)

Site Specific Advisory Board Meeting
Shieldalloy Metallurgical Corporation
Newfield, New Jersey
August 15, 2003

Requirements of 10 CFR §20.1403(d)

Subpart 1 of the above regulation requires Shieldalloy to seek advice, from individuals and institutions in the community who may be affected by the proposed decommissioning, regarding the following matters:

"(i) Whether provisions for institutional controls proposed by the licensee:

(A) Will provide reasonable assurance that the TEDE from residual radioactivity distinguishable from background to the average member of the critical group will not exceed 25 mrem (0.25 mSv) TEDE per year;

(B) Will be enforceable; and

(C) Will not impose undue burdens on the local community or other affected parties.

(ii) Whether the licensee has provided sufficient financial assurance to enable an independent third party, including a governmental custodian of a site, to assume and carry out responsibilities for any necessary control and maintenance of the site;

(2) In seeking advice on the issues identified in § 20.1403(d)(1), the licensee shall provide for:

(i) Participation by representatives of a broad cross section of community interests who may be affected by the decommissioning;

(ii) An opportunity for a comprehensive, collective discussion on the issues by the participants represented; and

(iii) A publicly available summary of the results of all such discussions, including a description of the individual viewpoints of the participants on the issues and the extent of agreement or disagreement among the participants on the issues;"

NJ REEF NEWS

2001 Edition

FREE COPY

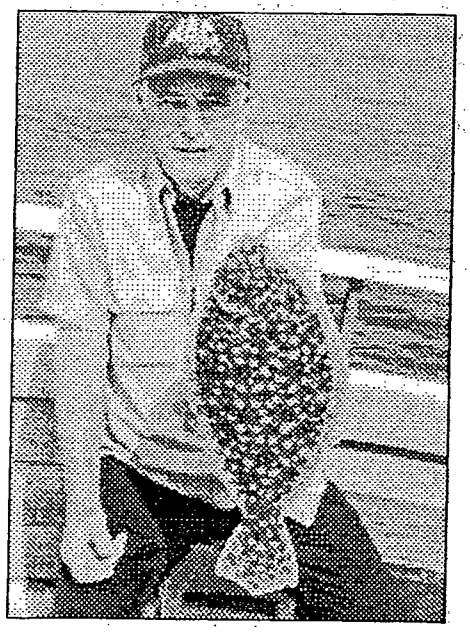
New Jersey's Recreational Reef Fishery

The Creation of a Marine Resource

New Jersey's reefs have come a long way in the past fifteen years. Prior to 1984, Sea Girt was the only active reef site off the Jersey coast and that site only had a half-dozen reef structures. Since then, the Departrnent of Environmerital Prptection's Division of Fish and Wildlife developed a network of 14 reef ites, stretching from Sandy Hook to Cape May, and constructed over 1,300 fishing and diving reefs on these sites.

Both fish and fishermen have responded to this effort by the State. Considering only fishing trips for bottom species, such as sea bass, tautog and porgy, artificial reefs accounted for only 7 percent of the private and 3 percent of the party boat trips in 1970; with only a few artificial reefs in existence, the vast majority of bottom fishing occurred on the hundreds of shipwrecks sunk by storms, accidents and wars along the Jersey coast. In 1991, following initial reef construction efforts, use of artificial reefs rose to 42 percent of the private and 20 percent of the party boat bottom fishing activity. By 2000, following extensive reef building, reefs dominated the bottom fishing action, with 90 percent of private and 47 percent of party boat trips targeting bottom species occurring on reefs created by the Division. In other words, for anglers seeking bottom species like sea bass and tautog, private boat captains went to reefs

(continued on next page)



New Jersey Department of Environmental Protection

Division of Fish and Wildlife

SPORT FISH RESTORATION

Recreational Reef Fishery

(continued from page 1)

9 out of 10 trips and party boat captains preferred reefs 1 put of every 2 trips.

New Jersey's recreational wreck/reef fishing fleet now consists of 5,401 private, 240 charter and 64 party boats. During the course of the 2000 fishing season, one-third of a million angler-trips targeted wreck/reef species throughout the State's ocean waters. In 2000, these boats caught an estimated 7.9 million wreck/reef fishes, with 4.8 million of these being taken on our 14 ocean reef sites. The most important species in the catch was sea bass (5.6 million), followed by porgy (0.5 million), tautog (0.4 million) and fluke (0.3 million); 25 other species were caught in smaller numbers.

New Jersey anglers caught 4.8 million fish on ocean reefs in 2000.

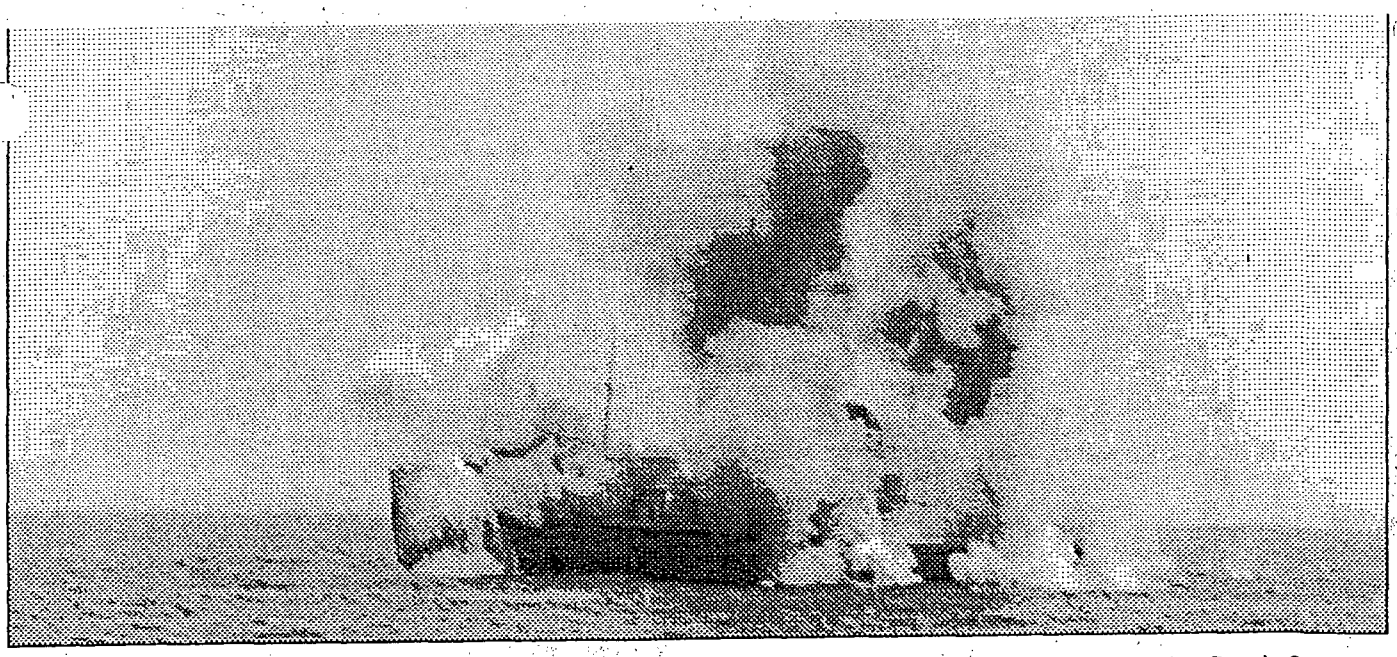
Fortunately, about 56 percent (4.4 million) of the fish caught were released alive. This season was marked by an outstanding run of sea bass that were represented by several strong year classes. For private boats, the Garden State North (28 fish/angler), Sandy Hook (24), Wildwood (23) and Atlantic City (21) reefs produced the best daily catches (includes kept and released), while Shark River (7), Great Egg (10) and Ocean City (13) reefs had the lowest catch rates. The catch rate for bottom fishing on wrecks not on reef sites was 24 fish per angler. National recreational fishing surveys estimated the State's total catch of all saltwater species averaged about 27 million fish annually during 1979-1999. Thus, the reefs accounted for 18 percent of all of the fish

caught in our state's saltwaters. In other words, roughly 2 out of every 11 fish caught along the Jersey shore during 2000 were caught on a reef built by the Division of Fish and Wildlife. This is a particularly amazing statistic given the fact that reef sites only comprise 0.3 percent of New Jersey's sea floor. "This survey demonstrates the importance of artificial reefs," said Bob McDowell, Director of the Division of Fish and Wildlife. "The time and effort the Division has invested in developing our ocean reef network is now paying big dividends for New Jersey anglers. The Reef Program is creating a valuable new marine resource that will benefit the State's marine sport fishing industry for decades to come."

This information was collected as part of an intensive survey conducted between April and November, 2000. During this time, the Division interviewed 1,055 private and charter boat captains and 1,012 party boat anglers to obtain information about their fishing activities. We appreciate the support and cooperation of all the fishermen who participated in the study.

Some DGPS Coordinates

Structure	Latitude	Longitude
Coney Island, 250' tanker	4006.285	7341.365
Capt. Etzel, 110' barge	4007.910	7356.168
Ocean Wreck Divers III, 165' tanker	4000.587	7359.555
PSI, tank	3945.016	7401.582
Jerry, 42' tug	3937.757	7400.828
VHFC, 44' CG Cutter	3933.496	7405.991
A.C. Westcoat, 60' barge	3915.540	7414.691
Peggy Diana, 56' LCM	3850.830	7442.510



Explosive charges set by the State Police Bomb Squad sank the 165-foot Navy tanker "Capt. Bart" in less than three minutes.

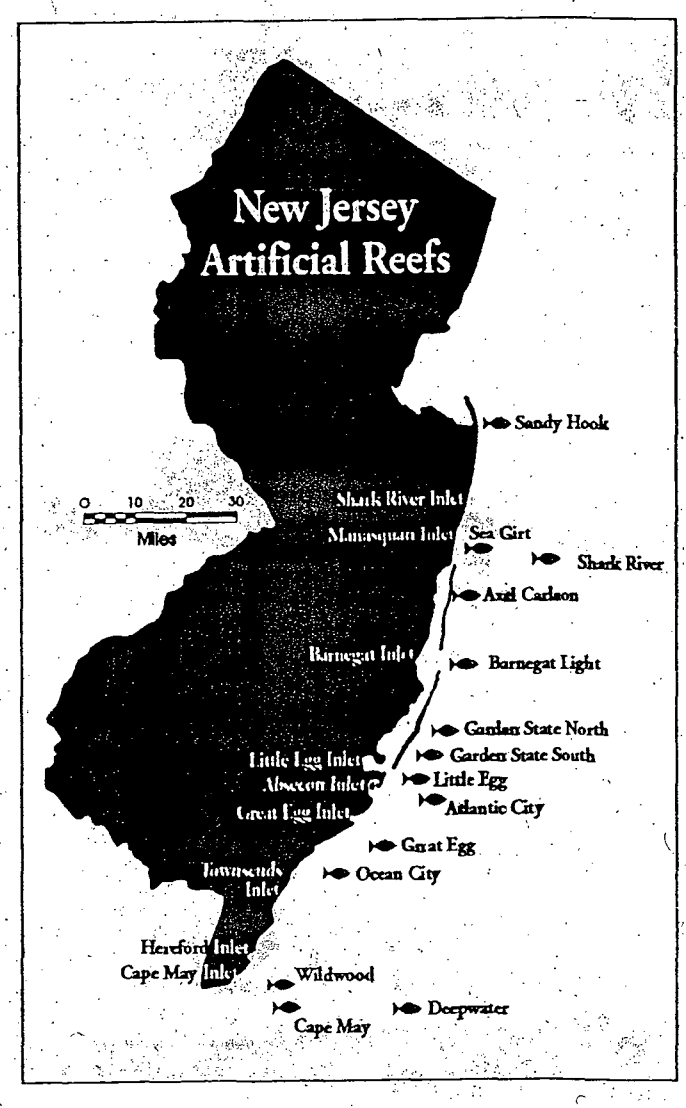
Accomplishment, 1984-2000

Since the inception of the Division of Fish and Wildlife's Reef Program in 1984, 1,374 patch reefs have been built on New Jersey's network of 14 ocean reef sites. A patch reef is a several-square-yard to several-acre reef created by sinking a ship or placing a barge load of other material on the sea floor. In 2000, 60 patch reefs were constructed.

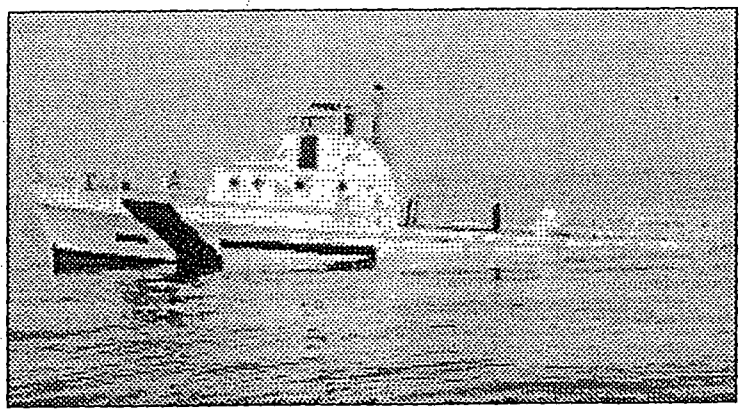
Reef Material	Patch Reefs Built in 2000	Total Patch Reefs Built 1984-2000
Tire Units	—	228
Concrete	2	180
Rock	—	392
Vessels, Barges	4	95
Army Vehicles	—	397
Reef Balls	34	49
Other	20	33
Total	60	1,374

Objectives of The Reef Program

New Jersey's Reef Program is administered by the Department of Environmental Protection's Division of Fish and Wildlife. The objectives of the program are to construct hard-substrate "reef" habitat in the ocean for certain species of fish and shellfish, new fishing grounds for anglers and underwater structures for scuba divers.

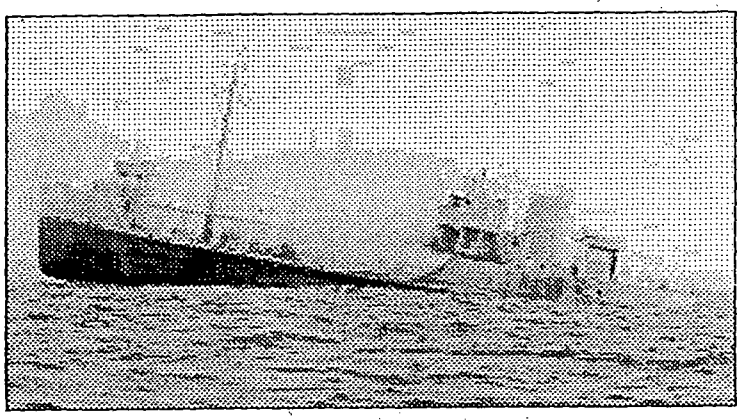


New Wrecks in Y2K



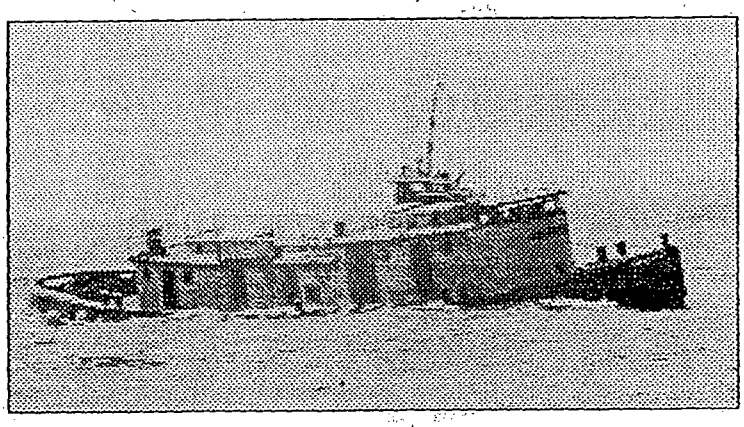
"Point Swift"

An 83' Coast Guard cutter sponsored by the Cape May County Party and Charter Boat Association was sunk on March 30 on the Cape May Reef at DGPS coordinates 3853.621 7440.600.



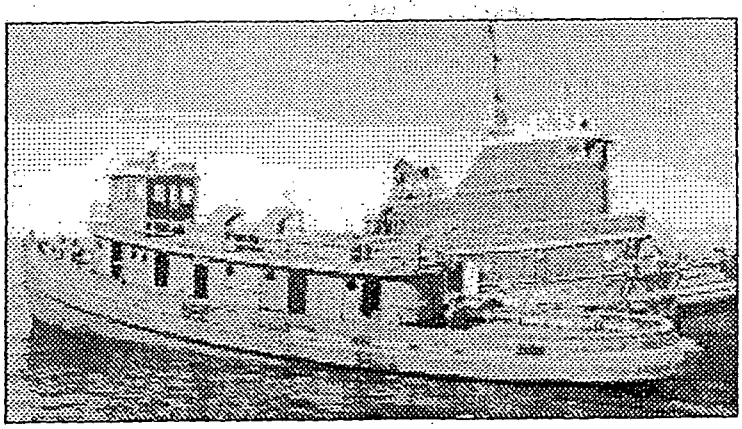
"Captain Bart"

A 174' Navy tanker sponsored by the Greater Pt. Pleasant Charter Boat Association, Crown Beer Distributors and Budweiser was sunk on June 9 on the Shark River Reef at DGPS Coordinates 4007.103 7341.479 in memory of Charlie "Captain Bart" Rozanski.



"McGurr's Tug"

An 85' canal tug sponsored by the Ocean Wreck Divers Scuba Club was sunk on September 12 on the Axel Carlson Reef at DGPS coordinates 4002.473 7359.599 in loving memory of Charles J. McGurr, Jr.



"HRFA-NJ"

A 98' tug sponsored by the Hudson River Fisherman's Association was sunk on September 22 on the Shark River Reef at DGPS coordinates 4006.883 7341.534.

Divers Joe Morrison (left to right), Terry Zeller and Charles Cole retrieved two portholes from the Red Oak, a 157-foot Coast Guard buoy tender sunk oh the Cape May Reef in 1999. Photo by Capt. Joe Morrison of the Charter boat "Black Khight".

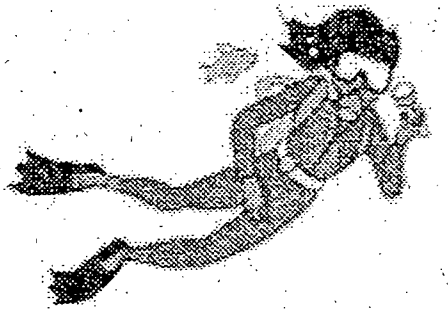
WANTED

EXPERIENCED DIVERS

The Reef Program needs experienced divers to assess the condition of shipwrecks on New Jersey reef sites. Your underwater observational skills will assist our efforts to inventory over 100 wrecks sunk on artificial reef sites. The types of information we need include depth, shipwreck orientation, hull condition, diver hazards, and more. The ultimate goal of this project is to prepare a book on shipwreck vital statistics for use by divers and fishermen. Each participating diver will be credited in the book.

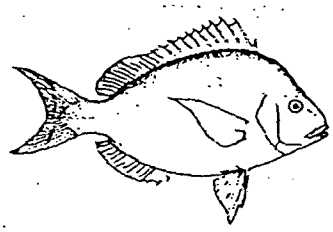
If you would like to help, call the Reef Program at 609-748-2020. We will supply the data forms and a list of wrecks to be surveyed and their locations.

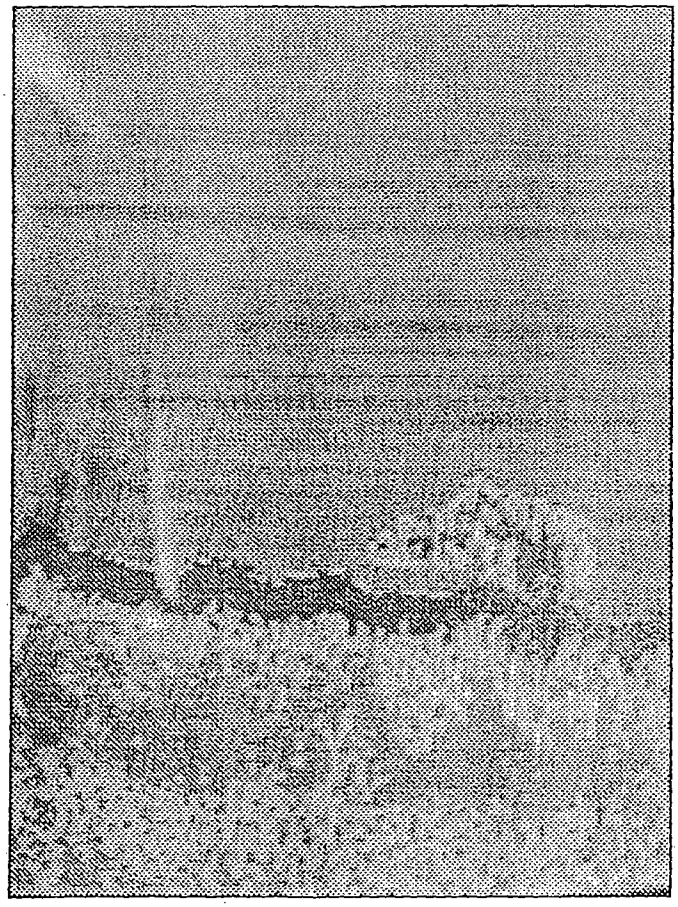
Photo by Herb Segars



Reef Plans for 2001

Reef Ball Habitats	700
Dredge Rock	250,000 cubic yards
Concrete	20,000 cubic yards
APL-31	260' Navy troop transport





What's that structure on the fathometer?

A single Reef Ball habitat on the Axel Carlson Reef as recorded by Capt. John Hawryluk of the party boat Norma K III. The habitats were covered with sea bass and porgy

How Reef Structures Benefit Marine Life

Surface Area: In the ocean, the surface area of a habitat is very important because it represents the interface between the surface upon which an animal lives and its exposure to the water column where it feeds and respires. The sandy sea floor is two-dimensional and has a relative surface area of 1. Three-dimensional reef structures, on the other hand, have height and thus more living area for the same relative unit of sea floor that they occupy. A human analogy would be a comparison between the floor space of a ranch house and that of a high-rise apartment building, both occupying the same footprint on the ground. The taller and more complicated a structure, the more surface area is available for marine life to colonize and consequently, the more productive it can be.

Firm, Stable Substrate: Unlike sand that is constantly shifting, reef structures provide firm, stable substrates for the attachment of marine life. Once anchored in place on a reef structure, marine life can withstand strong ocean currents and storms.

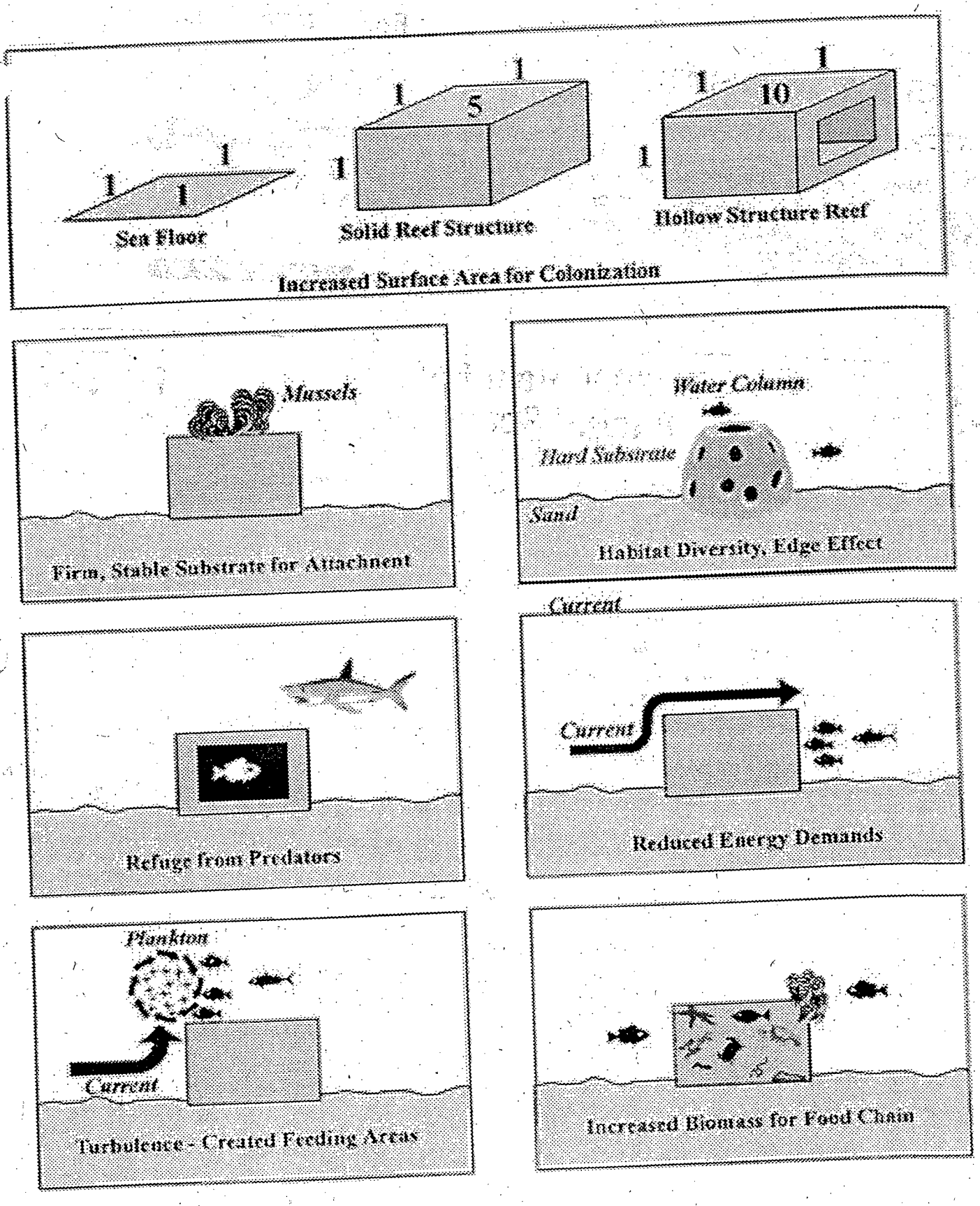
Habitat Diversity: Reef structures add a third component to New Jersey's marine environment, which now consists of sandy sea floor and water column habitats. The more diverse an environment, the more options are available to marine life and thus, the greater the diversity of species living there.

Refuge: The nooks and crevices of reef structures provide hiding places for juvenile and adult fish and other marine life to avoid predation.

Reduced Energy: The diffusion of currents by reef structures provides calm water, resting areas for fish, much like a boulder provides relief for a trout in a stream. Thus, the energy that would otherwise have been wasted upon swimming against the current can be better put towards growth.

Turbulence: The deflection of currents by reef structures can result in the creation of eddies that concentrate plankton, a prime food source for young fish. Schools of planktivorous fish often concentrate in these feeding zones.

Increased Biomass: The increased biomass (weight of marine life) associated with reef structures provides a ready source of food for fish and other marine life.



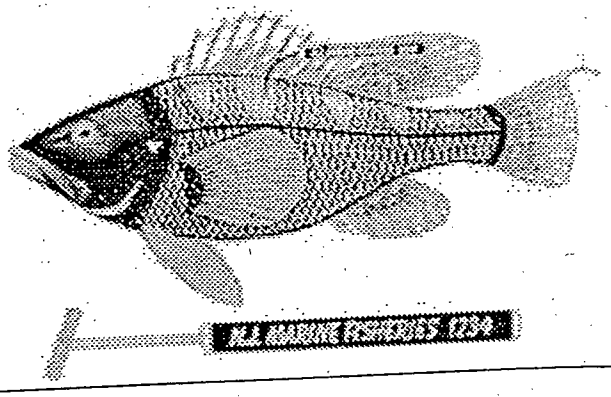
How Reef Structures Benefit Marine Life

REEF WEB SITE

ATTENTION: "CYBER DIVERS"

The New Jersey Division of Fish and Wildlife's Internet web site provides information about New Jersey artificial reefs: www.njfishandwildlife.com.

Report tagged fish



2000 Reef Ball Habitat Sponsors

Sponsor Kathi Smock created "The Wanderer Reef" for her two brothers, Tom and Don Zmuda.

Reef Ball sponsors from the New Jersey Council of Diving Clubs included Glen Gunther, Peggy Bowen, New Jersey Skin Diving Club, Ocean Wreck Divers, Al Guzzo, On the Bottom Dive Club, New Jersey Aquanauts, New Jersey Divers Association, Shore Aquatic Club, Staten Island Sport Divers, and Philadelphia Sea Horses.

Sponsor Walter Metzger created the "Hi Mom" reef.

Earl Gallup sponsored the "Rande Reef."

Fred Brucker sponsored the "Fred's Beds" reef.

Adam Siodlowski sponsored the "Adam Siodlowski" reef.

Peter O'Connor sponsored the "Ratcatcher" reef.

Marine Academy of Science and Technology Scuba Club sponsored the "MAST PTSA" reef.

Bruce Liming sponsored a reef in memory of his fishing buddy, Frank Maloney, Jr.

Gordon Wiegmann sponsored the "Top Gun" reef.

The Gordon and Barry Wiegmann families sponsored a reef in memory of "Rick" Colicchio.

Janice Kennedy sponsored the "Bob Kennedy Last Chance" reef.

Dr. Nicholas Cavarocchi sponsored the "Alexis" and "Nicky" reefs.

Cynthia Hamilton sponsored the "Woodrow W. Page" reef.

Peter Donnelly sponsored the "Rag Doll" reef.

GWL and LSL sponsored the "GWL/LSL" reef.

Jeff Meckler sponsored the "Mecklerstone" reef.

Michele Fennimore sponsored the "Len Fen" reef.

John Scalzo sponsored the "John's Glory" and "John's Bait Shop" reefs.

Lou Meier sponsored "Lou's Reef".

Carmen Russo sponsored "Russo's Ridge".

See page 11 for details on how you can sponsor a reef habitat.

Y2K Reef Adoptions

"Salty Rinse"

On August 12, 12 Reef Balls sponsored by Robert C. Shawger, Jr. were placed on the Axel Carlson Reef.

"Frank and Elizabeth Frasco Reef"

On August 25, 12 Reef Balls sponsored by Frank and Fran Frasco, Jr. were placed on the Barnegat Light Reef in memory of Frank and Elizabeth Frasco, Sr.

"Bayhead Shores Fishing Club Memorial Reef"

On August 11, 20 Reef Balls sponsored by the Bayhead Shores Fishing Club were placed on the Axel Carlson Reef as a living memorial for past members.

"Foggy Notion Reef"

On August 18, 12 Reef Balls sponsored by Don Kamienski were placed on the Barnegat Light Reef.

"Beach Haven Yacht Club Reef"

On August 20, 7 Reef Balls sponsored by the Beach Haven Yacht Club were placed on the Garden State South Reef.

"Materazzi Reef"

On August 1, 7 Reef Balls sponsored by the Village Harbor Fishing Club were placed on the Garden State South Reef in memory of the club's vice-president, Ernie Materazzi.

"Sam and Jim Blair Reef"

On August 16, 12 Reef Balls sponsored by Lois Blair were placed on the Axel Carlson Reef.

"Morrison's Marina and Restaurant Reef"

On August 20, 12 Reef Balls sponsored by Morrison's Seafood Inc. were placed on the Garden State South Reef.

"Marion and Cliff Reef"

On August 9, 30 Reef Balls sponsored by the Kleimenhagens, Rdshellis, Gablers and Figleys were placed on the Garden State South Reef in memory of Marion Figley and Clifford Ellis.

"Sea Gypsies Reef"

On August 2, 20 Reef Balls sponsored by the New York City Sea Gypsies Diving Club were placed on the Axel Carlson Reef.

"Dive Council Reef"

On August 2, 30 Reef Balls sponsored by the New Jersey Council of Diving Clubs were placed on the Axel Carlson Reef.

"Miss Dawnie Reef"

On August 20, 12 Reef Balls sponsored by Walter Herrmann were placed on the Garden State South Reef in honor of his wife's birthday.

"Rick Schmidt's Reef"

On November 8, 50 Reef Balls sponsored by family and friends were placed on the Barnegat Light Reef in memory of Rick Schmidt.

"Thai's Fin Alley"

On November 13, 12 Reef Balls sponsored by James W. Thai were placed on the Axel Carlson Reef Site.

"TNT Reef"

On August 11, 20 Reef Balls sponsored by Thomas and Theresa DePaola were placed on the Axel Carlson Reef Site.

"Edward N. Headley Reef"

On August 28, 12 Reef Balls sponsored by Tom Headley were placed on the Garden State North Reef Site.

"Jacob John Dmitruck Reef"

On November 9, 12 Reef Balls sponsored by Rose Dmitruck and John Racioppi were placed on the Barnegat Light Reef in honor of Jacob John Dmitruck.

"Kirkenir Reef"

On August 21, 12 Reef Balls sponsored by John H. Kirkenir were placed on the Garden State South Reef.

"Billy L. Sidney Reef"

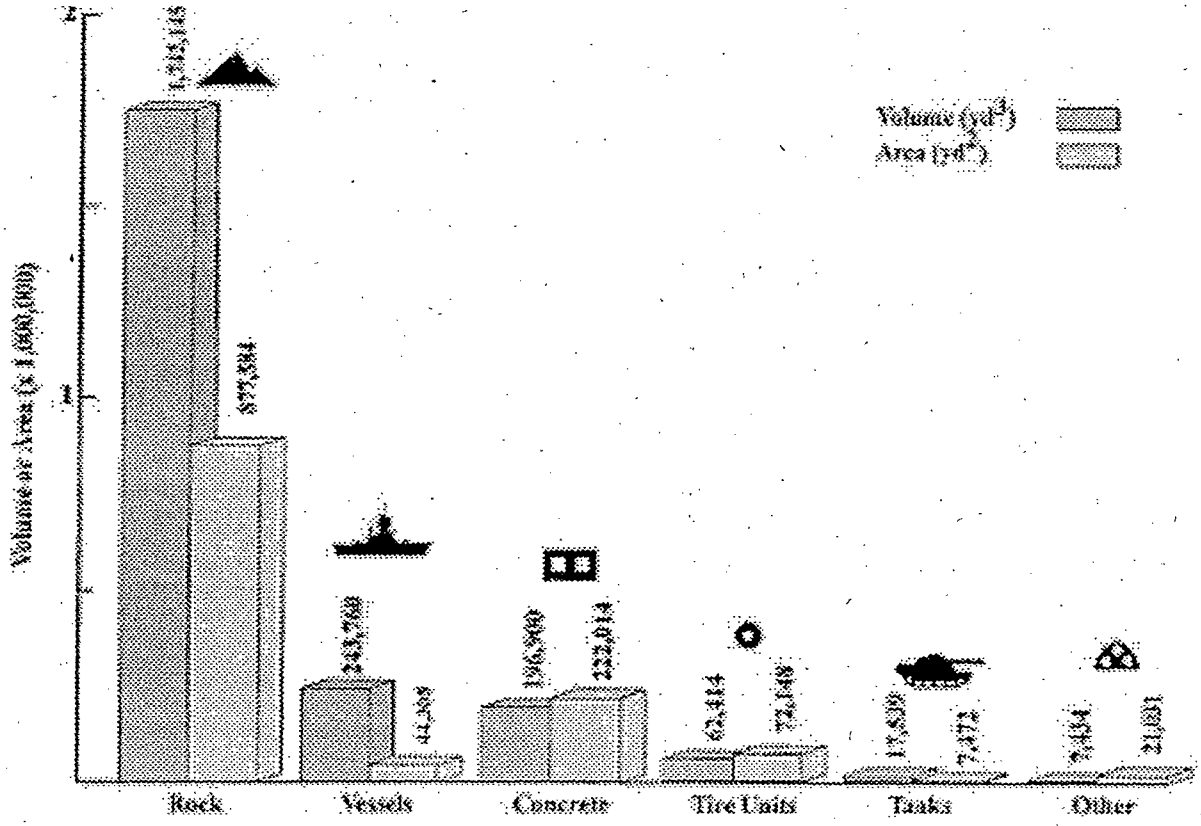
In November, 12 Reef Balls sponsored by Wanda Sidney and friends were placed on the Axel Carlson Reef in memory of Billy L. Sidney.

"Beach Haven Marlin and Tuna Club Reefs"

On August 1 and 21, 20 Reef Balls sponsored by the Beach Haven Marlin and Tuna Club were placed on two sites on the Garden State South Reef.

"Forked River Tuna Club III"

On August 18, 7 Reef Balls sponsored by the Forked River Tuna Club were placed on the Barnegat Light Reef.



The volume and area of reef structures placed in NJ reefs through 2000.

Artificial Reef Association

The Artificial Reef Association (ARA) was founded in 1991 by a group of party and charter boat captains and marina owners. The goal of the ARA is to promote reef constmction throughout the State's coastal waters. The primary function of the non-profit organization has been to raise money to help pay the costs of cleaning, preparing and towing ships and barges destined for sinking on reef sites. So far the ARA has provided funds to sink 19 vessels.

The ARA has raised most of its funds through the sale of Reef T-shirts and Reef Books. Donations from fishing and diving clubs are particularly helpful. If your club would like to help sponsor the sinking of a vessel on a reef, contact:

ARA, PO Box 16, Oceanville, NJ 08231

Sportfish Fund

The Sportfish Fund is a nonprofit foundation administered by the Fisherman Magazine. Its purpose is to raise money to promote recreational fishing opportunities. Funds donated to the Reef Program are held iri the Sportfish Fund account until they are needed to pay for reef construction activities.

PARTICIPATING AGENCIES

The following agencies have helped make New Jersey's Reef Program a success:

Federal
U.S. Fish and Wildlife Service
U.S. Coast Guard
U.S. Army Corps of Engineers
National Marine Fisheries Service
U.S. Navy and Reserves
U.S. Army and Reserves
U.S. Customs Service
U.S. Environmental Protection Agency

State
N.J. State Police
N.J. State Police, Marine Bureau
State Agency for Surplus Property
Division of Land Use Regulation
Southern State Correctional Facility
N.J. Army National Guard

County
Ocean County Bridge Department
Ocean County Department of Corrections
Cape May Municipal Utilities Authority

Municipal
Atlantic City Police Bomb Squad

ADOPT-A-REEF HABITAT

A great gift or memoriam for a fisherman or diver

CREATE AN UNDERSEA CONDO FOR NEW JERSEY MARINE LIFE

New Jersey's marine life - sea bass, lobsters, crabs and many others - need a place to live. You can help by sponsoring the placement of a concrete reef habitat on a New Jersey ocean reef. Not only will your habitat create a home for marine life to thrive, but it will also provide anglers and divers a new place to fish and explore.

A tax-deductible donation will help pay for the fabrication and transportation of your habitat(s) to a New Jersey ocean reef site.

How much does it cost and what will you receive for sponsoring ocean habitats?

Build your own ocean reef

Number of Habitats sponsored	Donation	A color chart depicting location of your habitat(s)	Listing as a sponsor in next edition of Reef News	A plaque commemorating your habitat(s)	Your reef name published on NJ reef charts
1	$125	yes	yes	no	no
3	$300	yes	yes	no	no
7	$500	yes	yes	yes	no
12	$750	yes	yes	yes	no
20	$1000	yes	yes	yes	yes

Effective January 1, 2001

Adopt-A-Reef Habitat Application

Sponsor's Name _____

Address _____

_____ Zip _____ Phone No. _____

Your habitat name" _____ " Number of habitats sponsored ____

Your donation is tax - deductible

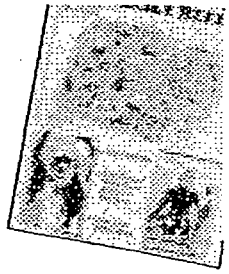
Make check payable to "Sportfish Fund" and mail to:

Adopt-A-Reef Habitat
Artificial Reef Association
P.O. Box 16
Oceanville, NJ 08231

For more information, call the Reef Program at 609-748-2020

The ultimate reef book is here!

A Guide to Fishing and Diving New Jersey Reefs



- This 64-page book is a complete directory of New Jersey's 14 ocean reef sites, which encompass over 1200 reefs.
- The book features both LORAN and DGPS charts of all of the state's 14 reef sites.
- LORAN and DGPS coordinates of every named reef are provided.
- The pages are made of durable, waterproof plastic designed for use in bad weather and at sea.
- The book can be purchased at many bait and tackle shops or ordered through the mail (an order form is provided on the back cover).
- Every fisherman and diver needs these maps to find the sunken treasure (fish and lobster) on New Jersey's 14 reef sites.
- Don't leave the dock without it.

ORDER FORM

"The Ultimate Reef Book"

Name _____

Address _____

_____

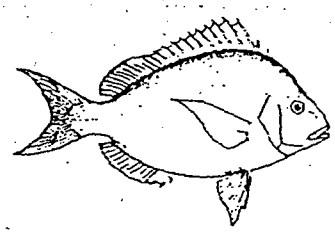
_____ Zip _____

Phone _____

Please send a copy of *"A Guide to Fishing and Diving New Jersey Reefs."* Enclosed is my check, payable to "ARA" for $20.00 ($17.95 for book plus $2.05 for postage).

Artificial Reef Association
PO Box 16
Oceanville, NJ 08231

REEF PROGRAM
DIVISION OF FISH
AND WILDLIFE
P.O. BOX 418
PORT REPUBLIC, NJ
08241



Postmaster
Address Correction
Requested

SITE SPECIFIC ADVISORY BOARD
Shieldalloy Metallurgical Corporation

Minutes of the September 19, 2003 Meeting

SSAB Members in Attendance:

David R. Smith - SMG representative
C. Lee Harp, Esq. - Archer & Greiner (facilitator)
Carol D. Berger, C.H.P. - IEM (technical consultant to SMC)
Loretta Williams - Newfield resident and public school employee
Donna L. Gaffigan - NJDEP Bureau of Federal Case Management representative
Nancy W. Stanley - NJDEP Bureau of Environmental Radiation representative
Rick Westergaard - Mayor of Newfield
Tom Daily - Newfield resident and retired school teacher
Janet Magliocco - Newfield resident and retired school teacher
George R. Sartorio - City of Vineland Health Department
Linda Graumann - Newfield resident and real estate agent
James Woods - Gloucester County Health Department
(see attached sign-in sheet)

Discussion: (see attached agenda)

Lee Harp conducted a review of the minutes of the August 15, 2003 meeting for the benefit of the new SSAB members. Included in that discussion was a review of SMC's preferred decommissioning method for the SMC site, a discussion on applicable radiation dose limits and their comparison to background values, a review of the actions SMC has taken to identify potential beneficial reuses for the slag, and the matter of durable institutional controls.

Carol Berger handed out excerpts from Rev. 0 of the SMC Decommissioning Plan dated August 28, 2002. *Sections of Report No. 94005/G-28247, (Rev. 0), "Decommissioning Plan for the Newfield Facility" that were handed out during the meeting are attached.*

Donna Gaffigan and Nancy Stanley wanted information on site conditions beyond what was provided in the foregoing handout. SMC committed to providing a full and cbmplete copy of Rev. 0 of the decommissioning plan to Nancy Stanley, Loretta Williams and Rick Westergaard (via Toni VanCamp, Municipal Clerk). However, David Smith and Carol Berger cautioned against further distribution of Rev. 0 since it was not accepted for technical review by the USNRC, and that Rev. 1 would soon be-distributed.

Donna Gaffigan offered comments on the draft minutes of the August 15th meeting, which resulted in a correction to those minutes by deletion of a statement conceming the use of Newfield slag in artificial reefs. *A copy of the final version of the minutes from the August 15, 2003 meeting is attached.*

Donna Gaffigan pointed out that NJDEP regulations governing artificial reef prohibits using "radioactive materials". Lee harp stated that his research to date indicated no such prohibition in federal regulations dealing with artificial reefs outside the three-mile limit. While it appears that the use of the slag for artificial reefs would face significant regulatory and public perception challenges, this option has not yet been ruled out by SMC. *A copy of Donna Gaffigan's Sepiember 18, 2003 letter that contains comments on the August 15th meeting minutes and regulatory information on artificial reefs is attached.*

In connection with artificial reefs, a question was raised as to whether it might be feasible for SMC to use the slag in an on-site operation to construct concrete reef elements. SMC is taking this into consideration.

Lee Harp posed the following questions for which 10 CFR 20.1403.d.1.i.A, B and C requires a response from members of the SSAB: (1) Does the institutional control proposed by SMC (i.e., maintaining a "possession only" license) provide

reasonable assurance that the TEDE from residual radioactivity distinguishable from background to the average member of the critical group will not exceed 25 millirem per year?; (2) Will it be enforceable?; and (3) Will it avoid undue burdens on the local community or other affected parties? Each member of the SSAB was given an opportunity to provide their response to these questions. In all cases, none felt that they had sufficient information to permit them to give a response, but there was some response that the concept of a "possession only" license would be preferable than traditional institutional contrbls (i.e., deed restrictions).

Lee Harp then posed the following question that also required input from the SSAB (see 10 CFR 20.1403.d.1.ii): "Whether SMC has provided sufficient financial assurance to enable an independent third party and/or government custodian of the site to assume and carry out responsibilities for any necessary control and maintenance of the site?" Each member of the SSAB was given an opportunity to provide their response to this question, but in all cases they felt that they did not have a good understanding of the amount of financial assurance necessary in order to provide a response. The group generally felt that this question really couldn't be answered until Rev. 1 of the decommissioning plan was provided to them for review.

A number of other issues (summarized below) were discussed during the meeting in addition to those required in 10 CFR 20.1403. These are summarized below. Because there is still important information to be exchanged, the SSAB agreed to meet again in approximately one (1) month, primarily to allow for time for interested SSAB members to review Rev. 0 of the Decommissioning Plan, and for the Mayor to have the engineering details of SMC's proposed on-site construction reviewed by an independent engineer. At this point, the second meeting of the SSAB was closed. David Smith of SMC will schedule the next meeting.

Other Issues and Questions to be Addressed:
Mayor Westergaard expressed disappointment that the Borough of Newfield had not received copies of reports and correspondence related to the decommissioning of the SMC site in the past. SMC confirmed that all future information of this type would be forwarded to the Borough.

There was interest expressed in setting up a repository for SMC-related documents either in the Borough Hall or the local library.

Mayor Westergaard asked about the availability of federal funds to permit the Borough of Newfield to hire its own independent consultants to review the SMC drawings and other commitments was raised. Donna Gaffigan stated that there may be such funding available from the USNRC.

New members of the SSAB were concerned that they were asked to be involved in the decommissioning planning process too late for their input to matter. SMC responded that they are actually getting involved early in the process, since their input would be used in the development of Rev. 1 of the decommissioning plan, which would be provided to them for review and comment. Once all comments were resolved, the USNRC would likely prepare an Environmental Impact Statement that would again offer opportunities for public involvement during the hearing and comment periods.

The question was raised as to whether Newfield residents currently receive any measurable dose from the residual radioactivity in the slag pile. Carol Berger gave the dose rates at the perimeter fence of SMC's property, confirmed that there was no radiological impact on the neighbors due to their distance from the site, and described the radiation monitoring program for SMC employees who have been in relatively close proximity to the slag and baghouse dust over the years, but have incurred no significant dose.

There was additional discussion on the use of slag in steel production. Loretta Williams volunteered to contact steel producers to see if they would be interested in the slag, as long as she had details on what it contained. Carol Berger pointed out that the excerpts from Rev. 0 of the Decommissioning Plan describe the content of the slag, but that attempts to generate interest in the use of slag would likely be met with lack of success. (Previous interactions with a variety of steel mills, both domestic and foreign, by SMC and representatives of SMC did not result in any potential users of the slag for reasons that were unrelated to radiological safety or licensing, but on political and perceived issues.)

The matter of the visual impact of the proposed capped slag piles on a nearby subdivision was raised. The proposed cap design and end dimensions were reviewed, as were the issues of a protective fence around the Storage Yard and the deployment of passive radiation dosimeters as part of the long-term surveillance for the site. It was noted that the top of the engineered cap would not be as high as the top of the existing slag piles.

The type of zoning for the area surroundihg the slag yard was raised in order to identify possible long-term land uses. SMC pointed out that this information is contained in Rev. 0 of the Decommissioning Plan.

Donna Gaffigan was concerned about whether SMC's preferred decommissioning methodology might constitute some fonn of NJDEP-regulated solid waste disposal.

Loretta Williams provided SMC with a recent quotation from a low-level waste processing and disposal firm (from Mr. Tim Curtain of American Ecology). That quotation was for disposal and transportation of approximately 100,000 tons of slag and baghouse dust for a cost of $19M (excluding site work), with a basis of $200 per ton. SMC stated that American Ecology is not eligible to receive SMC's slag or baghouse dust for disposal, and that quotations from Envirocare of Utah, although hard to pin down, appeared to run between $50 and 250 per cubic foot, for an approximate total disposal cost of over $100M. SMC also pointed out that "disposal" of radioactive materials at Envirocare is not necessarily permanent as contracts have a "take back" provision.

During discussions about institutional controls, the impact of the decommissioning on the economics of the Newfield area was raised, and there were concerns about what would happen if SMC discontinued operations in Newfield. SMC pointed out that they are not terminating their business in Newfield; they are only decommissioning those portions of the property that were impacted by the USNRC-licensed operations. Other non-licensed production and manufacturing activities are on-going. While SMC was not sure the employee population would ever exceed 300, they were hopeful that it would increase beyond its current level.

The question of the railroad doing a "rails to trails" conversion where the rail spur runs along the SMC property was raised. The potential impact of that action on SMC's decommissioning, and vice versa, is unknown.

The dimensions of the closed (capped) area of the Storage Yard were discussed.

The SSAB agreed to invite a representative of the USNRC to attend the next meeting of the SSAB, but the meeting would go on regardless of whether a USNRC representative was in attendance.

The issues of leachability of the radioactivity from the slag, as well as the presence of radioactivity in groundwater were raised. David Smith and Carol Berger pointed out that leachability testing on the slag demonstrates that the radionuclides therein are tenaciously retained. David Smith stated that no radioactivity other than background radioactivity has been identified in the groundwater sampling program.

Concerns were raised as to what would happen with the institutional controls if/when SMC leaves the site or sells the property. David Smith and Carol Berger expressed the view that if SMC went out of business with no successor, a perpetual "possession only" license would be in place, coupled with sufficient financial assurance to permit the USNRC to contract out the maintenance and surveillance obligations.

The issue of what the Borough would have to go through in order to make the property productive and what burdens that would impose on the community was discussed.

The issue of whether the method selected for capping the slag and baghouse dust on the SMC property is the best one available was raised.

Action Items and Responsible Individuals:
Distribute minutes (Carol Berger)

Schedule next meeting of the SSAB (David Smith)

Distribute copies of Rev. 0 of the "Decommissioning Plan for the Newfield Facility" (David Smith)

SITE SPECIFIC ADVISORY BOARD
Shieldalloy Metallurgical Corporation

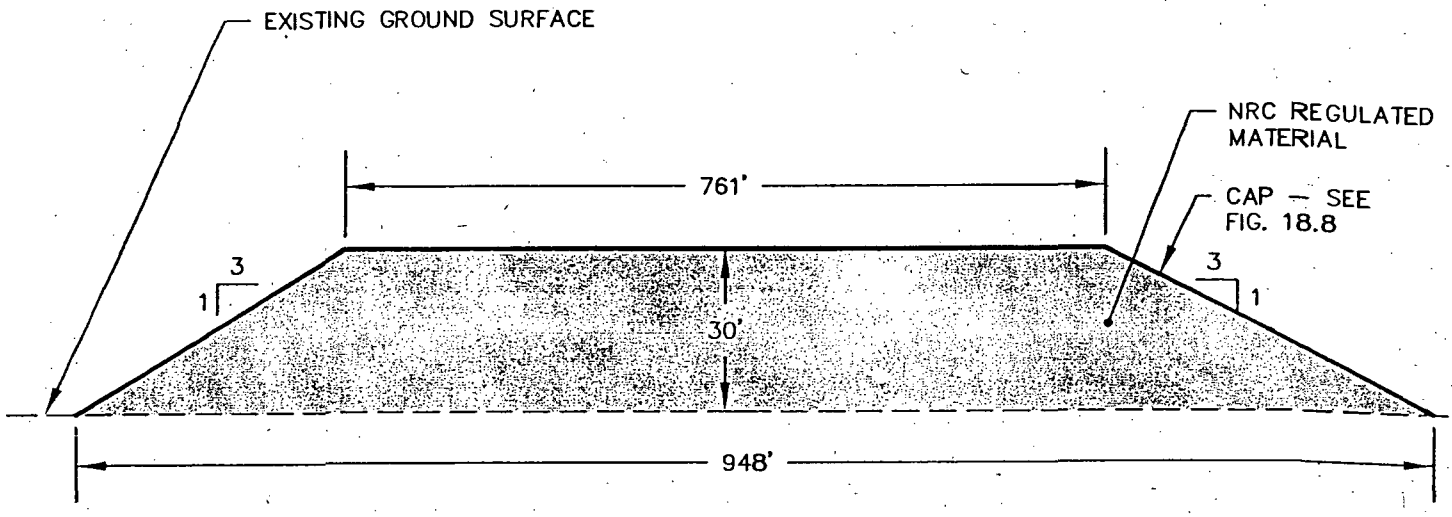
Meeting
Septeniber 19, 2003 - 9:00 a.m. to 12:00 a.m.

Welcome. introductions and sign-in and brief purpose of meeting	C. L. Harp
Review of minutes from previous meeting	C. L. Harp
Response to general questions from previous meeting	D. R. Smith/C. D. Berger
Hand-out and review of additional information	C. L. Harp
Listing of SSAB input, interests, and concerns	C. L. Harp
Discussion and clarification of issues	C. L. Harp
SSAB determination as to whether listing is final	C. L. Harp
Summary and review of action items	C. L. Harp/C. D. Berger
Adjourn	

PARTICIPANT SIGN-IN SHEET

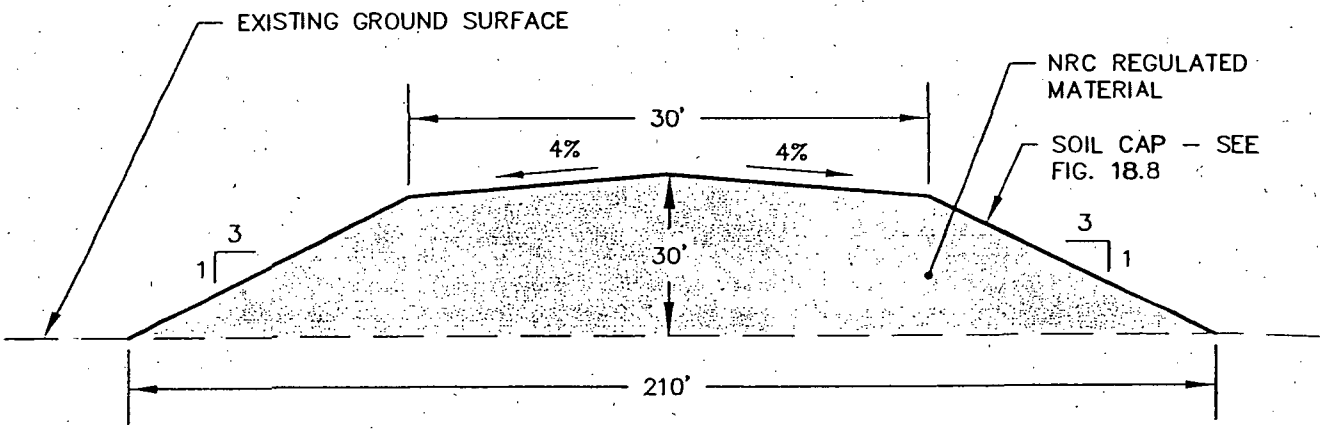
Shieldalloy Metallurgical Corporation SSAB: Follow-up meeting at the Newfield, New Jersey facility				
Date: September 19, 2003		**Facilitator:** Charles L. Harp, Esq.		
Your Name (Print)	**Your Signature**	**Your Address**	**Your Telephone Number (with area code)**	**Your e-Mail Address**
Loretta Williams	Loretta Williams	[redacted]		
		Newfield NJ 08344	[redacted]	
Donna Gaffigan	Donna Gaffigan	[redacted] Trenton NJ 08625-0028	[redacted]	[redacted] us
Nancy Stanley	Nancy Stanley	[redacted] Trenton NJ 08625-0415	[redacted]	[redacted] .us
Rick Westergaard	Rick Westergaard	Newfield 08344	[redacted]	[redacted] com
Tom [redacted]	Tom [redacted]	[redacted]	[redacted]	[redacted]
Janet Magliocco	Janet Magliocco	Newfield NJ 08344	[redacted]	
CAROL D BERGER	Carol D Berger	GAITHERSBURG MD 20877	[redacted]	[redacted] com
GEORGE R. SARTORIO	[redacted]	City of Vineland H.D. [redacted] Vld NJ 0836[illegible]	[redacted]	[redacted] org
LINDA GRAHMANN	[redacted]	[redacted] /NEWFIELD	[redacted]	[redacted] .NET
David Smith	David R Smith	[redacted] Newfield	[redacted]	[redacted] m
James Wade	[redacted]	[redacted] Clayton	[redacted]	[redacted]

COPIES OF HANDOUTS



SECTION A–A'

N.T.S.



SECTION B–B'

N.T.S.

TRC
Customer-Focused Solutions

5 Waterstds Crossing
Windsor, CT 06095
(860) 298-9692

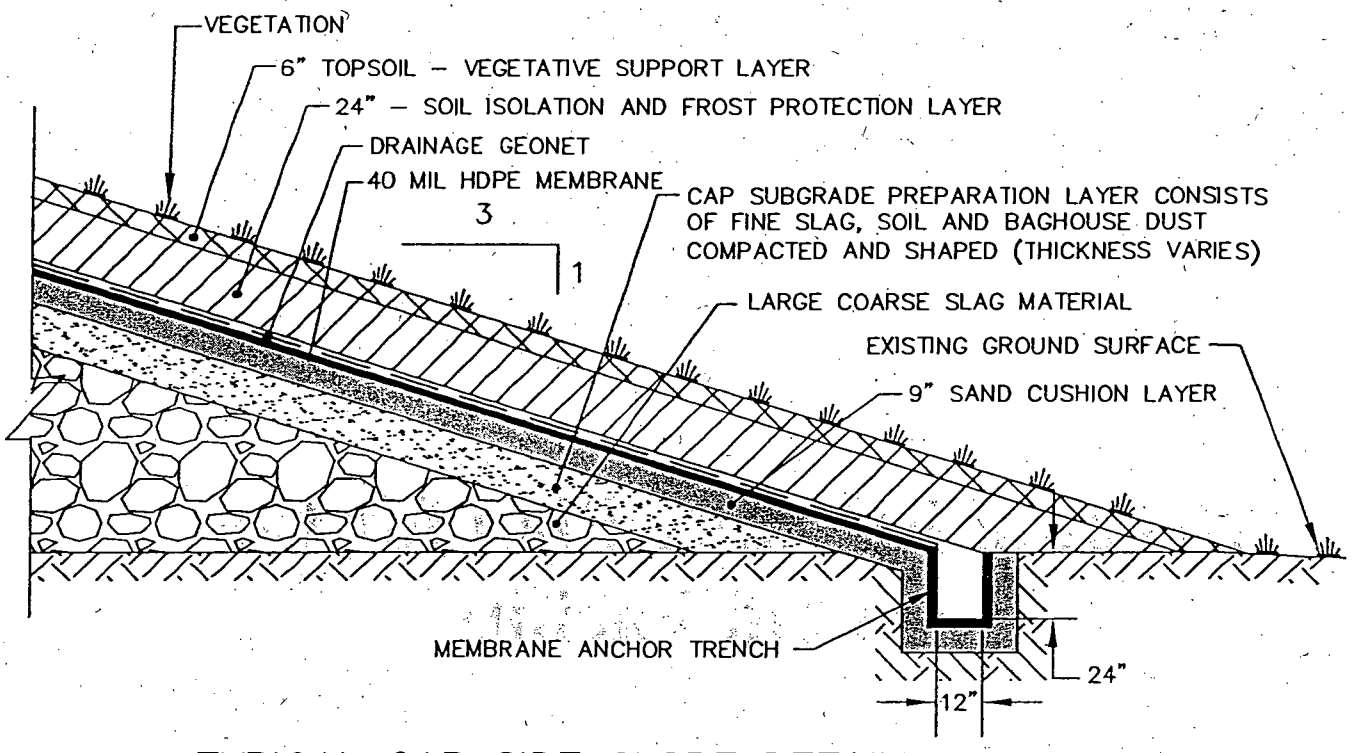
SHIELDALLOY METALLURGICAL CORPORATION
NEWFIELD, NEW JERSEY

FIGURE 18.11
CAPPED PILE SECTIONS

Date: 08/02

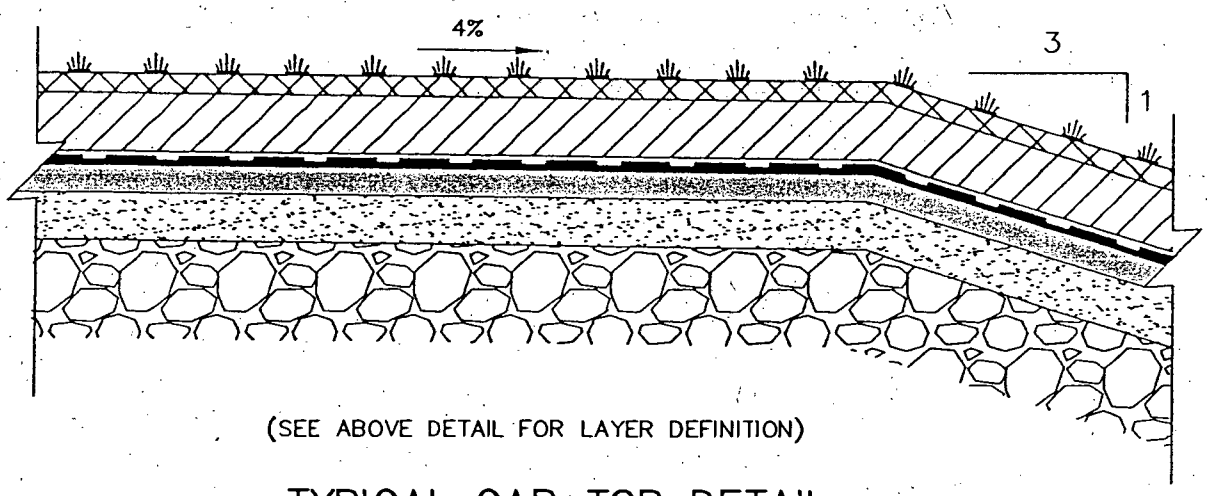
Project No. 37149-0000-00007

\37149\Fig-18.11



TYPICAL CAP SIDE SLOPE DETAIL

N.T.S.



(SEE ABOVE DETAIL FOR LAYER DEFINITION)

TYPICAL CAP TOP DETAIL

N.T.S.

TRC
Customer-Focused Solutions
5 Waterside Crossing
Windsor, CT 06095
(860) 298-9692

SHIELDALLOY METALLURGICAL
NEWFIELD, NEW JERSEY

FIGURE 18.10

CAP CONSTRUCTION DETAILS

Date: 08/02 | Project No. 37149-0000-00007

\37149\FIG-18.10

Decommissioning Plan for the Newfield Facility

Submitted by:

Shieldalloy Metallurgical Corporation
12 West Boulevard, Post Office Box 768
Newfield, New Jersey 08344
(856) 692-4200

Report No. 94005/G-28247. (Rev. 0)
August 28, 2002

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3.6 Surface Water Hydrology

3.6.1 Site Drainage and Fluvial Features

During periods of increased precipitation, the Hudson Branch originates as far as 300 feet east of the site. At present, under normal conditions, the "headwaters" of the Hudson Branch are located approximately 300 feet, from the toe of the Storage Yard, in a marsh area in the southeast corner of the SMC property (see Figures 18.2and 18.8). The Hudson Branch flows westward through portions of the property and along the southern property boundary.

Historically the site included three permitted discharge outfalls. Outfall 001 historically included discharges of remediated ground water and treated stormwater, stormwater from a portion of the Borough of Newfield north of the SMC site, and non-contact cooling water (which was later rerouted to Outfall 002). Outfall 002 historically included discharges of stormwater and non-contact cooling water. Outfall 003 included discharges from an employee parking lot and industrial areas (laboratory and maintenance department).

Modifications made to site drainage, however, have resulted in the presence of only two stormwater outfalls associated with discharges from the SMC facility, of which only one qualifies as a permitted outfall. Former Outfall 001 still conveys stormwater from off-site Borough of Newfield sources into the Hudson Branch but does not include any facility-generated waters or stormwater. A 36-inch diameter pipe from Newfield Borough enters the SMC facility at the northern property line, crosses the SMC facility from north-to-south, and discharges into the Hudson Branch at this former outfall location. Existing Outfall 002 now conveys a combination of stormwater, non-contact cooling water, and treated water from the on-site ground water treatment system. A small man-made ponded area has been constructed immediately upstream of this outfall. Flows are recorded at an H-flume located at the outfall. While facility stormwater is still discharged at former Outfall 003, activities within the drainage area have been modified such that there is no longer a potential for industrial stormwater impacts.

The Hudson Branch joins the Burnt Mill Branch approximately 6,500 feet southwest of the site. An approximately 15-acre pond (Burnt Mill Pond) has formed at the confluence of the Hudson Branch and Burnt Mill Branch. The Burnt Mill Branch joins the Maurice River an additional 9,000 feet southwest of Burnt Mill Pond.

The historical configuration of the Hudson Branch and tributaries in the immediate site area has changed since the development of the site. A review of historic aerial photographs indicates the characteristics of the Hudson Branch during the period when the facility was used for glass manufacturing (based on a 1940 aerial photograph), and changes in the characteristics of the Hudson Branch as the site was further developed (based on 1951, 1962, 1965, 1974, 1977 and 1986 aerial photographs). The 1940 aerial photograph shows the Hudson Branch as originating in the same area east of the facility, although it appears that drainage from an area east of the facility but north of the railroad track may contribute to the Hudson Branch headwaters. The existing ponded area south of the facility is not apparent in the 1940 photograph. The 1940 aerial photograph also indicates the

presence of a drainageway which enters the Hudson Branch near the location of current Outfall 002. The drainageway extends to the north-northeast through mostly undeveloped land that is currently the center of SMC's production area. The drainageway continues to the railroad tracks along the northern edge of the facility and it appears that drainage from an area north of the railroad tracks (as far north as Catawba Avenue) may also contribute to this drainageway.[26]

The upstream drainage area of the Hudson Branch (upstream of a point adjacent to the slag piles on site) is estimated at 0.55 square miles, of which approximately 95% of the area is only sparsely undeveloped. Ground water discharge is the source of the Hudson Branch in times of no or low precipitation. In addition, the outfalls reportedly represent a major portion of the flow of the Hudson Branch in the vicinity of the site. The initial results of a 1993 study indicated that there is no hydraulic connection between the Hudson Branch and the Maurice River during low-flow conditions; in fact, during the study the flow in the Hudson Branch steadily decreased until there was no measurable flow immediately upstream of Burnt Mill Pond.[27]

When the level of the Hudson Branch rises in response to precipitation, the surface water may discharge to the adjacent aquifers in some areas. Runoff during storm events at the site has been observed to cause flooding of the Hudson Branch in a marsh area at the southwest corner of the site, approximately 900 feet downstream of the slag piles.

The channel of the Hudson Branch on site and adjacent to the site varies in size and ranges from 10 to 20 feet wide and one to three feet deep. During typical flow conditions, the Hudson Branch channel is approximately 300 feet from the slag piles.

3.6.2 Water Resources Data

There are no stream gaging stations on the Hudson Branch or the Burnt Mill Branch downstream of the site. The closest downstream gaging station is located on the Maurice River at Norma, New Jersey, approximately 9,000 feet downstream of the confluence of the Burnt Mill Branch and the Maurice River (4 miles southwest of the site).

3.6.3 Topographic Maps

A copy of information available on the USGS Newfield Quadrangle (photo revised 1994), as reprinted from CD ROM, is shown in Appendix 19.1.

3.6.4 Surface Water Bodies

See Section 3.6.1 above.

---

[26] "Remedial Investigation Technical Report", TRC Environmental Consultants, Inc., 1992; Draft Final Feasibility Study Report, TRC Environmental Corporation, April 1995.

[27] "Post valuation of Fate and Transport of Chromium and Total Dissolved Solids in the Hudson Branch-Burnt Mill Branch Tributaries to Maurice River", Environmental Resources Management, Inc., November 6, 1995

3.6.5 Water Control Structures and Diversions

There are no known surface water diversions in the Hudson Branch or the Burnt Mill Branch downstream of the site. The same is true upstream of the convergence with the Maurice River.

Ground water is the primary source of domestic, agricultural, community, and municipal water supplies in the area of the site. Public wells are in the range of 150 to 200 feet deep (probably within the Bridgeton/Cohansey Formation); the depths of private wells vary. Ground water would appear to provide a good quality and reliable quantity of water at an economical depth, whereas it is assumed that surface water is a less reliable source.

The maps in Appendix 19.1 show the locations of water-supply wells within one mile of the site (as of 1994 and additional research conducted in 2001) and the area of a water-supply well restriction area located downgradient of SMC as of 1986.[23] The 2001 survey identified 13 water wells with permitted daily withdrawals of 100,000 gallons or more per day within a one-mile radius search area, which included the site (five of which are owned by SMC). Two wells within the area were listed as owned by the Borough of Newfield and were confirmed to be in use at the time of the survey. The nearest City of Vineland municipal well is outside of the search area, approximately 1.5 miles west of the center of the search area. The table included in Appendix 19.1 lists the addresses of well permits in the one-mile radius search area.

3.6.6 Flow Duration Data

There is no stream flow gaging station on the Hudson Branch, although flow rates in the Hudson Branch have been characterized by a number of studies. There are a number of limitations and apparent inconsistencies in the data, probably owing to seasonal variations in recharge/discharge relationships, local withdrawals, precipitation, etc.

Woodward-Moorhouse & Associates, Inc. (WMAI) conducted a study in 1974, before ground water extraction and treatment was initiated. They reported flows of 225 gpm near Outfall 001, 290 gpm at the culvert under West Boulevard and 360 gpm just upstream of West Arbor Avenue.

Stream flow rates were measured as part of Dan Raviv Associates, Inc. (DRAI) studies conducted in November 1983, June 1988 and April 1989.[24] These studies were all conducted during the period that ground water extraction and treatment was occurring at a rate of approximately 80 gpm. Therein, it was reported that Outfall 001 discharge rates were in the range of 250 to 350 gpm and Outfall 002 discharge rates were approximately 50 gpm during this period. The stream flow rates (in gpm) measured during this period are suminarized in Table 17.3.

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[23] Personal communication w/Paul Horner, City of Vineland Water-Sewer-Utility Department on 08/09/02; and TRC file information.

[24] "Modification of Surface Water Discharge Permit", Dan Raviv Associates, Inc., August 1988.

DRAI interpreted the WMAI results and the results presented above, in combination with field observations and ground water quality information, as indicating that the upper segment of the stream (Segment 1), from the headwaters of the Hudson Branch to just upstream of Outfall 001, is intermittent. Segment 2, which continues from Segment 1 to West Boulevard, was characterized as an area in which the stream recharges the ground water or there is a significant difference in the stream gradient and storage compared to other segments of the stream. The second explanation is described as being more probable, since no indication of stream loss (i.e., mounding) was observed in the water levels of nearby monitoring wells. Segment 3 continues downstream from West Boulevard to prior to sampling station 8, with this portion of the stream described as a "gaining" segment (i.e., there is a contribution from ground water to the stream). Segment 4, continuing downstream from sampling station 8 to West Arbor Avenue, is described as an area in which stream recharge and ground water discharge appear to be in equilibrium. [DRAI, 1988a and DRAI, 1990]

While the descriptions presented above have been referenced in subsequent environmental reports, there are other factors which must be considered in their utilization. These are:

- The data do not support the conclusions as unequivocally as they are stated in the reports. For example, while the 1983 and 1988 data indicate a reduction in flow between West Boulevard and Weymouth Road, the 1989 data indicate a 920 gpm increase in flow over this segment. Furthermore, the 1988 data from West Boulevard to sampling station 8 indicate an overall decrease in flow in this stretch which is described by DRAI as a "gaining" segment.

- The data indicate the potential for errors in flow estimates. Again, the 1989 data for the segment between West Boulevard and Weymouth Road indicate a 920 gpm increase in flow over a distance of approximately 500 feet. There are no known direct discharges to the stream within this segment and it is highly unlikely that ground water would be discharging to the stream at such a rate. Therefore, it is likely that an inaccurate estimation of stream flow velocity or stream cross-sectional area is responsible for the suspect results. Other errors in such calculations could impact other estimated flow rates and result in inaccuracies in the hydrologic evaluation of the stream.

- The evaluation did not account for the potential impacts of precipitation events on flow rates, nor did it consider ground water table elevations immediately adjacent to the stream. Existing monitoring wells are not located immediately adjacent to the stream and may not be screened over a sufficiently shallow interval to reflect the true water table elevation.

- The data reflect surface water flow characteristics during a period when the treatment system was operating at a rate of 80 gpm and outfall flows totaled 300 to 400 gpm. This data may not reflect current conditions where ground water is being extracted

2 FACILITY OPERATING HISTORY

2.1 License Status

The majority of the licensed radioactive material inventory at the Newfield plant consists of slag from the D-111 production department, and dust from the D-111 baghouses. After processing of consumable pyrochlore ore and other feed materials for ferrocolumbium and other metallurgical operations, greater than 99% of the radioactive species remained in the slag and, to a much lesser extent, in the baghouse dust.[3]

License No. SMB-743 authorizes possession of up to 303,050 kilograms of thorium in any chemical/physical form, and up to 45,000 kilograms of uranium in any chemical or physical form. As of September 17, 2003, SMC was at 96.8% of the thorium limit and 87.6% of the uranium limit.

2.2 License History

SMC currently holds USNRC License No. SMB-743 which allows possession, use, storage, transfer and disposal of source material ancillary to metallurgical operations. The most recent amendment of SMB-743 was issued on October 9, 2001, and the license expiration date is October 20, 2002.

2.3 Previous Decommissioning Activities

2.3.1 Haul Road

The Haul Road was, at one time, a county right-of-way that ran through SMC's Newfield plant. Over the years, the south portion of Haul Road was surfaced with crushed slag from SMC operations. Although the Haul Road was never used to perform principle activities authorized by License No. SMB-743, it was nonetheless included in site characterization efforts that took place in 1988 and in 1991.[4,5] These surveys showed that the contact exposure rates in and near the Haul Road were only slightly discernible from background, and that the slag used to form the road bed was not characteristic of licensed material (i.e., ferrocolumbium slag).[6]

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[3] IT Corporation, "Assessment of Environmental Radiological Conditions at the Newfield Facility", IT Corporation Report No. IT/NS-92-106, April 1, 1992.

[4] Oak Ridge Associated Universities, "Radiological Survey of the Shieldalloy Metallurgical Corporation, Newfield, New Jersey", Report No. ORAU 88/G-79, July, 1988.

[5] IT Corporation, "Assessment of Environmental Radiological Conditions at the Newfield Facility", Report No. IT/NS-92-106, April 2, 1992.

[6] Exposure rates in and near the Haul Road generally ranged from background to 26 microR per hour, with a maximum exposure rate of 90 microR per hour. The contact exposure rate from ferrocolumbium slag is in the vicinity of 1,000 to 2,000 microR per hour.

The radioactive materials identified within the Haul Road were excavated and relocated to the Storage Yard. A final status survey was performed and documented in the fourth quarter of 1998.[7]

2.3.2 AAF Baghouse

Ferrocolumbium production was performed within a single building (D-111) equipped with an operator control room, mechanical booms and heavy equipment handlers, storage containers, scales, a variety of melting pots, two furnaces, other miscellaneous items, and a dust collection system comprised of two interconnected emission control units with high-efficiency baghouses. One of the emission control units was an American Air Filter baghouse, termed the "AAF Baghouse".

Because of improvements made to the air handling system in the immediate vicinity of the smelting operation, and because maintenance performed on a baghouse that operated in tandem with the AAF Baghouse improved its efficiency, in early 1999, SMC determined that it was no longer necessary to operate two emission control systems. Therefore, the decision was made to decommission the AAF Baghouse.

During the remedial action, which occurred between May 17 and June 17, 1999, the AAF Baghouse was disassembled. Structural components and materials that were generated during the demolition were surveyed to determine whether they could be released for unrestricted use (i.e., without regard for radiological constituents). Those items that did not meet the applicable release criteria were decontaminated and re-surveyed, or controlled as licensed material. A final status survey report was prepared, and the area, with the exception of the concrete pad, was released for unrestricted use in a license amendment.[8] The AAF concrete pad remains in place, and is addressed further in Chapter 5, below.

2.3.3 Building D203(G)

One area at the Newfield plant where source material was temporarily stored pending shipment or use is D203(G), also known as "G-Warehouse". G-Warehouse consisted, primarily, of open floor space to facilitate forklift movement, and a series of storage bays. However, operational and programmatic changes resulted in source materials being stored at locations within the SMC controlled area other than G-Warehouse. Because SMC no longer needed G-Warehouse to perform the primary activities authorized under License No. SMB-743, it was decommissioned.

Routine radiological surveillance of this area demonstrated that it was relatively free of residual radioactivity. Therefore, no remedial actions were necessary. In October of 2000, a final status

[7] Integrated Environmental Management, Inc., Report No. 94005/G-17172, "Final Status Survey of Haul Road", October 1998.

[8] Integrated Environmental Management, Inc., Report No. 94005/G-20187, "Demolition and Final Survey of the AAF Baghouse", November 2000.

survey of G-Warehouse was performed and doeumented.[9] The building was subsequently released for unrestricted use in a license amendment.

2.3.4 Building D203(A)

Another area where source material was received and temporarily stored pending shipment or use in D203(A), also known as "A-Warehouse". This building was constructed with a concrete slab floor and sheet metal siding and roof, and consisted, primarily, of open floor space to facilitate forklift movement, and a series of storage bays. When SMC no longer needed A-Warehouse to perform the primary activities authorized under License No. SMB-743, it was decommissioned.

Routine radiological surveillance of A-Warehouse indicated that it had become contaminated during use as a temporary storage location for radioactive materials awaiting shipment. The necessary remedial actions were performed, and a final status survey was conducted and documented.[10] The building was subsequently released for unrestricted use in a license amendinent.

2.3.5 East End of the Storage Yard

The east end of the Storage Yard was used, at one time, to store ferrovanadium slag. However, placement of those materials often resulted in mixing with ferrocolumbium slag. Eventually, the two slag types were segregated, and the ferrovanadium slag pile was sold for beneficial re-use. The footprint of the pile was then excavated to remove all any remaining ferrocolumbium slag, with the excavated materials segregated within a single pile of soil/slag within the Storage Yard.

Soil sampling and walkover gamma surveys of the excavated area were performed and documented in 1999.[11] The soil sampling results were negative for residual radioactivity above the applicable release criteria, and the USNRC released the area for re-forestation.[12] On the other hand, the ambient exposure rates in the area, as a result of its proximity to the ferrocolumbium slag piles, were too high to permit measurement of residual radioactivity in non-sampled areas.

2.3.6 Building D111, D102 and D112

As part of a commitment made by SMC to the USNRC to continue on-going efforts to reduce the number and size of the existing restricted areas within the facility, in July of 2002, SMC began the

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[9] Integrated Environmental Management, Inc. Report No. 94005/G-16171, "Final Status Survey of G-Warehouse", November 2000.

[10] Integrated Environmental Management, Inc. Report No. 94005/G-16171, "Final Status Survey Report for 'A' Warehouse", October 1998.

[11] Integrated Environmental Management, Inc., IEM Report No. 94005/G-18198, "Soil Sampling/Survey of Storage Yard After Remediation", January 2000.

[12] Olivier, J. A., U. S. Nuclear Regulatory Commission, to D. R. Smith, "Former Storage Yard Area to be Reforested (TAC No. L31310)", April 6, 2000.

decommissioning of the D111 Production Department, and the D102/D112 Production Department from that listing.[13] All work was performed in full compliance with the requirements of License No. SMB-743, and was approved, in advance, by the USNRC.

As of September 1, 2002, the work on this project is still on-going. However, when all remedial actions are complete, SMC will perform and document a final status survey that follows the guidance in NUREG-1575, "Multi-Agency Radiation Survey and Site Investigation Manual" (MARSSIM), and will enclose a copy of the final status survey report in an application to remove the three buildings from the listing of permanent restricted areas that currently appears on License No. SMB-743.

Because that application will be submitted to the USNRC shortly after the submission of this decommissioning plan, an immediate amendment to the Plan would be necessary. Therefore, for the remainder of this report, it will be assumed that Buildings D111, D102 and D112 were addressed in a *completed* decommissioning activity, and that they are no longer considered to be a permanent restricted area on License No. SMB-743.

2.3.7 Non-radiological Activities

Environmental investigations have been ongoing at the Newfield site since 1972, when the first hydrologic investigation was conducted to evaluate the source of hexavalent chromium, which had been detected in a nearby municipal water supply well. In addition, a series of subsequent ground water and surface water studies were conducted to evaluate potential environmental impacts associated with SMC facility operations. Under the October 1988 Administrative Consent Order (ACO) with NJDEP, SMC contracted the design and installation of a 400 gallon per minute groundwater pump and treat system to control off-site migration of hexavalent chromium. As a result of the October 1988 ACO and further discussions with the NJDEP, SMC commenced with the removal of all of the materials from the Storage Yard that were not regulated by the USNRC. The only materials that in the Storage Yard today are those that are under the USNRC's jurisdiction.

A remedial investigation/ feasibility study (RI/FS) was also initiated under the ACO to fully characterize and evaluate potential non-NRC environmental impacts associated with the site. The 1988 ACO had noted NJDEP's and SMC's disagreement regarding the hazardous waste status of chromium slag piles and solid waste status of other slags, dross and baghouse dusts stored at the facility. The ACO stated that the chromium slag pile area and general slag area had not been fully investigated and required that investigation and remediation of soil and ground water contamination at and emanating from these areas be performed during the RI/FS. The 1988 ACO also acknowledged that the site was regulated by the USNRC and, therefore, certain activities conducted pursuant to the ACO could require the approval of the USNRC in addition to the approval of the NJDEP.

[13] Written communication from D. R. Smith, (Shieldalloy Metallurgical Corporation) to T. S. Sherr (U. S. Nuclear Regulatory Commission), "Intent to Terminate Source Material License No. SMB-743", August 27, 2001.

The RI report was completed in 1992, and several focused feasibility studies and supplemental investigations have been completed since then. A Record of Decision (ROD) was signed on September 24, 1996 which addresses the ground water remedial action.

In 1995, a series of six former wastewater treatment lagoons (designated as B-1, B-2, B-3, B-5, B-1T and B-12) were remediated and closed. The contents of the lagoons consisted of water and settled sludge containing metals (primarily chromium), generated from treatment, storage and settling/polishing stages of the treatment process. Remediation of these lagoons entailed the following primary activities:[14]

- Characterization of the sludge in each lagoon;
- Removal, treatment and discharge of standing water from each of the units;
- Demolition of associated pump houses, valve pits and piping with disposal of all generated wastes;
- Solidification, excavation and off-site disposal of the accumulated sludge, lagoon liner, and impacted underlying bedding material and soils;
- Collection and chemical analysis of confirmatory soil samples from each lagoon;
- Supplemental excavation and disposal of impacted soils located beneath portions of the lagoons; and
- Backfilling and restoration of final grade.

In 1994, a lagoon characterization investigation was conducted for three additional former wastewater treatment lagoons (B6, B7 and B8). The objectives of the investigation were to characterize the lagoons' contents with respect to quantity and composition. Closure involved the treatment and removal of lagoon surface water, excavation and disposal of sludge, removal and off-site disposal of lagoon liners and contaminated soils, and backfilling and grading of the lagoon excavations. Approximately 2.5 million gallons of chromium hydroxide sludge were removed, dewatered and disposed as part of this remedial action, the details of which were captured in a 1999 report.[15]

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[14] TRC Environmental Corporation, Closure Report, Surface Impoundments BB1, B2, B3, B5, B11 and B12, Liner and Comaminated Soil Removal and Disposal, dated April 1996 (revised August 2000).

[15] TRC Environmental Corporation, Closure Report, Surface Impoundments B6, B7 and B8, Liner and Contaminated Soil Removal and Disposal, April 1999.

2.4 Spills

No radiological spills have been reported over the history of the license. Non-radiological incidents are described in Section 8.4, below.

2.5 Prior On-site Burials

No burial of radioactive material, other than that described in Section 4.4, below, has been reported over the history of the license.

3 FACILITY DESCRIPTION

3.1 Site Location and Description

SMC's Newfield facility is located in the town of Newfield, Gloucester County, New Jersey. (A site location map is provided in Figure 18.1.) The primary portion of the site, consisting of the manufacturing facilities and their support areas, covers 67.7 acres. An additional 19.8 acres of farmland, located approximately 2,000 feet southwest of the primary site in Vineland, Cumberland County, New Jersey, are also owned by SMC.[16]

The primary site is bounded to the north by Conrail lines and to the west by East Boulevard. Woods, residential homes, and small businesses are present to the east of the site. The southern property line is bounded by the Hudson Branch and associated wetlands, just north of residences located along Weymouth Road. An unnamed pond is located in this portion of the Hudson Branch.[17] The majority of the site is surrounded by secure steel-wire fencing, except for a small portion of the property along the western property boundary which contains the facility parking lot. A detailed map depicting site boundaries and physical features of the plant is provided in Figure 18.2.

The topography of the Newfield Area is relatively flat, and the SMC facility is located on a slight topographic high (approximately 100 feet above mean sea level), with the ground surface generally sloping to the west-southwest, toward the Hudson Branch. The facility is comprised of three primary areas: (1) Manufacturing Area; (2) Undeveloped Plant Property (including the former Lagoon Area); and (3) Storage Yard, each of which is described as follows:

- Manufacturing Area - This area is characterized by presence of plant operations, offices, loading docks, and other facilities associated with former and present production operations (refer to Figure 18.2). The majority of this area is covered by buildings, other structures, asphalt or concrete. Much of this area has been evaluated with respect to potential environmental concerns including the former Manpro-Vibra Degreasing Unit; the Railroad Siding Area; the Department 102 Area; several areas associated with former underground storage tanks; and the Building 101(B) Glass Stack Area. Operations within the Manufacturing Area have been curtailed, with only limited manufacturing operations presently being performed on-site. Portions of the Manufacturing Area have been investigated, and several areas will be subject to remediation to address identified environmental impacts. In addition, this area also contains the Wastewater Treatment Facility, housed in Building 216 in the

[16] This property has not been impacted by licensed operations other than as described herein.

[17] The Hudson Branch is a tributary to Burnt Mill Pond, from which the Burnt Mill Branch flows to the Maurice River. The Hudson Branch is an intermittent, slow-moving surface water body which flows from east to west adjacent to the site.

southwestern corner of the site, which was installed to treat groundwater contaminated with hexavalent chromium and volatile organic compounds (VOCs). Treated groundwater is discharged to the adjacent Hudson Branch, subject to the requirements of a NJPDES Discharge to Surface Water Permit.

- Undeveloped Property - This area consists of several undeveloped strips of property, the majority of which extends along the southern portion of the property, and includes areas east and west of the Manufacturing Area. No buildings or other significant structures are present in this area. The extent of this area is depicted in Figure 18.2. Areas of potential concern that have been evaluated in this portion of the site include the Former Material Storage Area, the Drum Storage Area, the Former Chromium Button Storage Area, and the Tank T12 Chromium Wastewater Spill Area (site of a 1990 wastewater spill).

- Former Lagoon Area - This area occupied the central portion of the site and consisted of up to nine wastewater treatment lagoons. An unlined lagoon used to hold untreated process wastewater during the 1960s, was subsequently replaced with the nine smaller lined lagoons in which wastewater was treated for discharge. Over time, the wastewater treatment process was modified, and the lagoons were gradually phased out and closed. Final characterization, remediation, and closure of these lagoons were performed in the 1990s. Discussion of these closure activities was provided previously in Chapter 3, above.[18]

- Storage Yard - This area, which comprises about eight (8) acres of the eastern portion of the site, has historically been used to store by-product materials generated as a result of former manufacturing processes. A defined portion of this area has been designated a restricted area in License No. SMB-743. Currently, the Storage Yard contains a number of segregated piles, the layout of which is shown in Figure 18.3. A breakdown of the volumes of the various regulated material types is provided in Table 17.1.

3.2 Population Distribution

The property owned by SMC is located in part in three different communities and two counties; the Borough of Newfield, the City of Vineland, Franklin Township, and Gloucester and Cumberland Counties. Population distribution information is not available by town in Newfield or Franklin Township, therefore a comprehensive demographic listing was created by county. Current population information for the counties surrounding the site was obtained from the U.S. Census

[18] The former Lagoon Area is a relatively flat, open portion of the site and is predominantly covered by grass. Portions of this area are also presently used for temporary storage of equipment and non-regulated materials. Other portions of the Undeveloped Property portion of the facility are generally open and vegetated with grass and/or small shrubs and trees.

Bureau website. The City of Vineland maintains its own website, which includes projected population growth. These data are included in Table 17.2.[19]

3.3 Current/Future Land Use

Current land use in the general vicinity of the site has been determined through review of Master Plans and Zoning maps from the local municipalities, and contact with municipal officials. Specifically, the vicinity of the SMC site within a one-mile radius encompasses several municipal entities: Borough of Newfield, City of Vineland, and Township of Franklin. The site itself is zoned for heavy industry. Figure 18.4 depicts specific land uses within a one-mile radius, based on the following sources:

- Borough of Newfield Master Land Use Plan, February 1979;
- City of Vineland Master Plan, January 1992;
- City of Vineland Zone Map, January 1996; and
- Township of Franklin Zoning Map, April 2001.

Recent contact with municipal representatives indicates that land use planning has not changed substantially since the preparation of these documents. Figure 18.4 shows distribution of residential, business (i.e., commercial and industrial), and cultivation (i.e., agricultural) and woodlands. As can be seen from this figure, much of the region to the east of the site is zoned for residential use while much of that to the west/southwest is agricultural and/or undeveloped. Based upon the available information, no specific planned changes in future land use could be determined.

3.4 Meteorology and Climatology

The Philadelphia International Airport was chosen as a climatologically representative site. Philadelphia, like the Newfield, NJ site, is inland while other airports in the region are coastal and show coastal influences (e.g. sea breezes) that do not typically affect Newfield.

In the 2001 Local Climatological Data-Annual Summary with Coinparative Data for Philadelphia, the National Oceanic and Atmospheric Association (NOAA) describes the climate of the region as being moderate:

> "The Appalachian Mountains to the west and the Atlantic Ocean to the east have a moderating effect on climate. Periods of very high or very low temperatures seldom last for more than three or four days. Temperatures below zero or above 100 degrees are a rarity. On occasion, the area becomes engulfed with maritime air during the

[19] Neither Newfield nor Franklin had projections on population growth, and a statistic for the entire state was not included because it would not necessarily be representative of these smaller communities.

summer months, and high humidity adds to the discomfort of seasonable warm temperatures.

Precipitation is fairly evenly distributed throughout the year with maximum amounts during the late summer months. . . . Single storms of 10 inches or more occur about every five years."

National Climate Data Center (NCDC) data were obtained for the years 1972 through 2001. These demonstrate an average annual temperature of 54.7 degrees Fahrenheit, and average annual precipitation of 40.81 inches, and an average amount of snowfall of 19.9 inches. The average annual relative humidity in the afternoon is 55 percent.

3.4.1 Winds

In the *Local Climatological Data-Annual Summary with Comparative Data*, NOAA states that: "The prevailing wind direction for the summer months is from the southwest, while northwesterly winds prevail during the winter. The annual prevailing direction is from the west-southwest. Destructive velocities are comparatively rare and occur mostly in gustiness during summer thunderstorms. High winds occurring in the winter months, as a rule, come with the advance of cold air after the passage of a deep low pressure system. Only rarely have hurricanes in the vicinity caused widespread damage, primarily because of flooding."

The following data from NCDC is based on climatological normals from 1961-1990. The mean annual wind speed is 9.6 miles per hour and the prevailing wind direction is 230 degrees (west-southwest). The maximum 2-minute wind speed of 51 miles per hour at 300 degrees (west-northwest) occurred in June 1998. The maximum 5-second wind speed of 71 miles per hour also occurred in June 1998, from the west-northwest.

3.4.2 Precipitation

The annual average amount of precipitation in the region of the Newfield facility is 41.41 inches. The normal amount of snowfall is 23.2 inches. The normals are based on NCDC data from 1961-1990. The average monthly precipitation is based on data from 1972-2001 and ranges from 2.68 inches in October to 4.25 inches in August.

Thunderstorms occur an average of 27.1 days each year. Snowfall greater than one inch occurs on an average of 6.4 days per year. The mean number of days with heavy fog (visibility less than or equal to ¼ mile) is 21.2.

The site is near the county lines of Gloucester to the east and Cumberland to the west therefore, storm data for both counties was obtained from NCDC. The period of record for the data is January 1, 1972 to April 30, 2002. In Gloucester County 4 tornadoes and 1 funnel cloud were reported during that time period. In Cumberland County 9 tornadoes and 1 tropical storm were reported for the same period.

3.4.3 Air Quality

The nearest Class I air quality area is the Brigantine Wilderness Area, located approximately 31 miles to the east of Newfield. The rest of the state is considered a Class II PSD (Prevention of Significant Deterioration) area. Cumberland and Gloucester Counties are classified as severe nonattainment areas for ozone, although the area is in attainment for all other National Ambient Air Quality Standards.

3.5 Geology and Seismology

3.5.1 Geologic Characteristics of the Site and Surrounding Area[20]

The Newfield site is located in the Atlantic Coastal Plain physiographic province. It is underlain by a thick sequence of unconsolidated materials, comprised of several distinct formations, which overly unconformably on bedrock.

Bedrock below the site consists of a banded, micaceous schist or gneiss of the Wissihickon Formation of Precambrian age. The formation primarily contains mica, quartz, feldspar, and chlorite, and the formation has numerous fractures and joints and folding of individual layers. This formation outcrops northwest of and outside of Gloucester County and, based upon average dip, the top of the formation is projected to be at a depth of over 2,000 feet below grade in the Newfield area. Relative to the overlying unconsolidated materials, the bedrock is not expected to be a significant water supply resource in the area both due to depth and comparatively low yield.

The unconsolidated materials underlie much of southern New Jersey and dip and thicken to the southeast. Therefore, the formations thin to the northwest and further thicken to the southeast of the site area. The Middle to Lower Cretaceous sediments are primarily continental deposits consisting of alternating layers of clay, silt, sand and gravel. The Upper Cretaceous and most Tertiary sediments were deposited in beach and shelf environments, and tend to be finer grained than continental deposits. Very fine grained sediments are recognized as transgressive marine deposits, which formed during major incursions of the sea. Coarsening-upward deposits that overlie the fine-grained units are recognized as marine regressions, deposited in inner-shelf, near-shore or beach environments as the ocean was retreating. The formations typically outcrop in sequential bands striking northeast-southwest, with the earliest deposits outcropping further to the west, near the Delaware River.

The deepest among the sequence of unconsolidated deposits are the Upper Cretaceous Raritan and Magothy Formations. Below the site area, the combined formation thickness is expected to be 500 feet or more. The Raritan Formation is composed of quartzose sand, clay, and some gravel; the Magothy Formation consists of beds of dark-gray to black clays alternating with micaceous fine sand. These formations represent a significant aquifer system in parts of Gloucester County,

[20] "Special Report 30: Water Resources and Geology of Gloucester County, New Jersey", NJDCED, Hardt, W.F, and Hilton, G.S., 1969 and "Generalized Structural Contour Maps of the New Jersey Coastal Plain", Report 4, NJGS, Richards, H.G., Olmsted, F.H., and Ruhle, J.L., undated.

particularly to the northwest, closer to the outcrop area, but the water may be brackish below the site area.

The Raritan and Magothy Formations are overlain unconformably by Upper Cretaceous sediments of the Merchantville Formation. This is overlain, in turn, by the Woodbury Clay, the Englishtown Formation, the Marshalltown Formation, the Wenonah Formation, the Mount Laurel Sand, and the Navesink Formation.

The Merchantville Formation is described as a glauconitic micaceous silt or quartzose or glauconitic sandy clay (the composition varies within the county), and the thickness ranges from 45 to 70 feet. This formation is a minor aquifer within the county and, together with the overlying Woodbury Clay, acts as an aquaclude.

The Woodbury Clay is a dark blue to black clay (with some white sand streaks and marine fossils in some areas). The Woodbury Clay thickness in Gloucester County ranges up to 80 feet.

The Woodbury Clay is overlain unconformably by the Englishtown Formation, which is described as a fine-to-coarse-grained quartzose sand with local lenses of clay and occasional lignite, mica, and glauconite. In some areas the sand grades into clay and is indistinguishable from the overlying and underlying units. Fossil assemblages suggest both continental and marine origins. The Englishtown Formation is a minor aquifer in Gloucester County.

The Marshalltown Formation consists of a dark-green to black clay, sandy clay, and silt, with mica and glauconite in some areas. Marine fossils have been found in the formation. The formation acts as a confining layer for the underlying Englishtown Formation. The top of the Marshalltown Formation is expected to be at an elevation of approximately 800 feet below mean sea level in the Newfield area, or approximately 900 feet below grade level.

The Wenonah Formation conformably overlies the Marshalltown Formation. The Wenonah Formation and the Mount Laurel Sand are similar in composition and are mapped as a single unit in Gloucester County, although the Mount Laurel Sand is the predominant formation. The unit is composed of medium-to-coarse-grained quartz sands with varying percentages of glauconite.

The Navesink Formation conformably overlies the irregular surface of the Mount Laurel Sand and the Wenonah Formation. The formation consists of glauconitic sand and clay mixed with quartz sands, and can be clayey at the surface and pebbly at the base. The Navesink Formation and the overlying Hornerstown Sand function as confining layers.

The Navesink Formation is overlain unconformably by the Tertiary age Hornerstown Sand which is, in turn, overlain by Tertiary sediments of the Vincentown Formation, the Manasquan Formation, the Kirkwood Formation, and the Cohansey Sand.

The Hornerstown Formation is composed of clay and sand and can have significant percentages of glauconite. As noted above, this formation, along with the Navesink Formation, functions as a confining layer. The top of the Hornerstown Sand is at an approximate elevation of 600 feet below mean sea level in the Newfield area or approximately 700 feet below grade.

The Vincentown Formation can occur as a quartz sand with glauconite or a limey sandstone with shell fossils. It ranges up to 55 feet in thickness in Gloucester County. The Manasquan Formation is similar in composition to the Vincentown Formation, so is difficult to distinguish. The Manasquan sand can contain a high percentage of glauconite, and acts as a confining layer for the Vincentown Formation.

The Kirkwood Formation consists of clay, silt, and very-fine-to-coarse quartzose micaceous sand and represents only a minor aquifer in the county. The Kirkwood ranges in thickness from 50 to 100 feet.

The Cohansey Sand is composed of fine-to-coarse quartz sand, lenses of clay, and lenses of gravel and is approximately 130 feet thick in the Newfield area. Grain size varies both vertically and laterally, which is consistent with deposition within a coastal environment. The Cohansey Sand is the second most productive aquifer in the county. The Cohansey Sand below the site is composed of coarse sands and little to trace silt in the upper 40 feet, and generally finer sand and some silt, with some clay and silt stringers in the lower 60 to 80 feet. Discontinuous silt and clay lenses, up to 6 feet in thickness, were encountered. The Kirkwood Formation, described as a gray silt and clay layer, was encountered at a depth of 120 feet below grade in one of the well borings.

The Pleistocene Bridgeton Formation unconformably overlies the Cohansey Sand and is overlain by other sediments of Pleistocene age, including the Pensauken and Cape May Formations. The Pensauken and Cape May Formations, although present in parts of Gloucester County, are not expected to be present in the site area.

The Bridgeton Formation is composed of fine-to-very coarse quartz sand and gravel possibly of glacial or interglacial origins. The Bridgeton Formation reveals itself at the SMC site as a brown sand. Its thickness ranges from 0 feet in the vicinity of well SC-17D to 28 feet in the vicinity of well SC-12D (see Appendix 19.1). In the area of the site it is expected to be hydraulically connected to the underlying Cohansey Sand. Ground water in the Bridgeton Formation is expected to be under water table conditions.

Erosion, deposition, cutting, and filling have altered the landscape in and around the site area. Such actions may expose the Cohansey Sand at the surface where the Bridgeton Formation has been removed. Reworked sediments of the Bridgeton Formation and the Cohansey Sand may be present in stream valleys and floodplains.

3.5.2 Tectonic History

The Newfield site is located above a thick sequence of unconsolidated sediments which lie unconformably upon Precambrian age bedrock. To the north and west of the site lies the Newark Basin which was an active post-Devonian age rift zone. The Ramapo fault and the associated fault zone lie at the approximate western edge of the rift zone, approximately 80 miles north of the site area. The Newark Basin is filled with sedimentary and igneous rock of Triassic and Jurassic ages, including sandstone, siltstone, shale, conglomerates, basalts and diabases. Thrust faults to the north of Philadelphia (possibly a Precambrian suture zone) separate the Newark Basin sediments from the Precambrian bedrock which underlies the site. The attached geologic map of the Newark Quadrangle presents the underlying bedrock structural geology that might influence the tectonics of the site area.

According to NJGS Report 31, "New Jersey is not especially prone to earthquakes and has had no major earthquakes within the last several hundred years."[21] New Jersey is 2,000 miles from the Mid-Atlantic Ridge, the nearest plate boundary. Historical earthquakes felt in New Jersey are caused by fault movements within the North American tectonic plate (not at the plate boundary). The reference cites three general areas of seismic activity that can be felt by seismographs in New Jersey, these include:

- Several northeast-trending faults in north-central New Jersey and New York, of which, the Ramapo fault is the most active. The Ramapo fault is approximately 80 miles north of the site.
- In the Delaware Valley between Trenton and Wilmington and in the Wilmington area. Trenton and Wilmington are 50 miles north and 30 miles west from the site, respectively, and the valley trends northeast-southwest approximately 25 miles northwest of the site.
- Subsidence in the Raritan Bay, which has caused tremors in that area. The Raritan Bay is approximately 80 miles to the northeast of the site.

3.5.3 Regional Tectonic Map

New Jersey is 2,000 miles from the Mid-Atlantic Ridge, the nearest plate boundary. Appendix 19.1 shows the epicenters of earthquakes recorded or felt in New Jersey.[22] Appendix 19.1 summarizes those earthquakes with magnitude of 3 or greater or Mercalli intensity of IV or greater centered within 200 miles of the site which were felt in New Jersey.

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[21] "Catalog of New Jersey Earthquakes through 1990", NJGS Report 31, 1992; "Geologic Map of the Newark 1 x 2 degree Quadrangle, New Jersey, Pennsylvania, and New York", USGS MI Map I-1715, Lyttle, P.T., and Epstein, J.B., 1987.

[22] Copied from "Catalog of New Jersey Earthquakes through 1990", NJGS Report 31, 1992.

3.5.4 Structural Geology

The Newfield plant area is characterized by a thick sequence of unconsolidated materials which overly unconformably on bedrock at a depth of over 2,000 feet below grade. The unconsolidated materials underlie the entire county and dip and thicken to the southeast. Figures in Appendix 19.1 depict the sedimentary sequence.[23]

3.5.5 Crustal Tilting, Subsidence, Karst Terrain, Landslides, and Erosion

Metamorphic and igneous bedrock is present below the Newfield site at considerable depth (see 3.5.1. above). Subsidence, either due to collapse of karst terrain or fault movement related to underlying bedrock is not believed to be a significant concern in the area.

The surficial materials in the vicinity of the site consist of sands, silts, and gravels (Bridgeton Formation and Cohansey Sand). Relief on the site and in the immediate vicinity of the site is slight. Excluding the slag piles, relief depicted on the USGS 7.5-minute topographic map of the area (Newfield Quadrangle, 1994) is on the order of 20 feet or less across the entire site (between 85 and 105 ft NGVD 1929). Local land surface highs are depicted at 130 ft NGVD 1929 (3,000 feet north of the site) and 140 ft NGVD 1929 3,000 feet east-southeast of the site. Because of the low relief and low seismic potential in the area, landslides are not believed to be a significant concern in the site area.

The site is located near the source of the Hudson Branch, the small stream which crosses the southeastern corner of the property. The sandy surficial materials and low relief would be expected to allow infiltration of precipitation in undeveloped areas surrounding the site, consequently, the potential for stormwater movement to cause erosion of surficial materials appears to be slight. After the site is decommissioned and buildings are removed, the overall area of impermeable surface may be reduced, decreasing runoff from the site during and immediately following storm events.

With respect to off-site stormwater crossing the site via the Hudson Branch, the site is located in the upper portion of the drainage area. The 100-year flood zone mapped by the Federal Emergency Management Agency (FEMA) includes a cross section of 100 to 120 feet across the Hudson Branch near the site.[24]

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[23] Copied from "Special Report 30: Water Resources and Geology of Gloucester County, New Jersey", NJDCED. Hardt, W.F. and Hilton, G.S., 1969: "Generalized Structural Contour Maps of the New Jersey Coastal Plain", Report 4, NJGS, Richards, H.G., Olmsted, F.H., and Ruhle, J.L., undated.

[24] "Remedial Investigation Technical Report", TRC Environmental Consultants, inc., 1992; "Flood Insurance Rate Map and Street Index, Borough of Newfield, New Jersey", FEMA, 1982.

3.5.6 Geologic Characteristics (Surface and Subsurface)

The dominant subsurface geologic characteristic of the site is the large sequence of unconsolidated materials which underlie the site. This dominant feature influences landform, drainage, and water supply availability.

3.5.7 Geomorphology

The deposits of the Bridgeton Formation, possibly of glacial or interglacial origins, rest unconformably on the Cohansey Sand. Surface drainage across these sands during deposition and posi-deposition has carved small stream valleys throughout the area, possibly exposing the Cohansey Sand in the stream valleys.

3.5.8 Faults

The nearest mapped fault of seismic significance is the Ramapo fault, located approximately 80 miles to the north of the site. The locations of faults mapped in bedrock to the north and west of the site are documented.[25]

3.5.9 Deformation

Published descriptions of the Precambrian Wissahickon Formation, which underlies the Newfield site at a depth of over 2,000 feet, indicate that nearer the outcrop area the formation contains fractures, joints, crumpling, and folding. Future deformation of bedrock or the unconsolidated sequence above bedrock at this site is not a significant concern due to the low anticipated seismic potential and the considerable sequence of unconsolidated materials underlying the site and between the site and the bedrock surface.

3.5.10 Man-Made Geologic Features

Fill material has likely been placed along roadways and stream crossings, and the landform at the site and that of surrounding properties may have been modified by cutting and filling.

To the northeast, and bordering the SMC property, is the former Newfield municipal landfill. Aerial photographs from 1962-1986 identify a landfill, which at its largest covered 1.2 acres (estimated on the basis of those photographs. The USGS topographic map of the area does not show any significant change in relief which would suggest the presence of a landfill.

3.5.11 Seismicity

The seismic potential of the area is considered to be low, as described previously. Appendix 19.1 contains a listing of historical earthquakes.

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[25] "Geologic Map of the Newark 1 x 2 degree Quadrangle, New Jersey, Pennsylvania, and New York", USGS MI Map I-1715, Lyttle, P.T., and Epstein, J.B., 1987.

3.6 Surface Water Hydrology

3.6.1 Site Drainage and Fluvial Features

During periods of increased precipitation, the Hudson Branch originates as far as 300 feet east of the site. At present, under normal conditions, the "headwaters" of the Hudson Branch are located approximately 300 feet, from the toe of the Storage Yard, in a marsh area in the southeast corner of the SMC property (see Figures 18.2and 18.8). The Hudson Branch flows westward through portions of the property and along the southern property boundary.

Historically the site included three permitted discharge outfalls. Outfall 001 historically included discharges of remediated ground water and treated stormwater, stormwater from a portion of the Borough of Newfield north of the SMC site, and non-contact cooling water (which was later rerouted to Outfall 002). Outfall 002 historically included discharges of stormwater and non-contact cooling water. Outfall 003 included discharges from an employee parking lot and industrial areas (laboratory and maintenance department).

Modifications made to site drainage, however, have resulted in the presence of only two stormwater outfalls associated with discharges from the SMC facility, of which only one qualifies as a permitted outfall. Former Outfall 001 still conveys stormwater from off-site Borough of Newfield sources into the Hudson Branch but does not include any facility-generated waters or stormwater. A 36-inch diameter pipe from Newfield Borough enters the SMC facility at the northern property line, crosses the SMC facility from north-to-south, and discharges into the Hudson Branch at this former outfall location. Existing Outfall 002 now conveys a combination of stormwater, non-contact cooling water, and treated water from the on-site ground water treatment system. A small man-made ponded area has been constructed immediately upstream of this outfall. Flows are recorded at an H-flume located at the outfall. While facility stormwater is still discharged at former Outfall 003, activities within the drainage area have been modified such that there is no longer a potential for industrial stormwater impacts.

The Hudson Branch joins the Burnt Mill Branch approximately 6,500 feet southwest of the site. An approximately 15-acre pond (Burnt Mill Pond) has formed at the confluence of the Hudson Branch and Burnt Mill Branch . The Burnt Mill Branch joins the Maurice River an additional 9,000 feet southwest of Burnt Mill Pond.

The historical configuration of the Hudson Branch and tributaries in the immediate site area has changed since the development of the site. A review of historic aerial photographs indicates the characteristics of the Hudson Branch during the period when the facility was used for glass manufacturing (based on a 1940 aerial photograph), and changes in the characteristics of the Hudson Branch as the site was further developed (based on 1951, 1962, 1965, 1974, 1977 and 1986 aerial photographs). The 1940 aerial photograph shows the Hudson Branch as originating in the same area east of the facility, although it appears that drainage from an area east of the facility but north of the railroad track may contribute to the Hudson Branch headwaters. The existing ponded area south of the facility is not apparent in the 1940 photograph. The 1940 aerial photograph also indicates the

presence of a drainageway which enters the Hudson Branch near the location of current Outfall 002. The drainageway extends to the north-northeast through mostly undeveloped land that is currently the center of SMC's production area. The drainageway continues to the railroad tracks along the northern edge of the facility and it appears that drainage from an area north of the railroad tracks (as far north as Catawba Avenue) may also contribute to this drainageway.[26]

The upstream drainage area of the Hudson Branch (upstream of a point adjacent to the slag piles on site) is estimated at 0.55 square miles, of which approximately 95% of the area is only sparsely undeveloped. Ground water discharge is the source of the Hudson Branch in times of no or low precipitation. In addition, the outfalls reportedly represent a major portion of the flow of the Hudson Branch in the vicinity of the site. The initial results of a 1993 study indicated that there is no hydraulic connection between the Hudson Branch and the Maurice River during low-flow conditions; in fact, during the study the flow in the Hudson Branch steadily decreased until there was no measurable flow immediately upstream of Burnt Mill Pond.[27]

When the level of the Hudson Branch rises in response to precipitation, the surface water may discharge to the adjacent aquifers in some areas. Runoff during storm events at the site has been observed to cause flooding of the Hudson Branch in a marsh area at the southwest corner of the site, approximately 900 feet downstream of the slag piles.

The channel of the Hudson Branch on site and adjacent to the site varies in size and ranges from 10 to 20 feet wide and one to three feet deep. During typical flow conditions, the Hudson Branch channel is approximately 300 feet from the slag piles.

3.6.2 Water Resources Data

There are no stream gaging stations on the Hudson Branch or the Burnt Mill Branch downstream of the site. The closest downstream gaging station is located on the Maurice River at Norma, New Jersey, approximately 9,000 feet downstream of the confluence of the Burnt Mill Branch and the Maurice River (4 miles southwest of the site).

3.6.3 Topographic Maps

A copy of information available on the USGS Newfield Quadrangle (photo revised 1994), as reprinted from CD ROM, is shown in Appendix 19.1.

3.6.4 Surface Water Bodies

See Section 3.6.1 above.

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[26] "Remedial Investigation Technical Report", TRC Environmental Consultants, Inc., 1992; Draft Final Feasibility Study Report, TRC Environmental Corporation, April 1995.

[27] "Evaluation of Fate and Transport of Chromium and Total Dissolved Solids in the Hudson Branch-Burnt Mill Branch Tributaries to Maurice River", Environmental Resources Management, Inc., November 6, 1995

3.6.5 Water Control Structures and Diversions

There are no known surface water diversions in the Hudson Branch or the Burnt Mill Branch downstream of the site. The same is true upstream of the convergence with the Maurice River.

Ground water is the primary source of domestic, agricultural, community, and municipal water supplies in the area of the site. Public wells are in the range of 150 to 200 feet deep (probably within the Bridgeton/Cohansey Formation); the depths of private wells vary. Ground water would appear to provide a good quality and reliable quantity of water at an economical depth, whereas it is assumed that surface water is a less reliable source.

The maps in Appendix 19.1 show the locations of water-supply wells within one mile of the site (as of 1994 and additional research conducted in 2001) and the area of a water-supply well restriction area located downgradient of SMC as of 1986.[23] The 2001 survey identified 13 water wells with permitted daily withdrawals of 100,000 gallons or more per day within a one-mile radius search area, which included the site (five of which are owned by SMC). Two wells within the area were listed as owned by the Borough of Newfield and were confirmed to be in use at the time of the survey. The nearest City of Vineland municipal well is outside of the search area, approximately 1.5 miles west of the center of the search area. The table included in Appendix 19.1 lists the addresses of well permits in the one-mile radius search area.

3.6.6 Flow Duration Data

There is no stream flow gaging station on the Hudson Branch, although flow rates in the Hudson Branch have been characterized by a number of studies. There are a number of limitations and apparent inconsistencies in the data, probably owing to seasonal variations in recharge/discharge relationships, local withdrawals, precipitation, etc.

Woodward-Moorhouse & Associates, Inc. (WMAI) conducted a study in 1974, before ground water extraction and treatment was initiated. They reported flows of 225 gpm near Outfall 001, 290 gpm at the culvert under West Boulevard and 360 gpm just upstream of West Arbor Avenue.

Stream flow rates were measured as part of Dan Raviv Associates, Inc. (DRAI) studies conducted in November 1983, June 1988 and April 1989.[24] These studies were all conducted during the period that ground water extraction and treatment was occurring at a rate of approximately 80 gpm. Therein, it was reported that Outfall 001 discharge rates were in the range of 250 to 350 gpm and Outfall 002 discharge rates were approximately 50 gpm during this period. The stream flow rates (in gpm) measured during this period are summarized in Table 17.3.

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[23] Personal communication w/Paul Horner, City of Vineland Water-Sewer-Utility Department on 08/09/02; and TRC file information.

[24] "Modification of Surface Water Discharge Permit", Dan Raviv Associates, Inc., August 1988.

DRAI interpreted the WMAI results and the results presented above, in combination with field observations and ground water quality information, as indicating that the upper segment of the stream (Segment 1), from the headwaters of the Hudson Branch to just upstream of Outfall 001, is intermittent. Segment 2, which continues from Segment 1 to West Boulevard, was characterized as an area in which the stream recharges the ground water or there is a significant difference in the stream gradient and storage compared to other segments of the stream. The second explanation is described as being more probable, since no indication of stream loss (i.e., mounding) was observed in the water levels of nearby monitoring wells. Segment 3 continues downstream from West Boulevard to prior to sampling station 8, with this portion of the stream described as a "gaining" segment (i.e., there is a contribution from ground water to the stream). Segment 4, continuing downstream from sampling station 8 to West Arbor Avenue, is described as an area in which stream recharge and ground water discharge appear to be in equilibrium. [DRAI, 1988a and DRAI, 1990]

While the descriptions presented above have been referenced in subsequent environmental reports, there are other factors which must be considered in their utilization. These are:

- The data do not support the conclusions as unequivocally as they are stated in the reports. For example, while the 1983 and 1988 data indicate a reduction in flow between West Boulevard and Weymouth Road, the 1989 data indicate a 920 gpm increase in flow over this segment. Furthermore, the 1988 data from West Boulevard to sampling station 8 indicate an overall decrease in flow in this stretch which is described by DRAI as a "gaining" segment.

- The data indicate the potential for errors in flow estimates. Again, the 1989 data for the segment between West Boulevard and Weymouth Road indicate a 920 gpm increase in flow over a distance of approximately 500 feet. There are no known direct discharges to the stream within this segment and it is highly unlikely that ground water would be discharging to the stream at such a rate. Therefore, it is likely that an inaccurate estimation of stream flow velocity or stream cross-sectional area is responsible for the suspect results. Other errors in such calculations could impact other estimated flow rates and result in inaccuracies in the hydrologic evaluation of the stream.

- The evaluation did not account for the potential impacts of precipitation events on flow rates, nor did it consider ground water table elevations immediately adjacent to the stream. Existing monitoring wells are not located immediately adjacent to the stream and may not be screened over a sufficiently shallow interval to reflect the true water table elevation.

- The data reflect surface water flow characteristics during a period when the treatment system was operating at a rate of 80 gpm and outfall flows totaled 300 to 400 gpm. This data may not reflect current conditions where ground water is being extracted

at a greater rate and outfall discharges are likely to exceed the 1988 rates, based on the treatment of ground water (and its subsequent discharge into the Hudson Branch) at approximately 400 gpm.

Studies conducted by DRAI from August 1991 through May 1992 provided monthly flow rate information for the Hudson Branch. These studies were conducted during a period when the ground water treatment system was operating at a typical rate of 200 gpm. The flow rates measured in the Hudson Branch were significantly reduced from those estimated in previous studies. Flows measured at Weymouth Road (sampling station 4) and at sampling station 8 were less than 25 gpm for all monthly measurements except for those made in February 1992. Again, the flow data did not unequivocally support DRAI's previous interpretation of the inter-relationship between ground water and surface water.[25]

A 1995 study conducted by Environmental Resources Management, Inc. included the collection of flow measurements at nine locations on the Hudson Branch, Burnt Mill Branch and Maurice River during a low-flow period (autumn 1993) and a high-flow period (spring 1995).[26] As with previous studies, flow measurements were collected by measuring flow depth and velocity. The flow rate was then determined by multiplying the velocity by the estimated cross section. The ground water treatment rate during the study period approximated 400 gpm.

During the autumn 1993 portion of the study, the flow in Hudson Branch decreased from Outfall 001 to the confluence with Burnt Mill Pond, with no measurable flow immediately upstream of Burnt Mill Pond. Reductions in flow were consistently measured both from Outfall 001 to Weymouth Road and from Weymouth Road to ERM's downstream sampling station 8 (which was located in the same general area as DRAI's sampling station 8).

During the spring 1995 study, variable flow rates in upstream portions of Hudson Branch were measured. Periods of relatively constant flow, periods of steady flow decreases and one period of steady increases in flow were observed. For the portion of the stream between Outfall 001 and Weymouth Road, reductions in flow rate were observed during every monitoring event but one. For the portion of the stream between Weymouth Road and sampling station 8, flow reductions were measured during four events, flow increases were measured during three events, and relatively constant flows (i.e, within a range of plus or minus 10 gpm) were measured during three events. In the area immediately upstream of Burnt Mill Pond, measurable rates of flow were present during the first half of the spring 1995 portion of the study, but flow was not measurable during the second half of the study period.

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[25] Dan Raviv Associates, Inc., 1991.

[26] "Evaluation of Fate and Transport of Chromium and Total Dissolved Solids in the Hudson Branch – Burnt Mill Branch Tributaries to Maurice River", Environmental Resources Management, Inc., November 1995.

An evaluation of the flow rates estimated during the ERM study in combination with the analytical parameters (i.e., chromium and TDS concentrations) further demonstrate that a more complicated situation is present with respect to the ground water discharge/surface water recharge areas along the Hudson Branch. Areas which may exhibit surface water gain during some times of the year may exhibit surface water loss during others. Areas of surface water loss would be expected to exhibit a loss of flow, with no significant change in chromium or TDS concentration. However, contradictory indications were often observed, such as a measured reduction in surface water flow in combination with an increase in chromium levels.[27]

As described in Section 3.6.1, modifications have been made to site drainage since these Hudson Branch studies were conducted. While no net change in total discharge volume has resulted from these modifications, the individual outfall locations at which the discharges occur, specifically with respect to Outfalls 001 and 002, have changed.

3.6.7 Aerial Photography of the Site

An aerial photograph of the site showing the approximate 100-year floodplain of the Hudson Branch, generated from Federal Emergency Management Agency (FEMA) publications, is included in Appendix 19.1. That figure also shows the separation between the slag piles and the Hudson Branch.

3.6.8 Existing and Planned Surface Water Uses

There are no known or planned surface water diversions in the Hudson Branch or the Burnt Mill Branch downstream of the site and upstream of the convergence with the Maurice River.[28]

3.6.9 100-Year Floodplain

Appendix 19.1, generated from Federal Emergency Management Agency (FEMA) publications, contains the predicted extent of the 100-year flood plain at the SMC site.

3.6.10 Man-Made Changes

The SMC site and the town of Newfield, which is located adjacent to the site and to the north, are partially covered with impermeable materials (buildings and pavement) which would result in increased runoff as compared to undeveloped land. The topographic map of the area (see Appendix 9.1) indicates a likely drainage divide north of the center of the town so that drainage would be directed to both the Mill Branch (north) and the Hudson Branch (south).

Development of the site caused some modification of drainage features at and near the site. Other man-made changes which may influence the surface water flow include: roadway runoff during storm events, culverts below roadways which may restrict flow in significant flood events, and non-

[27] Draft Final Feasibility Study Report, TRC Environmental Corporation, April 1995.

[28] Personal communication w/Paul Horner, City of Vineland Water-Sewer-Utility Department.

stormwater discharges (such as the non-contact cooling water and associated discharges from the SMC site) into the Hudson Branch which add to the base flow of the stream.

3.7 Groundwater Hydrology

3.7.1 Saturated Zone

The Cohansey Sand is the major geologic formation identified in the wells drilled below the site. The Cohansey Sand dips southeast about 11 feet per mile and is about 130 feet thick at Newfield, New Jersey. It is a water table aquifer with depths to ground water ranging from 4 feet in the southern portion of the site to 16 feet in the northern portion. The Cohansey Sand below the site is composed of coarse sands and little to trace silt in the upper 40 feet, and generally finer sand and some silt, with some clay and silt stringers in the lower 60 to 80 feet. Discontinuous silt and clay lenses, up to 6 feet in thickness, were encountered. The Kirkwood Formation, described as a gray silt and clay layer, was encountered at a depth of 120 feet below grade in one of the well borings.

3.7.2 Monitoring Wells

Tabular summaries of the SMC monitoring wells located at and surrounding the site are shown in Tables 17.5 And 17.6. A monitoring well location map (Figure 18.5) and representative ground water level elevation contour maps (Appendix 19.1) are also included.

3.7.3 Ground Water Flow Directions and Velocities

The ground water flow directions in both the water table and lower Cohansey Sand closely correspond to the general topography of the site, which slopes towards the southwest. A downward hydraulic gradient was observed at most of the well clusters across the site. Due to the smaller grain size and increased percentage of silt and clay, the transmissivity of the lower Cohansey Sand is lower than in the upper Cohansey Sand. The average linear shallow ground water flow velocity was calculated at approximately 1 to 3 feet per day.[29]

3.7.4 Unsaturated Zone

Test boring and monitoring well drilling at the site identified primarily fine to coarse sands and gravels in the unsaturated zone at the site; these sediments are likely to be representative of the Bridgeton Formation. The thickness of the unsaturated zone ranges from 0 feet at the Hudson Branch to approximately 17 feet below the northwest portion of the site. The depth to ground water ranges between approximately eight and 15 feet below grade in the vicinity of the slag piles.

3.7.5 Monitor Stations

Figure 18.5 depicts the groundwater monitoring well locations that are present on the Newfield site.

[29] "Ground Water Remedial Alternatives", Dan Raviv Associates, Inc., 1988; "Remedial Investigation Technical Report", TRC Environmental Consultants, Inc., 1992.

3.7.6 Physical Parameters

The hydraulic characteristics for the Cohansey Sand at the SMC site were determined in previous investigations and are summarized in Tables 17.7 and 17.8. These investigations have determined separate transmissivities and specific yield values for both the shallow (water table) and deep (lower Cohansey Sand). These values were averaged from four aquifer tests performed for SMC, as well as from two tests conducted during development the Newfield supply well adjacent to the site (to the northwest):[30,31] Vertical hydraulic conductivities of 0.006 to 3 gpd/ft^2 were calculated at locations across the site.[32]

3.7.7 Numerical Analysis Techniques

Numerous investigations and on-site and off-site hydraulic tests have been performed over the past 30 years associated with the investigation and remediation of ground water contaminated with chromium and volatile organic compounds. The information from the report, "Summary of Geohydrologic Information Collected Since January 1988" (Dan Raviv Associates, Inc., April 1990), shown in the attachments summarizes those results and the data analysis. Computer modeling of the ground water flow system was performed and documented in the report, "Ground Water Remediation Alternatives" by Dan Raviv Associates, Inc. (January 1988).

3.7.8 Distribution of Radionuclides

Several quarterly radiological ground water sampling events were performed from December 1988 through January 1990 utilizing the following onsite monitoring wells: W3 (representative of background conditions), and W2, SC11, SC12, and SC13 (representative of conditions in the vicinity of the Storage Yard), and A (generally downgradient of the Storage Yard and near the downgradient property line. The purpose of the radiochemical sampling was to determine if thorium and uranium, which occurs naturally in some of the raw materials used at the facility, and thus in some of the slag, had impacted ground water. As thorium and uranium decay naturally, energy is released in the form of alpha and beta emissions, measured in picocuries per liter (pCi/l). Both filtered and unfiltered ground water samples were analyzed to determine the influence of suspended versus dissolved solids on ground water quality.

Screening levels established by the USEPA for acceptable concentrations for community drinking water systems are 5 and 50 pCi/l for gross alpha and gross beta, respectively. The highest level of gross alpha was 10 pCi/l and was found at monitoring wells SC12 and SC13 in the vicinity of the slag piles. The highest level of gross beta was 530 pCi/l at SC13. In addition, there were

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[30] Woodward-Moorhouse & Associates, Inc., "Preliminary Report Groundwater Contamination Study Phase II", September 12, 1974.

[31] Roy F. Weston, Inc., "Hydrogeologic Investigation of Ground Water Contamination" Interim Report, February 1972.

[32] "Evaluation of Remediation Alternatives", Dan Raviv Associates, Inc., January 1988; "Remedial Investigation Technical Report", TRC Environmental Consultants, Inc., 1992.

exceedences of the gross alpha screening levels found at SC11, while W2, W3, and A were consistently below the screening levels for both gross alpha and beta. Wells SC11 and SC12 exhibited exceedences of the screening level for gross beta, although these results were lower than at SC13. Greater concentrations of gross alpha or beta were not consistently found in the unfiltered samples, as compared to the filtered samples. Therefore, the suspended sediment in the ground water does not contain significant levels of gross alpha or beta. (It should be noted that the method detection limits for gross alpha and beta analysis varied depending on the amount of suspended solids in each sample, and the error range generally increased as the detection of analytes increased.)

The results of this investigation indicate the presence of radionuchdes in the wells in the immediate vicinity of the Storage Yard. However, those wells to the west and downstream of the Storage Yard are below the USEPA screening levels.[33]

3.8 Natural Resources

3.8.1 Potable, Agricultural, or Industrial Ground or Surface Waters

Ground water is used for local water supply by municipal and private wells. The attached maps show the locations of water-supply wells within one mile of the site (as of 1994). There are no known or planned surface water diversions along the Hudson Branch or Burnt Mill Branch downstream of the site and upstream of the Maurice River for water supply or other purposes.

3.8.2 Economic, Marginally Economic, or Sub-economic Known or Identified Natural Resources [34]

According to Daniel Dombrowski of the New Jersey Geologic Survey, there are no known mineral, fuel, hydrocarbon, or other natural resources in the area surrounding the site, with the possible exception of sand or gravel. (Personal communication, 7/29/02). This information is validated in addition by the Geologic Map of New Jersey, which identifies the formations surrounding the site as layers of gravel, sand, silt, and clay. This geologic formation, referred to as the Coastal Plain, "has been mined in the past for bog iron, glass sand, ceramic and brick titanium.... The mineral glauconite for use in fertilizer, and titanium....Today the Coastal Plain sediments continue to supply glass sand, and are extensively mined for construction material. The sand formations are productive aquifers and important ground water reservoirs."[35] Specific listings of mineral resources were not available.

3.8.3 Mineral, Fuel, and Hydrocarbon Resources Near and Surrounding the Site

There are no mineral, fuel, or hydrocarbon resources in the area other than sand and gravel. Mining of sand and gravel beyond the property boundaries in the future should not affect the dose estimates.

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[33] "Quarterly Radiochemical Ground Water Sampling;" reports from 1988 – 1990, Dan Raviv Associates, Inc.

[34] As defined in U.S. Geological Survey Circular 831

[35] From USGS website, www.usgs.gov/

3.9 Ecology/Endangered Species

3.9.1 Commercially or Recreationally Important Invertebrate Species Known to Occur within 5 km of the Site

An inquiry has been made to the Office of Natural Lands Management for a search of the Natural Heritage Database for information on commercially- or recreationally-important species in the vicinity of the Newfield site.[36] The inquiry included the location of the SMC property, its Plane Coordinates, and a USGS quadmap showing the outline of the premises.

3.9.2 Commercially Important Floral Species Known to Occur within 5 km of the Site

According to Jim Johnson, Cumberland County, NJ Agricultural Extension Agent, no native species in New Jersey are harvested for commercial use.

3.9.3 Commercially or Recreationally Important Vertebrate Animals Known to Occur within 5 km of the Site

Refer to Section 3.9.1. Farm animals, domestic animals, and game animals may be present in the vicinity of the site.

3.9.4 Estimates of Relative Abundance of Both Commercially and Recreationally Important Game and Non-game Vertebrates

Refer to Section 3.9.1. No specific information regarding the relative abundance of commercially and recreationally important game and on-game vertebrates could be determined that the time of this Plan's development.

3.9.5 A List of All Endangered Species at or within 5 km of the Site

In 1994, an endangered and threatened plant species survey and stressed vegetation survey were conducted by Amy S. Greene Environmental Consultants, Inc. as part of the remedial investigations for the site. This investigation included a field-based survey as well as database research through NJDEP's Office of Lands Management, Natural Heritage Program. Results of those activities indicated that although habitats specific to several species of concern existed in the vicinity of the site, no specimens of the listed species were identified on the site. A copy of the final report is provided in Appendix 19.1.

More recently, in preparation for this Decommissioning Plan, an updated report of endangered and threatened species was requested from the Natural Heritage Program. The Landscape Project database (Version 1.0) search results show that suitable habitat patches of emergent wetland, forest, and forest wetland occur on the SMC site, however, it identified no records for rare or endangered plants, animals, or natural communities in those habitat areas. A copy of the letter report which presents the result of the research is provided in Appendix 19.1. The report includes list of rare species from records in the Natural Heritage Data Base in the general vicinity of the site, as well as

[36] Office of Natural Lands Management, Natural Heritage Program, PO Box 404, 22 South Clinton Avenue, Trenton, NJ 08625-0404.

lists of rare species and natural communities that have been documented from Gloucester and Cumberland Counties.

4 RADIOLOGICAL STATUS OF THE FACILITY

4.1 Contaminated Structures

The Newfield plant is divided into three functional areas, plus administration facilities. These are the manufacturing area, the Storage Yard, and other undeveloped plant property. The following are brief description of each functional area:

- Manufacturing Area - This area contains a number of operations facilities, offices, and loading docks. For the most part, the area is covered with buildings and asphalt or concrete pavement. Included are the Railroad Siding Area, Department 111 (ferrocolumbium operation), Department 102 (former aluminothermic reduction operation), Department 112 (crushing operations), Department 107 (induction melting) Department 101 (metal grinding operafions), Department 115 (aluminum master alloys), Department 116/118 (metal powder compaction operations), Department 203 (warehouse operations), and Department 204 (maintenance operations).[37,38]

- Storage Yard - This area is located on the eastern portion of the property, and is used to store materials generated during manufacturing operations. Slag generated during the ore processing procedures is stored in this area, as is baghouse dust and excavated soils.

- Other Undeveloped Plant Property - This area is located along the southern plant property boundary, and includes all undeveloped and unused areas of the plant.

By far the preponderance of the Newfield site has either never been impacted by licensed operations, or has already been free-released. The former includes the visitor center, administrative offices, Department 107, Department 101, Department 115, Department 116/118, Department 203, and Department 204, all of which have never housed licensed materials. The following is a listing of those structures or facilities that were, at one time, impacted by licensed operations, but that have since been remediated, as necessary, with final status surveys performed and documented, and the facilities subsequently released for unrestricted use: A-Warehouse; G-Warehouse; AAF Baghouse (with the exception of the concrete pad); and the ferrovanadium slag sorting area in the Storage Yard

[37] Department 111 and Department 102 process the radioactive materials for this operation.

[38] At one time, D-116 processed polishing compounds and other materials that are exempt from licensing pursuant to 10 CFR 40.13. Although these materials contained thorium and uranium, the cost of characterization, remediation and final status survey of D-116 is not included in this Plan because it was never a radiologically restricted area, and because the operations therein were exempt from the regulations in 10 CFR 40.

(recently re-forested).[39,40,41,42] Finally, D-111, and D-102/112 were recently decommissioned, and a final status survey is planned for calendar year 2002, a copy of which will be submitted to the USNRC. Section 2.3, above, contains additional information about all previously-decommissioned structures.

There are over 20 buildings on the property, and their construction is either steel or wood frame or concrete block. Only three of them are currently designated as restricted areas, meaning source material was stored/used there at one time. These are D-117 (Cave), D-202 (Laboratory) and D-Warehouse. Figure 18.6 shows the location and size of the three restricted areas.

Ambient gamma exposure rates in background locations have been performed as part of a number of different surveillance operations (e.g., final status surveys of A-Warehouse, G-Warehouse etc.), including the compliance surveys performed and documented each quarter. The following subsections summarize the measured levels.

4.1.3.1 Ambient Gamma

Data acquired with a Bicron Microrem meter at a height of approximately one (1) meter above a ground or floor surface, indicate ambient gamma background dose rates in buildings ranging from seven (7) to eight (8) microrem per hour.[43]

4.1.4.2 Surface Contamination

Alpha backgrounds ranging from zero (0) to two (2) counts per minute were obtained using hand-held instruments. Background alpha activities using a large area floor monitors ranged from eight (8) to thirteen (13) counts per minute. Background beta results for the large area floor monitors ranged from 900 to 1080 counts per minute.

In all three of the restricted areas (D-117, D-202 and D-Warehouse), routine surveillance data acquired each calendar quarter confirm that there is no residual radioactivity in these areas.

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[39] Shieldalloy Metallurgical Corporation, License Amendment Application to remove D203A (known as "A-Warehouse") from listing of permanent restricted areas, submitted on January 28, 1999. Amendment issued on July 20, 1999.

[40] Shieldalloy Metallurgical Corporation, "License Amendment Application to Remove Bldg. D203(G), also known as "G-Warehouse" from the listing of permanent restricted areas, submitted March 30, 2001.

[41] Shieldalloy Metallurgical Corporation, "License Amendment Application to Remove AAF Baghouse from the listing of permanent restricted areas, submitted January 30, 2000.

[42] Integrated Environmental Management, Inc., Repon No. 94005/G-18198, "Soil Sampling/Survey of Storage Yard After Remediation", submitted to Shieldalloy Metallurgical Corporation, January 20, 2000.

[43] A Microrem meter provides a tissue-equivalent response allowing a readout in microrem per hour (μrem/hr).

Nonetheless, their final radiological status as compared to the site-specific release criteria will be included in the final status survey report for this decommissioning effort.

Quarterly walkthroughs of the D202 laboratory (upper level) showed general area dose rates of approximately six (6) microrem/hr, even in the vicinity of energized x-ray analysis equipment. Dose rates on the lower level ranged from 6 to 7 microrem/hr (the majority of a separate storage room containing a locked safe housing radioactive materials), with a maximum of 40 microrem/hr at one foot from the aforementioned safe. General area dose rates in Building D117 (i.e., the "Cave") were 6 to 7 microrem/hr. All of these ambient dose rates, with the exception of those near the safe, are consistent with the background data set.

4.2 Contaminated Systems and Equipment

The only buildings that contained systems and equipment for processing source material were D-111, the Flex-Kleen Baghouse, the AAF Baghouse, and D-102/112. The AAF Baghouse was demolished and released for unrestricted use in CY 2001. The Flex-Kleen Baghouse, D-111 and D-102/112 were decommissioned in CY 2002, and the final status survey report is soon to be submitted to the USNRC. Consequently, there are no longer any contaminated systems or equipment to be addressed in the site-wide decommissioning effort.

4.3 Surface Soil Contamination

The only areas within the Newfield plant property lines where residual radioactivity exists in surface soils, other than in the Storage Yard, are the concrete pads that housed the former AAF and Flex-Kleen Baghouses.[44] In addition, residual radioactivity was identified in the Hudson's Branch watershed in the late 1980's.[45] The Hudson's Branch, an intermittent, slow-moving tributary of Burnt Mill Branch in the Maurice River Basin, is the predominant surface water body in the vicinity of the plant. It borders the southern boundary of the property, where it flows from east to west.[46]

Ambient gamma exposure rates in background locations have been performed as part of a number of different surveillance operations (e.g., final status surveys of Haul Road, ferrovanadium slag sorting area, etc.), including the compliance surveys performed and documented each quarter. The values recorded are instrument- and geometry-dependent. However, data acquired with a Bicron Microrem meter at a height of approximately one (1) meter above a ground indicates background dose rates ranging from eight (8) to 15 microrem per hour in outdoor areas.[47]

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[44] Section 4.4, below, describes the radioactive materials present in the Storage Yard.

[45] "Baseline Radiological Risk Assessment for the Hudson's Branch Watershed", IT Corporation Report No. IT/NS-92-116, submitted to Shieldalloy Metallurgical Corporation, Newfield, New Jersey, November 3, 1992.

[46] The Hudson's Branch flows from northeast to southwest after it leaves the SMC property.

[47] A Microrem meter provides a tissue-equivalent response allowing a readout in microrem per hour (μrem/hr).

Background soil samples have been collected and analyzed by a variety of organizations and methodologies over the years. Table 17.6 is a compendium of background soil concentrations of uranium and thorium isotopes acquired during three measurement campaigns.

On and around the concrete pad that remained after demolition of the AAF Baghouse, the only radionuclides of concern are thorium and uranium, with progeny in general equilibrium. From the final status survey report for the AAF Baghouse decommissioning, the concrete pad was shown to contain up to 19,800 dpm/100 cm^2 of residual beta activity.[48] During the most recent quarterly compliance surveillance effort, a maximum of 1868 dpm/100 cm^2 of alpha activity from direct frisks was noted. Smears of the pad are negative for the presence of removable alpha or beta activity, meaning the measured residual radioactivity is affixed to the pad.

The radionuclide concentration in the Hudson's Branch was summarized in a 1992 risk assessment report.[49] There it was shown that the presence of those materials, which were uranium and thorium plus progeny, presented an insignificant radiological risk to members of the public. A scale drawing and map showing the Hudson's Branch Watershed, with ambient exposure rates, is included herein as Figure 18.7. Figure 18.8 shows the location of soil sampling, along with a graphical representation of the results.

4.4 Subsurface Soil Contamination

Subsurface soil contamination, in the form of ferrocolumbium slag, is present in the Storage Yard. and at a number of locations throughout the Newfield plant where slag was used as fill. The dimensions of these locations were described in detail in a 1992 report.[50]

Ferrocolumbium standard slag, ferrocolumbium high-ratio slag, and columbium nickel slag generated from the D111 and D102 smelting operations consist of solid, non-combustible material with the consistency of vitrified rock. All three slag types were maintained separately from the others at their respective points of generation and are transported in trucks from D111 and D102 to the Storage Yard. There are approximately 20,000 cubic meters of ferrocolumbium slag (high ratio and standard) in the Storage Yard. In addition, baghouse dust was transported by truck to the

[48] Integrated Environmental Management, Inc. Report No. 94005/G-20187, "Demolition and Final Survey of the AAF Baghouse", submitted to Shieldalloy Metallurgical Corporation on January 7, 2000.

[49] "Baseline Radiological Risk Assessment for the Hudson's Branch Watershed", IT Corporation Report No. IT/NS-92-116, submitted to Shieldalloy Metallurgical Corporation, Newfield, New Jersey, November 3, 1992.

[50] Berger, C. D., A. Chance, K. Wiggins and H. Prichard, "Assessment of Environmental Radiological Conditions at the Newfield Facility", IT Corporation Report No. IT/NS-92-106, submitted to Shieldalloy Metallurgical Corporation, Newfield, New Jersey, April 1, 1992.

Storage Yard. Approximately 20,000 cubic meters of baghouse dust are currently in the Storage Yard.[51,52]

Ambient gamma exposure rates in background locations have been performed as part of a number of different surveillance operations (e.g., final status surveys of Haul Road, ferrovanadium slag sorting area, etc.), including the compliance surveys performed and documented each quarter. The values recorded are instrument- and geometry-dependent. However, data acquired with a Bicron Microrem meter at a height of approximately one (1) meter above the ground surface indicates a background dose rate range of eight (8) to 15 microrem per hour.[53] Background soil samples have been collected and analyzed by a variety of methodologies over the years (see Table 17.6).

There are approximately 23 curies each of uranium and thorium in the form of slag and baghouse dust in the Storage Yard. The concentration of each in the slag is approximately 400 pCi/gram. In the baghouse dust, the concentrations are less than 10 pCi/g each.

The physical form of the slag in the Storage Yard slag (glass-like rock) does not permit the radioactive elements to leach out into the regional water supply or local wetlands. Leachability studies performed on samples of the slag support this conclusion.[54] Also, the surface of the baghouse dust pile forms a "crust" when it encounters moisture, which serves to deter fugitive dust emissions. The radiation exposure rates in this area range from background to 0.2 milliR per hour, with the maximum measured exposure rate being due north of the Storage Yard, approximately 30 feet from the slag piles.

The Storage Yard also contains less than 6,500 m^3 of soil excavated during a previous remedial action. In addition, there are other deposits throughout the plant that may be returned to the Storage Yard as part of the decommissioning process. The following is a description of all of these materials:

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[51] Historically, dusts generated from both ferrocolumbium production and un-recycled dusts from ferrovanadium production were not segregated. Currently, however, the ferrovanadium contribution to the collected dusts is negligible.

[52] From the volumetric information obtained from ah October, 1991 fly-over of the Newfield site, the Storage Yard contained 16,800 m^3 of standard slag and 1040 m^3 of high-ratio slag at that time, for a total of 17,840 m^3 (Shieldalloy Metallurgical Corporation, "Applicant's Environmental Report for the Newfield, New Jersey Facility", October 1, 1992). The volume of slag produced during ferrocolumbium operations performed after the 1991 fly-over and before the date of this report was added to this total in order to estimate the present-day volume of slag in the Storage Yard.

[53] A Microrem meter provides a tissue-equivalent response allowing a readout in microrem per hour (µrem/hr).

[54] Teledyne Isotopes, "Report of Leachability Studies for Shieldalloy Metallurgical Corporation", Teledyne Isotopes, Westwood, New Jersey, 1992.

- Haul Road - The Haul Road was, at one time, a county right-of-way that ran through SMC's Newfield plant. Over the years, the south portion of the road was surfaced with crushed slag from SMC operations. Characterization efforts that took place in 1988 and 1991 showed that the contact exposure rates in and near the road were only slightly discernible from background, that the contaminants therein were natural uranium and natural thorium, and that the slag used to form the road bed was not characteristic of licensed material (i.e., ferrocolumbium slag).[55,56,57] In September of 1998, approximately 6,500 m^3 of predominantly soil, with some residual slag, was scraped from the road transferred to the Storage Yard. This soil is assumed to contain approximately 0.2 curies of uranium, and thorium.[58] A final status survey of the remediated area demonstrated that the Haul Road may be released for unrestricted use (i.e., without regard for radiological constituents).[59]

- Slag Used as Fill - The remaining areas on the property where fill slag may exist (i.e., the southwest fence line and in the T12 Tank Area) are not designated "Restricted Areas" since the ambient exposure rates in these areas currently range from baekgrotind to only a few tens of inicroR per hour.[60] While the mass of fili slag has not been well-characterized, the lateral extent of elevated surface exposure rates identified in a previous site characterization effort (i.e., approximately 8,000 m^2)

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[55] Oak Ridge Associated Universities, "Radiological Survey of the Shieldalloy Metallurgical Corporation, Newfield, New Jersey", Report Nb. ORAU 88/G-79, July, 1988.

[56] IT Corporation, "Assessment of Environmental Radiological Conditions at the Newfield Facility", Report No. IT/NS-92-106, April 2, 1992.

[57] Exposure rates in and near the road generally ranged from background to 26 microR per hour, with a maximum exposure rate of 90 microR per hour directly over slag pieces. If these are compared to the contact exposure rate from ferrocolumbium slag, which is in the vicinity of 1,000 to 2,000 microR per hour, it is clear that the slag in the road was the result of a different operation.

[58] If the source material content of ferrocolumbium slag (i.e., 400 pCi per gram each of thorium and uranium) is multiplied by the ratio of the maximum contact exposure rates for the materials excavated from the road and ferrocolumbium slag, a reasonable estimate of the source material concentration in the excavated soils is 18 pCi per gram. Assuming a soil density of 1.6 grams per cm^3, and a total soil volume of 6,500 m^3, the curie content of the excavated soils is about 0.2 curies each of uranium and thorium.

[59] Integrated Enviromnental Management, Inc. Report No. 94005/G-17172, "Final Status Survey of Haul Road", June 22, 1999.

[60] IT Corporation, "Assessment of Environmental Radiological Conditions at the Newfield Facility", IT Corporation Report No. IT/NS-92-106, April 1, 1992.

gives a reasonable estimate the spatial extent of residual radioactivity therein.[61] A conservative assumption of uniform thickness (i.e., one meter) over this entire area results in an estimate of 8,000 m^3 of fill slag on the property, containing approximately 4.2 curies each of uranium and thorium.[62]

The slag and baghouse dust contained within the Storage Yard have been placed directly upon the ground surface. Because the leach rate of radionuclides from these materials is low, sub-surface activity beyond a nominal depth of 30 cm, attributable mainly to slag burial, is unlikely. In those areas on the property where slag was used as fill, the maximum depth of deposition can be reasonably assumed to be one (1) meter or less.[63]

4.5 Surface Water

From many years of sample collection and analysis, it can be shown that the surface water collected from the vicinity of the Newfield site does not exhibit elevated (above background) radionuclide concentrations.[64]

4.6 Groundwater

The radionuclide content of groundwater collected from the vicinity of the Newfield site is described in Section 3.7.8, above. In general, no elevated levels of radionuclides have been identified.

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[61] Berger, C. D., A. Chance, K. Wiggins and H. Prichard, "Assessment of Environmental Radiological Conditions at the Newfield Facility", IT Corporation Report No. IT/NS-92-106, submitted to Shieldalloy Metallurgical Corporation, Newfield, New Jersey, April 1, 1992.

[62] Assuming a source material concentration of 400 pCi per gram each of thorium and uranium in the slag, a slag density of 1.3 grams per cubic centimeter, and a total slag volume of 8,000 m^3, the curie content of the slag used as fill is approximately 8.4 curies each of uranium and thorium.

[63] However, it is important to note that, in order to main the structural integrity of the areas where slag was used as fill, the radionuclide distribution and depth have not yet been well-characterized.

[64] TRC Environmental Consultants, Inc., "Remedial Investigation Technical Report", Project No. 7650-N51, Windsor Connecticut, April, 1992.

8 PLANNED DECOMMISSIONING ACTIVITIES

This chapter contains the description of SMC's approach for decommissioning of the remaining restricted areas at the Newfield site. It also contains a schedule for completion of those activities. As described previously, the decommissioning program will involve the following general steps:

- Finalization of decommissioning work plan and procedures, which will cover the detail and procedures, including the final design and technical specifications, health and safety plans (HASPs), construction issues, and performance and documentation of the Final Status Survey.
- Consolidation, stabilization, grading, and preparation of the regulated material within the Storage Yard;
- Characterization of those portions of the Storage Yard surrounding the final storage area's footprint; construction of the final cap and associated infrastructure (e.g., drainage systems); and
- Performance of the Final Status Survey of the soil excavation areas and the completed capped area to confirm the absence of residual radiological activity above the site-specific criteria.

A detailed description of the planned closure activities, in accordance with the USNRC decommissioning guidance titled *Consolidated NMSS Decommissioning Guidance*, and a schedule for these activities, are presented in the following subsections. In addition to those areas of the facility that will be subjected to active decommissioning processes (e.g., excavation, cap construction, etc.), several additional areas that were formerly associated with radiological source material but no longer exhibit residual activity will be subjected to Final Status Survey assessment as part of this site-wide decommissioning effort.

8.1 Contaminated Structures

As described in Section 2.3, above, residual activity was present in building materials and/or equipment associated with several Newfield site structures. These included Building D-111 and associated (Flex-Kleen and AAF) air handling systems, and the D102-112 Production Department facilities. Associated building and equipment decontamination, demolition, and disposal activities have already been completed. Non-licensed material that has been generated as part of these activities has been recycled or disposed off-site; licensed materials have been stockpiled in the Storage Yard.

As a result of the recent decommissioning actions associated with contaminated structures on-site, approximately 2,630 cubic meters of USNRC-regulated material is assumed to be incorporated into

the Storage Yard closure program. This material is located in the southern part of the Storage Yard, as depicted in Figure 18.3. No additional decommissioning activities are thus necessary in order to address contaminated structures.

8.2 Contaminated Systems And Equipment

As described in Section 2.3, decommissioning activities have been performed to address other identified portions of the Newfield facility that exhibit radiological activity. Contaminated systems and equipment have been managed as part of the contaminated building program, including Building D-111 and its two air handling systems, and the D102-112 Production Department facilities. As a result of those recent decommissioning actions, approximately 110 cubic meters of contaminated materials, in the form of baghouse dust, was generated and placed into the Storage Yard. Based upon the findings of routine surveillance activities and previous radiological site characterizations, as well as historical process knowledge, no additional facilities with residual radioactivity remain at the site.

8.3 Soil

The focus of this Plan is the consolidation, capping and management of remaining process slag, baghouse dust, radiologically-impacted soils and USNRC-regulated materials into the existing Storage Yard. For purposes of this Plan, all of these materials will be categorized as "soil". Site materials exhibiting radiological activity above applicable release criteria will be incorporated into the capped landfill area. The following sequence of steps will be performed to address the management and final disposition of soil materials on-site which exhibit radiological activity above established background levels:

- Installation of erosion and sedimentation control systems to prevent off-site migration of regulated materials during construction activities and the control of run-on into the work areas;
- Dust control;
- Preparation of final capped disposal area (grading, compaction, drainage, etc.);
- Consolidation of regulated materials (slag, baghouse dust, soils, stockpiled decontamination/demolition regulated material) beneath the planned cap;
- Sampling and radiological analysis of surface soils surrounding the capped area, within the Storage Yard, followed by excavation and consolidation of additional regulated soils, if required;
- Final grading, compaction, and cap installation;

- Performance of Final Status Survey of the entire Storage Yard (consisting of capped and surrounding areas; and
- Establishment of O&M and monitoring programs.

Specific activities associated with the first four of these steps, including sequence and methods, are described individually below. The Final Status Survey and long-term monitoring and maintenance of the site are discussed in detail in Chapters 11 and 16, below.

The final design and specifications for the cap will be developed in accordance with USNRC requirements, as summarized in Title 10 Code of Federal Regulations, Section 61.52, with the final plans and specifications provided in a subsequent submission, and will include the following design elements:

- Final contour plan;
- Cap system design details;
- Slope stability analysis;
- Description and availability of final cover material;
- QA/QC Plan for cap construction;
- Detailed description of erosion control measures;
- Post-closure monitoring plan;
- Surface water management system design;
- Contingency plans for differential settling;
- Construction Quality Assurance Plan;
- Performance Standard Verification Plan; and
- Operation and Maintenance Plan.

Primary design considerations include: (1) physical characteristics of the stockpiled regulated materials (size, density); (2) volumes of the material piles; and (3) relative location of the material piles. The cap will be designed and constructed in order to minimize material relocation, while

establishing a stable storage system. Specific design considerations include provision for the following:

- Provide required radiological shielding through installation of calculated soil cap thickness;
- Facilitate drainage off of cap and away from unit;
- Ensure long-term cap slope stability through appropriate design and construction;
- Install erosion controls for implementation during construction and for long-term cap maintenance;
- Provide dust control during cap construction;
- Minimize need for waste material handling (loading, transfer, and installation) to lower construction costs and simplify logistics;
- Utilize baghouse dust, soil and finer slag material as subgrade preparation for the soil cap, over the larger size slag material;
- Minimize requirements for off-site cover material to lower construction costs;
- Minimize surface area of cap while meeting requisite slope stability and other key design objectives to simplify long-term maintenance and lower overall program costs; and
- Use low maintenance vegetative cover materials.

8.3.1 Cap Construction

Construction of the cap will be initiated through consolidation of the collected/stockpiled regulated materials and preparation of the final subgrade for cap construction. Surface drainage systems will be constructed, which will direct surface runoff from the cap away from the capped material. Cap preparation will also involve the physical movement of slag, baghouse dust, and other materials using standard construction equipment (front-end loaders, bulldozers, dump trucks) such that effective consolidation and compaction is achieved.

Due to the large size and rough texture of the resident ferrocolumbium slag, it is anticipated that the finer-grained slag, soils and baghouse dust will be used to prepare the cap subgrade by filling the larger void spaces among the slag matrix. Final decisions as to the location of the various materials within the constructed capped unit will be made by SMC's Contractor based upon field conditions and final cap design considerations.

During consolidation of the various regulated materials into a single pile, comprehensive health and safety protocols will be followed to avoid exposing workers and nearby resident to site contaminants, and to prevent migration of contaminants into the surrounding environment. Water and/or other appropriate dust-control media will be used during all material movement activities. Continuous monitoring of the access and haul roads will be performed and appropriate dust control activities will be performed to minimize vehicle-induced fugitive dust generation. Material loading and unloading activities will also be monitored and controlled in a similar fashion. Further, real-time dust monitoring and radiological monitoring will be performed by SMC's Contractor to ensure exposures to radiological contaminants as well as other constituents of potential concern (i.e., metals) do not occur as a result of materials handling activities.[75] These actions, combined with the fact that the closest residence is more than 28 meters from the SMC property boundary, will ensure radiological and safety conditions that cannot be distinguished from those prior to the start of work will be maintained.

8.3.2 Adjacent Soil Characterization

As part of the regulated material consolidation process into a single pile, supplemental radiological surface soil characterization will be conducted within the Storage Yard by SMC's contractor to determine whether soils outside of the footprint of the storage cap are impacted by radiological contaminants of potential concern. Historical storage of licensed materials in this area could have caused the co-mingling with the underlying site surface soils. These potentially-impacted shallow surface soils may therefore be required to be consolidated in the capped pile.

Following removal of all of the licensed material beyond the areal extent of the final planned capped pile, soil sampling and radiological surveys will be conducted to determine the extent of any possible additional licensed material. Actual number, location, and depth of samples will be determined following completion of all initial consolidation activities, however sampling will involve the collection of a statistically significant number and distribution of shallow surface soil samples, which will be subjected to analysis for radiological constituents.

Upon receipt of the shallow surface soil characterization results, SMC's environmental Contractor(s) will make a determination as to which soils shall be placed beneath the cap. Soils exhibiting radiological activity above the release criteria for soil excavation will be transferred to the Storage Yard for capping. SMC may place other inert (unticensed) soils beneath the cap to prepare the cap subgrade, to shape the site surrounding the cap or to isolate other soil materials regulated by NJDEP.

8.3.3 Cap Completion

Upon final consolidation of materials, the final cap will be constructed on the prepared subgrade in order to achieve the design criteria described in Section 5.0 of this Plan. The cap has been designed

[75] In the event that exposure levels above established site-specific health and safety action levels are identified, additional dust control activities (e.g., increased application of water or other control medium or use of different/supplemental controls systems) will be implemented.

in accordance with USNRC specifications. On this basis, the final graded and compacted impoundment will be covered with a one-meter-thick compacted soil shield barrier. Thickness of the soil barrier layer was calculated using a RESRAD computer model, and demonstrates that the potential for radiation exposures to from all exposure pathways over the next 1,000 years is less than 100 millirem per year (see Chapter 5, above). The cap in its entirety will consist of a geotextile membrane for water diversion, and one (1) meter of compacted suitable soil, topped with a six-inch thick final vegetative soil layer that is then seeded with suitable low maintenance and drought resistant grasses.

Surface drainage from the top surface of the capped pile will be collected near the top of the side slopes via open drain swales and directed down the side slopes in erosion control-lined downchute open channels. The discharge from the downchutes will be directed away from the pile and either allowed to spread and disperse or it will be directed via open channels or pipe to a suitable stormwater outfall location. Final cover soil material will be secured from a certified off-site source, and will be of appropriate grain size and quality to be stable and augment the overlying vegetative soil layer. Proposed location and dimensions of the final cap are depicted in Figure 18.9; details of design elements are provided in Figure 18.10.

Due to the long-term nature of the planned materials storage program, the size of the capped area, and the future secure nature of the area, SMC intends to evaluate the final storage area as a potential wildlife preserve. Such an application will enhance the aesthetic appearance of the area, provide an undisturbed refuge for local wildlife, and provide a secondary value for the property. To that end, the final cap design process will include a detailed ecological evaluation of the local flora and fauna, as well as the identification of appropriate plant species and other physical features that may be implemented into the final cap restoration. In addition to increased habitat value, the establishment of permanent vegetation also serves to protect the surface from soil erosion and remove water from the cover soils via evapotranspiration.

Given the current conditions that exist on the site, a successional old-field community is proposed in order to provide long-term stabilization of the cap and minimize future maintenance requirements, while promoting rehabitation by indigenous species, as well as migrating birds. The vegetation selected for the restricted release area should include a mixture of herbaceous and shrub species. Upland areas may be planted with a mix of perennial species during the growing season to establish permanent vegetative stabilization. Perennials develop a strong sturdy root structure that generally inhibits the growth of volunteer woody vegetation that may affect the integrity of the cap. The seed mix selected for the area may include grass and legume species including annual rye grass (Lolium spp.), birdsfoot trefoil (Lotus corniculatus), red clover (Trifolium pratense), and vetch (Vicia spp.). Shrub species selected for the area may include juniper (Juniperus communis) and staghorn sumac (Rhus typhina). A monitoring plan would be recommended to ensure successful establishment of selected plant species on the capped area. The final planting scheme would be prepared in close cooperation with the final engineering design of the cap.

8.3.4 Final Status Survey

Following completion of all material consolidation and capping activities, SMC's Contractor will conduct a Final Status Survey of the disturbed areas and capped unit. The survey will follow protocols and methods established in the *Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM)*. The primary purpose of the Final Status Survey will be the confirmation that the former radiologically-controlled and/or impacted areas of the site associated with controlled by-product material used on-site (stored or used as fill) meet the established exposure criteria for the site. Detailed discussion of the Final Status Survey is provided in Chapter 11.

8.3.5 SMC Commitment Statement

SMC is committed to implementation of conservative radiological protection practices, and intends to be consistent with federal requirements that licensed radioactive materials be handled and released in a manner that ensures that exposures are as low as reasonably achievable (ALARA), taking into account economic and societal factors. Because the goal of decommissioning at the Newfield site is to ensure that members of the general population do not incur radiation doses in excess of 100 millirem per year after the license is terminated, these two objectives (i.e., the dose limit contained in 10 CFR 20.1402 and the ALARA provisions) form the basis for the level of effort necessary for decommissioning of this facility.

8.4 Ground Water

As described in Chapter 4, previous investigations at the site, including evaluations in the vicinity of the Storage Yard, yielded no radiological impacts above USEPA screening levels in downgradient ground water. Non-radiological contaminants (e.g., metals and/or volatile organic compounds) were detected in ground water and have been further evaluated and addressed under the NJDEP RI/FS process. Results of previous investigations are presented in the report titled *Remedial Investigation Technical Report*, dated 1992. Based on the absence of exceedances of radiological action levels in downgradient ground water, no decommissioning actions are planned to address the ground water. However, the planned decommissioning program will be designed and implemented in order to prevent discharges of radiological and/or chemical constituents to these environmental receptors through effective erosion and sedimentation controls, materials and equipment management, and proper completion of the designed cap. Future effectiveness of this storage unit will be evaluated through installation of long-term monitoring program; specifications of the O&M and monitoring of this unit are provided in Chapter 16 of this Plan.

8.5 Decommissioning Schedule

The projected schedule for the Newfield Decommissioning program is shown in Figure 18.12. This schedule presents the estimated time that will be required to perform the full closure process, from finalization of the project Work Plan through submission of the Construction Completion Report and receipt of final USNRC approval. The primary tasks depicted on the schedule consist of the following activities:

- Work Plan Development;

- Final Design;
- Bidding and Award;
- Implementation of Decommissioning Activities;
- Cap Construction; and
- Construction Completion Report and Certification.

The presented schedule, which depicts the relative sequence of tasks and the projected time frame for each task/subtask, has been based upon a number of general assumptions, including time requirements for the review and approval of submittals to the USNRC. SMC acknowledges that this schedule may change substantially based on USNRC input, final design requirements, site-specific conditions, etc. In the event that the schedule as provided in this Plan cannot be maintained, as the project moves forward, SMC will develop and submit an updated schedule to the USNRC.

SITE SPECIFIC ADVISORY BOARD
Shieldalloy Metallurgical Corporatibn

Minutes from August 15, 2003 Meeting

Attendance: (see attached sign-in sheet)

David R. Smith - SMC
C. Lee Harp, Esq. - Arter and Hadden (facilitator)
Carol D. Berger, C.H.P. - IEM (technical consultant to SMC)
Loretta Williams - Newfleld resident
Donna L. Gaffigan - NJDEP representative
Nancy W. Stanley - NJDEP representative
Rick Westergaard - Mayor
(see attached sign-in sheet)

Discussion: (see attached agenda)
Welcome, introductions, sign-in, and a brief discussion on the purpose of meeting was delivered by Lee Harp.

David Smith provided a brief introduction to SMC, incltiding its history, its licensing status and the current decommissioning activities, followed by a brief walking tour and visit to the Storage Yard. *The following handout was provided and attached io these minutes: Background information on SMC*

Carol Berger gave an introduction to the concepts of radiation and radioactivity, with emphasis on definitions, units (i.e., the "millirem"), typical background radiation exposures (U. S. Average is 360 millirem), the regulatory dose limits for license termination for unrestricted use (25 millirem) and restricted use (100 millirem), and radiation-related risks (no demonstrable risks below 10,000 millirem). *The following handouts were provided and attached to these minutes: Presentation Outline ("Introduction to Radiation and Radioactivity"), a brochure on "Radioactivity Basics", and a webcard showing the address of a weh site where more information on radiation and radioactivity can he found.*

The regulations associated with decommissioning in general and public involvemeht in particular was provided and sunnnarized by Carol Berger, with emphasis on those pertaining to stakeholder and public involvement. *The following handouts were provided and attached to these minutes: Presentation Outline ("Purpose of the Site Specific Advisory Board") and USNRC decommissioning regulations.*

Lee Harp discussed the rble of the SSAB during decommissioning of the Newfield site. *The following handout was provided and attached to these minutes: "Requirements of 10 CFR §20.1403(d)".*

David Smith presented the three decommissioning options currently being evaluated with respect to radiological and economic impacts (ALARA analysis). These are: "No Action", packaging and shipping all residual radioactivity to the Envirocare disposal site in Utah, and "in-situ" disposal of the residual radioactivity within the Storage Yard under an engineered cap.

Donna Gaffigan asked about "intermediate" options, such as sale of the baghouse dust in concert with off-site disposal. David Smith stated that there are no feasible intermediate options, and then presented SMC's parallel effort to identify recycle/reuse possibilities for the slag and baghouse dust, what has been done to date (slag fluidizers, shielding, shielding constituents, high-strength concrete, dry cask storage for spent nuclear fuel, concrete admixtures), and what is currently being pursued (slag fluidizers, artificial reefs). Additional information on the use of the slag in the construction of artificial reefs and as an amendment to steel manufacture was provided. *The following handout was provided and attached to these minutes: NJ Reef News, 2001 Edition.*

A number of preliminary key issues (summarized below) were discussed. However, there was insufficient time to prepare a complete listing of SSAB interests in the Newfield decommissioning process. Therefore, first meeting of the SSAB was closed with a mutual agreement to hold a follow-up meeting in September of 2003.

Key Issues and Questions to be Addressed:
o(This is a preliminary listing. A more definitive listing will be prepared at the next meeting of the SSAB. SMC will respond to each item, and the item and SMC's response will be incorporated into the decommissioning plan.)

What is the time frame associated with any beneficial reuse options and why has there been no beneficial re-use yet found for the radioactive slag within the past 5 years?

No one knows what future development issues in the Newfield area might arise over the next 1,000 years, thus it is difficult to make decisions on decommissioning.

Is SMC committed to in-situ disposal of the residual radioactivity or are alternatives still under consideration?

A waste broker (American Ecology) provided a preliminary disposal cost for the slag and baghouse dust at Newfield to a member of the SSAB.

Has an environmental impact statement been prepared? If not, is it necessary to prepare one?

How does the SSAB role fit into the typical public involvement role and opportunities for comment under CERCLA?

The recent drop in worker population and the reduction in commercial activities at SMC and the previous bankruptcy filing raises the question about how long SMC will remain a business entity in Newfield over the long term, thus it is not clear how they can possibly remain responsible for the site, and what would happen to the residual radioactivity (and remaining decommissioning funds) at that time.

Is SMC in favor of finding a useful purpose for the subject material if one can be found?

It is doubtful that anyone other than SMC would build a business at the Newfield site for fear of lawsuits.

No one really knows whether there are health risks associated with the radioactivity at the Newfield facility, therefore it is best to simply ship it off for disposal.

tt is difficult to accept institutional controls that are supposed to last for 1,000 years.

Has SMC posted enough financial assurance to assure "unrestricted release" of the site if the institutional controls should fail over time or if SMC defaults on decommissioning commitments?

Can the make-up of the SSAB be made broader? (It is, and that others did not accept invitations to attend.)

The SSAB would like more time to develop the list of key issues and concerns, but does not want to be the justification for delaying any submissions (i.e., the August 29, 2003 ALARA analysis) to the USNRC.

It is unclear whether the use of the Newfield slag in the construction of artificial reefs would be acceptable to the State of New Jersey.

The health effects on fish and vertebrates if the slag is used as an artificial reef might need to be investigated.

The SSAB wants to receive a copy of the pending ALARA analysis as well as the draft decommissioning plan.

The SSAB would like to receive sections of the August 28, 2002 decommissioning plan that describe the current radiological and physical conditions of the site.

The SSAB would like to learn more about the use of Newfield slag in the steel manufacturing process.

Action Items and Responsible Individuals:
Distribute minutes (Carol Berger)

Schedule next meeting of the SSAB (David Smith)

Distribute information on the radiological environment at the Newfield facility as described in the most recent version of the decommissioning plan (Carol Berger)

Determine whether there are State (NJ) regulations that would ban the use of Newfield slag in the construction of artificial reefs (Donna Gaffigan)

Distribute information on the use of slag in steel manufacturing (David Smith)

nes E. McGreevey
Governor

State of New Jersey

Department of Environmental Protection
Bradley M. Campbell
Commissioner

September 18, 2003

David R. Smith
Director of Environmental Services
Shieldalloy Metallurgical Corporation
12 West Boulevard
Newfield, NJ 07344

Re: Draft Minutes of August 15, 2003 Site Specific Advisory Board Meeting
Shieldalloy Metallurgical Corporation Site
Newfield, Gloucester County

Dear Mr. Smith:

The New Jersey Department of Environmental Protection (NJDEP) is in receipt of the Draft Minutes of August 15, 2003 Site Specific Advisory Board (SSAB) Meeting. The Draft Minutes were undated, but were received by NJDEP on August 28, 2003.

Upon review, NJDEP offers the following clarifications on the "Key Issues and Question to be Addressed."

1. Can the makeup of the SSAB be made broader? (It is, and that others did not accept invitations to attend.)

   The parenthetical comment must be deleted as it is misleading. As explained at the meeting, only two other individuals were asked to participate, but neither could attend. Both are Newfield Borough business owners. More effort should be made to increase participation. Also, since part of the Shieldalloy property lies in Vineland (although not the portion were the slag and baghouse dust resides), it will be advantageous to include members representing the interests of the citizens, government and businesses of Vineland and Cumberland on the SSAB.

2. It is unclear whether the use of the Newfield slag in the construction of artificial reefs would be acceptable to the State of New Jersey. The SSAB appeared to favor that decommissioning option.

   First, the use of radioactive materials in the construction of artificial reefs is prohibited by the New Jersey Coastal Zone Management Rules, specifically, N.J.A.C. 7:7E-4.21(c), where it is stated that "the reef materials shall not be radioactive." This specific section has been enclosed for your convenience.

   Second, it is not my recollection that the SSAB appeared to "favor" the artificial reef option for decommissioning. Strictly from the rock-like appearance of the slag, it was

stated that the slag material would be useful as an artificial reef, however, the radioactive content of the slag would probably limit its use. Nancy and I stated that we would review the state regulations regarding artificial reefs and disposal of radioactive materials in the ocean. As stated above radioactive material cannot be used as an artificial reef.

The only generalization that can be made regarding the opinion of the SSAB is that the SSAB would prefer reuse of the material, but not if it involves an open-ended search process. It has already been five (5) years since Shieldalloy ceased regulated operations at the site and few visible signs of the United States Nuclear Regulatory Commission required decommissioning are evident. Continued lengthy searches for a reuse option is not acceptable.

If you have any questions, I can be reached at (609) 633-1494.

Respectfully,

Donna L. Gaffigan

Donna L. Gaffigan, Case Manager
Bureau of Case Management

Enclosure

C: Nancy Stanley, NJDEP/BER
Loretta Williams, SSAB
Mayor Rick Westergaard, SAAB
Kenneth Kalman, USNRC
Marie Miller, USNRC
Charles L. Harp, Archer & Greiner
Carol Berger, IEM

reported using latitude and longitude coordinate pairs, in the WGS 84 (World Geodetic System 1984) datum, that were arrived at using the global positioning system (GPS). To reduce the impacts of fishing on cables by notifying the commercial fishing industry of the locations of areas where the cable is buried less than 1.2 meters deep, a copy of the report shall be submitted to the fishing interest groups identified in N.J.A.C. 7:7-4.2(a)3.

10. A report containing the results of inspection and maintenance of the submerged cable required in 8 above, if applicable in the reporting year, a discussion of storm events which could have affected the cable, and reported hits of the cable for the previous year shall be submitted by the permittee to the Department in January of each year. The report shall also indicate if and when the cable becomes out-of service.

11. Within two years of taking the cable out of service pursuant to Federal Communications Commission regulations, the submerged cable shall be removed both from Surf clam areas, N.J.A.C. 7:7E-3.3, and from areas where Marine fish, as defined at N.J.A.C. 7:7E-8.2, are commercially harvested using mobile bottom-tending gear. The Department may allow all or portions of the cable to remain in place if leaving the cable in place would not result in a long term adverse impact to the ocean and/or ocean resources, and the cable would not unreasonably interfere with fishing or other uses of the seabed. A permittee who seeks to leave an inactive cable in place shall submit a request, including the reasons and justification for leaving the cable in place. The Department shall solicit public input on the request, including input from the fishing interest groups identified in N.J.A.C. 7:7-4.2(a)3.

12. If portions of the cable located either within Surf clam areas, N.J.A.C. 7:7E-3.3, or within areas where Marine fish, as defined at N.J.A.C. 7:7E-8.2, are commercially harvested using mobile bottom-tending gear, are not buried to a depth of 0.6 meters, the permittee shall provide a one-time monetary contribution to the Department's dedicated account for shellfish habitat mitigation. The amount of each mitigation contribution provided under this section shall be based on the length of cable that is not buried to a depth of 0.6 meters, based on the inspection required in (c)8i above. The contribution will be calculated at the rate of $100 per meter of cable which is buried to a depth of less than 0.6 meters. Moneys in the Shellfish Habitat Mitigation account are to be administered by the Department's Bureau of Shellfisheries and utilized for shellfish habitat restoration, enhancement and related research projects.

(d) Rationale: See the note at the beginning of this Chapter.

7:7E-4.21 Artificial reefs

(a) Artificial Reefs are man-made structures intended to simulate the characteristics and functions of natural reefs created by placing hard structures on the sea-floor for the purpose of enhancing fish habitat and/or fisheries. In time, an artificial reef will attain many of the biological and ecological attributes of a natural reef Artificial reefs do not include shore protection structures, pipelines, fish aggregating devices, and other structures not constructed for the sole purpose of fish habitat.

(b) New reefs shall be sited in accordance with the following:

1. The reef site shall not be located in the following special areas: surf clam areas (N.J.A.C. 7:7E 3.3), prime fishing areas (N.J.A.C. 7:7E-3.4), navigation channels

(N.J.A.C. 7:7E-3.7), inlets (N.J.A.C. 7:7E-3.9), and Submerged infrastructure routes (N.J.A.C. 7:7E-3.12) and historic and archaeological resources (N.J.A.C. 7:7E-3.36);

2. The reef site shall be located in the Atlantic Ocean;

3. The reef site shall be located in a manner that minimizes impacts on commercial fishing operations;

4. The reef site shall not be located within shipping lanes, and/or anchorages;

5. The natural seafloor at the reef site shall have a firm substrate to minimize sinking of reef materials;

6. The reef site shall not be located within an area environmentally influenced by dredge disposal sites, sewage outfalls, or other areas known to experience hypoxic events, contaminated waters or sediment that may impair the quality of fish habitat; and

7. The reef site shall not be located in an area with currents that have the potential to cause material instability, scouring, or sanding over.

(c) Construction of new or expanded artificial reefs is conditionally acceptable provided that at the time of deployment, and at all times after creation, the following conditions are met:

1. The reef materials are of sufficient density so that it will not move outside of the approved reef boundary;

2. The reef materials shall not float;

3. The reef materials shall not pose a hazard to navigation;

4. The reef materials shall not pose a threat to the marine environment;

5. The reef materials shall not be toxic;

6. The reef materials shall not be hazardous;

7. The reef materials shall not be explosive;

8. The reef materials shall not be radioactive;

9. The following reef materials are acceptable for deployment, provided that (c)1 through 8 above are met:

i. Ships;

ii. Armored military vehicles;

iii. Manufactured reef habitats;

iv. Dredge rock;

v. Concrete and steel rubble;

vi. Demolition material free of floating debris;

vii. Obsolete submarine telephone cable; and

viii. Miscellaneous reef materials that meet the conditions in (c)1 through 8 above;

10. The reef material shall be deployed in the following manner:

i. No materials shall be deposited until notification has been provided to the Department at least 72 hours in advance;

ii. Inspection by the Department prior to deployment, to ensure materials are not harmful to the marine environment, and will not pose a threat to human safety, and comply with the reef material conditions (c)1 through 8 above;

iii. Department personnel shall directly observe and oversee the deployment of any reef materials;

iv. To the extent practicable, deployment of reef materials shall not adversely impact the marine environment; and

v. The locations of artificial reef sites shall be recorded using a Global Positioning Satellite (GPS) system.

(d) An Artificial Reef Management Plan shall be submitted for each individual reef permit application and shall include the following:

1. A description of the proposed site;
2. A mechanism for recording materials used in constructing the reef; and
3. A monitoring schedule to measure the stability, durability and biological attributes of reef materials and impacts to the marine environment. The schedule shall include submission of monitoring reports, including a listing of materials deployed in the previous year, to the Department every year during reef construction, and every five years thereafter.

(e) It shall be the responsibility of the reef builder to provide the location of the artificial reef to the US Department of Commerce, NOAA, National Ocean Survey, 1315 East-West Highway, Silver Spring, MD 20910-3282, for inclusion on nautical charts.

(f) Rationale: See the note at the beginning of this Chapter.

7:7E-4.22 Miscellaneous uses

(a) Miscellaneous uses are uses of Water Areas not specifically defined in this section or addressed in the Use rules (N.J.A.C. 7:7E-7).

(b) Water dependent uses of Water Areas not identified in the Use rules will be analyzed on a case-by-case basis to ensure that adverse impacts are minimized. Non-water dependent uses are discouraged in all Water Areas.

(c) Rationale See the note at the beginning of this Chapter.

SUBCHAPTER 5. REQUIREMENTS FOR IMPERVIOUS COVER AND VEGETATIVE COVER FOR GENERAL LAND AREAS AND CERTAIN SPECIAL AREAS

7:7E-5.1 Purpose and scope

(a) This subchapter sets forth requirements for impervious cover and vegetative cover on sites in the upland waterfront development area, as defined at N.J.A.C. 7:7E-5.2, and in the CAFRA area, as defined at N.J.A.C. 7:7E-5.2. In addition:

1. For a site in the upland waterfront development area, the applicable impervious cover limits and vegetative cover percentages are determined under N.J.A.C. 7:7E-5A, based on the site's growth rating, development potential, and environmental sensitivity; and

2. For a site in the CAFRA area, the applicable impervious cover limits and vegetative cover percentages are determined under N.J.A.C. 7:7E-5B, based on the site's location in a coastal center; in a Coastal Planning Area; in a CAFRA center, CAFRA core, or CAFRA node; or on a military installation.

SITE SPECIFIC ADVISORY BOARD
Shieldalloy Metallurgical Corporation

Minutes of the November 5, 2004 Meeting

SSAB Members in Attendance:
David R. Smith - SMC representative
C. Lee Harp, Esq. - Archer & Greiner (facilitator)
Carol D. Berger, C.H.P. - IEM (technical consultant to SMC)
Loretta Williams - Newfield resident, public school employee and planning board member
Donna L. Gaffigan - NJDEP Bureau of Federal Case Management representative
Jenny Goodman - NJDEP Bureau of Environmental Radiation representative
Linda Graumann - Newfield resident and real estate agent
(see Attachment 1 for the sign-in sheet)

Visitors in Attendance:
Jim Milton - Newfield resident
Patricia Gardner - Chief, NJDEP Bureau of Environmental Radiation
John Nessel - Newfield resident
Jim Kinkade - Sentinel (press) representative
Kevin Keltman - Franklin Township resident
Joseph Diegel - Vice President & General Manager, Shieldalloy Metallurgical Corporation
(see Attachment 1 for the sign-in sheets)

Discussion: (see Attachment 2 for the agenda)
Lee Harp opened the meeting with introductions and a brief discussion on the meeting format and objectives. He then reviewed the minutes of the September 19, 2003 meeting. Following discussion, the minutes were approved without change. Lee Harp reviewed the handout information given to each member of the SSAB, and pointed out where visitors could find copies.

David Smith briefly reviewed licensed operations at the site since 1952 and why the facilities associated with those operations are being decommissioned. The status of the decommissioning effort to date was also reviewed, including the original submission of a decommissioning plan that the USNRC rejected because of acceptability issues (i.e., insufficient institutional controls and a requirement for SSAB involvement only after the plan was submitted). David Smith also briefly reviewed the existing financial assurance for decommissioning of the USNRC-controlled area, which is $5M for the benefit of the USNRC, USEPA and the NJDEP. *[In response to a November 29, 2004 request from the NJDEP, the following additional detail on SMC's financial assurance is hereby provided: The assurance is comprised of a $750,000 trust account for the benefit of the USNRC and a $4.25 million irrevocable standby letter of credit for the benefit of the NJDEP and the USEPA.]*

David Smith recounted events that had occurred since the last meeting of the SSAB. Those included the May, 2004 decommissioning guidance issued by the USNRC, and the June 29, 2004 USNRC public meeting (wherein the guidance was discussed). SMC also had follow-up telephone calls with the USNRC to resolve outstanding technical issues associated with the revised decommissioning plan preparation, and there was a series of letters the USNRC had received from Commissioner Campbell (NJ), Senator Corzine (NJ) and Jill Lipoti (NJDEP).

David Smith then presented the next steps in the decommissioning process. These include additional technical interactions with the USNRC staff, pre-submission of the chapters on dose modeling and environmental reporting (for acceptability review), acquisition of additional environmental data, and then preparation and submission of Rev. 1 of the decommissioning plan. The USNRC will then review the plan for acceptability and make a public announcement that it has been received and submitted for technical review. Once the technical review is complete, and if the plan

is approved for implementation, an environmental impact statement will be prepared. The public will have multiple opportunities to comment on the plan at various stages in the process.

Donna Gaffigan inquired as to whether an ALARA analysis had been performed as part of the phased approach to decommissioning. David Smith and Carol Berger reported that an ALARA analysis had been included in Rev. 0 of the decommissioning plan. A more site-specific analysis is currently being performed and will be included as Chapter 7 of Rev. 1 of the decommissioning plan. Donna Gaffigan asked to receive the Rev. 0 ALARA information. *[Since November 5th SSAB meeting, a review of correspondence with the USNRC reveals that SMC had a number of questions on completing a site-specific ALARA analysis for the Newfield site using the guidance of NUREG-1727. A subsequent telephone discussion with the USNRC resulted in SMC's letter (from D. Smith of SMC to R. Bellamy of the USNRC dated August 22, 2003) with a final commitment on the decommissioning methodology based upon the ALARA analysis that appeared in Rev. 0 of the decommissioning plan. A copy of that letter, along with SMC's August 20, 2003 inquiry regarding the NUREG-1727 methods are included herein as Attachment 3.]*

The issue of beneficial re-use of the slag was raised, and the various options were discussed (i.e., use as a slag fluidizer in steel manufacturing, dry cask construction, uranium reclamation, artificial reefs). SMC is still pursuing the steel and the reef issues and maintains that any recycle/reuse option would be beneficial for all concerned if one would become available.

There were a number of side discussions on groundwater treatment issues (non-radiological) and the TRC Exit Strategy proposal.

The SSAB then discussed the topic of property subdivision as it pertains to the USNRC's guidance. David Smith reported that the USNRC, at this time, will not permit the property to be subdivided for future sale.

Lee Harp asked the SSAB to complete the input form that was provided as one of the hand-outs. The information on each submitted form will be captured in Rev. 1 of the decommissioning plan, along with SMC's responses to the issues raised by those submitting the completed forms. Particularly, each SSAB member's opinions in regard to the viability of the institutional controls being proposed by SMC for the restricted release decommissioning option, and their opinion on the adequacy of financial assurance available for the site once the Long Term Control (LTC) license is issued was solicited. (Visitors to the meeting were told that additional copies of the input form were available. Each was invited to complete one and submit it to SMC, who would provide a response in the decommissioning plan. Visitors were also encouraged to distribute the form to others that they thought might have an interest in the decommissioning planning for the Newfield site.)

Visitor Comments:
Lee Harp opened the meeting to members of the public who may have comments, questions or concerns. The first to speak was John Nessel, a Newfield resident. He was concerned about why he only earned by accident about the SSAB meeting. He also wanted a cancer cluster study to be done, and expressed concerns about the capped area being near a wetlands. He felt that the community needed an environmental attorney to represent their interests. He said that the site is valuable to Newfield and wants to see it used in the future. He was also concerned about others bringing in other waste to add to the capped piles in the future. Finally, he was concerned about property values in light of SMC's plans.

Jim Milton, a Newfield resident, also complained of the adequacy of SMC's public notice for this SSAB meeting. (David Smith told the audience that the meeting was noticed in the local newspapers - Gloucester County Daily Times and the Vineland Journal - and was given to the SSAB members which include the Borough of Newfield Council members, the Mayor of Newfield and members of the Vineland and Gloucester County Health Departments.) Mr. Milton also inquired as to whether badges would be needed for people visiting the site. (Carol Berger and David Smith explained that workers who frequented the Storage Yard and the operational areas where feed materials were stockpiled/used were monitored for radiation exposure for many, many years. None of the doses of record were even close to the level that required monitoring, thus individual monitoring was discontinued. However, passive monitoring of radiological conditions at the fence line is still on-going.) He was also concerned about acid rain on the slag pile

and whether radioactive materials were leaching. Finally, he raised the issue of the baghouse dust pile and the fact that materials were blowing around. (David Smith and Carol Berger spoke to the low levels of source material in the baghouse dust and its ability to set up like cement, thereby severely limiting the potential for dust migration.)

Jenny Goodman pointed out that according to USNRC decommissioning guidance, the SSAB should have an elected chairperson, a charter and operating procedures.

Jim Kinkade of the Sentinel Newspaper inquired as to the size of the slag piles and other plan-related issues.

Jim Milton inquired about the groundwater wells (e.g., their location, who samples them, etc.). He also asked about the types of materials processing going on right now, whether the site maintained insurance for these matters, and if the slag pile wasn't being shipped off-site because of the cost to SMC.

Carol Berger provided a quick review of radiation fundamentals in order to put the radiological issues associated with decommissioning into perspective.

Jenny Goodman felt that people would understand the issues better if a risk comparison (rather than a dose comparison) was presented. She asked that there be a risk handout for the next SSAB meeting. She then stated that she did not have enough information to complete the input form since they have not had an opportunity to review the decommissioning plan. (Dave Smith and Carol Berger stated that SSAB input to the plan at this stage of the game is required by the USNRC. However, SSAB members would be given a copy of Rev. 1 of the plan and would have an opportunity to comment then, as well as during the EIS process.) She then inquired as to why the focus of and provisions in the decommissioning plan were for only 1,000 years since the residual radioactivity in the slag will be here for a lot more than that period of time. (Carol Berger stated that this was a regulatory planning period only, and that in reality it is impossible to predict events even as far as 100 to 200 years in the future.)

An unidentified member of the audience asked whether the USNRC had been specifically invited to attend this meeting of the SSAB. David Smith responded that while SMC was keeping the USNRC informed of all SSAB matters, including meeting dates, the USNRC had not been specifically invited to attend the November 5th meeting.

There was a closing discussion involving visitors and various SSAB members in regard to property values, rateables, and what would happen if SMC left the area. Both David Smith and Joe Diegel stated that SMC had no intention of leaving the area.

Action Items and Responsible Individuals:
Distribute minutes (Carol Berger)

Complete and return Input Forms to David Smith (all members of the SSAB)

Schedule June/July meeting with SSAB to present and discuss USNRC deliverables and to solicit final input forms (David Smith)

ATTACHMENT 1
Meeting Agenda

SITE SPECIFIC ADVISORY BOARD
Shieldalloy Metallurgical Corporation

SSAB and Public Meeting
November 5, 2004 - 9:30 a.m. to noon

Welcome	C. L. Harp
Review and approval of minutes from previous SSAB meeting	C. L. Harp
Background Information	D. R. Smith
Purpose of SSAB	C. L. Harp
Review of new/additional information since last SSAB meeting	C. L. Harp
Summary and review of Pending Activities	C. L. Harp/C. D. Berger
Complete the Listing of SSAB input, interests, and concerns	C. L. Harp
SSAB Open Discussion	C. L. Harp
Audience Questions	C. L. Harp
Adjourn	

ATTACHMENT 2
Sign-in Sheets

PARTICIPANT SIGN-IN SHEET

Shieldalloy Metallurgical Corporation SSAB: Third meeting at SMC's Newfield facility				
Date: November 5, 2004		Facilitator: Charles L. Harp, Esq.		
Your Name (Print)	Your Signature	Your Address	Your Telephone Number (with area code)	Your e-Mail Address
Lorena Williams	Lorena Williams	[redacted], Newfield	[redacted]	[redacted]
Lee Fiura	Lee Fiura	[redacted]	[redacted]	[redacted]
LINDA GRAHAM	Linda Graham	[redacted]	[redacted]	[redacted]
Jenny Goodman	Jenny Goodman	[redacted] Ewing	[redacted]	[redacted]
Donna L Gaffigan	Donna L Gaffigan	[redacted] Trenton	[redacted]	[redacted]
David Smith	David Smith	[redacted] Newfield	[redacted]	[redacted]
CAROL BERGER	Carol Berger	[redacted]	[redacted]	[redacted]

PARTICIPANT SIGN-IN SHEET

Shieldalloy Metallurgical Corporation SSAB: Third meeting at SMC's Newfield facility				
Date: November 5, 2004		Facilitator: Charles L. Harp, Esq.		
Your Name (Print)	Your Signature	Your Address	Your Telephone Number (with area code)	Your e-Mail Address
Patricia Gardner	[signature]	[redacted]	[redacted]	
John Nassel	[signature]	[redacted]	[redacted]	
JIM KINKADE	[signature]	[redacted] FRANKLINville NJ 08322		[redacted]

VISITOR INFORMATION

In consideration of the agreement by Shieldalloy Metallurgical Corporation to allow me to visit the Newfield Plant and view its premises, I agree that for a period of three (3) years from this date, I will hold any and all information learned form this visit in confidence and that I will not disclose the information to any person other than my employer's employees who have a need to know such information. I understand that I may be responsible for any damages or losses suffered by Shieldalloy Metallurgical Corporation if I violate this confidence. i have been shown an example of a radiation symbol and a radiological caution sign. I will not enter any Restricted Area or any area posted with a radiological warning or caution sign unless an escort has been provided to me. I will contact the Shieldalloy Radiation Safety Officer if I have any questions or concerns about radiological issues.

Date	Arrive	Leave	Signature	Print Name	Company	Contact Person	Hat/ Glasses
10-21-4	1055	1155	[illegible]	Robert U Todd	S.J. Gas Co	Scott Baureis	
10.22.04	0802	0835	[illegible]	Yuri Volpin	CRC, Inc	Scott B.	
10.22	10 [illegible]		[illegible]	J R Burke	[illegible]	"	
10/26	1500		[illegible]	D Rukalcosto	TRC	D Smith	
10/26	1500	1700	[illegible]	L Bar[illegible]	TRC	D. Smith	
10/29	7:45		[illegible]	M.H. Mcken[illegible]	PWL	Abdul	
11/5/04	8:00		[illegible]	Carol Berger	IEM	D Smith	
11/5/04	915		[illegible]	John Nessel	citizen	meeting	
11/5/04	9:20		Donna L Goffigan	Donna L Goffigan	NJDEP	D Smith	

CAUTION RADIATION

RADIATION SYMBOL AND RADIOLOGICAL CAUTION SIGNS

CAUTION RADIATION AREA

SENT BY: SML NEWFIELD ; 11- 8- 4 ; 15:02 ; SML NEWFIELD→ 240 631 8991;# 5/ 5

VISITOR INFORMATION

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Date	Arrive	Leave	Signature	Print Name	Company	Contact Person	Hat/ Glasses
11/5/04	9:25		Jenny Goodman	Jenny Goodman	NJDEP		
11/5/04	9:25		Patricia Gardner	Patricia Gardner	NJDEP	Dave Smith	
11/5/04	9:25		Linda Grauman	LINDA Grauman	Council	"	

RADIATION SYMBOL AND RADIOLOGICAL CAUTION SIGNS

ATTACHMENT 3
ALARA-Related Correspondence

COPY

Date: August 20, 2003
From: David Smith - Shieldalloy Metallurgical Corporation, Inc.
To: Kenneth Kalman, Mark Thaggard - USNRC
Re: ALARA Analysis using NUREG 1727 methods

Appendix D to NUREG 1727 provides guidance in the performance of an ALARA analysis as part of the site decommissioning and license termination process. In evaluating the decommissioning options applicable to the Shieldalloy Metallurgical Corporation (SMC) site in Newfield, NJ. there are several important considerations that are not addressed in the NUREG. These are listed as follows:

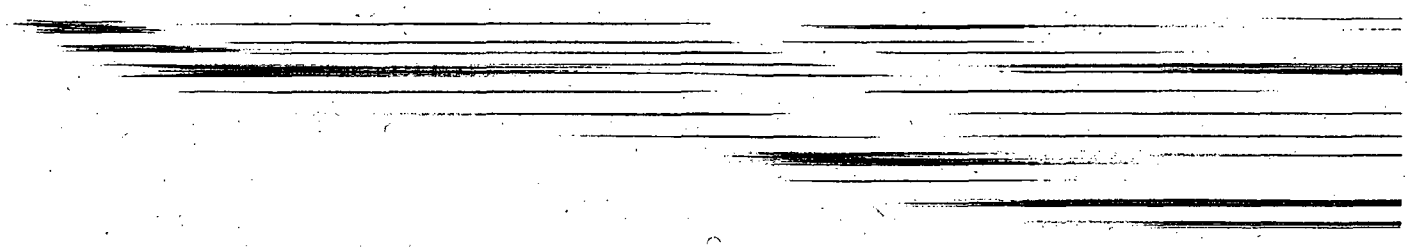
1. The modeling of "no action" is not defined in NUREG-1727. (Recommendation: SMC proposes that the "no action" scenario be modeled by placing a hypothetical residence immediately next to the slag pile in its current configuration, and reducing the viable exposure pathways to direct exposure only.

2. The modeling of the site for an in-situ disposal option is not defined in NUREG-1727. (Recommendation: SMC proposes that the information and conclusions contained in NUREG-1543 "Environmental Impact Statement: Decommissioning of the SMC Cambridge, Ohio Facility" [1996] be used as the bases for in situ disposal at the Newfield site. This proposal is based on the strong similarity between the two sites as it regards the type of material (slag and baghouse dust) being evaluated. The conclusions found in NUREG-1543 are directly transferable to the conditions at the Newfield site for the purpose of ALARA analyses.)

3. The cost modifier that takes into account the additional cost and benefit considerations to be included in the ALARA calculations seems to be missing from the version of NUREG-1727 that is available on the USNRC's web page. Although this modifier is referenced in NUREG-1727, Appendix D, page D10, stating that it should be found in Section 1.7 of the appendix, there is no Section 1.7 in Appendix D.

4. Equations D2 and D8 do not account for either "no action" or in situ disposal. The factor "F." when set to zero drives the "Present Worth of Averted Dose" (equation D2) to zero, and causes the Residual Radioactivity Levels that are ALARA (equation D8) to be undefined. We will accept your recommendation on how to account for retaining materials on-site in order to complete the analysis.

5. If, as was mentioned in our teleconference of earlier today (August 20, 2003) the NUREG-1727 guidance on ALARA analyses was not intended for use at sites where the residual radioactive materials are not shipped elsewhere, are there other guidance



documents that you would suggest we incorporate into the SMC analysis?

In order to meet our August 29, 2003 deadline for submission of our ALARA analysis, we will need to have your response to the aforementioned questions no later than Friday, August 22, 2003. If that timeline is not possible, please let me know as soon as possible so that I can effect a similar delay in the due date for the final report. Thank you in advance for your prompt attention.

Sincerely,

David R. Smith

CONFIDENTIAL/PRIVILEGED ATTORNEY/CLIENT/CONSULTANT COMMUNICATION

COPY

DAVID R. SMITH
ENVIRONMENTAL MANAGER
Aluminum Products & Powders Division

August 22, 2003

Ronald R. Bellamy, Chief
Decommissioning and Laboratory Branch
Division of Nuclear Materials Safety
U. S. Nuclear Regulatory Commission
475 Allendale Road
King of Prussia, PA 19406-1415

Re: Preferred Approach to Decommissioning the Newfield Facility (License No. SMB-743, Control No. 132074)

Dear Mr. Bellamy:

On July 30, 2003, Shieldalloy Metallurgical Corporation (SMC) forwarded to you an Action Plan and commitment dates as part of a phased approach to resubmission of the SMC decommissioning plan. Item No. 6 of the Action Plan required SMC to "Present the results of the ALARA analysis to the USNRC to secure approval for the preferred decommissioning approach" on August 29, 2003.

Since the Action Plan was submitted, SMC and representatives of the USNRC have participated in a number of monthly conference calls to discuss various matters related to decommissioning. In our August 22, 2003 call, Mr. Ken Kalman, Mr. Robert Johnson, and SMC agreed to an alternative deliverable for Item No. 6 of the Action Plan. Instead, it was agreed that SMC present its preferred decommissioning approach, with justification, and with feedback from potentially affected parties on August 29th. The purpose of this letter is to provide you with that information.

In order to decommission the Newfield facility, SMC intends to move all licensed radioactive material present at the site to the Storage Yard, where it will be stabilized and capped as described in our August 28, 2003 decommissioning plan.[1] Following capping, institutional controls including access restrictions, maintenance, monitoring (visual inspections, radiation surveys, and groundwater and surface water sampling), and legal restrictions against future residence construction farming or business re-development on the restricted release area would then be implemented. At that time, SMC will amend License No. SMB-743 to permit "possession only" of the 57,240 cubic meters of slag, baghouse dust, and soil under the cap. From analysis performed to date using generous exposure scenarios, SMC is confident that this approach will ensure no member of the general population will incur a radiation dose in excess of 100 millirem TEDE per year for 1,000 years after the license is terminated.

---

[1] Shieldalloy Metallurgical Corporation, "Decommissioning Plan for the Newfield Facility", Report No. 94005/G-28247 (Rev. 0), August 28, 2002.

The decision to pursue "restricted release" of the site was made after consideration of three decommissioning options. There were: (1) restricted release, (2) unrestricted release, wherein all residual radioactivity is excavated, shipped and disposed of at a low-level waste disposal facility in Clive, Utah, and (3) no action. An ALARA analysis of the same three options, performed for a site with equivalent residual radioactivity and with other site parameters that are similar to those at SMC's Newfield site, forms the basis for SMC's decision at Newfield. And while it is reasonable to rely upon a non-site-specific analysis for initial planning purposes, SMC will include a site-specific ALARA analysis of the three options in its revised decommissioning plan, currently being prepared for submission to the USNRC. The site-specific analysis will demonstrate that Option (1) for Newfield results in population doses that are as low as reasonably achievable (ALARA), and that further attempts to reduce the dose potential at the site would increase rather than reduce the overall risk associated with the decommissioning.

SMC has convened a Site Specific Advisory Board (SSAB) to provide input to the decommissioning process, and to provide feedback on the various decommissioning options available to SMC. In an August 15, 2003 meeting of the SSAB, there was agreement that maintaining a "possession only" license, with the USNRC serving as the government entity to ensure durability of institutional and physical controls, was preferable assigning that responsibility to a local or state agency, as described in the August 28, 2002 version of the decommissioning Plan. However, SSAB also asked that the viability of other decommissioning options (i.e., beneficial reuse of the slag or baghouse dust) continue to be evaluated. If any are deemed feasible, SMC agreed to repeat the ALARA analysis with the new option incorporated into the comparison.

in summary, SMC is committed to decommissioning the Newfield site under "restricted release" conditions, and to maintaining a "possession only" license as one means of ensuring the durability of institutional controls. This approach has been deemed ALARA at a site with similar radiological and physical characteristics as the Newfield site, thus it is likely to be ALARA for Newfield as well. Nonetheless, a site-specific ALARA analysis demonstrating that further reductions in dose are unwarranted will be included in the re-submission of our decommissioning plan. And if other decommissioning alternatives appear feasible, they will be included in the ALARA analysis along with Options (1), (2) and (3), described above.

Because the scope and extent of this deliverable differs from that which appears in our Action Plan, we are also taking this opportunity to submit a revised Action Plan (attached). This revision incorporates the outcome of our discussions with the USNRC during our monthly conference calls, and it supercedes the July 30th version in its entirety.

We will continue to keep you apprized of any other matters that might impact our decommissioning plans, and we will continue to participate in the on-going teleconferences and meetings with the staff. In the meantime, please do not hesitate to call me at (856) 692-4200, ex. 226 if I can answer any questions or provide you with additional information.

Sincerely,

David R. Smith
Radiation Safety Officer

cc: Eric Jackson
Joe Deigle

CONFIDENTIAL/PRIVILEGED ATTORNEY/CLIENT/CONSULTANT COMMUNICATION

Charles L. Harp, Esq. - Archer & Greiner
Carol D. Berger, C.H.P. - IEM
Ken Kalman - USNRC (Hq)
Robert Johnson - USNRC (Hq)

PHASED APPROACH TO DP REVISION

Action Plan and Commitment Dates

November 15, 2004

Item No.	Action	Start Date	Due Date	Current Status
1	Select the preferred decommissioning approach	05/01/03	05/31/03	Complete
2	Meet with Newfield Mayor and City Council to provide preliminary information and solicit input on members of a Site-Specific Advisory Board (SSAB). (Members may include but are not limited to City Council members, immediate neighbors of SMC, and other borough/county/state/federal stakeholders.)	05/16/03	06/06/03	Complete
3	Designate date/time/location for first meeting between potential SSAB members and SMC technical and management personnel. The purpose of the meeting will be to present the preferred decommissioning approach, a listing of issues yet to be resolved, the role of the SSAB in the decommissioning planning process, how information will be communicated to SSAB members, and a suggested (planned and periodic) meeting schedule.	06/09/03	07/01/03	Complete
4	Forward invitations to potential SSAB members to attend first meeting with SMC personnel.	06/16/03	07/01/03	Complete
5	Meet with SSAB. Based on discussions, conclusions and agreements reached during the meeting, finalize the preferred decommissioning approach and prepare a community involvement program plan.	06/23/03	08/15/03	Complete
6	Prepare an ALARA analysis demonstrating the effectiveness, implementability and cost of the preferred decommissioning approach as compared to alternative approaches.	07/31/03	08/29/03	Complete
7	Provide the USNRC with the preferred decommissioning approach, its basis, and a summary of SSAB feedback to the USNRC.	07/31/03	08/29/03	Complete
8	Receive written USNRC concurrence with the preferred approach	TBD	TBD	Open
9	Complete input parameter selection and sensitivity analysis for dose modeling of the preferred decommissioning approach and forward same to the USNRC.	TBD	30 days after completion of Item 8	Open
10	Receive written USNRC concurrence with the parameter selection.	TBD	TBD	Open
11	Update previous environmental assessments, as necessary and submit preliminary draft to the USNRC for completeness review.	TBD	30 days after completion of Item 10	Open
12	Receive written USNRC statement of completeness of the environmental assessment.	TBD	TBD	Open

Item No.	Action	Start Date	Due Date	Current Status
13	Revise decommissioning plan and submit to USNRC as well as members of the SSAB.	TBD	60 days after completion of Item 12	Open
14	Respond to comments on the revised decommissioning plan.	TBD	TBD	Open
15	Implement approved decommissioning plan on the schedule shown therein.	TBD	TBD	Open

Item No.	Action	Start Date	Due Date	Current Status
13	Revise decommissioning plan and submit to USNRC as well as members of the SSAB.	TBD	60 days after completion of Item 12	Open
14	Respond to comments on the revised decommissioning plan.	TBD	TBD	Open
15	Implement approved decommissioning plan on the schedule shown therein.	TBD	TBD	Open

10 CFR 20.1404 Alternate Criteria For License Termination.

(a) The Commission may terminate a license using alternate criteria greater than the dose criterion of §§20.1402, 20.1403(b), and 20.1403(d)(1)(i)(A), if the licensee--

(a)(1) Provides assurance that public health and safety would continue to be protected, and that it is unlikely that the dose from all man-made sources combined, other than medical, would be more than the 1 mSv/y (100 mrem/y) limit of subpart D, by submitting an analysis of possible sources of exposure;

(a)(2) Has employed to the extent practical restrictions on site use according to the provisions of §20.1403 in minimizing exposures at the site; and

(a)(3) Reduces doses to ALARA levels, taking into consideration any detriments such as traffic accidents expected to potentially result from decontamination and waste dispbsal.

(a)(4) Has submitted a decommissioning plan or License Termination Plan (LTP) to the Commission indicating the licensee's intent to decommission in accordance with §§30.36(d), 40.42(d), 50.82(a) and (b), 70.38(d), or 72.54 of this chapter, and specifying that the licensee proposes to decommission by use of alternate criteria. The licensee shall document in the decommissioning plan or LTP how the advice of individuals and institutions in the community who may be affected by the decommissioning has been sought and addressed, as appropriate, following analysis of that advice. In seeking such advice, the licensee shall provide for:

(a)(4)(i) Participation by representatives of a broad cross section of community interests who may be affected by the decommissioning;

(a)(4)(ii) An opportunity for a comprehensive, collective discussion on the issues by the participants represented; and

(a)(4)(iii) A publicly available summary of the results of all such discussions, including a description of the individual viewpoints of the participants on the issues and the extent of agreement and disagreement among the participants on the issues.

(b) The use of alternate criteria to terminate a license requires the approval of the Commission after consideration of the NRC staff s recommendations that will address any comments provided by the Environmental Protection Agency and any public comments submitted pursuant to §20.1405.

[62 FR 39058, July 21, 1997]

Prev TOC Next

10 CFR 20.1405 Public Notification And Public Participation.

Upon the receipt of an LTP or decommissioning plan from the licensee, or a proposal by the licensee for release of a site pursuant to §§20.1403 or 20.1404, or whenever the Commission deems such notice to be in the public interest, the Commission shall:

(a) Notify and solicit comments from:

(a)(1) local and State governments in the vicinity of the site and any Indian Nation or other indigenous people that have treaty or statutory rights that could be affected by the decommissioning; and

(a)(2) the Environmental Protection Agency for cases where the licensee proposes to release a site pursuant to §20.1404.

(b) Publish a notice in the Federal Register and in a forum, such as local newspapers, letters to State or local organizations, or other appropriate forum, that is readily accessible to individuals in the vicinity of the site, and solicit comments from affected parties.

[62 FR 39058, July 21, 1997]

Prev TOC Next

PUBLIC INVOLVEMENT REQUIREMENTS ON ENVIRONMENTAL ISSUES

As part of the restricted-use decommissioning process, the USNRC is required to prepare an Environmental Impact Statement (EIS), as specified in the National Environmental Policy Act (NEPA). Shieldalloy's proposed decommissioning plan would become the "preferred alternative" in the EIS, and the NEPA process provides an opportunity for the public to comment on a much broader range of Issues than human health and safety alone, such as how the plan would affect wildlife, impacts on air/water/land resources, and historical assets in the community.

The Council on Environmental Quality (CEQ) oversees the implementation of NEPA requirements in each federal agency, including the USNRC. Public involvement is a major component of the CEQ's regulations under NEPA (found in 40 CFR Parts 15–=1508). In fact, the USNRC is required, to the fullest extent possible, to encourage and facilitate public involvement in agency decisions that affect the quality of the human environment [40 CFR 1500.2(d)]. They must also make diligent efforts to involve the public in preparing and implementing their NEPA procedures [40 CFR 1506(a)]. Here are the required public involvement activities that relate to the preparation of an EIS:

- Writing the draft EIS with the public in mind
- Circulating the draft EIS
- Providing public notice of availability
- Soliciting public comments
- Holding at least ne public hearing
- Considering and responding to public comments oh the draft EIS
- Filing the final EIS with the U. S. Environmental Protection Agency and making it available to the public
- Publishing and disseminating the Record of Decision
- Making available to the public copies of any Mitigation Action Plan that is prepared and any relevant monitoring results.

timeline is not possible, please let me know as soon as possible so that I can effect a similar delay in the due date for the final report. Thank you in advance for your prompt attention.

Sincerely,

David R. Smith

CONFIDENTIAL/PRIVILEGED ATTORNEY/CLIENT/CONSULTANT COMMUNICATION

DAVID R. SMITH
ENVIRONMENTAL MANAGER
Aluminum Products & Powders Division

August 22, 2003

Ronald R. Bellamy, Chief
Decommissioning and Laboratory Branch
Division of Nuclear Materials Safety
U. S. Nuclear Regulatory Commission
475 Allendale Road
King of Prussia, PA 19406-1415

Re: Preferred Approach to Decommissioning the Newfield Facility (License No. SMB-743, Control No. 132074)

Dear Mr. Bellamy:

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We will continue to keep you apprized of any other matters that might impact our decommissioning plans, and we will continue to participate in the on-going teleconferences and meetings with the staff. In the meantime, please do not hesitate to call me at (856) 692-4200, ex. 226 if I can answer any questions or provide you with additional information.

Sincerely,

David R. Smith
Radiation Safety Officer

cc: Eric Jackson
Joe Deigle
Charles L. Harp, Esq. - Archer & Greiner
Carol D. Berger, C.H.P. - IEM
Ken Kalman - USNRC (Hq)
Robert Johnson - USNRC (Hq)

PHASED APPROACH TO DP REVISION

Action Plan and Commitment Dates

March 5, 2005

Item No.	Action	Start Date	Due Date	Current Status
1	Select the preferred decommissioning approach	05/01/03	05/31/03	Complete
2	Meet with Newfield Mayor and City Council to provide preliminary information and solicit input on members of a Site-Specific Advisory Board (SSAB). (Members may include but are not limited to City Council members, immediate neighbors of SMC, and other borough/county/state/federal stakeholders.)	05/16/03	06/06/03	Complete
3	Designate date/time/location for first meeting between potential SSAB members and SMC technical and management personnel. The purpose of the meeting will be to present the preferred decommissioning approach, a listing of issues yet to be resolved, the role of the SSAB in the decommissioning planning process, how information will be communicated to SSAB members, and a suggested (planned and periodic) meeting schedule.	06/09/03	07/01/03	Complete
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7	Provide the USNRC with the preferred decommissioning approach, its basis, and a summary of SSAB feedback to the USNRC.	07/31/03	08/29/03	Complete
8	Receive written USNRC concurrence with the preferred approach	TBD	TBD	Open
9	Complete input parameter selection and sensitivity analysis for dose modeling of the preferred decommissioning approach and forward same to the USNRC.	TBD	30 days after completion of Item 8	Open
10	Receive written USNRC concurrence with the parameter selection.	TBD	TBD	Open
11	Update previous environmental assessments, as necessary and submit preliminary draft to the USNRC for completeness review.	TBD	30 days after completion of Item 10	Open
12	Receive written USNRC statement of completeness of the environmental assessment.	TBD	TBD	Open

Item No.	Action	Start Date	Due Date	Current Status
13	Revise decommissioning plan and submit to USNRC as well as members of the SSAB.	TBD	60 days after completion of Item 12.	Open
14	Respond to comments on the revised decommissioning plan.	TBD	TBD	Open
15	Implement approved decommissioning plan on the schedule shown therein.	TBD	TBD	Open

SHIELDALLOY METALLURGICAL CORPORATION
ALUMINUM PRODUCTS & POWDERS DIVISION
P. O. BOX 768 - 12 WEST BLVD
NEWFIELD, NJ 08344 U.S.A.
856-692-4201 — 1-800-SMC-2020
FAX. 856-697-9025

FACSIMILE TRANSMITTAL SHEET

TO: Carol Berger
FROM: Dave Smith
COMPANY: IEM - Inc
DATE: 2/10/05
LOCATION: Gaithersburg MD
NO. OF PAGES: 4
FAX NUMBER: (240) 631-8991
CC: JTD
SUBJECT: NRC's Hr to Jill Lipoti.

☐ URGENT ☐ FOR REVIEW ☐ PLEASE COMMENT ☐ PLEASE REPLY ☐ PLEASE RECYCLE

NOTES/COMMENTS:

FYI

THE INFORMATION CONTAINED IN THIS FACSIMILE MESSAGE MAY BE PRIVILEGED AND/OR CONFIDENTIAL INFORMATION AND IS INTENDED ONLY FOR THE USE OF THE INDIVIDUAL OR RECIPIENT NAMED ABOVE. IF THE READER OF THIS MESSAGE IS NOT THE INTENDED RECIPIENT, OR THE AGENT OR EMPLOYER RESPONSIBLE TO DELIVER THIS TO THE INTENDED RECIPIENT, YOU ARE HEREBY NOTIFIED THAT ANY DISSEMINATION, DISCLOSURE, DISTRIBUTION OR COPYING OF THIS MESSAGE EXCEPT BY OR AT THE DIRECTION OF THE INTENDED RECIPIENT IS STRICTLY PROHIBITED. IF YOU HAVE RECEIVED THIS COMMUNICATION IN ERROR, PLEASE IMMEDIATELY NOTIFY US BY TELEPHONE AND RETURN THE ORIGINAL MESSAGE TO US AT THE ABOVE ADDRESS BY MAIL. WE WILL REIMPURSE YOU FOR THE POSTAGE. THANK YOU.

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

January 28, 2005

Mr. Jill Lipoti, Ph.D., Assistant Director
Radiation Protection and Release Prevention Programs
New Jersey Department of Environmental Protection
P. O. Box 415
Trenton, NJ 08625-0415

SUBJECT: U.S. NUCLEAR REGULATORY COMMISSION (NRC) STAFF RESPONSE TO NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION LETTER DATED DECEMBER 6, 2004, REGARDING THE SHIELDALLOY METALLURGICAL (SMC) SITE IN NEWFIELD, NEW JERSEY

Dear Dr. Lipoti:

I am responding to your December 6, 2004, letter to Samuel J. Collins, Regional Administrator of the U.S. Nuclear Regulatory Commission (NRC) Region I office regarding the Shieldalloy Metallurgical Corporation (SMC) site in Newfield, New Jersey. Please note that this response has been transferred here to the Division of Waste Management and Environmental Protection (DWMEP) in NRC Headquarters, because NRC's decommissioning program is managed in the DWMEP Decommissioning Directorate and includes project oversight of the SMC site.

Your letter expressed concerns with how SMC is implementing the requirement of 10 CFR 20.1403 to seek advice from affected parties regarding the use of institutional controls to restrict site use. You noted that SMC's use of the Site Specific Advisory Board (SSAB) was not consistent with NRC guidance and was not effective. The use of an SSAB is one acceptable method described in our guidance that a licensee can use to obtain advice. Although we have provided guidance to licensees on seeking advice from affected parties, the licensee is afforded flexibility for implementing the guidance as long as it meets the requirements of 10 CFR 20.1403. SMC, therefore, is responsible for the effectiveness of seeking advice from affected parties and documenting the results in the Decommissioning Plan (DP) for NRC's review.

We envision the licensee's involvement with its affected parties as an iterative process of informing and seeking advice, starting early at a general level and then becoming more detailed as specific plans and analyses are developed. We expect SMC to provide information about potential approaches commensurate with its early stage in planning, so that the affected parties can provide advice at a general level. For example, qualitative discussions of potential site access and use restrictions and how they could eliminate exposure pathways for specific radionuclides would provide useful risk insights for affected parties to understand and discuss before dose assessments are completed. Preliminary results of dose assessments, also could be discussed. This process for obtaining advice can continue as more detailed plans and analyses are developed by SMC for inclusion in submittal of its DP. Then, affected parties can provide more detailed comments to SMC, and when the DP becomes available, to NRC.

Your letter alsp noted specific concerns with NRC's implementation of the regulations, the scenarios that are being addressed, and the use of institutional controls. Although NRC has already responded to similar concerns raised in the letter from New Jersey officials about the license termination rule restricted use option and the long term control license, we would like to meef with you in New Jersey to discuss your additional specific concerns.

Please contact Mr. Ken Kalman, the NRC Project Manager for the SMC site if you wish to arrange a meeting date, or if you have any further questions on this matter. He can be reached by telephdno at 301-415-6664 or by email at kik@nrc.dov.

Sincerely,

Daniel M. Gillen, Deputy Director
Diyisipn pf Waste Management
and Environmental Protection
Office of Nuclear Material Safety
and Safeguards

cc: Shieldalloy Service List

Shieldalloy Metallurgical Corporation Service List

cc:

David Smith
Environmental Manager
Shieldalloy Metallurgical Corporation
Aluminum Products & Powders Division
14 West Boulevard
P.O. Box 768
Newfield, NJ 08344-0768

Eric Jackson, President
Shieldalloy Metallurgical Corporation
Aluminum Products & Powders Division
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P.O. Box 768
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Jill Liooti, Ph.D., Assistant Director
Radiation Protection and Release
Prevention Programs
New Jersey Department of
Environmental Protection
P. O. Box 416
Trenton, NJ 08625-0415

Donna Gaffigan, Case Manager
New Jersey Department of
Environmental Protection
Bureau of Case Management
P.O. Box 028
Trenton, NJ 08625-0028

Trevor Anderson
Emergency and Remedial Response
Division
New Jersey Remediation Branch
280 Broadway 19th Floor
New York, NY 10007-1866

State of New Jersey
Department of Environmental Protection

Richard J. Codey
Acting Governor

Bradley M. Campbell
Commissioner

November 29, 2004

David P. Smith
Director of Environmental Services
Shieldalloy Metallurgical Corporation
P.O. Box 768
Newfield, NJ 08344

Re: Site Specific Advisory Board
Minutes of the November 5, 2004 Meeting
Shieldalloy Metallurgical Corporation
Newfield Borough, Gloucester County

Dear Mr. Smith:

The New Jersey Department of Environmental Protection (NJDEP) is in receipt of the minutes of the November 5, 2004 Site-Specific Advisory Board (SSAB) meeting dated November 15, 2004. Upon review, NJDEP has the following comments. Many of these comments are also reflected in NJDEP's responses on the Input Form which was submitted to SMC under separate cover.

1. Discussion, page 1, paragraph 2

   The minutes shall reflect that the $5 million dollars in financial assurance cited by SMC for the Long Term Control License is actually composed of two separate parts which were established in accordance with paragraph 16 of the March 26, 1997 Bankruptcy Settlement Agreement, not in accordance with 10 CFR 20.1403(c) for license termination under restricted conditions. The two parts include:

   - A $750,000 trust account for the benefit of the United Stated Nuclear Regulatory Commission (USNRC)
   - A $4.25 million dollar irrevocable standby letter of credit for the benefit of NJDEP and the United Stated Environmental Protection Agency (USEPA)

   This information should have been provided to the SSAB to assist in answering the question on the Input Form regarding SMC's ability to provide sufficient financial assurance to enable an independent third party to assume responsibility for control and maintenance of the site.

2. Discussion, page 1, paragraph 3

   The minutes shall state why the "follow-up telephone calls with USNRC" were not announced and accessible to the public.

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also reflect SMC's response, that USNRC was not specifically invited to the meeting. Please note that the meeting minutes for the September 20, 2003 SSAB meeting indicated such an invitation would be made.

9. Page 3, Action Items

There is no mention in the minutes if another SSAB will be scheduled. The minutes must specifically state whether additional SSAB meetings are to be scheduled or if the November 5, 2004 meeting (and the completed Input Forms) represents the end of the public input for this phase of the decommissioning process. See also Comment No. 3, above.

If you have any questions regarding this letter please contact me at (609) 633-1494.

Sincerely,

Donna L. Gaffigan

Donna L. Gaffigan, Case Manager
Bureau of Case Management

C: SSAB members (attached list)
Senator Fred H. Madden
Patricia Gardner, NJDEP/BER
Trevor Anderson, USEPA
Councilman James Milton
Newfield Borough Clerk Toni Van Camp
Kenneth Kalman, USNRC

Richard J. Codey
Acting Governor

State of New Jersey
Department of Environmental Protection

Bradley M. Campbell
Commissioner

November 29, 2004

David R. Smith
Director of Environmental Services
Shieldalloy Metallurgical Corporation
P.O. Box 768
Newfield, NJ 08344

Re: Site Specific Advisory Board
Input Form
Shieldalloy Metallurgical Corporation
Newfield Borough, Gloucester County

Dear Mr. Smith:

Enclosed please find the Site Specific Advisory Board Input Form for the Shieldalloy Metallurgical Corporation (SMC) Site completed by the New Jersey Department of Environmental Protection (NJDEP). The Input Form was distributed at the November 5, 2004 Site Specific Advisory Board. SMC requested that the forms be completed at submitted by November 30, 2004. As you will see by NJDEP's responses, we do not believe that SMC's proposed financial assurance nor institutional controls are sufficient for the proposed Long Term Control License.

If you have any questions regarding this letter please contact me at (609) 633-1494.

Sincerely,

Donna L. Gaffigan

Donna L. Gaffigan, Case Manager
Bureau of Case Management

Enclosure

C: SSAB members (attached list)
Senator Fred H. Madden
Patricia Gardner, NJDEP/BER
Trevor Anderson, USEPA
Councilman James Milton
Newfield Borough Clerk Toni Van Camp
Kenneth Kalman, USNRC

SSAB Members:

Mayor Richard Westergaard
Councilwoman Linda Grauman
Ms. Loretta Williams
Ms. Janet Magliocco
Mr. Thomas Daily
Mr. George R. Sartorio, City of Vineland Health Department
Mr. James Woods, Gloucester County Department of Health
Mr. Charles L. Harp, Jr., Esq., Archer & Greiner
Carol D. Berger, Integrated Environmental Management, Inc.

SITE SPECIFIC ADVISORY BOARD
Shieldalloy Metallurgical Corporation
Input Form

This form has been designed to facilitate your input to the Shieldalloy Metallurgical Corporation (SMC) decommissioning process. Kindly complete the form to the best of your ability and return it to SMC at the following address:

David R. Smith
Shieldalloy Metallurgical Corporation
35 West Boulevard, PO Box 768
Newfield, NJ 08344

The forms must be received by November 30, 2004 in order for your input to be captured in the site-wide decommissioning plan. We will attempt to but cannot guarantee inclusion of later submittals.

In completing the form, the following definitions may be of use to you:

Financial Assurance - A means of demonstrating that SMC possesses the necessary funds to cover the estimated costs of conducting all licensed activities at the site once the decommissioning plan has been implemented.

Institutional Control - A program to physically control access to the SMC site after implementation of the decommissioning plan. The institutional control program for the site includes the maintenance of a "Long Term Control" license, an environmental monitoring and maintenance program, periodic surveillance, and other requirements to be specified in the decommissioning plan. It also includes funds sufficient to cover the costs for these activities.

Total Effective Dose Equivalent (TEDE) - The sum of the radiation dose from external exposure (i.e., from sources outside of the body) and from internal exposure (i.e., from sources taken into the body by inhalation, ingestion, etc.).

Your input is important to us and we appreciate your time in completing this form and returning it to us. We will be taking your input into account in the preparation of our decommissioning plan. We encourage you to review the plan once it is prepared and provide us with any comments you might have at that time. Other opportunities to provide feedback to SMC throughout the decommissioning process will be described in the plan.

Shieldalloy Metallurgical Corporation
Input Form

r Name (optional):	Who do you represent: (e.g., yourself, a neighborhood, community organization, etc.)
onna L. Gaffigan ancy Stanley nny Goodman	New Jersey Department of Environmental Pr

following sections pertain to SMC's plan to maintain a long-term control license as a means of ensuring long-term institutional rol over the decommissioned Newfield site.

o the institutional controls proposed by SMC provide reasonable assurance that average member of the public will not incur a radiation in excess of 25 millirem TEDE? ☐ Yes ☐ No ☒ Don't know

nents:

See Attachment

) you believe the institutional controls will be enforceable? ☐ Yes ☒ No ☐ Don't know

nents:

See Attachment

you believe the institutional controls will not impose undue burdens on the local community or other affected parties?
:s ☒ No ☐ Don't know

nents:

See Attachment

you believe SMC can provide sufficient financial assurance to enable an independent third party to assume responsibility for control intenance of the site? ☐ Yes ☒ No ☐ Don't know

ents:

See Attachment

n its decommissioning plan. SMC must pr[illegible]nt an assessment of the radiation dose potential [illegible] associated with its proposed decommissioning option for the following po[illegible]tion groups: (1) on-site workers that do not h[illegible] access to the capped area; (2) on-site workers that perform routine maintenance and inspection of the capped area; (3) trespassers; and (4) the nearest off-site resident. Are there other population groups that you think should be included in the dose assessment process?

Yes ☐ No ☐ Don't know

gested groups:

See Attachment

n have additional concerns, please describe them below, adding additional sheets as necessary.

ribe the issue:

See Attachment

do you believe that issue should be addressed?

See Attachment

is this issue a concern to you?

See Attachment

additional information do you need in order to resolve this issue or understand it better?

See Attachment

ional sheets attached: ☒ Yes ☐ No

ise describe any other comment, concerns or recommendations you would [illegible]
aning process:

See Attachment

SITE SPECIFIC ADVISORY BOARD
Shieldalloy Metallurgical Corporation
Input Form

NJDEP's responses:

1. Do the institutional controls proposed by Shieldalloy Metallurgical Corporation (SMC) provide reasonable assurance that an average member of the public will not iiicur a radiation dose in excess of 25 millirem Total Effective Dose Equivalent (TEDE)?

The New Jersey Department of Environmental Protection (NJDEP) does not have sufficient information on which to base a response. The characterization of the slag and baghouse dust pile was not provided to the Site Specific Advisory Board (SSAB), nor was the engineering design of the cap.

2. Do you believe the iiistitutional controls will be enforceable?

No. There has been no demonstration that the institutional controls proposed will be enforceable for the time period necessary, basically in perpetuity. The United States Nuclear Regulatory Commission's (USNRC) own regulations under 10 CFR Part 61.59 state that institutional controls may not be relied on for more than 100 years.

3. Do you believe the institutional controls will not impose undue burdens on the local community or other affected parties?

No. The institutional controls may well prevent the development of the rest of the SMC site, as well as surrounding properties. The NJDEP believes this presents an undue burden on the local and neighboring communities.

4. Do you believe SMC can provide sufficient financial assurance to enable an independent third party to assume responsibility for control and maintenance of the site?

No. SMC appears to be downsizing this operation. There is no value to the property with the slag pile present, only liability, possibly in the hundreds of millions of dollars. It appears that SMC is seeking the Long Term Control (LTC) option only to continue operating the facility for as long as SMC can profit from it. If SMC can not profit from this operation, abandonment of all radioactively contaminated materials appears likely.

Also, SMC states that it currently has posted $5 million dollars in financial assurance for addressing the USNRC regulated materials on the site. This amount was not posted in accordance with 10 CFR 20.1403(c) for license tennination under restricted conditions, but rather in accordance with paragraph 16 of the March 26, 1997 Bankruptcy Settlement Agreement. This amount was posted as a "Predeterinined Cost" in bankruptcy negotiations based on licensing issues relevant at that time and was not based on SMC's

and USNRC's current proposal for a LTC license. It is impossible for NJDEP to know if this amount will be sufficient for the current proposal since very few details have been made available to the SSAB.

5. **In its decommissioning plan, SMC must present an assessment of the radiation dose potential associated with its planned decommissioning option for the following population groups: (1) on-site workers that do not have access to the capped area; (2) on-site workers that perform routine maintenance and inspection of the capped area; (3) trespassers; and (4) the nearest off-site resident. Are there other population groups that you think should be included in the dose assessment process?**

Yes. According to the October 7, 2004 letter to Kenneth Kalman of the USNRC from SMC, the trespasser scenario means recreational, casual visitors, or hunters. While NJDEP agrees that the resident farmer scenario is not realistic because a house cannot be placed directly on top of the slag pile, we believe that a more conservative realistic scenario should be assessed, namely a future resident who uses crushed slag as fill under a house. We believe this is certainly realistic, given the fact that it was done by SMC at this site, even having full knowledge of the radioactive content of the material. NJDEP also believes that the nearest resident scenario should assume that the house is built next to the slag pile and that the engineering controls degrade and completely fail over time (see Comment No. 6 under Additional Concerns, below).

Additional Concerns:

1. NJDEP is on record with the USNRC opposing the issuance of the first Long Term Control license in the country based on both administrative and technical concerns. Please refer to the attached letter dated June 25, 2004 from NJDEP Commissioner Bradley M. Campbell, to USNRC Chairman Nils J. Diaz for details. The information that has been provided to the SSAB to date has not changed NJDEP's position regarding issuance of a Long Term Control license to SMC.

2. The statement made by SMC at the November 5, 2004 Site Specific Advisory Board meeting that one of the reasons SMC does not consider disposal of the slag pile a viable option is because of liability issues, such as the possibility that the material would have to be sent back to Newfield from Envirocare of Utah. Subsequent to the meeting, NJDEP spoke with Envirocare of Utah, who explained that this requirement is just an extension of the USNRC "cradle-to-grave" policy. Every generator of radioactive waste is responsible for the waste that it generates forever. This is a standard part of the contract that every Envirocare client must sign before they will accept the waste. NJDEP has dealt with numerous cleanups across the State with responsible parties ranging from private companies to the United States government. This issue has never been brought up as a reason to abandon disposal as an option.

3. The SSAB does not seem to be functioning as the regulatory framework suggests. Namely, NUREG 1757, Volume 1, Chapter 17 states that the SSAB should elect a

chairperson and adopt a charter and operating procedure. This was not done. The minutes of previous meetings reflect that SMC or its representatives have driven the discussion. Basic radiation protection principles were discussed at two SSAB meetings (which were necessary), but little discussion on specifics of the dose assessments or financial assurance was presented. According to NUREG 1757 the licensee is supposed to provide the SSAB with licensee studies and analyses that are pertinent to the decommissioning. The SSAB does not have the dose assessment or the 1996 Draft Environmental Impact Statement for the SMC site in Cambridge, OH that is supposed to contain the ALARA analysis that the USNRC is allowing to be used at this site. The SSAB should also have been provided with the thermoluminescent dosimeter (TLD) data from the fenceline near the slag pile. This would at least provide a point of reference when discussing regulatory dose limits. The SSAB has no documentation on financial assurance, only the total amount that SMC says is available. The work of the SSAB cannot be considered complete until these documents are distributed and a discussion is held among the members.

4. The cover page to this Input Form states that the form must be completed by November 30 in order for the SSAB input to be captured in the site-wide decommissioning plan. It then states that these concerns will be addressed in the Decommissioning Plan. Is this the final input on the question of institutional controls and financial assurance? If it is going to be included in the decommissioning plan then we assume this is the input that the USNRC is going to evaluate against their regulations. NJDEP believes that the SSAB should work to provide a consensus opinion to SMC. It is difficult for this to happen based on the way the SSAB meetings are currently being conducted.

5. When discussing institutional controls at the SSAB, SMC states that the controls will need to be relied on for 1000 years. This seems inappropriate given the half-life of the material that will be remaining at the site and the exposure rates when the engineering controls fail.

6. A copy of SMC's October 7, 2004 letter to Kenneth Kalman of the USNRC was provided to SSAB members at the November 5, 2004 meeting. NJDEP has concerns regarding item number 3 under Dose Modeling. The USNRC is allowing SMC to assume that engineering controls may or may not fail once institutional controls fail, or their effectiveness may degrade over time. Since we know this material will be present in perpetuity, NJDEP believes it is safe to assume that eventually there will be neither institutional nor engineering controls present. We understand that sometimes a degradation of engineering controls may be considered more conservative because erosion usually occurs irregularly, which may focus the flow and allow contamination to be channeled and concentrated at a particular location, referred to as the "bathtub effect." According to SMC, the type of material present at this site is not readily soluble, so this type of degradation of engineering controls would not be considered conservative in our view. NJDEP believes that all scenarios should be assessed based on the failure of <u>both</u> institutional and engineering controls.

State of New Jersey

mes E. McGreevey
Governor

Department of Environmental Protection
PO Box 402
Trenton, NJ 08625-0402

Bradley M. Campbell
Commissioner
Tel. # (609) 292-2885
Fax # (609) 292-7695

June 25, 2004

Honorable Nils J. Diaz
Chairman, Nuclear Regulatory Commission
Washington, DC 20555-0001

Dear Chairman Diaz:

I am writing to express my deep concern regarding the US Nuclear Regulatory Commission's (NRC) intent to pursue a Long Term Control (LTC), possession only, license for Shieldalloy Metallurgical Corporation (SMC).

The April 15, 2004 "NRC Interim Guidance for a Long-Term Control Possession Only License at the Shieldalloy Newfield Site" states that "The staff expects that lessons learned from this project will be useful for eventually preparing draft regulatory guidance for public comment..." In effect, the NRC is proposing to use New Jersey as a testing ground for an untried and possibly ill-conceived NRC policy.

That experiment would essentially create a low-level radioactive waste disposal facility in New Jersey. Just a short time ago, New Jersey worked very hard to interest a community within the state in becoming a volunteer host for a low-level radioactive waste site. Even large monetary incentives were not enough to persuade any community to host such a site. I do not believe that our residents will be any more willing to accept a low-level radioactive waste site in the guise of an LTC site arriving through the back door.

The NRC has announced a "public meeting" on the proposed LTC on June 29 in Rockville, Maryland. On behalf of the public who will be interested and affected by your decisions in this matter, I ask that the location be changed to Newfield or some nearby location to allow them to participate in the meeting. Participation by telephone conference is not a true substitute for enabling residents to be present when a regulatory agency and its licensee are discussing leaving a large pile of radioactive material in a residential neighborhood for an unspecified time period.

The SMC site is home to some 28,000 cubic meters cubic yards of radioactively contaminated ferrocolumbian slag and 20,000 cubic meters of baghouse dust. Smaller piles of soils and debris bring the total volume of radioactively contaminated materials to 57,000 cubic meters. This large an amount of material should be disposed of in an environmentally responsible manner, not left for an indeterminate time, possibly even for future generations.

The volume and physical characteristics of the material raise concerns regarding the stabilization of the material when it is consolidated. An environmentally robust monitoring program will be

needed to ensure that chemical and radiological contaminants do not migrate off site. The very general discussion of monitoring requirements contained in the interim guidance do not engender a feeling of confidence that the public health and the environment will be properly protected.

The NRC is also proposing to allow much greater exposure to radiation if all controls at the site fail than would be allowed under New Jersey's rules. The NRC would permit an "all controls fail" annual effective dose equivalent of 500 millirem per year while New Jersey's is 100 millirem per year. I strongly believe that the State's more stringent standard is necessary to protect public health and the environmeht.

There are human and social factors to be considered when delaying the decommissioning of radiologically contaminated sites. Safety practices may decline as a result of the attrition of key personnel. Management interest in an LTC site will be less than if the site were in operating or in active decommissioning. Bankruptcy, corporate takeover or other unforeseen business changes could negatively impact safety at an LTC site. We do not see these concerns as adequately addressed in the guidance document.

I look forward to your actions to address our concerns.

Sincerely,

Bradley M. Campbell
Commissioner

SITE SPECIFIC ADVISORY BOARD
Shieldalloy Metallurgical Corporation

Minutes of the September 21, 2005 Meeting

SSAB Members in Attendance:

David R. Smith - SMC representative
C. Lee Harp, Esq. - Archer & Greiner (facilitator)
Carol D. Berger, C.H.P. - Integrated Environmental Management, Inc. (radiological consultant to SMC)
Loretta Williams - Newfield resident, public school employee and planning board member
Donna L. Gaffigan - NJDEP Bureau of Federal Case Management representative
Jenny Goodman - NJDEP Bureau of Environmental Radiation representative
Linda Graumann - Newfield resident and Newfield Councilwoman
(see Attachment 1 for the sign-in sheet)

Visitors and Others in Attendance:

Jean Oliva - TRC Environmental Corporation (environmental consultant to SMC)
Joseph Diegel - Vice President & General Manager, Shieldalloy Metallurgical Corporation
Dan Gillen - USNRC HQ
Marie Miller - USNRC Region I
Marjorie McLaughlin - USNRC Region I
Others as shown in Attachment 1

Discussion:
Attachment 2 contains a copy of the agenda handed out at the meeting. Attachment 3 contains the meeting transcript.

Action Items and Responsible Individuals:
Prepare and distribute minutes of the September 21, 2005 SSAB meeting (David Smith and Carol Berger)
Launch the SMC Decommissioning Web Site (David Smith)

Post the preliminary cost estimates for the LTC and the LT options on the web site (Jean Oliva)

Post the SSAB Input Form on the web site (Carol Berger)

Place SSAB Meeting Sign-In Sheet and the SSAB Input Forms into the repository (David Smith)

Complete and return SSAB Input Forms to David Smith (all members of the SSAB)

Notify the SSAB when Rev. 1 of the Decommissioning Plan is available on the web site and in the repository (David Smith)

Additional Meetings:
It was the consensus of the SSAB that another meeting was not necessary before Rev. 1 of the Decommissioning Plan is submitted to USNRC. Another meeting will be scheduled once the Plan has been released and reviewed by the membership, if requested.

ATTACHMENT 1
Sign-in Sheets

PARTICIPANT SIGN-IN SHEET

Shieldalloy Metallurgical Corporation SSAB: Fourth meeting at SMC's Newfield facility				
Date: September 21, 1005		Facilitator: Charles L. Harp, Esq.		
Your Name (Print)	Your Signature	Your Address	Your Telephone Number (with area code)	Your e-Mail Address
JAMES P. VALENTI	[illegible]	[redacted] SICKLERVILLE, NJ	[redacted]	[redacted]
Marie Miller	Marie Miller	[redacted] RI	[redacted]	[redacted]
Dan Gillen	[illegible]	[redacted]	[redacted]	[redacted]
Marjorie McLaughlin	[illegible]	[redacted]	[redacted]	[redacted]
Christy Gleason	Christy Gleason	[redacted]	[redacted]	[redacted]
[illegible]	[illegible]	[redacted]	[redacted]	
ROBERT WHITE	[illegible]	[redacted] NFLD	[redacted]	
Jenny Goodman	Jenny Goodman	[redacted]	[redacted]	[redacted]
Donna Goffigan	Donna Goffigan	[redacted]	[redacted]	[redacted]
Charles Grova	[illegible]	[redacted] Newfield	[redacted]	
Mary D'Meo		[redacted]	[redacted]	
Ed D'Meo		" "	"	
R.D. Shindel	[illegible]	[redacted]	[redacted]	
Jim Milton	[illegible]	[redacted]	[redacted]	
Gerald MARLBORO	[illegible]	[redacted]	[redacted]	[redacted]
Alfred F. Bucino III	[illegible]	[redacted]	[redacted]	

PARTICIPANT SIGN-IN SHEET

Shieldalloy Metallurgical Corporation SSAB: Fourth meeting at SMC's Newfield facility

Date: September 21, 1005 | Facilitator: Charles L. Harp, Esq.

Your Name (Print)	Your Signature	Your Address	Your Telephone Number (with area code)	Your e-Mail Address
[illegible]	[illegible]	[redacted]	[redacted]	[redacted]
Robert Harper	[illegible]	[redacted]	[redacted]	[redacted]
[illegible]	[illegible]	[redacted]	[redacted]	
[illegible]	[illegible]	[redacted]	[redacted]	
Terry Ragone	TERRY RAGONE	[redacted]	[redacted]	[redacted]
[illegible]	[illegible]	[redacted]	[redacted]	[redacted]
[illegible]	[illegible]	[redacted]	[redacted]	[redacted]
[illegible]	[illegible]	[redacted]	[redacted]	[redacted]

ATTACHMENT-2
Meeting Agenda

SITE SPECIFIC ADVISORY BOARD
Shieldalloy Metallurgical Corporation

SSAB Meeting (Open to the Public)
September 21, 2005 - 6:30 p.m.

Welcome	C. L. Harp
Review and approval of minutes from previous SSAB meeting	C. L. Harp
Purpose of SSAB	C. L. Harp
Background Information	D. R. Smith
Review of new/additional information since last SSAB meeting	D. R. Smith
Summary and review of Pending Activities	D. R. Smith
Summary of Post-Plan Submission Activities and Schedule	Dan Gillen
SSAB input capture	C. L. Harp
SSAB Open Discussion	C. L. Harp
Audience Questions	C. L. Harp
Adjourn	

ATTACHMENT 3
Meeting Transcript

SHIELDALLOY METALLURGICAL CORPORATION
SITE SPECIFIC ADVISORY BOARD

In the Matter of:	: TRANSCRIPT
	: OF
PUBLIC MEETING in re	: PROCEEDINGS
DECOMMISSIONING PLAN	:
	:

- -

Wednesday, September 21, 2005
Shieldalloy Metallurgical Corporation
12 West Boulevard
Newfield, New Jersey 08344
Commencing at 6:35 p.m.

S S A B M E M B E R S P R E S E N T :

DAVID R. SMITH
CAROL BERGER
JEAN OLIVA
LORETTA WILLIAMS
JENNY GOODMAN
LINDA GRAUMANN
DONNA GAFFIGAN
RICHARD WESTERGAARD
CHARLES LEE HARP, JR., ESQ., Facilitator

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MR. HARP: Okay, everybody. We're going to start the meeting right now. And I wanted to let the public who hasn't been here before know what we're doing and what the process is. This is a meeting of the Site Specific Advisory Board of Shieldalloy Metallurgical Corporation in connection with a decommissioning plan to be submitted or pending in part before the United States Nuclear Regulatory Commission.

Part of the rules of the Commission require that this kind of body be set up in order to gain input for a few specific questions about the decommissioning plan. And this is actually the fourth meeting of this committee. The first one was in August of 2003.

We are going to conduct a meeting here among the Board members. The Board members will be asked to introduce themselves so you will all know who they are. And when we finish, we'll open this for comments and questions from the floor. There will also be an opportunity for comments on Shieldalloy's website, which is written down up here behind me. It's www.Shieldalloy.com. And there's a whole sub-page there for the

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decommissioning effort.

So without further ado, I'm going to start the meeting by asking people on the Advisory Board to introduce themselves. And I'll start with the lady on my right. For the court reporter's benefit and public, could you speak up?

MS. BERGER: Okay. My name is Carol Berger. I'm with Integrated Environmental Management, and I am a radiological consultant to Shieldalloy.

MR. HARP: And on her right is, Linda?

MS. GRAUMANN: Linda Graumann. And I'm a councilwoman with the Borough of Newfield.

MR. HARP: All right. And --

MS. GOODMAN: I'm Jenny Goodman. I work for the New Jersey Department of Environmental Protection in the Bureau of Environmental Radiation.

MR. HARP: And Donna?

MS. GAFFIGAN: Donna Gaffigan. I also work with the Department of Environmental Protection. I work on the overall cleanup of the site.

MR. HARP: Okay. And Loretta?

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MS. WILLIAMS: Loretta Williams. I'm a member the Planning/Zoning Board of the Borough of Newfield.

MR. HARP: David Smith?

MR. SMITH: Dave Smith. I'm director of Environmental Services and the radiation safety officer for Shieldalloy.

MR. HARP: And in the back, Rick?

MR. WESTERGAARD: Rick Westergaard. I'm the Mayor of the town.

MR. HARP: He's also a member of the Board, although he's sitting back there. And we'll have another person up here momentarily whose name is Jean Oliva, O-l-i-v-a, from ARC Corporation. And they're an environmental consultant advisor to Shieldalloy Metallurgical Corporation. So that's everybody from the Board who's here tonight. Our first order of business has to do with the minutes.

MR. SMITH: And she has them. Jean has them.

MR. HARP: Oh, Jean has them. So we'll defer till a later time. I should say that my name, by the way, is Lee Harp. I'm an attorney for the company, but I'm acting as

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facilitator of these meetings. And the main purpose of the SSAB is to give input on a few specific questions as to the decommissioning plan.

Very briefly -- and I'm speaking now to the Board, but also to the public, so you know what we're talking about -- Shieldalloy has a series of slag piles in the back of this property. And they have radioactive materials in them; fairly low level. And the plan is what to do with them, because Shieldalloy no longer manufactures product using the materials that generated those byproducts. The decommissioning plan that Shieldalloy proposes is to obtain a perpetual possession only license for the NRC, and to reconfigure the slag piles into a single pile that you can hear more detail about that will be engineered and contoured.

And the plan also calls for financial assurance for the maintenance and monitoring of that pile for a thousand years. The purpose of it is to make sure that no member of the affected group, potentially affected group -- you will hear more about that -- receives a dose in excess of 25 millirems per annum above background.

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Now, all of this will be part of some rather voluminous presentations to the NRC. And the NRC has its own procedures for reviewing that. So we're pretty much at an early stage of that. I neglected to say earlier that we have with us tonight Daniel Gillen, G-i-l-l-e-n, from the U.S. NRC, who will explain the timetable, the processes and the steps that follow once we submit the decommissioning plan in all its many parts.

So the purpose of the SSAB, as I said, is to address certain questions. We've had earlier sessions that talked about that, and we have some more information to present to this Board tonight that deal with the issues that the SSAB is supposed to be addressing.

I'd like to turn to Mr. Smith just for a little bit of where we are with documentation to the -- that's been submitted to the NRC and what's been put in the --

UNIDENTIFIED SPEAKER: Could you speak louder, please? We can't hear you in the back.

MR. HARP: Yes. Okay. David Smith, I'm going to ask to tell everybody where we are with the documents that have been produced and are

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about to be produced. So ...

MR. SMITH: We in the last year have been working on a number of sections of the decommissioning plan and have submiued drafts of those chapters to NRC for their review and comment. In April we had submitted one on the dose modeling. And then in July we sent in a copy of the environmental report, the draft copy. Everything that we've submiued so far has been draft, because this is a work in progress. We're continuing to put in calculations and information as we are generating that.

And then we also have submiued the Chapter 7, the ALARA chapter, ALARA being As Low As Reasonably Achievable. And it looks at the different scenarios of possible exposure of different groups, residents or trespassers, farmers, and such. We're -- once again, all these chapters have been put imo the repositories over in the Borough Hall. And tomorrow we're hoping to have our web page up for everyone to look at. And we're going to continue to maintain that once we put it up, and it will be updated periodically with the most current information that we have

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available. They'll keep everyone apprised of the different progress that's being made with this project.

And what we're looking to do is we're on target to submit our decommissioning plan in October of this year. And that will still be consistent with what NRC's expectations for this submittal date was. We've been working in close coordination with NRC in a very complex type of decommissioning where we're trying to decommission part of the site for unrestricted use. In other words, it can be utilized for industrial purposes. And then the other part where the slag pile is will be a restricted release, where they'll have engineering controls; the cap, engineering design cap, with a fence. And that will also be overseen by institutional controls, which will be the long-term control license, which we will possess or apply for and get from NRC.

NRC will then conduct annual reviews. And I believe on a five-year renewal will apply, and the license hopefully will be reissued on a five-year basis. That's about

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where we are as far as our documents go.

MR. HARP: Now, one of those chapters includes cost estimates and the description of financial -- the financial assurance for monitoring and --

MR. SMITH: Long-term maintenance.

MR. HARP: Long-term maintenance. And Jean Oliva just came in. Jean, would you introduce yourself for the record, please?

MS. OLIVA: My name is Jean Oliva. I'm with TRC Environmental Corporation.

MR. HARP: And your company is responsible for developing the cost estimate for the cap, and so forth?

MS. OLIVA: Yes, we are.

MR. HARP: I'd like to submit -- or not submit, but circulate to the Board --

UNIDENTIEIED SPEAKER: Would you speak a little louder, please? I can't hear you.

MR. TIARP: I'm sorry. I'm sorry. I'll do my best. We have here cost estimates for the building of this cap and the land -- the slag pile reconfiguration, plus maintenance and long-term costs. And I was about to circulate that to members of the Board And

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we have extra copies for the public, too, and ask Jean Oliva to explain how these were arrived at. So I'll keep one and ask you to pass the rest of them around. And please, I'm sorry if my voice fails. I haven't had any dinner tonight. I'm an old guy.

UNIDENTIEIED SPEAKER: We're all in the same boat. We're all in the sarne boat.

MR. HARP: So just let me know if you can't hear me, and I'll try to keep it up.

MS. OLIVA: For the on-site stabilization action, the costs include the costs of mobilization and preparing the site for construction. And we estimate that at $80,000. Cap construction itself will include the implementation of dust controls. Monitoring. The consolidation of the materials into a single pile. Preparation of that pile for capping. The construction of the cap, which will include both soil, flares, and a geomembrane. The characterization of soil in the adjacent area of the storage pile. Because some of the materials will be moved to consolidate them in the capped area. And then establishment of vegetation over the cap. Followed by -- that cost is 2.3 million

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dollars. That would be followed by a final status survey at 50,000.

And then there are what we call here implementation costs: the design, administrative and legal costs, and the actual oversight of the construction activities. Those total $800,000, for a total for construction of about 3.2 million dollars. Then after that, there are annual costs. And those include visual and radiation surveys. Maintaining the site security. Maintaining the cover. NRC fees, which include both annual inspections and additional inspections and license fees every five years. And records retention fees. And on an annual basis that would amount to $19,000 per year.

We then expanded those out over a thousand years, came up with a present worth estimate, using discount rates that are prescribed in NRC guidance, which is 3 percent and 7 percent. And per NRC guidance, we add a contingency of 25 percent to that total number. And that gives us a range of 4.4 to 4.9 million dollars.

MR. HARP: And the NRC -- do you have a question back there?

UNIDENTIFIED SPEAKER: Yes.

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MR. HARP: We'd like to ask you to hold the questions till we're through up here. But we will get to you. What input did the NRC have in some of these individual items?

MS. OLIVA: I think I mentioned discount rates are prescribed per NRC guidance. The contingency amount is per NRC guidance. The fees that the NRC could charge for their annual surveys, and also the fees every five years for license renewal and surveys, those are accounted for.

MR. HARP: Now David, I've had some questions in the past about the nature of the financial assurance for this. Could you tell us what the plan proposes?

MR. SMITH: The plan proposes a fully-funded trust fund to cover the cost of the decommissioning. We currently have a trust fund, which was originally established at a hundred -- $750,000 that has grown to over a million dollars. In addition to that, there is letters of credit in the amount of 4.25 million dollars. And those letters of credit currently are for the benefit of US EPA and the State of New Jersey for issues associated with the slag pile. If the cost

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for the decommissioning were to increase above the original 7 point -- or $750,000, the agreement to establish the five million dollar lump sum of financial assurance called for reducing the amount that is in the possession for the state and US EPA. And it would be redirected to the benefit of NRC. So with the current cost estimates, we have sufficient overall financial assurance.

But the other issue is the annual maintenance in the monitoring, the 19,000 per year over a thousand years, I believe comes out to somewhere around --

MS. OLIVA: Well, depending on whether you use a 3 percent or 7 percent discount rate, it ranges from 277,000 to 655,000 in present worth dollars.

MR. SMITH: So the current --

MS. OLIVA: 277,000 and 655,000.

MR. SMITH: So the current trust fund will address that issue, and the construction of the cap will have to be addressed either, you know, through letters of credit or in another method. But the plan itself calls for putting moneys into a trust fund for the full amount.

MR. HARP: Okay. Any questions from the

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Board for either David or Jean?
MS. GRAUMANN: I have a question regarding the -- you had mentioned or somebody had mentioned -- I'm sorry -- no, Dave, I think you did -- that the -- every five years the license has to be renewed?
MR. SMITH: Yes.
MS. GRAUMANN: What's the criteria that needs to be met in order to have a license? To me, when I hear that a license has to be up for renewal, is there the possibility that there's not some threshold has been met, so therefore a renewal of the license could be denied?
MR. SMITH: I believe the threshold is if we're not in compliance with the conditions of that license and we are not taking corrective actions, NRC could seek to not renew the -- and take legal action against the company.
MS. GRAUMANN: And then what happens? I mean if it's something that you're not maintaining properly, or whatever, I mean then what? So you're in violation. Then there's the potential that there's something in the air that doesn't belong there, something going into the ground that doesn't belong there. I mean it's not just paper

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issues. There's also issues of the maintenance of the site. What's the position of the NRC at that point?
MR. SMITH: I believe the position of NRC is they would -- once you take legal action against the company, and as well as take control of the trust fund to make sure that the --
MS. GRAUMANN: The violations are being taken care of.
MR. SMITH: Yes.
MS. WILLIAMS: I have a question about the financial assurances.
MR. HARP: She has a question about the financial assurances.
MS. WILLIAMS: There's no cost estimates. You didn't give any cost estimates of what this is going to cost over a period of a thousand years to possibly remove the cap and the construction of another.
MR. SMITH: That's what we just shared with you.
MS. GRAUMANN: If I understand correctly, the cost estimates are based on 3 percent and 7 percent, and those are predetermined numbers that were given those

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equations, so to speak.
MS. WILLIAMS: What about the scenario about if this has to be recapped sometime?
MS. GRAUMANN: That would have to come out of the four point --
MS. WILLIAMS: I'm asking him. I'm sorry.
MR. SMITH: I'm sure if it had to be recapped, it would have to come out of the trust fund. And they would have to re -- you know, the company would have to reestablish the fund level.
MS. WILLIAMS: What if there was a scenario if there was a hurricane disaster --
UNIDENTIFIED SPEAKER: We came to a meeting here. We can't hear you. Not a word, what you're saying. What, you have the meeting up there? We want to hear it, too. That's why we're here.
MR. HARP: I'll repeat her question.
UNIDENTIFIED SPEAKER: What the hell's going on?
MS. WILLIAMS: I guess you have to have microphones.
MR. NESSEL: May I suggest we have the next meeting at Borough Hall where we have

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air-conditioning and a speaker system? Could we do that next time around?
MS. WILLIAMS: What I'm saying is you don't have cost estimates that -- to cover costs over a thousand years. And this particular material stays radioactive for a thousand years.
MR. HARP: She's saying we don't have cost estimates for over a thousand years, and this material will stay radioactive for a thousand years. And the response to that is?
MR. SMITH: The response to that is our cost estimate is based on a thousand years time period for maintenance, and our design is been designed to address heavy severe erosion issues and address those catastrophes that you're talking about as far as hurricanes and such.
MS. WILLIAMS: Hurricanes, and terrorism possibly.
MR. HARP: She said terrorism possibly.
MS. WILLIAMS: Also there's no liner underneath this pile to prevent nny seepage from -- radioactive seepage from going into the groundwater.
MR. HARP: She's saying there is no liner under this to prevent nny seepage of any

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radioactivity going into the groundwater.
MR. SMITH: The design that we've developed is based on including a cap to prevent, you know --
MS. WILLIAMS: Cap over.
MR. SMITH: A cap over, to prevent precipitation from penetrating into the pile. The material itself, however, is not -- it's extremely low leachability. It's not zero, but it's a very stable material. So nothing is really leaching out of it.
MS. WILLIAMS: Where are your leachability studies? I'd like to see your leachability studies. I'm raising my voice. I'm trying to make everybody hear. I'm not shouting or anything.
MR. SMITH: Those are going to be pan -- you know, they're part of the document that's being prepared and going to be submined to NRC. But you have -- in the original Revision 0, much of that information already exists.
MS. WILLIAMS: How long was the leachability studies done? Is how long ago?
MR. SMITH: The original ones that Rev. 0 were based on were quite a few years ago.

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We've done some this past year. That's the work in progress part of it, and to just substantiate and verify the previous information was correct and accurate.
MS. WILLIAMS: Well, another thing, this information was -- that was sent to the library, everything had blanks. I mean there was no amounts. Everything -- you know, there were a lot of blanks there. That wasn't telling us anything. We don't have enough information. We need more information.
MR. SMITH: The documents were submitted to NRC in order to give them a sense and have their review look at whether once we filled in those calculations and data, would it be acceptable for technical review.
MS. WILLIAMS: Why was this meeting held, when we weren't given the information, when the meeting wasn't advenised in any of the newspapers? I received written notice from you two days ago. You're supposed to give a two-week notice. The people from the state heard -- what was it? Eight, nine days before?
MR. HARP: Acutally we published notice in both the Vinehnd Daily Journal and the

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Gloucester Tiines.
MS. WILLIAMS: Nobody's seen that. Did anybody see that in the Vineland paper?
UNIDENTIFIED SPEAKER: No, ma'am.
MR. HARP: Well, I have an Affidavh of Publication from the newspaper that says it was. So that's how we rely on that. So -- and my office sent the notices to those two newspapers.
MS. WILLIAMS: Well, as far as I'm concerned, there's no financial assurances because we don't have proper cost estimates. And you didn't even get an estimate from -- did you get an estimate from Envirocare about off-site disposal?
MR. SMITH: We did.
MS. WILLIAMS: Where is it?
MR. SMITH: We received a presentation from Envirocare with -- in which they provided the company with projected numbers or quotes. They have asked us not to disclose that information. We are working with them to determine if we are going to be able to provide it to NRC. But as of right now, we are not allowed to provide that numher.
Second, in addition to that, however, independently from the Envirocare quote, NRC did a

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quote or a cost estimate for off-site removal and disposal. And that number, we can share with you. And do we have that with us, or not?
MS. WILLIAMS: Did they give separate for the slag and the baghouse dust? Was there separate cost estimates for that? Or is it going to be cost for the whole thing?
MR. SMITH: Envirocare presentation was a lump sum number for both. It did not go into detail.
MS. WILLIAMS: They didn't separate the two.
MR. SMITH: No.
MR. WESTERGAARD: Question. What's the volume and the dimensions of that pile?
MR. HARP: The question -- we have a problem here with the document. David, you heard the question?
MR. SMITH: No.
MR. WESTERGAARD: What's the vohime and the dimensions of the pile?
MR. SMITH: The volume --
MS. OLIVA: The consolidated volume of the pile will be 76,000 cubic yards.
MR. WESTERGAARD: Now, is the

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engineering design for the pile. is that complete?
MR. SMITH: The engineering design, no.
MR. WESTERGAARD: When will that be completed?
MR. SMITH: Once the NRC approves it. We wouldn't go into engineering design package until you have an approved plan and a license amendment.
MR. WESTERGAARD: Who would do that? You would bring in a consultant to do that?
MR. SMITH: Yes.
MS. GAFFIGAN: Is the volume based on more recent surveys of the pile?
MR. HARP: She's asking, is the volume based on more recent surveys of the pile?
MR. SMITH: Yes. Because we did an aerial fly-over this past year and quantified the materials. Because even though we haven't had production of new slag, there's been activities where soils and other materials from the site have been moved out that will be controlled in there.
UNIDENTIFIED SPEAKER: What would you say cubic yard is to --
MR. HARP: We just have to hold the

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question. I'm sorry. This is all Board stuff now. Sorry for the delay here. Do you have another question, Rick?
MR. WESTERGAARD: Yes. Dave, what were the dimensions of the pile, the length, the width, and the height? Do you happen to know?
MR. SMITH: I think Jean will help me in that. You mean once it's built?
MR. WESTERGAARD: Right.
MR. SMITH: What we're proposing to be built.
MS. OLIVA: It's roughly a thousand feet by 200 feet. But it's a boomerang shape, so -- it's 30 feet high.
MR. WESTERGAARD: 1,000 by 200 by 30? Is that what you said?
MS. OLIVA: Right. But like I said, it's a boomerang shape, so that's kind of misleading. It's not a long rectangle.
MR. SMITH: I'll take this back and then bring it back.
MS. GRAUMANN: Is that something that maybe she has a slide of, an aerial?
MR. HARP: While you're looking at that, I wanted to get a little bit more detail on the

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long-term license --
MS. GRAUMANN: Can I ask a question?
MR. HARP: Yes. Sure.
MS. GRAUMANN: Do you guys need to see this? Can I pass this around to the folks just so they can see?
MR. SMITH: As long as it comes back.
MS. GRAUMANN: As long as it comes back you guys can review this. And this is probably like a construction kind of question, but why -- Ms. Williams asked why there's no liner or something underneath. Why not? I mean I realize that would impact the cost of the construction. But if it would give residents a better sense that at least it was better contained, even though it's a low leachability, would that be a problem?
MR. SMITH: It would -- something we can evaluate. But the cost will be substantially increased. Right now the design and construction, as I understand it, is to minimize the movement of materials in a manner where the slopes are, you know, gentle enough so that the cap will not be eroded over a thousand years. So they could be done, but the cost would drive the price up

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considerably. Whether it would be -- it's something that possibly could be looked at.
MS. GRAUMANN: How much different would the overall cap be with a liner versus without a liner? I kind of get the feeling from what you just said that that would significantly change or alter what the outside cap would look like.
MR. SMITH: No.
MR. HARP: You have to move all that stuff
MS. GRAUMANN: Right. But that would still be significantly less than hauling it out of here, which you don't want to do.
MR. SMITH: Right. I'm not sure of what the cost difference would be. And it's something we can ask NRC to give us the -- to look at and come up with.
MS. GRAUMANN: And who would be looking into that for you?
MR. SMITH: TRC.
MR. HARP: TRC.
MR. SMITH: They are the ones that --
MS. GRAUMANN: Oh, the cost company.
MR. HARP: TRC is the company. Any other questions of the Board?

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MS. WILLIAMS: There's also scenarios it should be expanded to like failure scenarios such as hurricane. Exposure should be developed for dispersal of radioactivity. And these scenarios may result in and include the increase in population densities that will be affected at least over the next thousand years. And they should -- the selection, the model selection of those modeling should be justified and include the pros and cons of a number of available models. It should not be limited only to the long-term control option, but also include the license termination option and maybe other scenarios.

MR. SMITH: I'm not quite clear what you mean about the long-term versus --

MS. WILLIAMS: That those modeling should not be limited just to the preselected long-term control license that this is based on. It should also include license termination option.

MR. SMITH: You mean moving the material off-site?

MS. WILLLAMS: Moving the material off-site, and then the suspension of the license or other scenarios should be included in these

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scenarios as low as reasonably achievable.

MR. SMITH: If the material were to be moved off site, those criteria for the site would be the 25 millirem, which is the same criteria for leaving material on site with the engineering controls and institutional controls in place.

MS. WILLIAMS: If it was moved off-site, wouldn't it bc less than 25 millirems?

MR. SMITH: No.

MS. WILLIAMS: Why not?

MR. SMITH: Because the regulation requires us to meet the 25 millirem.

MS. WILLIAMS: Well, you would say that it would be less than that then if it was moved off site.

MR. SMITH: No. I'm saying the dose modeling is what individuals would be exposed to.

MS. WILLIAMS: It's based on that regulation of the NRC.

MR. SMITH: Sb the 25 millirem for unrestricted release, moving material off-site, or for the restricted release, is the same: 25 millirem. The difference is if the institution of controls failed, the long-tenn control license failed, then NRC or -- then what we're required to

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do is look at the engineering controls disappearing and/or the different exposure scenarios --

MS. WILLIAMS: So a hundred millirem.

MR. SMITH: To a hundred millirem.

MS. WILLIAMS: If Shieldalloy one day just leaves, goes to South America or leaves the country, there is no institutional controls unless we could attach your assets and make sure that the -- whatever cost to do these things is going to be that the NRC could actually attach your assets in order to pay for this, in order to make sure that financial assurances are done, and to make sure that this is -- this procedure, you know, proceeds. So you really have no institutional controls under this plan. Because we can't do that. We can't go after you and bring you back and make you pay for this. You could skip with your assets. We can't attach your assets. I should ask the Board, am I correct in assuming that?

MR. HARP: No.

MS. WILLIAMS: Why not?

MR. HARP: Because that's what the financial assurances are for. That's an

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independently-funded trust fund over which Shieldalloy --

MS. WILLIAMS: What if there's not enough money, which I don't think there is.

MR. HARP: I understand. But that's an issue that the NRC will pass on. And we understand that you don't think it's enough, and that will be an issue they have to decide. And your comments will be part of what we submit to NRC.

MS. WILLIAMS: I see the total cost for the off-site estimate is S58,100,000. I think that's a fair price for 50 years. And if the -- the NRC people are here tonight?

MR. SMITH: Yes.

MS. WILLIAMS: I'd like to say something to the NRC. For 50 years ybu let this company leave that material here and pile it up. You could have told them every year we have to move them on off-site license facility. You didn't do that. It's the NRC's fault we have this mess, more so than Shieldalloy. And to be honest with you, they let them stay here. You know, you've done this town in. We cannot understand. We cannot develop that piece of ground, that 57 acres

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of ground with that material sitting there, capped or uncapped.

MR. SMITH: The one thing you should know is the property, the restricted portion of the property is not going to be developed, but the unrestricted is available for development.

MS. WILLIAMS: Can you sell that? Can you subdivide? You haven't gone to the Planning Board and had a subdivision. Is the NRC going to allow them to subdivide that property once that's capped, and allow them to sell it to other companies? Or are they going to operate here for a thousand years?

MR. SMITH: Right now we're -- our plan is not to move. A thousand years, I can't guarantee that.

MR. HARP: But there are other scenarios than selling. You could lease long-term.

MS. WILLIAMS: You could lease.

MR. HARP: Without subdividing.

MS. WILLIAMS: You could lease, but you'd still have ownership, so you'd still have to be held responsible for this site. But you couldn't sell it, pan and parts. Am I correct?

MR. SMITH: The current plan does not

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call for selling parts of it. Because the guides NRC issued for long-term control licenses, they prefer to keep the property as a whole.

MS. WILLIAMS: Intact, to keep responsible. Who is the third party? Who is the third party that's going to regulate, to really be responsible if Shieldalloy should leave? Can I ask that of NRC?

MR. GILLEN: That's not identified yet.

MS. WILLIAMS: Is the NRC willing to take financial responsibility if they skip and their financial assurances isn't enough to cover?

MR. GILLEN: No. Our responsibility is to ensure that there is enough financial assurance.

MS. WILLIAMS: Well, I'm telling you right now that there isn't.

MR. GILLEN: Well, we haven't seen it.

MS. GRAUMANN: I have a question for the NRC. Obviously as a resident of the Borough, I think that I speak on behalf of all of them, the first option would be to ship this stuff off-site. And we've discussed that at previous meetings. Recognizing that that can be cost prohibitive, and perhaps also and in addition to

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that the NRC doesn't exactly back the Borough in that regard, my understanding is that the NRC, as long as Shieldalloy as a corporation comes up with some kind of feasible plan that's acceptable to you, then that's what you go with. I mean we have limited input through the SSAB. But that's pretty much it. I mean it's not as though we can dig our heels in and say we don't like that you're doing this, and you guys will say, yeah, you know what, they're right. Am I correct?

MR. SMITH: Can I interrupt? Sorry.

MS. GRAUMANN: Okay. I kind of would like --

MR. SMITH: Dan is going to give a presentation in a little bit, part of the meeting. I think he might cover it.

MS. GRAUMANN: My question to you, because we did discuss this at a previous meeting, I have a problem -- if we have to go with this cap system, my problem with that is that we have -- we're only 1.7 square miles. This is like a phenomenal amount of ground for us to just have frittered away because it's under this restricted licensing. So what are the possibilities that you guys would actually approve the site being

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self-contained -- contained by itself, and whatever we can salvage from the rest of the parcel, which is probably going to be affected by brownfields at the very least, and have that subdivided so at least we still have some viable ratables, that the company or somebody can come in and actually develop again. I understand that you're not wild about that idea, but I'm not wild about seeing 67 acres just sitting here hoping for somebody to come in that's willing to take on the responsibility of the decommissioned license.

MR. GILLEN: There are reasons why -- and we discuss in our guidance, why we prefer to have the site remain as a whole. It keeps the company more involved than just having them have a pile and nothing else; have a valuable piece of land that they can use, they can sell.

MS. GRAUMANN: Well, see, but the fallacy in that, which we've already experienced, is that whether it was the NRC or some other organization, one of the other agencies, they required that Shieldalloy tear down, dismantle some of the buildings that were affected. So they dismantled the buildings. Well, the buildings aren't there anymore. So now it's unimproved

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ground. So they appealed their taxes. That devastated us. We're still just kind of coming out of that. Okay. So you kind of sandwiched them into a corner where yes, they have to keep the whole thing together. Well, they're running on a skeleton crew npw. So once everything's finalized, what? They have one token building and a parking lot, and that's it? And then they come back to us and say we're going to take down the rest of the buildings because we're non-operational. And it affects our ratables again. I mean the end result is that we're still left behind with a ghost town as far as this site is concerned. Do you follow what I'm saying?

MR. GILLEN: I understand.

MS. GRAUMANN: It just continues to regress until h's valueless.

MS. MILLER: Marie Miller, NRC Region I. There are no other buildings on the property that were part of the NRC license. So with that, we would not be expecting the need to decommission or dismantle any additional buildings.

MS. GRAUMANN: Oh, you may not require it. But if they continue to phase out this location, as they have, and there's not anything

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left to do, well, then what's the point of keeping buildings? Why should they continue to pay in excess of a hundred thousand dollars a year in real estate taxes when it's basically just lip service: it's not a viable business for them anymore. I mean it would make sense to me if I were in their shoes. So, you know, they continue to tear buildings down or dismantle or to try to reduce their costs. Well, and then what are they going to do? Eventually they're going to come back and say, well, you know, we want our stuff to be reevaluated again. Even if it's not required, to me, that's the path that you're in a downward spiral.

And all of those things make perfect sense from a business standpoint. Those are the things that I would do if I were in their shoes. But at the same time, I'm in my shoes. I'm in the Borough's shoes. And whether I'm a Councilwoman or not a Councilwoman, I'm concerned as a resident. Because where is this going to go? We're not a Washington -- well, you don't have to go to Washington Township. But I mean we're not a huge town where we can just absorb this. That's the point.

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MS. MILLER: I understand your comment with respect to the buildings. I grew up in South Jersey.

MS. GRAUMANN: Oh, okay.

MS. WILLIAMS: We still need a third party. Is the state going to be the third party? The Borough of Newfield isn't going to be the third party, is it?

MS. GRAUMANN: I guess you haven't answered my question oh would you take that on advisement as far as to help the town if it became -- if it was a better scenario for us to permit Shieldalloy to subdivide the albatross.

MR. GILLEN: Yes, we would.

MS. GRAUMANN: You would. Okay. That answers my question. Thank you.

MR. HARP: Okay. Just for a little bit more detail on what this institutional control, the long-term license means, Carol, would you just for the Board and for the public lay out what those requirements would be?

MS. BERGER: Yes. What that would be in essence is Shieldalloy would have a radioactive materials license, much like the one they have now, which is to follow a certain set of

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provisions or requirements in order to keep that license active. And those requirements would include monitoring, radiation monitoring as well as visual monitoring of the status of the restricted area. It would include surveillance of the cap, making sure that the cap is -- doesn't have any pieces missing out of it, or that somebody's not walked through and dug a hole in it or something like that. And doing all of the necessary reports to the NRC.

The NRC would still come in on an annual basis and inspect the site to make sure that the provisions of the license are still in place. And the NRC would then go through the same license renewal process, I would presume that they're going through now, every five years, which is to revisit it, look to see if everything's being done the right way; does the license still contain applicable provisions and requirements. And then if it does and everything else that the NRC looks at seems reasonable, I would presume that the license would be renewed then. And then they go through the same process, every year inspections; every five years relicensing.

MR. HARP: Okay. Mr. Gillen, would you

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come up here and -- I'm going to ask Mr. Gillen the tell everybody about what the process is as we move forward.

MS. GRAUMANN: Could I just ask one question of Dave? How long your Ohio -- your Ohio facility has a decommissioned license on it, doesn't it?

MR. SMITH: It has a decommissioning -- it has possession only for decommissioning. And we have two slag piles in Ohio. One, the cap has been finished. And I think it was just completed this past year. The other pile I think is scheduled to be completed in 2006, maybe 2007.

MS. GRAUMANN: Oh, okay. So it doesn't have a track record of any kind. I thought it was already done and finished a couple years ago. I guess that's not the case. I guess not, if it was just done last year.

MR. SMITH: The final completion of the cap -- the pite has had a cap for -- since '92.

MS. GRAUMANN: Oh.

MR. SMITH: But there's been an improvement to that cap. And it's not driven by the Ohio Department of Health, but by the Ohio Department of Environmental Protection.

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MR. HARP: Okay. Can you do it from there?

MR. GILLEN: Yes, I prefer to do it from here, and that way everyone can hear me. Hopefully I have a little bit louder voice than some people have here. And my kids will attest to that. What I've handed out -- and I wasn't sure -- I thought maybe we were going to be using slides on a projector. So I'm prepared to do that. So I brought 25 copies. It may not be enough to go around. If anyone doesn't have a copy, I can get their name and address and send you one if you'd like.

My purpose -- and you got into a little bit of discussion with us already here. This is all pre-submittal of the decommissioning plan to the NRC. And Lthank you for inviting me to this meeting and I'm happy to be here to discuss some of the NRC's processes. But we at the NRC have our own process where we would involve the public once we do have the DP in our hands. And I'll get into some details on that.

I'm just here basically at the request of the Board and Shieldalloy to discuss some of the process. And as I said, we have not yet had

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submittal of the decommissioning plan. That's scheduled for sometime in October. We have seen little pieces of it, which is something that we have done in our agency up front to try and prevent getting a document submitted to us that's really not acceptable. And what we do is we look at it in general terms. And some of the pieces we've looked at just to give Shieldalloy an idea of whether or not the -- there's big holes in what they plan to submit.

Not getting into any technical review at this point in time, so the staff that we have at the NRC has not looked at the details of this. The cost data that's here, really the first time that we've seen anything related to cost. We've not reviewed any of that. So this is all preliminary to us. So we have not yet begun to do our review of this plan.

So what I have here -- and I'm going to talk a little bit about our decommissioning standards, the process that we have for the entire decommissioning process, as well as details on our review process of this decommissioning plan. And then some information on what is involved from the NRC's standpoint as far as public involvement.

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So basically the NRC standards in our code of federal regulations for decommissioning has two pieces to it. Decommissioning by our definition is to remove a facility or site safely from service and reduce radioactivity to a level that permits either, one, release of the site for unrestricted use; or two, release under restricted conditions.

So under scenarios of unrestricted release, which would be as you heard here if they move the pile somewhere and dispose of it in Envirocare or another disposal area, our standards call for the site, as was discussed already, meeting 25 millirem per year. And that would be using scenarios of some other realistic scenario of use of the land once they remove the pile, to get a dose less than or equal to 25 millirem. And of course we have -- as you heard, the goal is reasonably achievable.

So generally when a site removes material and cleans up their site, most of our sites end up being much, much less than 25 millirem. And that dose that we have in our standards is calculated for the average member of the critical group, depending on what the scenario

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of tuture land use would be. And it includes all pathways. In includes pathways from the air and pathways from groundwater. And the performance period that we look at during those assessntents is a thousand years.

Now, under the restricted release, which is what you're hearing is going lo probably be their proposed option, we also have a requirement of 25 millirem per year. But that's, as Dave described, under restrictions, with institutional controls in effect. And that those institutional controls must be legally enforceable. And you heard them talk about the long-term control licenses being a possible option.

And then of course we have to assess that if those institutional controls were to fail, then the dose would have to meet criteria of less than a hundred millirem under thal supposition. Then of course we talked already in pretty much detail about financial assurance, and that tlie independent third party that is yet to be identified, but that there would have to be enough financial assurance, and we would review that, to ensure that if for whatever reason Shieldalloy disappeared, there would be enough money to cover

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bringing in a third party to take control of what Shieldalloy had beeh doing up to lhat point.

And then I'll get into some details in some of my oiher slides here on the licensing, the NRC public involvement and outreach requirement. For our complex materials sites -- and I use the term "complex." It's basically a term we use to define sites where there's enough complexity at the site where it requires the submittal of a decommissioning plan. There are many sites that NRC has, and licensees that are much less complex and don't even need or require a DP. We have probably 200 to 300 licensees a year, with a lot of small licensees. But this one is complex and requires the submittal of a DP.

The process for that whole -- goiiig from deciding we want to terminate to the end starts with them notifying us within 60 days of permanently ceasing their licensed activities, which has been done. And then they're required to submit a decommissioning plan to the NRC within twelve months of that time. Of course we've been beyond that point at this site, and there are some reasons why that occurred. But they did submit a decommissioning plan to the NRC twelve months

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after their decision, but it was rejected by the NRC. And they went back to the drawing board and have subsequently got to this point. There also was a iittle bit of delay sort of on NRC's part because we were in the midst of developing guidance related to the restricted release option. And then Shieldalloy elected to wait unlit that guidance was in a more formal state before they submitted their plan.

And then once they prepare the DP, they submit it to NRC. And I'll get into some details when that occurs. And we do offer public opportunity to request a hearing and comment. And I have some more details on that on another slide. And then we eventually get to the point where we either approve or disapprove what's been submitted. And we'll go through a period of request for additional information generally.

And then the licensee begins -- once there's an approved decommissioning plan in place, the licensee performs all the site decommissioning, during which time NRC continues to do inspection of those activities. You've heard some of us here -- I neglected to introduce Ms. Marie Miller here from NRC is from Region I.

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She's a branch chief in tbe decommissioning program there. And Marjorie McLaughlin is fairly new at this site, though she will be the inspector involved in tbe activities of the site.

And so we perform inspections during decommissioning, at which -- and then at the end, the licensee has to perform a final radiological survey, which they then submit a final status survey report to the NRC. And we review that report, and at the same time we go out and perform our own confirmatory surveys to ensure that areas were cleaned up as described in the decontmissioning plan, and eventually get to the end and terminate the license. In this case it's not exactly a license termination; it's a termination of the operating license that they have now, and conversion into a long-term control license.

What's in the decommissioning plan? You know, you've seen pieces of it that have been put in your library. And but the full plan needs to contain a characterization of the site with the radiological status. Needs to include what the planned decommissioning activities will be. Needs to have a plan to ensure protection of workers and

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the environment during the decommissioning. It has to have what their plans are for that final radiation survey that I spoke of. And it needs to have the cost estimate, which we're seeing pieces of here. And the funding mechanism that they would ensure for financial assurance. It has to include the schedule which they will do the decommissioning. And then in the case of proposal for restricted use, they would have to include in the decommissioning plan information with regard to how they involve the public in their activities and what institutional controls would be involved.

Now, once we get the plan in our hands, from this October, the first thing that we do at the NRC is we do an acceptance review. In the case of big projects such as this, our acceptance review generally takes no more than 90 days. It's a fairly detailed acceptance review. And based on some previous actions, we actually did reject the first one that we had from this licensee, which is why we're trying to work up-front in this case and see some pieces so that we don't get something that's totally unacceptable.

So once the acceptance review is over at

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the end of 90 days, and if we get the submittal in October, that would take the schedule to about mid-January. Then we send them a letter and say yes, it's acceptable; we are now going to begin our formal review. The formal review generally begins with our noticing the fact that we received a decommissioning plan in the Federal Register and other web page, and offering the public an opportunity for comment and opportunity to request a hearing. And once that's been done, our technical staff begin the review, which generally results in first -- once we -- about a month into the review, we then at NRC have a meeting, which is our standard public meeting that we have at the site. We come here. We will have a meeting to solicit input from the local people that are affected. And at that point in time we'll hear what your concerns are. We'll use that when we go back to begin our review.

But that doesn't mean that's the only opportunity you have. You can submit written comments to us in addition to that meeting. And at that meeting, again, I will be talking similar to what I'm doing tonight about our process and the schedule and whether or not that's changed

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since this being here tonight.

So generally we have a point in time somewhere into the review where we go to the licensee requesting additional information. My slide says additional information, if necessary. I've never seen a review that we've done where we haven't asked for additional information. Generally I expect that we will come back with questions and request for information that was lacking in the submittal.

And then eventually via a license amendment, we will approve a decommissioning plan or whatever that may be at the end of our back-and-forth questioning. And generally we have a projected schedule of twelve months to do the review. That's a goal. Sometimes we're under that, sometimes we're over it, depending on what circumstances, how many rounds of questions there have to be; whatever delays may insert themselves, which we can't predict. So that would put, just for general purposes, our schedule having completed our review of the decommissioning plan, somewhere about January of '07. That would be a year from when we accepted the document this coming January.

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MS. MILLER: Just the overlay of --

MR. GILLEN: Marie's reminding me that we also have as part of our process meeting the environmental regulations. We would have to prepare our own environmental assessment at the same time we're getting -- doing the safety review of the decommissioning plan. And we would publish that environmental assessment in the Federal Register and make it available to the public to see that.

MR. WESTERGAARD: What part of the CFR is that?

MR. GILLEN: 51.

MR. HARP: The question was what part of the Code of Federal Regulations. And it's 10 CFR, Part 51, which requires the environmental activity.

MR. GILLEN: As far as the interaction with the public, first I've got a slide that kind of describes some of the less formal means by which we involve the public in our activities. Public meetings. Well, this is a public meeting. It's not my meeting. I came as an invitee to a meeting being held by Shieldalloy. So I didn't have to notice this meeting. It was up to them to

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involve any noticing. But generally in the NRC and when I host my public meeting sometime around next February or March, it would involve notification in the Federal Register and in the local papers. And we also have to give certain advanced notice of that meeting and meet requirements for advanced notices.

We also have during reviews of any kind, whether it be a review of a decommissioning plan or any other licensing action that we're taking with any of our licensees, from time to time the licensees come in to meet with the NRC at our request generally to discuss issues. When we have such a meeting, those meetings are always open to the public. And we notice those meetings about two weeks in advance of their happening. Those are not generally had at the site, as would be the public meeting that I spoke of, but they're generally held in our offices in Washington.

MR. SHINDEL: Excuse me. Where does the notification take place at? I'm sorry. My name's Rick Shindel. I'm just a resident. S-h-i-n-d-e-l. I was wondering where the notice of those meetings --

MR. GILLEN: We notice those on our web

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page.

MR. SHINDEL: On your web page. So you got to go to the web page and look for it, basically?

MR. GILLEN: Yes.

MR. NESSEL: How often?

MR. GILLEN: How often?

MR. NESSEL: We don't know when it's going to be on there. Wouldn't it be easier to just the notify our Borough Committee, our Mayor, the fact that you're going to have a meeting, so that we as a community can participate? Can we ask you to do that?

MR. GILLEN: We generally have certain people that we call and inform, yes.

UNIDENTIFIED SPEAKER: My concern is such that I was here in November and I spoke with Mr. Smith and he assured me -- I was standing right over here -- and he assured me that he was going to notice me well in advance so we could notify a lot of the people in the Borough of Newfield when that meeting was going to take place. That didn't happen. Why did we have to sign the paper back here last time, and we were never notified of this meeting this time? What

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was the purpose of that? That's a little suspect. I'm not sure that it is, but --

MR. HARP: That's better addressed to us, but we'll respond.

MR. NESSEL: You can jump right in.

MR. HARP: I'm trying to do this in an orderly way. His notice, is I understood it, Mr. Gillen, the Mayor is on your list of people to be notified of meetings?

MS. MILLER: Routine distribution.

MR. GILLEN: We have -- each project manager has a routine distribution list. And I'm not at all sure who is on the one for Shieldalloy. But as I said, it's two weeks in advance of the meeting.

MR. WESTERGAARD: But what I think the gentleman is saying is like the Federal Register, there's probably nobody in the room that gets it. So what I would request --

MR. GILLEN: This is our web page.

MR. WESTERGAARD: Okay. But what I would say is so that we know what's going on, if you'd please send our administrator the notices and the press releases, it would really help. Because I bet you nobody in the room reads the

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Federal Register. I don't do it on a daily basis. But I would say that please get this information to us in a timely fashion.

MR. GILLEN: For the public meetings I have at this site, you will definitely be well-aware of the meeting. There will be sent out multiple sources of noticing, whether it be in the newspapers, letters to you, or Federal Register. But what I'm speaking of now is multiple means that are had just with the NRC and the licensee. And generally they would be put on our web page. But I'll look into the list that we have of locals to see how we can better serve that purpose.

We also have workshops from time to time. We just had one in April this past year where there were a number of issues discussed. Stakeholders, licensees, states, came and attended. And we discussed many technical issues. I mention this now because one of the issues was restricted release options that we had. Also informal contacts with the NRC. Our web page gives how you can send an email to us with any questions. You can look at that list back there. My phone number and email address is on there, as well as Marie's and Marjorie's. And

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you can pick up the phone, call us, and we'll put you in touch with the people who can answer your questions.

Press releases. If there are certain issues or site actions that warrant a specific press release, we will issue those, as well as other Federal Register notices on issues. Then again, I mentioned our website. I have the web address as the last slide in here. So it's just recently been expanded. I'll talk a little bit about what kind of things are on the web page. And then there's also licensee initiated community outreach, of which this Board meeting is one.

We have some more formal procedures for public involvement, including what's in our regulations at 10 CFR, part 20. And the citations are there. Those are specific to restricted release type options which require certain additional activities on the part of the licenses and the NRC for involvement of the public.

MS. GRAUMANN: Is that also on your website, your additional restrictions?

MR. GILLEN: Yes. Because on the website you can access those code of Federal Register -- or regulation citations.

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MS. GRAUMANN: What was the code?

MR. GILLEN: It's in a slide. 10 CFR 20.1403 and .1405.

MS. GRAUMANN: You're saying that's in a slide?

MR. GILLEN: The citations are on the slide, but the details of the words, you'd have to go to the site page.

MS. GRAUMANN: Okay.

MR. GILLEN: We also have a hearing process in our 10 CFR Part 2, which describes the -- I mentioned the fact that we offer opportunity for hearing. Describes what would be involved in that process. I also have 2.206 petitions. This is where anyone can request to institute a proceeding related to modification, suspension, or revocation of any license. Then we have Freedom of Information Act requests. Any member of the public can submit a FOIA request for any documentation related to any action. And there's also a process of allegations of inappropriate activity whereas anyone can allege something. And it can be involving matters of -- affecting public health and safety.

Last slide I have here is where you can

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go for more information to our web page. And the website is listed there. And the types of things that we have on our web page for decommissioning include information on each of the sites that we have in decommissioning now. And those sites number about 70 different sites that I have right now, from reactors to complex material sites. It has the listing and access to all the regulations and guidance that would apply to decommissioning. It describes the process that I've talked to you about tonight. It has information on public involvement. It has keys into all different program documents that we have: Our guidance documents, or any document related to this activity at Shieldalloy be accessible, as well as information on frequently asked questions and lessons learned and international aspects to decommissioning. So there's lots of information on our decommissioning program.

And I'm not sure how you're working the process of questions. Like I said, I'm here in advance of submittal. I prefer not -- I'm hearing a lot of your concerns that are technical related. I can -- I'd prefer to get those once we have it in our hands and start to look at the

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details of the technical proposal. But I can speak to any questions related to our process. Is that appropriate for me to take questions at this time?

MR. HARP: We'll see how it goes. I was going to try and finish this meeting and then have you stay, if you wouldn't mind, for questions.

MR. GILLEN: I can do that.

MS. GRAUMANN: Would it be a problem if we would just take questions while everything is fresh in everybody's mind?

MR. HARP: I was just going to say we'll see how it goes.

MS. GRAUMANN: Okay.

MR. HARP: So the first hand I see is the lady over here.

MS. GLEASON: I'm Christie Gleason, G-l-e-a-s-o-n. I'm with the offices of Senator Fred Madden, Assemblyman David Mayer, and Assemblyman Robert J. Smith. My question is in the Nuclear Regulatory Commission review process, where does D.E.P. fit in, if at all? Is there any consultation with the state with regarding the site?

MR. HARP: No, the state is --

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UNIDENTIFIED SPEAKER: EPA, you mean?
MR. GILLEN: The DEP.
MS. GLEASON: The Department of Environmental Protection.
MR. GILLEN: The state will probably be doing their parallel review at the same time. Is that correct?
MS. GLEASON: I just wanted to make sure everybody understands where, or at all, D.E.P. fits into your process.
MS. MILLER: I can answer that. Marie Miller, NRC. We've been working with D.E.P. through these several years with Shieldalloy. There are several opportunities for involvement. But formally we have a policy of cooperation with states, is the first point. From the standpoint of inspections, they're involved in the inspection aspect. So they're going to observe any of our inspections. From the standpoint of license review, we solicit -- we officially send the decommissioning plan, once it's been accepted, to the state for comment. In fact, the last time I notified Jenny, for example, that plan was in, it appeared that there were some major flaws. So rather than burden the state with reviewing the

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document that we weren't going to accept, I said, you know, we won't be soliciting formal comments at this time. However, if you want the document, here it is. That type of relationship we have.
As I mentioned, as I guess I should say as I interrupted Dan to mention 10 CFR Part 51, the NEPA process, we're also required to consult not only with D.E.P., but depending on the issues, various agencies: historical committees, Fish & Wildlife, depending on what the issues are. So they're just to name a few off the top of my head. And I don't know if there are any others. But the bottom line is we have an ongoing working relation both with the radiation end, and also with Donna Gatfigan with respect to the Superfund activities.
MR. GILLEN: Though they are independent, we always cooperate. We don't have to wait for the state to approve the same -- react on our own in this case.
MR. HARP: Next question. Sir?
MR. McKEE: Yes. My name is Tom McKee, M-c-K-e-e. I'm a volunteer technical assistant with Councilman Milton and Assemblyman Mayer. And I have a question about the financial assurance.

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We were provided with a sheet that lays out some of the money that's going to be used for --
MR. GILLEN: The one that I just handed out.
MR. McKEE: Right. And to me, this looks like a list of construction costs. And I'm wondering if that is an appropriate -- is this actually financial assurance, or is this construction costs? Are they two different things?
MR. GILLEN: One feeds the other. There has to be a cost estimate that involves construction costs as well as any other costs that would be involved to get into the end point of the completion of decommissioning; whatever is proposed. So first of all, they have to lay out the cost. Then they have to provide the mechanism to make that money available in financial assurance.
MR. McKEE: Right. But this money will be consumed in the construction. So in terms of the long-term financial assurance that will provide for maintenance, monitoring, and catastrophe response --
MR. GILLEN: Financial assurance would

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change after they get to that point.
MR. McKEE: So this figure of five million is not necessarily the money that will be in financial assurance after they construct their -- do we have any idea what that figure is?
MR. GILLEN: Yes. They would have to have that available. If we told them --
MS. OLIVA: That's that $19,000 per year. And when you take that out over a thousand years, depending on whether you use the 3 percent, the 7 percent discount rate, it ranges from $277,000 lump sum in today's dollars, to $655,000.
MR. McKEE: So the financial assurance could be as low as $270,000?
MS. OLIVA: Yes.
MR. McKEE: Is that sufficient to respond to catastrophe scenarios, such as the failure of the cap, or erosion by a hurricane, or things like that? Where would that money come from?
MS. OLIVA: It includes a regular amount of maintenance every year. Some years we won't spend that. Some years you'll spend more than that. So it does allow for different events.

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MR. McKEE: But it seems to me that if you calculated that 50 million dollars will be necessary if that material has to be removed, a financial assurance of only -- which is a worst case scenario -- of only $200,000 is not in the ballpark.

MR. HARP: Well, I'm sorry to respond. But the financial assurance, if accepted, would assume that the in situ plan is the one that we're going to go with.

MR. McKEE: But given that is the one that actually happens, a financial assurance of only $200,000 for foreseeable contingencies related to that facility, it seems like you have to at least have as one of the scenarios you're providing for is the removal of that material eventually, if the license is not renewed or some other catastrophe.

MR. GILLEN: There would be -- well, generally I assume that they would -- they'd be replacing it to its original state; not taking it and disposing of it. If there's some kind of disruption of the cover, they'd just put the cover back on.

MR. McKEE: Right.

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MR. HARP: Okay. In the back, in the middle.

MR. NESSEL: My name is John Nessel, spelled N-e-s-s-e-l. Mr. Gillen, what impact would the input from the general public have with regard to the decision of the NRC to close this site and leave the material on site?

MR. GILLEN: The comments that you provide to us during the decommissioning process will be considered in our review.

MR. NESSEL: That's basically it. My other question is during the past two decades some of the material that's in question has been removed from site. What's the NRC doing to make sure that that stuff isn't leaching into the soil, or what are they doing to catch up with that stuff?

MR. GILLEN: Been moved to where?

MR. NESSEL: There was some brought back in front of the fire department on Oak Road. And when the city of Buena found out that it carried -- it was radioactive material, the city made whomever brought it there -- I'm sorry to be vague; I don't mean to be vague -- made them remove that. Now, that's one situation that I know of,

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because it was in the newspaper. But there may be other situations where the material was -- in fact, I found a piece in front of Edgarton School one day. I called the police department, tell them there's a bunch of stone in the road. But the thing is that that stuff has been removed from site off and on during the last two decades. In fact, it was ground on site, pulverized on site.

So my concerns are two-fold. You know, what impact has all the dust done, number one. But more importantly, the stuff that was moved off site during the last two decades at different intervals, at different times, what's the NRC doing to track that down?

MR. GILLEN: We're not on our own going out to do surveys to track that down. But I would expect the licensee would have to include any cleanup of any additional materials off site as well as on site.

MR. NESSEL: Would they have to have a record where it was brought to, and who carried it?

MR. GILLEN: They should have, if it was licensed by the NRC.

MR. NESSEL: I'm not sure how long you

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guys been involved. It's been two decades.

MS. MILLER: Marie Miller, NRC Region 1. I'm not aware of any material that was NRC-licensed material that was removed from the site. The reason I'm making the distinguishing point here is that there was some -- there is some material and there was some material at the site that was -- may have contained some radioactivity, but it was not at a level or concentration that required NRC licensure. So I can't comment on that at all because it's not within my purview. But with regard to NRC material, the license specifically prohibits the release of volumetric material.

MR. NESSEL: Well, we don't know for sure what material that was released on site. We don't know if it was in fact NRC-licensed material or not.

MS. WILLIAMS: Do you have a record of it?

MR. SMITH: I'm not sure what material you're talking about specifically.

MR. NESSEL: I'm not sure either. But it was out in front of Edgarton School. And there was some brought down -- I mean you guys must have

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some record of -- I don't know how many dump truck loads to fill the retention basin in front of the Vineland fire department on Oak Road. That was in the newspaper. And that's how I knew about it. But I'm going back a few years now, in all fairness.

MR. GILLEN: If you have information on this, provide it to us and we'll look into it.

MR. NESSEL: Other than just going and researching the newspaper. They would probably have better records than I could probably get, if in fact there are records of it.

MS. WILLIAMS: What year was that, John?

MR. NESSEL: I don't remember.

MS. WILLIAMS: I remember hearing that, but I don't remember --

MR. NESSEL: Probably about ten years ago, I'm guessing.

MR. GILLEN: Part of the DP includes the characterization. That's an historical look at everything that was done. So if they submit something in there and you think there are things that are missing --

MR. NESSEL: But I won't know. Other than that particular thing, I don't know, I can't

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say what other stuff was brought off-site. I don't have any indication. I mean we didn't have as much -- we didn't have a group such as the SAA -- whatever that is, board, to go ahead and monitor that. In fact, we have no rights to go on this property to see what's going on or what's going off, so to speak.

MS. WILLIAMS: They don't have to give us any.

MR. NESSEL: We have no information at all. In fact, our own fire department isn't even allowed on site, is my understanding, unless they're invited onto the site. Is that accurate? It's kind of like, you know, the X Files here almost, you know. And we're concerned. I mean we have some serious concerns. And I apologize for my manner. I know Mr. Smith characterized me last time as being somewhat abrasive or aggressive. And that's just me. But the point of the matter is that we are concerned. We are very concerned. And the rumor around town is the fact that you, being the NRC, not you personally, but the NRC is entertaining the situation of closing the site here, encapsulating the material here on site, and the D.E.P. takes a different view. That's just

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information I'm receiving from other people. And I'm concerned about that.

MR. GILLEN: We have to entertain it as part of our regulations. It evolves. Not just at this site, but any site has the option.

MR. NESSEL: Your meeting in Washington, is that -- for what purpose?

MR. GILLEN: Which meeting in Washington?

MR. NESSEL: You said something about your meeting in Washington.

MR. GILLEN: What I said is we will have a meeting similar to this once we've reviewed the decommissioning plan that will be here. Not in this room though. It's too damn hot.

MR. NESSEL: I made that suggestion last Council, but no one took advantage.

MR. GILLEN: The meetings in Washington I'm talking about are at some point in time during our review I may have a health physicist that has an issue that he wants to discuss with the licensee, and we'll bring them in. And those meetings are the ones that I spoke of that we would give two-week notice if the public wants to be involved. Sometimes the state gets involved,

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and they patch in it by phone and they listen to the meeting. Those kind of meetings are in Washington.

MR. NESSEL: The other thing is we as a community, I suggested it to Council, that we as a community hire an attorney, an environmental attorney, to protect we the citizens and our propeny values. And I think that's a good idea. At what point does he become part of the noticed, you know, list I should say, I guess? I mean if we did that, would you be obligated to notify him, if we make him a matter -- I mean I'm sorry. An attorney of record for the Borough of Newfield?

MR. GILLEN: I think we would.

MR. HARP: The lady in the back.

MS. RAGONE: Terri Ragone, R-a-g-o-n-e. At what point in the process is the environmental impact study done, and how is that disseminated to the public, you know, prior to any public meetings? That's the first part of the question. And the second one is the petition. When you say request revocation or suspension of license or whatever, what rights does the public, municipality have to petition your decision? And how, you know, how effective has that been? Do

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you have any precedents where a town has put forth a petition, rejected your, you know, recommendation that the process go forward?

MR. GILLEN: I'll start with the first -- well, I'll stan with the second question. I'm not aware of incidents where the public has changed the total plan. And I'm sure there are probably some out there, but at least in my involvement in our decommissioning program. And this restricted release option is not a frequent one. It's, you know, so most sites --

MS. RAGONE: We might be the first.

MR. GILLEN: There's a couple other ones. There's one in the state of Ohio.

MS. RAGONE: I'm familiar with this.

MR. GILLEN: So I can't give you an example of where the public -- I know the public has certainly changed aspects of the plan.

MS. RAGONE: So what is that petition for then on your -- you have notification hearings, petition.

MR. GILLEN: The hearing process, as I've described, is one which when we notice receipt of the decommissioning plan, anyone has the right to request a hearing and provide the

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basis for why they disagree with whatever's being proposed and get involved in our hearing process.

MS. RAGONE: But you don't know what that petition would involve in terms of the public involvement, what --

MR. GILLEN: The 2206 petition that's on the slide?

MS. RAGONE: Yes. That's a public petition.

MR. GILLEN: That's a petition on any issue related to -- that's another process.

MS. RAGONE: So the public has n right to at least petition with their --

MR. GILLEN: Correct.

MS. RAGONE: -- opinions, grievances, whatever, to the NRC for your decision. Can that petition go to litigation, or -- I'm just trying to understand the process.

MR. GILLEN: Marie's reminding me that on our website there's a description of that process. And also through the website you can get to part 2, which describes the whole hearing process of our code of federal regulations.

MS. RAGONE: We have submitted a petition with 200 names on it early on, because

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the very first time that we heard about this meeting, which was held in Vista, not in Newfield, what? How many years ago? Almost ten years ago.

MS. WILLIAMS: It was in Franklin Township. It was in Delsea Regional back in '93, I believe.

UNIDENTIFIED SPEAKER: '94.

MS. RAGONE: That was the first time that we actually heard about the decommissioning process and what it was. So we did petition them to hold it here, and we did have meetings here through the years to try to get some information about it and get some public awareness. So I'm just wondering what the step is in terms of legally opposing any kind of decision. You know, if the municipality has any --

MR. GILLEN: It's all laid out in Part 2.

MS. RAGONE: I'll take a look at it.

MR. GILLEN: If I had one of my lawyers here, he could probably describe it to you in detail. But unfortunately I'm an engineer, not a lawyer.

MS. MILLER: To comment on that. Marie Miller, NRC. If you go to the website and under

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Part 2, they do provide contacts that you can contact an NRC legal person to provide general guidance about the process. As technical people, we're not adept at that. But that's why we refer you there.

MS. RAGONE: You can see our concerns. I mean we have no regress, as Linda Graumann pointed out. We have no regress, it looks like, to -- as the public.

MR. GILLEN: I've laid out multiple ways by which the public can involve themselves through comment and hearing requests and petition.

MR. HARP: The gentleman --

MR. BUONO: My name is Fred Buono, B-u-o-h-o.

MR. HARP: Is that "B" or "D"?

MR. BUONO: "B." Maybe I'm a little bit behind the times here, and I apologize; kind of operating on just semi-reliable rumors. Where has the NRC been for the 20 years that we've been having a slag pile pushed on us? I mean at what point did you come into this process, that now we have to abide by your decision?

MR. GILLEN: Do you know what year?

MS. MILLER: I don't know the year.

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(Off the record discussion.)
MS. MILLER: I'm just consulting. I'm not speaking --
MR. GILLEN: She's referring to the timeliness rule, which is -- at best it's related to decommissioning. I think these questions go beyond that, back when did we first begin licensing this material.
MS. WILLIAMS: It was licensed in '55, right? By the Atomic Energy Commission? And then the NRC came in --
MR. BUONO: I don't know why she's answering my question. But I was asking it to you.
MR. GILLEN: Well, she knows the date.
MS. WILLIAMS: I know the date, because I know -- '55 they -- right? '55, you started your operations?
MR. SMITH: We started our operations, but I'm not sure when we started our --
MR. HARP: Too many people talking at once. Okay. The question really was when did the NRC license, the operating license, go into effect. That's when NRC asserted jurisdiction over their predecessor agency. We don't have the

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exact date. Loretta Williams thinks it was about 1955. It's been at least since 1960, do you think?
MR. SMITH: Yes.
MR. HARP: So it's been an operating license for 35 years, plus.
MR. BUONO: So theoretically you've been licensed and supposedly monitoring this all this time?
MR. GILLEN: Correct.
MR. HARP: I'm sorry. We're not through with you. Does that answer your question?
MR. BUONO: That answered my question. Thank you.
MR. HARP: Okay. Anybody else who hasn't? This gentleman right here.
MR. WHITE: My name is Robert White. I live here in Newfield.
MR. HARP: How do you spell your last name?
MR. WHITE: W-h-i-t-e.
MR. HARP: Thank you.
MR. WHITE: You get very few opportunities in your lifetime to shut up, and this probably should be mine. I'm looking at the

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cost of this. And what I'm getting out of this whole thing -- this is the first time I've been to this thing. It looks to me -- correct me if I'm wrong -- if you guys follow the criteria that the NRC has laid out, you guys are home free. Am I right or wrong?
MR. HARP: Well, the NRC has to approve the license. And we're a long way from that. But assuming we can, yes.
MR. WHITE: Okay. Well, I'm looking at 53 million dollars. Between getting rid of it -- and I don't know where you'd do it. I don't know if you could take it to Yucca mountain. Can you do that? No. But you're going to spend five million dollars. That's a given. You're willing to do that. But you also would be willing to spend as much as 58 million dollars. Is that right?
MR. HARP: No.
MR. SMITH: No.
MR. HARP: Wrong.
MR. WHITE: Okay.
MR. HARP: One of the analyses that Dave Smith referred to is ALARA, A-L-A-R-A, As Low As Reasonably Achievable. And that had to do with

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costs for alternate methods of disposal, including off-site disposal. So the 58 million, or whatever the number is that you're looking at, was an alternative for off-site disposal. It's not something the company was proposing to do. It's just showing that that would be the cost if they had to do that.
MR. WHITE: Okay. Another question I have is how much radiation is actually being emitted right now as we're talking? Anybody know?
MR. SMITH: Carol, do you want to do a little explanation?
MS. BERGER: Carol Berger. Radiation is everywhere, and it's part of life. So it's not --
MR. WHITE: That's true. You're talking millirems.
MS. BERGER: Right. You have to separate what is naturally occurring and what we're exposed to every single day versus what is contributed by the Shieldalloy operation. And you've heard the numbers. The term millirem, that's just a unit of radiation exposure, just as miles per hour is a unit of speed, and so on. So

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to try to put some of these numbers in perspective in order for the NRC to approve the decommissioning of the Shieldalloy site, Shieldalloy has to be able to demonstrate to them, to all of their technical satisfaction, that a member of the critical population does not receive more than 25 millirem in any given year. That's the first number to start comparing with.

People, just as part of being alive, from radiation exposure we receive from the cosmos, from the ground we walk on, from the food we eat, the water we drink, the air we breathe, we receive anywhere, depending upon where we live in the county, annual average background radiation dose ranging from about 200, 250 millirem to sometimes as high as a thousand. Again, there's a lot of things that go into that. The annual average is about 360 millirem. So that might give you a point of comparison.

The 25 millirem is the dose objective. That doesn't mean people will actually receive 25 millirem from the decommissioned site. It just means that Shieldalloy has to demonstrate that no one will exceed that. The actual doses are likely to be none. But that's the dose objective that

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has been set by the NRC. So I don't know if that helps or not.

MR. GILLEN: He wants to know what's coming off of the pile right now.

MS. BERGER: Off of the pile right now? Where you're standing right now, you're getting --

MR. WHITE: If I was over there leaning up against that pile, what would I be absorbing? An x-ray, or what?

MS. BERGER: No. Again, radiation dose depends upon where you are with respect to the pile, how long you stay there, and then the various pathways for exposure. If you're up next to the pile somewhere, you're being exposed pretty much only by direct radiation. Those are great big rocks. It's really hard to inhale these great big boulders. So unless you're chinking it around or kicking up dust. The only real pathway for exposure, when you're in that storage yard back where that pile is, is direct radiation exposure.

Shieldalloy has got little monitoring devices that go all around the outside of the fence there. And we know the exposure rate at different distances from that pile all around. There's one spot that's very close to the pile.

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There's a monitoring device very close to that pile. And then others are farther away. The ones that are farther away on the far side of the fence, and so on, they're indistinguishable from regular normal background exposures. If you get right up next to that pile, you will receive radiation exposures on a quarterly basis of -- if you stood there 24 hours a day, you know, for three months straight -- you can't leave at any point in time; you must stand there -- I believe it was 200 millirem. 200, 230, something along those lines.

MR. SMITH: What's that compared to an x-ray?

MR. WHITE: Okay. So what you're saying --

MS. BERGER: Well, a CAT scan of the whole body could be something on the order of --

MR. WHITE: I'm sure it's very low. I'm sure it's very low. But what you just said is ten times more than what you said earlier. And I'm sure -- you know, I don't want to sound like an alamist. But I guess I'm just going to say it right out, just say it right to your face. You guys been putting that stuff out there for I don't

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know how long. You're going to pay a few million dollars and you're going to buy it back, and Newfield's going to get left with it for a thousand years. Now, if it's not such a big deal, why not just pave the streets with it or something and be done with it? You know what I'm saying? Why are we making such a big deal out of nothing?

MR. SMITH: That's a good question.

MR. WHITE: Maybe you want to answer that.

MR. HARP: Good question.

MR. WHITE: Can anyone answer that?

MS. GRAUMANN: I think what his question is if it's not a big deal, why are we making a big deal. Isn't that correct? If the pile in fact is not really --

MR. WHITE: We're going to have 67 acres in Newfield, which is a lot, that nobody's going to want.

MR. HARP: Well, one of the things we talked about in the meetings earlier, for alternative uses in the steel industry. For example, the slag has value. But somebody would have to either become a co-licensee with Shieldalloy or get their own license to handle the

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stuff. Another application would be for an artificial reef in the ocean. So no, no. Please.

UNIDENTIFIED SPEAKER: D.E.P. refused that.

MR. HARP: D.E.P. has a rule that nothing radiological can be there. But everything is radiological. But anyway, so in New Jersey that wouldn't work. Other areas don't have that kind of restrictions. But really, if you study that material and its potential for radiation and exposure values, a thing like an artificial reef would be good. But we're not able to do that in New Jersey.

One of the things that the company has talked about is keeping their bptions open for some kind of alternate disposal somewhere. Not 58 million dollars to get rid of it somewhere, but actually have it be reused. So your idea about putting in a road, that would be nice, except the regulations don't allow it.

MR. SMITH: We've actually contracted for a study with Penn State University for looking at use of it as an aggregate in concrete and special types of situations like airport runways

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and stuff like that. But it just becomes cost prohibitive, and the regulatory issues are very difficult to get over. So it's something that we're looking at and we'll probably -- even after the pile gets capped, one of the things about having a long-term control license, the license is -- can be amended later on if there is a beneficial use that can be found.

MR. WHITE: I guess what I'm -- I'm just going to finish up with this. Looks to me like everyone has kind of just assumed the fact that we're going to get left with this thing, we're going to do what we have to do, and then we're going to go on our way. That's what I'm getting at. And then further on down the line we're going to have a petition with the NRC, and maybe there will be something resolved with that. I don't think Newfield wants that thing left here. That's -- I mean you can gather that from just seeing the people out here night. And with that being said, I guess that's all I can really say about the matter. Except the fact that Newfield -- pardon the expression -- is getting dumped on here. And I really believe that. And I'm just sorry to hear it, because I like this little old town.

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MR. HARP: These questions really are for Mr. Gilleu.

MR. WHITE: That's true.

MR. GILLEN: That one wasn't.

MR. HARP: No, I know that. But what I meant to say was this question section from the public is really directed to Mr. Gillen. We kind of strayed a little bit. Jenny, you have a question?

MS. GOODMAN: Yes. I maybe wanted to address your question. And you can correct me if I'm wrong. But you gave the example of the TLD that's the closest to the pile. So if you were there for a year, it would be about 920 millirem just from direct exposure. From background direct exposure you would expect about 43 millirem per year. So that just gives you a comparison.

MS. RAGONE: And where did you get those figures? That was my question. Some of those studies, aren't they public, be they federal registry or other?

MS. GOODMAN: The TLD data, I just got the last two years from Mr. Smith. The background, I'm just assuming five microwatt per hour

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MS. BERGER: It's 5 to 18.

MS. GOODMAN: So I was a little low. But just to put it in perspective, which I think was your question.

MS. RAGONE: According to Ken Kalman, who worked at the NRG last year, April bf 2004, there was radioisotopes above the E.P.A. screening limit in the groundwater exceeding their limit in the immediate vicinity of the slag pile. And I have that in an email. So that does give you some sense that there are some contaminations.

MS. GRAUMANN: I'm sorry, Terri. Did I understand you to say that the email indicated to you that there's radioactivity in the water?

MS. RAGONE: Radio isotopes above the E.P.A. screening hmit in the immediate vicinity of the slag pile. In other words, they aren't further afield. But as you get closer, they are. And they said that they were. There was to be an inspection in April of 2004 to be analyzed. And that's as far as I got.

MR. MILTON: My name is James Milton. I'm a resident of Newfield. M-i-l-t-o-n. Recently our tests they do -- you know, they send that to us every year -- they had to come back and

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do a second test because the alpha numbers were over the limit. That was only a couple months ago.

MS. RAGONE: This was in 2003. They said they would be able to determine whether there was an increase in gross alpha or gross beta activity that may be attributable to the radioactive isotope.

MR. MILTON: This was our well, our municipal well, a couple months ago.

MS. RAGONE: So I'm just saying there's information -- there's some information gap here that --

MR. MILTON: A little less than half a mile away.

MS. WILLIAMS: Upgrade.

MR. MILTON: Test wells have showed positive for chromium up there.

MS. GRAUMANN: Do you have information on that? No?

MR. HARP: That's sort of an NRC question. Sir?

MR. SHINDEL: Richard Shindel, S-h-i-n-d-e-l. I have a question for the NRC. In the other facilities that were capped over like

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this one here, were they the same radionuclide, the same energies? And what were they contained -- were they the same aggregates? Do you know?

MR. MILTON: No.

MR. GILLEN: Almost. There are a number of sites around the county that have been capped. There's generally uranium mill tailing sites.

MR. SHINDEL: Low population?

MR. GILLEN: Pennsylvania. Texas.

MR. SHINDEL: Generally low population densities though?

MR. GILLEN: Not in Pennsylvania. But generally in the west, yes.

MR. SHINDEL: Yeah. Because I mean I know the technology, and it's commonly used out West. I didn't know if it was used in the Midwest or even on the East Coast. And there's problems with that technology as well. Also, as I sit here and listen to this -- that was the only question I had for the NRC.

As I sit here and listen to your description of radiation dose, right? What's disturbing to me is this characterization is

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somewhat misleading. Because if you don't know the energies and the radioisotopes, if you're just talking about radiation exposure -- you have to talk in terms of contamination. And you have to talk in terms of uptake. And you have to talk in terms of alpha energy. Because if you don't talk in those terms, then you're not talking about the hazards to the public. I'm not worried about the radiation coming off the slag pile. Why? Because it's just gamma radiation. If you're not standing close to it, it doesn't affect you. It's really no big deal.

The concern is leaching from acid rain or whatever of the materials into the water system. I don't see any cost here related to doing water testing. I don't see anything in the remediation plan that talks about preventing entrance into the groundwater. I don't see any airborne contamination issues for the slag movement. Because those are just bad, right? If you get an alpha emitter in your lung, it's a far greater -- these are very low energies -- it's a far greater damaging issue than if you're standing next to a slag pile. I'll sleep on a slag pile, but I won't inhale dust from it. I won't.

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Because I know better. Because an alpha emitter in your lungs is bad. And depending on what the nucleoids are. It could be strontium, which is a great bone seeker. It could be iodine, which goes to your pituitary system. You pick your hazard. But it seems strange to me that the discussion doesn't talk about that at all. Nor does the remediation plan.

So I find the conversation somewhat misleading. And when you were talking about dose events, when the woman was speaking about that, I found it surprising when the woman asked you, well, if you remove it all, what will it change the dose to, and you said 25. And that's not the case. You remove it, it's not there.

MS. WILLIAMS: It's not there. That's what I'm saying.

MR. SHINDEL: What you were reponing was your restricted limit as a license holder. I understand that. It's 25 millirem at the fence. That's fundamentally the same restriction for any license holder. But to say that to the lady was pretty misleading.

MR. GILLEN: I want to clarify that we have lots of sites that dispose of material, bin

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they still have a standard that we have that they can leave residual radioactivity at a site that's 25 millirem. What I'm saying is even if they ship it all off to Utah, they might still leave some around. It's not going to be totally zero.

MR. SHINDEL: You can't do it.

MR. GILLEN: But it's probably less than 25. I would say that.

MR. SHINDEL: Yeah. It's incredibly impractical to haul everything away. I've got that thoroughly covered and understand it, you know. But to hide behind the foil of ALARA is kind of surprising, particularly with people here who know that was a design really for not environmental concerns; more so for industrial and the life in the '50s.

MR. HARP: We're delaying our --

MR. SHINDEL: All I'm saying to you is that I find the conversation misleading about the radiation doses, because you're not talking about contamination. And I found it surprising that the remediation plan doesn't talk about groundwater contamination. That's all.

MR. HARP: Well, actually in detail it does. And that's what the purpose of the cap is,

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to keep stuff from running through the landfill into the groundwater. And the portions of the cost estimate would include monitoring. So I think unless you -- we gave a summary of what the cost estimate was, the actual plan. And all those components are far more detailed, as are the dose scenarios that are required to show, to demonstrate compliance with a 25 millirem per annum.

MR. SHINDEL: Also you said it's uphill. Uphill according to the aquifer movement that is known? Or uphill physically on a topographical basis? I mean because unless you're talking in terms of the aquifer movement, then it's really neither here nor there, what topographic arrangement is.

MR. SMITH: Upgrading from the groundwater movement.

MR. SHINDEL: Upgrading from the groundwater movement.

MR. SMITH: Yes.

MR. SHINDEL: I understand. They serve you with a dye, or do they do that with what?

MR. SMITH: Water level measurements from various soils and U.S.G.S. measurements.

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MR. SHINDEL: So it's a U.S.G.S. measurement from like 1962.

MR. SMITH: Regional.

MR. SHINDEL: So you don't know what the local movement is then. You have no idea.

UNIDENTIFIED SPEAKER: It's a very complex system because there's so much pumping from --

MR. SHINDEL: Sure. Every time you draw, you can pull the waterway any way you want, especially --

UNIDENTIFIED SPEAKER: Agricultural as well as --

MR. HARP: Excuse me, gentlemen. Anything else for Mr. Gillen?

MR. SHINDEL: I thank you. I didn't mean to --

MR. HARP: No, but we're getting into a dialogue that was not related directly to this. And we're going to come back to questions from the public when we get through this meeting.

MS. MILLER: I think there was a statement made --

MR. HARP: Go ahead. For the record --

MR. GILLEN: That is related to the

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question on the groundwater.

MS. MILLER: Right. Marie Miller, NRC. The inspection report is dated March 20th, 2005. That was issued. And it included the groundwater sampling that was -- NRC did some independent -- in the NRC inspection report there that was issued in March, 2005, we collected five water samples from the Shieldalloy property. We independently analyzed that through our laboratory, our contract laboratory, which is the environmental survey and site assessment program at the Oak Ridge Institute for Science and Education. The results were included in that inspection report. And the samples were analyzed for gross alpha and gross beta. And all five groundwater monitoring wells that were sampled were less than the Environmental Protection Agency screening limits for groundwater.

And the wells that we sampled were the wells -- we specifically selected the wells that perhaps would show the highest level. So we did conservative sampling. I know the state did some additional sampling. I can't speak on their behalf. And then as the gentleman mentioned, there was some other sampling. Again, I'm not

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addressing those. I'm just addressing these tive samples that we took. I had shared this with Ken and also with the Mayor's office. So if there's any questions with regard to that, I'd be happy to discuss those later tonight, or give me a call at my telephone number. Thank you.

MR. HARP: The court reporter needs to change paper, so we can take -- go outside and get some fresh air.

(Whereupon, a recess was taken from 8:30 to 8:45 p.m.)

MR. HARP: We're going to resume this meeting. Please take your seats. Okay, guys. Mr. Nessel, your hand is up to talk.

MR. NESSEL: Yes. I have one other question for Mr. Gillen, if I may, please.

MR. HARP: Okay. Mr. Gillen, one more question.

MR. NESSEL: My name is John Nessel again.

MR. GILLEN: Can I make a couple of clarifications when -- I just stood up, because I was talking to a number of people on the break, and a couple things I want to clarify. One is I think I mentioned when we do our environmental

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review or we -- I said environmental assessment. In the case of a restricted release proposal to NRC, we immediately do an environmental impact statement. So we go through a stronger analysis than just the environmental assessment, which is a lower review. So in this case we did an environmental impact statement.

The other thing I wanted to clarify is when I talked about the criteria that we have in part 20 about restricted and unrestricted release, I may have given the impression that anybody out there who's a licensee to NRC can just say I want to go with restricted release and leave material on my site and have this option. Any licensee has the alternative to propose that. But there are a number of hurdles. The normal course of action is the preferred optibn of unrestricted release, disposing of all the material, as you all would like.

But if they're going to go to a proposal for restricted release, they have a number of hurdles, arguments to make to the NRC to allow us to approve that. It's not just here it is, and NRC, you got to approve it. So there's a number of things, and it's in the regulations, about what

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needs to be done with regard to various arguments. And of course the institution of controls that we talked about. That's just two points.

MR. NESSEL: Along those lines, I have a second question. Along those lines, who's to say -- you said they have hurdles to -- in other words, as long as they meet that criteria, they'll get the opportunity to store that on site.

MR. GILLEN: Correct.

MR. NESSEL: So basically If they do what you say you want them to do. As a taxpayer and a citizen of the Borough of Newfield is saying, listen, I don't really want this stuff here; what can we do to get it off-site, really doesn't mean a whole heck of a lot.

MR. GILLEN: It does if you can plan out something that causes us to disagree with what they propose.

MR. NESSEL: Yeah. But if you're setting up restrictions and specifications and they're meeting that, and you say no, can't they sue you for not --

MR. GILLEN: You're right about the fact that if they meet everything we require of them in our regulations and make an acceptable proposal to

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us, we will accept it, yes, even if we don't like it.

MR. NESSEL: So your decision won't be based on whether or not the community submits a petition to you saying no, we don't want this here. That doesn't really hold that much weight with you. As long as they meet the restrictions that you set in place, then that's basically it. So basically having meetings with the public is just basically to assure the public that it's going to be done in a proper way; not whether or not we're going to stop it?

MR. GILLEN: That's correct.

MR. NESSEL: So in other words, you're saying already that as long as they do what you say, we're stuck with the slag pile.

MR. GILLEN: If they meet everything that we require.

MR. NESSEL: Well, then why are we having public meetings?

MR. GILLEN: Because maybe you'll raise an issue that causes them to go back and have to reassess. Maybe you want to know what --

MR. MILTON: Because it's part of the compliance. Nobody really cares. They just --

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it's part of the compliance.
MR. NESSEL: What concerns can I raise that you should already be raising, because you have a lot more knowledge in that area than I'll ever have. Do you understand what I'm saying? I mean my biggest concern right now, based on walking out the door, has to do with a cancer cluster study. But that's going to be towards Mr. Smith, because that's the portion of the meeting that I think I need to direct that to him.
More importantly, if we find people -- if people come forth and say you know what, I took material off from Shieldalloy and it's in my property, on my property, and it's here for this reason, that reason, or the other reason, and they want to come forward because they think that there's something has been done of concern. I know Marie spoke about this already. I guess she must have mentioned it.
MR. GILLEN: No, she didn't mention any --
MR. NESSEL: Well, my concern, what guarantees do they have that they're not going to be responsible for the cleanup?
MR. GILLEN: The people who have the --

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MR. NESSEL: On their site. On their property, yes.
MR. MILTON: Because there are people in this room now that have it possibly on their property.
MR. GILLEN: It depends on the circumstances and the history of why it got there. I mean if it was inappropriately disposed in somebody's back yard, they'd be responsible.
MR. NESSEL: Suppose I bought it as fill, and it's innocently --
MR. MILTON: Purchased as fill.
MR. NESSEL: Suppose I bought it as fill, but for whatever reason -- and now I said wait a minute, this might not be what I thought I was doing. And I come to you and I say, you know, Mr. Gillen, I got some stuff over here that I'm not sure I'm supposed to have. Are you going to say, well, Mr. Nessel, guess what?
MR. GILLEN: Either it was inappropriately and illegally sold by the licensee, or it was material that wasn't licensed by NRC and we don't have anything to do with it.
MR. NESSEL: Okay. That's fine. So then this property owner can come forward to you

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and say can you check and make sure this isn't the material that we worried about, as opposed to material we think it should be?
MR. GILLEN: Yes.
MR. NESSEL: That's fine. And the homeowner is free of liability, is that what you're saying?
MR. GILLEN: I would charge the homeowner to come out and survey their property.
MR. NESSEL: Who would have to pay to have it cleaned out of there?
MR. GILLEN: I don't know the answer to that.
MR. HARP: Okay. One more. That's it. Because we got to go back to our --
MR. MILTON: I just want to reaffirm and answer my question with him. So in other words, I'm not going to say it. Everything, the way everything's going here, reading from -- you've reviewed past reports, knocked down a little bit. But everything's on sight with leaving that stuff here. There's no -- you're not going to come back and say, hey, we changed our mind, we want out of here. You change your mind is what I mean. Because --

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MR. GILLEN: We don't have our mind made up.
MR. MILTON: You're right on track for leaving it here with them. Right?
MR. GILLEN: We have an option that allows them to pursue leaving it here. I'm not -- we have not reviewed anything.
MR. NESSEL: It doesn't matter.
MR. GILLEN: Your position that if they meet every requirement we have related to restricted release, yes, we would approve it on this site.
MR. NESSEL: But what input do we have as citizens?
MR. HARP: We're re-frying the same egg here.
MR. NESSEL: I don't think so. We've come up with a new point of view, new point of view being the fact that the NRC has set up some regulations, and as long as you follow those regulations as far as me, him, her, and these couple guys over here, it doesn't mean anything.
MR. HARP: He's already explained what their position is. And this is the third time I've heard it. So because we opened this up as a

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courtesy. But I really want to get back to this. If you have more questions, we'll take them later, but --

MR. NESSEL: That's fine. There's no more questions. I understand.

MR. GILLEN: Our responsibility at NRC is to ensure that whatever end result there is on any of our sites, that the public health and safety is taken care of.

MR. MILTON: Are you aware that D.E.P. Commissioner Campbell has a fairly strong language statement supporting the removal of that? Have you seen that?

MR. GILLEN: I have not seen that. Maybe you've seen it.

MS. MILLER: Yes. And the NRC has responded to that.

MR. GILLEN: We've responded to letters. We're aware of this.

MR. MILTON: Very strong language. Get it out of here from Commissioner Campbell. You've read that.

MR. GILLEN: Yes.

MR. MILTON: Okay. Thank you.

MR. HARP: Thank you. We're back to our

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internal business. Just as a matter of housekeeping, the minutes of the November 5, 2004 meeting was circulated by Dave Smith. The only comments that came back about it were from Donna Gaffigan.

MS. GRAUMANN: I don't have a copy of the minutes.

MR. HARP: Well, it went out. It went out, did it not?

MR. SMITH: Yes, it did.

MR. HARP: It did. Anyway --

MS. GRAUMANN: Last year? Oh, I'm sorry.

MR. HARP: November 5th of 2004. Donna's was the only comment letter we received.

UNIDENTIFIED SPEAKER: I think the meeting's a waste. It's a waste.

MR. WESTERGAARD: I didn't get a copy of the minutes.

MR. HARP: Well, in any event --

MS. GRAUMANN: I have a file on you guys at home. So I mean I'm not sure if I do or not.

MS. WILLIAMS: I think I got it.

MR. HARP: We think everybody got it because we did get comments back from Donna

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Gaffigan. If you didn't get it, Shieldalloy responded -- intended to respond in March of 2005, but the letter did not get sent to Donna Gaffigan. And I have copies of the letter, which we just dated today, attached to which are minutes that have been corrected in accordance with Donna's comments. She hasn't had a chance to look at everything because people were talking. But I want to circulate this to everybody. And if you have a problem with the minutes as they are, please let David know as soon as possible. And Donna is going to get back to him tomorrow. So I will give, you know, the people here who --

MS. GRAUMANN: I do remember your questions. Because you have me on the email. I mean you have the original letter.

MS. GAFFIGAN: Addressed to me.

MR. HARP: Now, where do we go from here? At our meeting of November 5 we again requested input forms. And the only person to submit any was the State of New Jersey. We're going to request that if you have some input to give us, that you do give it to us, and in the following context: What you've heard tonight, Chapter 16.

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MS. BERGER: Somewhere in there. They get renumbered.

MR. HARP: Well, there's a chapter of the decommissioning plan that will contain the comments we have received to date. That will be sent out to you by September 30th. Is that correct?

MS. BERGER: Yes.

MR. HARP: And we will ask you to give us your input at that time by October 14th. We will then revise, if necessary, Chapter 16.4 to incorporate all of that. Our submission to the NRC will also contain a transcript of tonight's meeting and the minutes of tonight's meeting. But we're trying to get your input. We have comments from you in the minutes. We have comments from you, I guess just in the minutes, except for mistakes. So we're anxious to get that together. The submission date for the plan with all its appendages and all its subparts is October 24. That's why we're asking for your input by October 14th.

We will make available on the website the various documents we're talking about prior to their submission, except for Revision 1, which is

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the original decommissioning plan. We will have available at the Township Borough itt the library input forms for any citizen to reflect. And they will be included in the record as well. So that's what we intend to do. Jenny, you have your hand up.

MS. GOODMAN: Will the Chapter 5 dose assessment be completed before October 14th then?

MS. BERGER: It should be. All of the chapter should be done before October 14th. And that chapter, the ALARA analysis and the environmental report will be put on the website so people can look at them.

MS. GRAUMANN: 10-14 was the date that the comments had that to be in by also?

MR. HARP: Yes. All of the ones that we thought you might have the greater interest in, up and available.

MS. GAFFIGAN: Dated August 29th, you sent comments to NRC on how you plan to address the dose assessment in Chapter 5. When will we be able to see that on the website?

MS. BERGER: We're going to try to get them up early. But in reality, it will be -- when the entire decommissioning plan is posted on the

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website will be on the 24th.

MS. GAFFIGAN: But how can we comment and give you intelligent comments if we can't read the entire dose assessment to understand exactly what you're doing and that you're doing it in accordance with the guidelines? We need more than a day to incorporate that and form comments.

MS. BERGER: Right. The comments we're looking for are primarily -- any comments are welcomed. But the ones we're looking for primarily are the ones that are required as part of the restricted release process. And those are the ones that the NRC is looking to us to respond to in that chapter. The rest of the technical issues associated with the rest of the chapters that are there, that will come when the plan is issued. And then everybody gets a chance to look at it, provide your -- like if there's something we're doing that you think isn't appropriate, that's the kind of information I would say that the NRC would like to receive from you.

MS. GOODMAN: Well, I think one of the things that the SSAB is supposed to comment on is the adequacy of the institutional controls. And I don't think we can do that unless we have the dose

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assessment.

MS. BERGER: Well, but keep in mind that with all of the institutional controls in place, the dose must be less than 25 millirem, or the NRC won't even talk to us about that. So it's going to be something less than 25. But the comment on the institutional controls, the effectiveness of the institutional controls is the one thing that is new, that is different. One of the biggest differences between this version of the plan and Rev. 0 of the plan is that the NRC becomes the perpetual license, is one of the biggest changes from that version. All the rest of the physical controls are the same.

MS. GRAUMANN: Say that again? The NRC, the biggest difference is that the NRC --

MR. HARP: The perpetual license is the long-term --

MS. BERGER: Right. The federal long-term oversight of the site. We talked about deed restrictions and deeding the propeny to the state or the borough. That was one of the primary reasons why Rev. 0 the plan was rejected, because the NRC didn't feel that that was a viable institutional control. And so we waited then

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until we, meaning Shieldalloy, until the NRC issued guidance, and that they would be willing to issue a long-term control license where Shieldalloy would in essence remain a perpetual licensee, with the federal government looking at the site as part of the licensing process.

MS. GRAUMANN: So how does that impact the Borough then? I ntean from our standpoint, is that greater security?

MS. BERGER: That's the input that I think the NRC is looking for from SSAB.

MS. GRAUMANN: It's a question. I don't know. I'm asking the question. What are the benefits of having the NRC be the perpetual license control versus the original plan, which was what?

MR. SMITH: The Borough, or possibly the state.

MS. GRAUMANN: I'm sorry?

MR. SMITH: Or possibly the state.

MS. GRAUMANN: Could you shed a light on that?

MR. GILLEN: The requiremems in our regulations with regard to getting up-front information from this group essentially limits the

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information to -- I'll read it here: Licensees proposing to decommission by restricted use of the site shall seek advice from such effective parties regarding the following matters. And one, whether provisions for institutional controls proposed by the licensee to provide reasonable assurance that the dose will be 25 millirem. Will be enforceable and will not impose undue burdens on the local community. And then two, whether or not the licensee has provided sufficient financial assurance. So really the focus of the group's comments are on the financial assurance and the institution of controls.

MS. McKEE: An undue burden, is that defined?

MR. GILLEN: Tom, I don't think it's defined.

MR. McKEE: What would be an example of that type of burden?

MR. GILLEN: Let's see. I think that means -- that's in terms of the institutional controls themselves, whether the controls that they've set up are requiring, you know, that the local community be somewhat involved in those controls. Those kind of burdens.

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MR. McKEE: For example, opportunity cost to the town in terms of what potential development could be here versus having a landfill. Would that be an undue burden?

MR. GILLEN: I don't think that fits what we're talking about here. But you could raise that issue.

MS. GRAUMANN: Yes. That would a good comment to put on that comment sheet. But I guess I don't understand -- and forgive me, but I guess I just don't understand, why was this a key change? Understanding this is something that the NRC requested? Or this is part of tbeir new guidelines?

MR. SMITH: No. It's something we requested of NRC because we saw a resistance from the state when taking control. And NRC indicated that the municipality was not a large enough organization to last a thousand years, or comment on it for a thousand years.

MS. GRAUMANN: We plan on it, but --

MR. SMITH: The town being here for a thousand years. So we proposed, because we had success out in Ohio with tlic possession only license as being institutional control, we

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proposed a similar type of scenario to NRC. They went through and developed guidance specifically for the long-ternt control license.

MS. GRAUMANN: But I guess the institutional control is limited to the items that you just read ofi?

MR. GILLEN: No. What I just read was the items that they're required by our regulations to get up-front input on.

MR. HARP: This is a handout that we gave out.

MS. GRAUMANN: I have a notebook at home like this.

MR. HARP: I'll be happy to send it to you again. But it's in your stuff, the requirements of what we're looking for. And it's also part pf the --

MS. GRAUMANN: No, no. I'm trying to understand from a practical standpoint what the advantage is of this. What's the advantage? You know, why --

UNIDENTIFIED SPEAKER: Is the meeting amongst yourself? Wc can't hear anything.

UNIDENTIFIED SPEAKER: Nobody can hear anything back here.

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UNIDENTIFIED SPEAKER: It's amongst yourselves. What the hell's the use in being here?

MR. HARP: Could you move up one row?

UNIDENTIFIED SPEAKER: They can't hear either.

UNIDENTIFIED SPEAKER: Come on!

MS. GRAUMANN: One of the major differences between the last --

UNIDENTIFIED SPEAKER: He's doing all the yaking up there. Let's hear it.

MR. HARP: She's trying to speak so you can hear her.

MS. GRAUMANN: One of the major differences is this last revision has a provision in there that the NRC is going to be the perpetual license control. Is that correct?

MR. SMITH: Yes.

MS. GRAUMANN: And before, it was going to be the state. And I'm just trying to figure out what the advantages are to changing that.

MR. SMITH: The state resisted. They said they would not.

MS. GAFFIGAN: They put out the plan without asking us first whether or not we would be

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interested in working with it. And after we saw the revision or the original document, no, we're not interested in overseeing it.

MS. GRAUMANN: What exactly are the responsibilities of whoever has the perpetual license control? What would their responsibilities be?

MR. SMITH: Their responsibility is to make sure that the engineering controls are maintained in place. And under the long-term control license, there will be the monitoring, as well as the annual inspection and renewals.

MS. GRAUMANN: So basically the NRC would be overseeing everything that happens to the site once the decommissioning plan is effective?

MR. SMITH: And the trust fund will be set up for them, should there be a failure of the licensee Shieldalloy doing that.

MS. GRAUMANN: I don't know where you were when I interrupted you.

MR. HARP: Thanks. Okay. The questions are in the form. And we can email you the form again if you'd like.

MS. GAFFIGAN: Are you looking for a consensus form from the entire advisory board? Or

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are you looking for individual entries from us and from anybody else who's --

MR. HARP: We're looking for individual entries from -- because I don't think we'll get consensus really. So I think we're looking for the sense of the various members. You will get a chance to see how it's characterized in our presentation to NRC before it goes to the NRC and to comment on that. That's October 14th. You know, September 30 to October 14th period we're talking about.

MS. GRAUMANN: The last time, you had actually provided us with comment sheets. Is that in this packet somewhere, or --

MS. BERGER: No, it's not in there.

MR. SMITH: It's going to be posted on our website.

MS. WILLIAMS: I don't have access to that.

MR. SMITH: I understand that. And we're also going to put it in the library, a number of the forms, so they're available.

MS. GRAUMANN: I'll make sure that they're available.

MR. MILTON: I can't quite hear what's

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going on. But in other words, you're not going to hand out that comment sheet tonight?

MR. SMITH: Not tonight.

MS. GRAUMANN: It's available on their website. The comment sheet, you can download and you can print it all.

MS. WILLIAMS: And also in the library.

MS. GRAUMANN: But it will also be at the library as part of the documentation. And I'll make sure that Tony has it down at Borough Hall.

MR. HARP: Okay. Anything else before this Board before we open it to the public?

MS. WILLIAMS: I have one thing. I was told that Envirocare did not want you to disclose the bid.

MR. HARP: She said that Envirocare -- I'm trying to be the microphone. There is an outfit out in Utah, I think, that handles some types of radioactive material. And Loretta was saying that you understand that Envirocare, with whom Dave Smith or about whom Dave Smith spoke a few minutes -- about an hour ago, discussed the price of off-site disposal using Envirocare, and Envirocare would not permit Shieldalloy to divulge

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the number that they were willing to accept the material for.

MS. WILLIAMS: Okay. Now, I want to know, who did this? On record.

MR. HARP: This is the preliminary estimate of off-site disposal.

MS. WILLIAMS: Okay. That's TRC. This is the same company that Shieldalloy is going to contract to clean up their groundwater?

MR. SMITH: It is a company which we are in negotiations with. The state, as well as --

MS. WILLIAMS: To give you an exit strategy?

MR. SMITH: Yes.

MR. HARP: Okay. Questions from the floor?

MR. McKEE: Follow-up on Loretta's question. The TRC numbers for disposal, is -- was there a particular landfill that they got these costs from?

MS. OLIVA: The disposal cost that was used in this estimate was based on information gained from the work that was done at their Cambridge, Ohio site, and also other information that we could glean off the web of other closure

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cost estimates.
MR. MILTON: You got no quotes from any disposal companies?
MS. OLIVA: Envirocare is pretty much the only game in town. And the quote they provided, they can't share with us.
MR. McKEE: Is that by some kind of confidentiality agreement?
MR. SMITH: It's a confidentiality agreement that they asked us to sign in order to, you know, get a final quote from them.
MR. McKEE: Can you tell us if their number was lower than this number?
MR. SMITH: It was slightly lower. I can tell you that.
MR. McKEE: Would it be -- because it seems like you have a six million dollar charge here just for loading the trucks.
MS. OLIVA: No. That also includes -- it would be going into railroad cars. It would have to be -- a lot of the bigger pieces would have to be crushed before they went into the railroad cars. So that's moving the material to a staging area, crushing it, and putting it in the railroad cars.

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MR. McKEE: And that costs actually more than building the landfill, just loading it on the railroad cars?
MS. OLIVA: Yes.
MR. McKEE: It just seems like these numbers, if you look at the cubic yard cost, it's over $450 a cubic yard.
MS. OLIVA: It's very expensive to dispose of
MR. McKEE: And does that compare with -- I mean in order to evaluate that number we really need to know, if Envirocare's the only game in town, what their number is.
MR. HARP: All we can say is that this is a representative ballpark figure. We can't give you the Envirocare figure.
MS. WILLIAMS: How about per tonnage? Wouldn't they also charge you by per tonnage? Wouldn't that be an easier way to come up with a price? I mean if you ask charges per ton, what would they charge per ton? Instead of cubic feet or yards or whatever.
MR. SMITH: They didn't give us even a detail of that type of information in their presentation. Once again, they're very concerned

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about giving out costs. And I'm not sure why.
MS. WILLIAMS: Case by case basis? Is that what they charge by?
MR. SMITH: They charge generally for disposal on a cubic foot basis. But this project that they were giving us a presentation on was for the removal, shipment, and disposal.
MS. WILLIAMS: Do they also do on-site work?
MR. SMITH: Yes.
MS. WILLIAMS: If, say, for instance after it's removed that they might have to go in and take soil out, and there'd be contaminated soil there after the piles are taken away, do they do that kind of work?
MR. SMITH: They do that kind of work. That was not part of the thing --
MS. WILLIAMS: In other words, that would be an additional cost?
MR. SMITH: That would be additional.
MR. HARP: In the public now. Richard.
MR. SMITH: He's a Board member, too.
MR. WESTERGAARD: I have a question. I work on some of our projects where we actually look at the impact of acid rain leaching materials

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into the groundwater. If we have a storm event tonight, is anybody monitoring that runoff? Or does anybody know what's in that runoff? I would also request that we do some -- look at if anything is running off, is it percolating into the aquifer? I think those are some of the things that we have to look at. We have enough water supply problems around here, and we don't need another one.
The other thing I'd like to see is -- I've lived here for 53 years. I'd like to see some soil sampling done. I can remember when material was shot off, or the runoff percolating. I'd like to see some soil samples done. And I'd like to see some sampling done in that stream. I saw on the state's web page where they have Hudson branch listed for TMDL in the next so many of years. I think we need some surface monitoring, and I think we need some wetland monitoring done. And I'd like to see those issues addressed ASAP.
MS. BERGER: There's been quite a bit if soil sampling done all around that area as part of --
MR. WESTERGAARD: Can we get copies of that?

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MS. BERGER: -- different campaigns. There's been -- there was -- how do I describe this? There was a different type of shtg was in that storage yard at one time. And it was mixed up a bit.

MR. MILTON: Could you give us a date on when you'll supply that?

MS. BERGER: I'm sorry. Say that again?

MR. MILTON: Could you give us a date when we could get that information so we could actually see it?

MR. SMITH: She didn't promise that yet.

MS. GRAUMANN: She's addressing something else.

MR. MILTON: It was a yes or no question.

MR. HARP: No was not a yes to the question.

MS. BERGER: Anyway, this is just one example. There have been a number of campaigns that have gone on at the facility. This particular one was a pile of a different kind of slag that was sold. And they had to separate that slag from the ferrocolumbian slag, which because the two piles were sort of close to each other

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there was some mixing or whatever with it. And all of the other -- the ferrocolumbian slag was put back on the existing pile. All of that soil in there has been surveyed and sampled.

There was sampling done at part of the pond remediation. Jean, I don't know the rough dates of that, when the ponds were closed. That was all sampled for radiological as well, even though --

MR. WESTERGAARD: How about during a storm event?

MS. BERGER: And there's been sampling as part of the original environmental report. That was fairly a comprehensive sampling and survey at that time. And of course the pile had been there for many, many years before that was ever done. As it turns out, the materials that are in those large rocks are very tightly bound on those rocks. Acid does not make them move. Basic, if you can get the water that it's in really, really, really basic, one of those elements will move slightly into the water. But the rest of them are not. It's very tightly bound.

MS. WILLIAMS: What about the dust?

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MS. BERGER: This baghouse dust, same thing. And the baghouse dust has also got very, very low concentrations compared to the slag. The slag is the preponderance of the radioactivity on the site.

MR. McKEE: So we have a leachability test that we can review that would confirm those findings?

MS. BERGER: The leachability testing and the K sub (d) determinations will be in the decommissioning plan.

MS. WILLIAMS: When were these tests taken? How long ago?

MS. BERGER: The leachability tests were done back in the early '90s.

MS. WILLIAMS: How about getting new ones?

MS. BERGER: We have new ones. Some were done just this year on both the slag and the baghouse dust. The testing done in the early '90s were all negative. They said nothing. But their detection limits for those measurements were a little bit high. So that's why we went in and did them again using a methodology with lower detection limits, so we can actually get results,

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as opposed to just saying zero or below this number.

MS. GRAUMANN: Now, those test results, are they in some of the stuff that you guys have been sending to us, or not?

MS. BERGER: No. They will be. Everything's being compiled.

MS. GRAUMANN: Oh, okay. So if it's going to be in the plan, we won't get it in advance of the plan?

MS. BERGER: No. Everything will be there. The plan is available for you to see and comment on and provide data input into the NRC. What the SSAB, we're hoping to get input on right now are just those two key questions as part of the decommissioning planning process. After then, you get another opportunity to comment.

MS. GRAUMANN: Okay.

MR. HARP: Mr. Milton?

MR. MILTON: Two questions; one for Mr. Smith. So as I understand it, you've entered into an agreement with Envirocare?

MR. SMITH: We have not entered into it, but we don't feel comfortable in disclosing it because we haven't signed it.

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MR. MILTON: I can't imagine what the reason for the secrecy is.
MR. SMITH: Pardon me?
MR. MILTON: The reason for the secrecy.
MR. SMITH: I don't know either. We tried to --
MR. MILTON: I know you try to release information at the eleventh hour, so on and so forth. But this one, I can't --
MR. SMITH: I can only tell you what I was --
MR. MILTON: So if we contacted them, maybe they would release it to us?
MR. SMITH: Could try.
MR. MILTON: And my second question is about the soil sampling. In the rear of the property, there's a -- several feet of soil was removed. I'll ask someone else if you don't want me to ask you, Ms. Berger.
MS. BERGER: Oh, no. I'm sony. I was -- we were listening to our stomach growling.
MS. GRAUMANN: We were having a human moment here.
MR. MILTON: So at the rear of the property, the soil sampling was very positive back

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there. That's why so much was removed.
MR. SMITH: Soil was excavated. And that was the area that Carol was talking about where we did the lay-down and separation of the two different types of slag. And we excavated that soil, put it onto the pile in the controlled area, then did a MARSSIM release survey and did a final status survey for that release.
MR. MILTON: Is it possible that this whole site might have to be scraped off two, three, four, five, six foot, like you did back there?
MR. SMITH: No.
MR. MILTON: Are you sure of that?
MR. SMITH: Once again --
MR. MILTON: Where is our information to go by?
MR. SMITH: We -- in order to get a release of the soil at that point, it wasn't done on a dose assessment, but on specific analytical numbers that were required to be adhered to in order to release it without going to a dose assessment type of release.
MR. HARP: What does that mean, David?
MR. MILTON: So you're asking to go a

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little extra that way, is what you're saying.
MS. BERGER: No. Well, another important point back there is all of the residual radioactivity that was in that yard was in slag chunks. It wasn't in the soil. The soil, it was just the easiest way to get it up was to pull up some soil and some chunks. But if there was a chunk of slag there, that's what you would pick up when you were walking over with your survey instruments.
MR. MILTON: The appearance is that it's not just -- it appears that several feet of soil were removed back there. That was necessary?
MR. SMITH: What Carol is saying, I believe, is if we wanted to spend the money to save the soil and separate the pieces of slag, we could go through that process and it would have probably been a ratio of -- let's see. Probably close to one to 50, soil would have been released to the slag.
MR. MILTON: The reason I'm asking the question is -- maybe I'm just totally wrong, but when I go back there and look at it, it looks like three, four, five foot of soil was removed in cenain areas. I mean it's the steepest gradient

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in Newfield back there. All of a sudden the ground just goes like this.
MR. SMITH: No. The ground has been contoured, because we brought back in clean fill.
MR. MILTON: Okay. I guess I'm seeing something.
MR. HARP: Sir.
MR. PRICE: Robert Price. Newfield here. One question the mayor brought up was the stormwater. Say we had a hurricane here, we had a storm surge. What's going to stop that runoff? I know the lady said that the panicles are so huge and the water can't penetrate them. But if you pile particle upon particle, you end up with dust, what is not getting in your groundwater.
MR. SMITH: No, it's not going to get into the groundwater from particle size. But if it were to actually be leached, that would be one way. That's why we've done the leaching test.
MR. PRICE: Could that possibility be the reason why our well came up with contamination?
MR. SMITH: It's very unlikely, because your wells are up-gradient, up-wind, and everything else.

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MR. PRICE: Okay. When we had a drought a couple years ago, weren't we in fear of saltwater coming back in?
MR. SMITH: Down at the seashore.
MR. PRICE: We had 20 feet of water here. And then it goes away. Where is the contamination? Everywhere. Like they have down there with the diesel fuel.
MR. HARP: You lost me.
MR. PRICE: Say we had a storm surge. Say we capped it, and the cap washed off.
MR. NESSEL: You're talking after the thing was closed.
MR. PRICE: Yes.
MR. NESSEL: If you guys are lucky enough to receive your closing permit after that point if there's a strong storm or there's a surge, what would stop the water from washing away the cap and spreading the smaller particles around, I think is what he's saying.
MR. SMITH: One of the things that -- in the design of the cap, in the erosion controls, they look at storm conditions, worst case type conditions in order to design the cap and the runoff

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MR. PRICE: Levees.
MR. WESTERGAARD: Just out of curiosity, Dave, did you happen to do a soil erosion sediment control plan for the district? When you put the cap on, did you have to go through any of the permitting process with the Soil Conservation District? Because they usually look at these things. And I would feel more comfortable if we had their engineers, when you come up with this cap, just to make sure there's no possibility of erosion or sedimentation. I'd feel more comfortable if they take a look at that when you get that information.
MR. SMITH: That would be something which NRC, their experts will be doing. And they'll be -- I mean the county's erosion control people can look at it. But it's really NRC's experts that will be looking at it from a technical point once it gets to that stage.
MR. HARP: I'm sorry, I forgot your name.
MS. RAGONE: Terri Ragone, R-a-g-o-n-e. I had a question about the cost estimate in terms of the annual fee for surveillance and monitoring. I was wondering about the site security

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maintenance, if that's -- human resources, is that 24/7? And if so, it appears that the $19,000 a year is an extremely meager figure.
MS. OLIVA: That's more like maintenance of fencing and physical attributes.
MS. RAGONE: There's really no person on site 24/7. There's no guard on site?
MS. OLIVA: We're not planning on having that, no.
MS. RAGONE: That's just the fence.
MS. OLIVA: Right.
MR. HARP: Sir
MR. McKEE: I have a question for the D.E.P. people. In New Jersey, if you build a landfill for household waste, you're required to have a liner and monitoring wall system in place. Do similar requirements apply to a radioactive waste landfill such as the one that's being proposed here?
MS. GOODMAN: We do not regulate that material. If we did, we wouldn't allow it to be a landfill situation. And we do have a regulation that says no burial of radioactive material unless written permission is received by D.E.P.
MS. RAGONE: Unless what?

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MS. GOODMAN: Written permission is received by D.E.P. But that's for material that we regulate.
MR. McKEE: Now, the reason this is not regulated is that it's too high a dose?
MS. GOODMAN: Its source material level concentration, there's a certain limit. If it's above that limit, then the NRC regulates it.
MR. McKEE: Oh, it's subject to less requirements because it's more, quote, dangerous?
MS. GOODMAN: Well, it's subject to federal regulations.
MR. MILTON: You could still view it as a landfill.
MR. McKEE: But because this is also a Superfund site, isn't there an agreement between E.P.A. and NRC that other environmental regulations apply here?
MS. GAFFIGAN: We're reviewing that with E.P.A. right now.
MR. McKEE: Do you have any determination on that yet?
MS. GAFFIGAN: No. We're reviewing that with E.P.A. right now.
MR. McKEE: When do you expect to have

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that?
MS. GAFFIGAN: A couple weeks.
MR. McKEE: Will you provide that to all these people in the room?
MS. GAFFIGAN: Yes, I will.
MR. McKEE: Thank you.
MR. HARP: I just want to ask, on the sign-in sheet, that people put their email addresses there so we have them?
MR. MILTON: Some.
MS. GRAUMANN: Is there a spot there?
MR. HARP: Because that's another way we can reach you. Mr. Nessel. Anybody else have their hand up? Because we've heard from you. Not stopping you. I just want to see if there's anybody else before we get back to you. And I see no one else.
MR. NESSEL: If in fact the NRC -- well, when the NRC grants your closing permit, what's the long-term plan for this site? For example, what portion of the site will be the closing area? Is it a three-acre piece? We're talking about a five-acre piece? I think we talked about this before. I think it's like a five-acre piece of land.

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MS. BERGER: The entire storage area is about seven acres. The capped area is about three and a half.
MR. NESSEL: Okay. So we're talking probably around ten acres.
MR. HARP: No. Seven acres.
MS. BERGER: Three and a half acres within the seven acres.
MR. NESSEL: That's fine. And the site, if I'm understanding correctly, is like 65 or 70 acres. Am I right?
MS. OLIVA: 67, I believe it is.
MR. NESSEL: Okay. What's the plan for the remaining property? What are your long-term plans for that?
MR. SMITH: A portion of approximately nine and a half acres is going to be -- have a conservation deed restriction on it. So it would not allow for any building or anything like that. But that's for mitigatipn of -- you know, wetlands environmental mitigation.
MR. NESSEL: So it would be at the southern portion of the property aiong Weymouth Road area?
MR. SMITH: It's the portion where --

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you know, the portion in the back where we excavated the soil, brought soil in, reforested that.
MR. NESSEL: And the remainder of the property, what are your plans for that?
MR. SMITH: The remainder of the property, as far as I am aware, is to continue manufacturing and find additional industrial uses for it.
MR. NESSEL: So there will be buildings on there. You're not planning on tearing down the buildings?
MR. SMITH: I'm not aware of any projects to tear anymore buildings down.
MR. NESSEL: The other thing was there was a piece of paper floating around, and no one seems to have it. I got a look at it. And it was different than their capital costs. The paper says capital costs on there. And there was a figure on there like 232-something dollars to transport this stuff off-site. I don't have -- it was like an exceptional amount of money. Said something about the transport --
UNIDENTIFIED SPEAKER: 58 million. Off-site.

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MR. NESSEL: So over a thousand a year, what does that represent? In other words, that's what it would cost for you guys to haul it off site and get rid of it? Is that my understanding what that's saying?
MR. SMITH: That's an estimate.
MR. NESSEL: So for a thousand years, what does that mean?
MS. RAGONE: Could be lower with Envirocare.
MR. NESSEL: Right. Could be lower. But what is the -- over a thousand years -- get your cap there, please -- over a thousand years, what is the cost per year?
MR. HARP: They want it paid now, not a thousand years out.
MR. SMITH: Are you suggesting that we wait a thousand years and then move it?
MR. NESSEL: Not at all. What i'm suggesting is, is it going to cost you the same amount of money over a thousand year period to take care of this problem for the Borough of Newfield, the same amount of money that it's going to cost you right now to get rid of it. That's the question. If it's going to be a question of

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58 million dollars over a thousand years or 58 million now. I would like to see you get rid of it. If it's going to cost you, it's going to cost you.

MS. WILLIAMS: For a period of a thousand years on site, he's talking about, that the off-site might have been a little --

MR. NESSEL: Your thousand year figures are really, really misleading. Because it makes it look like you're spending a ton of money. But if you divide the moneys you're suggesting over a thousand years, not all that much money. You know, you're misleading people by using that, quote, unquote, a thousand years. A thousand years.

MR. HARP: I think that -- no, there's a disconnect. Because the figure of $19,000 per year is the thousand year figure per year. And the figures that Jean has -- not on this sheet, but she talked about them earlier -- range between $277,000, present dollars, which would be invested over time, to $655,000. We're not saying that -- that would be the cost now to put into a trust fund to assure the annual surveillance and maintenance for a period of a thousand years. So

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we're not misleading anybody. That's the figure right there.

MR. NESSEL: Per year, that comes out to how much over a thousand years?

MS. OLIVA: If you use standard interest tables, $19,000 a year, seven percent interest over a thousand years would be $277,000.

MR. NESSEL: Over a thousand years.

MS. OLIVA: Right. That's the amount of money you have to put away today.

MR. NESSEL: $200,000.

MS. OLIVA: $277,000. That will give you enough interest over a period of a thousand years.

MR. NESSEL: But $200,000! In a corporation that makes much more than 200,000, that's not a whole heck of a lot of money to set aside.

MR. MILTON: That won't do nothing in a catastrophe.

MR. HARP: We're having a different -- it's not a huge number. But that's the number that the regulations, that the guidance from NRC suggests should be put into a trust fund to make sure that the maintenance goes on if Shieldalloy

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goes belly up or leaves the site.

MR. McKEE: We don't have that number. You're mischaracterizing it. That number is what you calculate based in the number you're doing in your estimate.

MR. HARP: Yes.

MR. McKEE: Using the percentages that we require. Which is a little different. If we didn't agree with your $19,000 a year, it would be a lot bigger number.

MR. HARP: That's correct.

MR. SMITH: Or if it was 15,000 a year, it could be a lot lower

MR. HARP: I didn't mean to say that NRC had approved the 19,000. I meant to say that the interest rates, those ranges came from NRC guidance. Yes. Okay.

MR. NESSEL: My other concern is that's $19,000 a year to maintain it. If there's a problem, and it's going to be a lot more than 19,000 bucks to fix, in 20 years from now, let alone a hundred years from now, you guys took it in the net, so to speak, when in fact you were doing something with chrome, plumes, whatever, and you guys had to do all the monitoring now and do

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work to clean up the groundwater. And what's to stop that from -- 50 years from now, somebody from the NRC says wait a minute, we said that was okay back then, but now it's got to be different. And then is there going to be monies -- stockpiled enough to if in fact they say it's got to be off-site to a certain area of the United States, is there going to be enough money there to do that? I mean you're basing all your stuff on 2005, 2006, and 2007. But you know what, man? Say 50 years from now, they say, hey, this is an environmentally significant piece of ground, and we want you to get it off here. $19,000 ain't going to do it.

MR. MILTON: They're basing it on compliance. That's all.

MR. NESSEL: That's what I'm saying. And I mean you guys are doing what the NRC is telling you to do. That's the problem. It's kind of like a dog chasing his tail.

MR. MILTON: A fox in the hen house.

MR. HARP: Ms. Ragone?

MS. RAGONE: I just wanted to know a point of information. And that is to get your license originally, did you -- you have to have a

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decommissioning in place in order to get your license. No?

MR. SMITH: Today, in today's world you would have to have that.

MS. RAGONE: No, not in 1955. But when they made that regulation, which was what? Like in the '70s or '80s? Somewhere in there.

MS. GRAUMANN: The regulation was changed. Does the NRC know when the regulation -- which regulation are you talking about? When was it?

MS. MILLER: I'm just trying to get a point of information. I can answer that. Marie Miller, NRC Region I. If you were to apply for a license for an activity, among the many things that you would describe would be your radioactive waste management practices. And then depending on the amount of material that you would be licensed for, you may be required at that point to put a financial assurance before you would get a license. And in the case of Shieldalloy, we didn't require a financial assurance in 1955. The financial assurance requirement came along much later.

MS. RAGONE: In the '70s?

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MS. MILLER: Financial assurance requirements, 1980.

MS. RAGONE: So 1980 was the financial assurance. So in order to get their license, theoretically they had to provide financial assurance. Now, did they also have to provide a decommissioning plan at that point?

MS. MILLER: No. The decommissioning plan is required under a timeliness rule that was passed in 1994. It specifies when you need to submit a decommissioning plan. And so for example, when they ceased operations, principal activities, then you have the time period within twelve months. Or you can request a schedule of relief and submit a decommissioning plan. And that -- this schedule would have to indicate that there would not be an impact on public health and safety, and the reasons why you have the schedule change. And that was the case with Shieldalloy.

MS. RAGONE: So theoretically since 1980 they should have been putting money away, or having some sort of financial assurance?

MS. MILLER: They -- when the rule passed, the financial assurance, there were set amounts that were required at the time. And then

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they were required to submit a decommissioning cost estimate and a funding plan. And they did submit that. And that was viewed as adequate at the time, subject to review. They submitted a decommissioning plan. And when that plan is submitted, they're required to update the decommissioning cost estimate. When we rejected the plan, there was no way for the staff to evaluate cost estimate if you don't know what the plan is. So that's why when the plan is submitted in October, we're expecting to see this decommissioning cost estimate and the funding mechanism. And then we'll make the determination of whether or not it's adequate or not at that time.

MS. RAGONE: So that hasn't been in place. Since 1994, that hasn't really been in place. But the NRC keeps the license in time of renewal, even though they haven't submitted a full decommissioning plan or put aside moneys?

MS. MILLER: The minimum amount, I think, is $750,000, plus the additional money that was court ordered from the Superfund settlement. It was the E.P.A. bankruptcy settlement.

MS. GAFFIGAN: Bankruptcy settlement.

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MS. MILLER: So the approximately five million has been there during this time period.

MS. RAGONE: The time frame -- you said from the bankruptcy. But not from 1994 when they were --

MS. MILLER: From the '94 time frame, it was the minimum amount of the 750,000. And then but we also have the knowledge of the coun settlement amount. And it was used specific to the slag pile remediation. In fact, the NRC did roll down some money from the financial assurance agreement for a period of time.

MS. RAGONE: For?

MS. MILLER: Because when -- I guess you were in bankruptcy?

MR. SMITH: Yes. Bankruptcy.

MR. HARP: Mr. Nessel.

MR. NESSEL: Just one more little question. Could we in fact have the meetings moved over to the Borough Hall, as opposed to having them here? Would you guys be willing to do that?

MR. SMITH: As long as the Borough Hall doesn't mind.

MR. WESTERGAARD: I don't think anybody

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would mind.
MR. NESSEL: As a citizen, I would appreciate that. And the other question was, a copy of the list, could you also supply that with the information at the library? Could we have a copy of the sign-in sheet tonight? That way if we do have some questions, we can go ahead and contact those individuals or someone else, rather than a hit-and-miss type situation?
MR. HARP: Yes. Jenny?
MS. GOODMAN: Has Shieldalloy considered moving the slag pile to tbe Ohio site?
MS. GRAUMANN: They've already agreed to have it. Excellent idea.
MS. WILLIAMS: You've got your third party there.
MS. GOODMAN: I understand that from Ohio, that Ohio's --
MS. GAFFIGAN: Their pile's in the middle of a cow field, as opposed to a town.
MS. GRAUMANN: They're a bigger town than we are.
MR. SMITH: I'm would imagine. Because first of all, the Ohio wouldn't --
MR. SHINDEL: Can't take any more than

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what they already have.
MR. MILTON: The reason they haven't capped their second pile is because they're actually trying to sell it right now.
MS. WILLIAMS: Sell it? To who?
MR. MILTON: I don't know. It's a tactic, I guess. But they're saying they're trying to sell it. Probably buying time so they don't have to spend the money to cap it.
MR. NESSEL: Probably trying to bring it over here.
MS. GRAUMANN: Maybe.
MR. MILTON: But the people in Ohio think it's a wonderful idea. They think we should make a reef out of it.
MR. HARP: Any further comments or questions from the public? Okay. Thank you. We're going to close the public session, as you guys do. Does this group want to meet again?
MS. WILLIAMS: If we meet, we meet at Borough Hall where there's microphones and air-conditioning?
MS. GAFFIGAN: What do we need to discuss?
MS. GRAUMANN: Between now and when?

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Basically you're saying October 14. Basically I don't see that there's anytlting further to discuss. We pretty much chewed it up.
MR. HARP: Okay. Thank you very much.
(Whereupon, the proceedings were concluded at 9:45 p.m.)

CERTIFICATE

I, MARY CAHILL JOHNSON, a Certified Shorthand Reporter of the State of New Jersey, do hereby state that the foregoing is a true and accurate transcript of my stenographic notes of the within proceedings, to the best of my ability.

MARY CAHILL JOHNSON, C.S.R., R.P.R.

License No. XI01739

Notary Public of the

State of New Jersey

Appendix 19.8 - Completed SSAB Input Forms

SITE SPECIFIC ADVISORY BOARD
Shieldalloy Metallurgical Corporation
Input Form

This form has been designed to facilitate your input to the Shieldalloy Metallurgical Corporation (SMC) decommissioning process. Kindly complete the form to the best of your ability and return it to SMC at the following address:

David R. Smith
Shieldalloy Metallurgical Corporation
35 West Boulevard, PO Box 768
Newfield, NJ 08344

The forms must be received by November 30, 2004 in order for your input to be captured in the site-wide decommissioning plan. We will attempt to but cannot guarantee inclusion of later submittals.

In completing the form, the following definitions may be of use to you:

Financial Assurance - A means of demonstrating that SMC possesses the necessary funds to cover the estimated costs of conducting all licensed activities at the site once the decommissioning plan has been implemented.

Institutional Control - A program to physically control access to the SMC site after implementation of the decommissioning plan. The institutional control program for the site includes the maintenance of a "Long Term Control" license, an environmental monitoring and maintenance program, periodic surveillance, and other requirements to be specified in the decommissioning plan. It also includes funds sufficient to cover the costs for these activities.

Total Effective Dose Equivalent (TEDE) - The sum of the radiation dose from external exposure (i.e., from sources outside of the body) and from internal exposure (i.e., from sources taken into the body by inhalation, ingestion, etc.).

Your input is important to us and we appreciate your time in completing this form and returning it to us. We will be taking your input into account in the preparation of our decommissioning plan. We encourage you to review the plan once it is prepared and provide us with any comments you might have at that time. Other opportunities to provide feedback to SMC throughout the decommissioning process will be described in the plan.

Shieldalloy Metallurgical Corporation
Input Form

ur Name (optional):	Who do you represent: (e.g., yourself, a neighborhood, community organization, etc.)
Donna L. Gaffigan Nancy Stanley Anny Goodman	New Jersey Department of Environmental Pr

e following sections pertain to SMC's plan to maintain a long-term control license as a means of ensuring long-term institutional trol over the decommissioned Newfield site.

Do the institutional controls proposed by SMC provide reasonable assurance that average member of the public will not incur a radiation e in excess of 25 millirem TEDE? ☐ Yes ☐ No ☒ Don't know

nments:

See Attachment

Do you believe the institutional controls will be enforceable? ☐ Yes ☒ No ☐ Don't know

iments:

See Attachment

Do you believe the institutional controls will not iinpose undue burdens on the local community or other affected parties?
/es ☒ No ☐ Don't know

inents:

See Attachment

o you believe SMC can provide sufficient financial assurance to enable an independent third party to assume responsibility for control naintenance of the site? ☐ Yes ☒ No ☐ Don't know

ments

See Attachment

In its decommissioning plan, SMC must pr[illegible]t an assessment of the radiation dose potentia[illegible]sociated with its planned decommissioning option for the following po[illegible]ion groups: (1) on-site workers that do not h[illegible] access to the capped area; (2) on-site workers that perform routine maintenance and inspection of the capped area; (3) trespassers; and (4) the nearest off-site resident. Are there other population groups that you think should be included in the dose assessment process?

☐ Yes ☐ No ☐ Don't know

Suggested groups:

See Attachment

If you have additional concerns, please describe them below, adding additional sheets as necessary.

Describe the issue:

See Attachment

Why do you believe that issue should be addressed?

See Attachment

Why is this issue a concern to you?

See Attachment

What additional information do you need in order to resolve this issue or understand it better?

See Attachment

Additional sheets attached: ☒ Yes ☐ No

ase describe any other comment, concerns or recommendations you would like SMC to consider during the decommissioning
ning process:

See Attachment

SITE SPECIFIC ADVISORY BOARD

Shieldalloy Metallurgical Corporation
Input Form

NJDEP's responses:

1. Do the institutional controls proposed by Shieldalloy Metallurgical Corporation (SMC) provide reasonable assurance that an average member of the public will not incur a radiation dose in excess of 25 millirem Total Effective Dose Equivalent (TEDE)?

The New Jersey Department of Environmental Protection (NJDEP) does not have sufficient information on which to base a response. The characterization of the slag and baghouse dust pile was not provided to the Site Specific Advisory Board (SSAB), nor was the engineering design of the cap.

2. Do you believe the institutional controls will be enforceable?

No. There has been no demonstration that the institutional controls proposed will be enforceable for the time period necessary, basically in perpetuity. The United States Nuclear Regulatory Commission's (USNRC) own regulations under 10 CFR Part 61.59 state that institutional controls may not be relied on for more than 100 years.

3. Do you believe the institutional controls will not impose undue burdens on the local community or other affected parties?

No. The institutional controls may well prevent the development of the rest of the SMC site, as well as surrounding properties. The NJDEP believes this presents an undue burden on the local and neighboring communities.

4. Do you believe SMC can provide sufficient financial assurance to enable an independent third party to assume responsibility for control and maintenance of the site?

No. SMC appears to be downsizing this operation. There is no value to the property with the slag pile present, only liability, possibly in the hundreds of millions of dollars. It appears that SMC is seeking the Long Term Control (LTC) option only to continue operating the facility for as long as SMC can profit from it. If SMC can not profit from this operation, abandonment of all radioactively contaminated materials appears likely.

Also, SMC states that it currently has posted $5 million dollars in financial assurance for addressing the USNRC regulated materials on the site. This amount was not posted in accordance with 10 CFR 20.1403(c) for license termination under restricted conditions, but rather in accordance with paragraph 16 of the March 26, 1997 Bankruptcy Settlement Agreement. This amount was posted as a "Predetermined Cost" in bankruptcy negotiations based on licensing issues relevant at that time and was not based on SMC's

and USNRC's current proposal for a LTC license. It is impossible for NJDEP to know if this amount will be sufficient for the current proposal since very few details have been made available to the SSAB.

5. In its decommissioning plan, SMC must present an assessment of the radiation dose potential associated with its planned decommissioning option for the following population groups: (1) on-site workers that do not have access to the capped area; (2) on-site workers that perform routine maintenance and inspection of the capped area; (3) trespassers; and (4) the nearest off-site resident. Are there other population groups that you think should be included in the dose assessment process?

Yes. According to the October 7, 2004 letter to Kenneth Kalman of the USNRC from SMC, the trespasser scenario means recreational, casual visitors, or hunters. While NJDEP agrees that the resident farmer scenario is not realistic because a house cannot be placed directly on top of the slag pile, we believe that a more conservative realistic scenario should be assessed, namely a future resident who uses crushed slag as fill under a house. We believe this is certainly realistic, given the fact that it was done by SMC at this site, even having full knowledge of the radioactive content of the material. NJDEP also believes that the nearest resident scenario should assume that the house is built next to the slag pile and that the engineering controls degrade and completely fail over time (see Comment No. 6 under Additional Concerns, below).

Additional Concerns:

1. NJDEP is on record with the USNRC opposing the issuance of the first Long Term Control license in the country based on both administrative and technical concerns. Please refer to the attached letter dated June 25, 2004 from NJDEP Commissioner Bradley M. Campbell, to USNRC Chairman Nils J. Diaz for details. The information that has been provided to the SSAB to date has not changed NJDEP's position regarding issuance of a Long Term Control license to SMC.

2. The statement made by SMC at the November 5, 2004 Site Specific Advisory Board meeting that one of the reasons SMC does not consider disposal of the slag pile a viable option is because of liability issues, such as the possibility that the material would have to be sent back to Newfield from Envirocare of Utah. Subsequent to the meeting, NJDEP spoke with Envirocare of Utah, who explained that this requirement is just an extension of the USNRC "cradle-to-grave" policy. Every generator of radioactive waste is responsible for the waste that it generates forever. This is a standard part of the contract that every Envirocare client must sign before they will accept the waste. NJDEP has dealt with numerous cleanups across the State with responsible parties ranging from private companies to the United States government. This issue has never been brought up as a reason to abandon disposal as an option.

3. The SSAB does not seem to be functioning as the regulatory framework suggests. Namely, NUREG 1757, Volume 1, Chapter 17 states that the SSAB should elect a

chairperson and adopt a charter and operating procedure. This was not done. The minutes of previous meetings reflect that SMC or its representatives have driven the discussion. Basic radiation protection principles were discussed at two SSAB meetings (which were necessary), but little discussion on specifics of the dose assessments or financial assurance was presented. According to NUREG 1757 the licensee is supposed to provide the SSAB with licensee studies and analyses that are pertinent to the decommissioning. The SSAB does not have the dose assessment or the 1996 Draft Environmental Impact Statement for the SMC site in Cambridge, OH that is supposed to contain the ALARA analysis that the USNRC is allowing tb be used at this site. The SSAB should also have been provided with the thermoluminescent dosimeter (TLD) data from the fenceline near the slag pile. This would at least provide a point of reference when discussing regulatory dose limits. The SSAB has no documentation on financial assurance, only the total amount that SMC says is available. The work of the SSAB cannot be considered complete until these documents are distributed and a discussion is held among the members.

4. The cover page to this Input Form states that the form must be completed by November 30 in order for the SSAB input to be captured in the site-wide decommissioning plan. It then states that these concems will be addressed in the Decommissioning Plan. Is this the final input on the question of institutional controls and financial assurance? If it is going to be included in the decommissioning plan then we assume this is the input that the USNRC is going to evaluate against their regulations. NJDEP believes that the SSAB should work to provide a consensus opinion to SMC. It is difficult for this to happen based on the way the SSAB meetings are currently being conducted.

5. When discussing institutional controls at the SSAB, SMC states that the controls will need to be relied on for 1000 years. This seems inappropriate given the half-life of the material that will be remaining at the site and the exposure rates when the engineering controls fail.

6. A copy of SMC's October 7, 2004 letter to Kenneth Kahnan of the USNRC was provided to SSAB members at the November 5, 2004 meeting. NJDEP has concems regarding item number 3 under Dose Modeling. The USNRC is allowing SMC to assume that engineering controls may or may not fail once institutional controls fail, or their effectiveness may degrade over time. Since we know this materiai will be present in perpetuity, NJDEP believes it is safe to assume that eventually there will be neither institutional nor engineering controls present. We understand that sometimes a degradation of engineering controls may be considered more conservative because erosion usually occurs irregularly, which may focus the flow and allow contamination to be chameled and concentrated at a particular location, referred to as the "bathtub effect." According to SMC, the type of material present at this site is not readily soluble, so this type of degradation of engineering controls would not be considered conservative in our view. NJDEP believes that all scenarios should be assessed based on the failure of both institutional and engineering controls.

SITE SPECIFIC ADVISORY BOARD
Shieldalloy Metallurgical Corporation
Input Form

Your Name (optional):	Who do you represent: (e.g., yourself, a neighborhood, community organization, etc.)
LINDA GRAUMANN	NEWFIELD BOROUGH COUNCIL

The following sections pertain to SMC's plan to maintain a long-term control license as a means of ensuring long-term institutional control over the decommissioned Newfield site.

1. Do the institutional controls proposed by SMC provide reasonable assurance that average member of the public will not incur a radiation dose in excess of 25 millirem TEDE? ☐ Yes ☐ No ☒ Don't know

Comments:

2. Do you believe the institutional controls will be enforceable? ☐ Yes ☐ No ☒ Don't know

Comments:

3. Do you believe the institutional controls will not impose undue burdens on the local community or other affected parties?
☐ Yes ☐ No ☒ Don't know

Comments:

4. Do you believe SMC can provide sufficient financial assurance to enable an independent third party to assume responsibility for control and maintenance of the site? ☐ Yes ☐ No ☒ Don't know

Comments:

5. In its decommissioning plan, SMC must present an assessment of the radiation dose potential associated with its planned decommissioning option for the following population groups: (1) on-site workers that do not have access to the capped area; (2) on-site workers that perform routine maintenance and inspection of the capped area; (3) trespassers; and (4) the nearest off-site resident. Are there other population groups that you think should be included in the dose assessment process?

☑ Yes ☐ No ☐ Don't know

Suggested groups:

ALTHOUGH TRC STATES THAT THERE IS MINIMAL RADIOACTIVE LEACHING FROM THE SLAG PILE INTO THE GROUND WATER, I BELIEVE AN EVALUATION OF EXACTLY HOW MUCH "MINIMAL" IS. IF THE DECOMMISSIONING PLAN IS APPROVED, ONGOING MONITORING OF RADIATION IN THE GROUND WATER SHOULD BE PART OF THE PLAN.

If you have additional concerns, please describe them below, adding additional sheets as necessary.

Describe the issue:

Please see attached page.

How do you believe that issue should be addressed?

Why is this issue a concern to you?

What additional information do you need in order to resolve this issue or understand it better?

Additional sheets attached: ☑ Yes ☐ No

Please describe any other comment, concerns or recommendations you would like SMC to consider during the decommissioning planning process:

Addltional Concerns:

1. Issue: Accepted procedure for containing the slag pile under NRC guidelines.

   N.J. DEP guidelines require an impermeable liner under contaminated materials in sites that have a radioactive level of 5 millirem or less. The site in question has radioactive levels of 25 millirem and the NRC does not require a liner, just canning. To further minimize the possibility of continued leaching into the surrounding ground and ground water, I believe the site should have a liner.

2. Issue: NRC discourages subdivision of the slag pile from the rest of the site.

   Newfield is 1.7 square miles big. The Sliieldalloy site is appnoximatcly 72 acres. The slag pile is approximately 7-8 acres. I'm concerned that the market of companies interested in the remaining 65 acres with buildings that suffer fimctionally obsolete floorplans, etc. AND the responsibility of maintaining the slag pile and decommissioned license are painfully slim. As a business decision, how long would Shieldalloy maintaih a virtualiy vacant facility? It's not unrealistic that Shieldalloy would dismantle the remaining buildings to alleviate their tax burden.

   The borough has had to absorb the negative impact of Shieldalloy's tax assessment reduction after the NRC required the firm to dismantle contammated baildings. A loss of additional revenue would be almost insurmountable for our small eommunity to overcoine.

   I would urge the NRC to consider subdivision of the slag pile from the site in order to encourage oommercial usc of the parcel.

SITE SPECIFIC ADVISORY BOARD
Shieldalloy Metallurgical Corporation

Input Form

Your Name (optional):	Who do you represent: (e.g., yourself, a neighborhood, community organization, etc.)
Ruth Dye	myself

The following sections pertain to SMC's plan to maintain a long-term control license as a means of ensuring long-term institutional control over the decommissioned Newfield site.

1. Do the institutional controls proposed by SMC provide reasonable assurance that average member of the public will not incur a radiation dose in excess of 25 millirem TEDE? ☐ Yes ☒ No ☐ Don't know

Comments:

2. Do you believe the institutional controls will be enforceable? ☐ Yes ☐ No ☒ Don't know

Comments:

3. Do you believe the institutional controls will not impose undue burdens on the local community or other affected parties?
☐ Yes ☐ No ☒ Don't know

Comments:

4. Do you believe SMC can provide sufficient financial assurance to enable an independent third party to assume responsibility for control and maintenance of the site? ☐ Yes ☐ No ☒ Don't know

Comments: I certainly hope so since it is SMC's responsibility

5. In its decommissioning plan, SMC must present an assessment of the radiation dose potential associated with its planned decommissioning option for the following population groups: (1) on-site workers that do not have access to the capped area; (2) on-site workers that perform routine maintenance and inspection of the capped area; (3) trespassers; and (4) the nearest off-site resident. Are there other population groups that you think should be included in the dose assessment process?

☐ Yes ☐ No ☑ Don't know

Suggested groups:

If you have additional concerns, please describe them below, adding additional sheets as necessary.

Describe the issue:

Our ground water must be protected for possible of leakage into it.

How do you believe that issue should be addressed?

A liner needs to be placed under this material

Why is this issue a concern to you?

Newfield has a water tower very close to the site and neighboring Franklin Twp. & others have individual home wells that could possibly be contaminated.

What additional information do you need in order to resolve this issue or understand it better?

I went to your website and understand your side. SMC must understand their responsibity to the town of Newfield.

Additional sheets attached: ☐ Yes ☐ No

1. Do the institutional controls proposed by SMC provide reasonable assurance that an average member of the public will not incur a radiation dose in excess of 25 millirem TEDE?

The Department of Environmental Protection (DEP) does not have sufficient information on which to base a response. The dose assessment chapter of the decommissioning plan is not complete. There are blanks for critical input parameters such as the thickness of the contaminated zone, the thickness of the engineered cover, soil density, etc. How can the SSAB be expected to answer this question without SMC providing the calculations to show that 25 mrem/y would be met? SMC has also mentioned leachability studies which we have not received. These would be useful so that accurate distribution coefficients can be used in the modeling.

2. Do you believe the institutional controls will be enforceable?

No. There has been no demonstration that the institutional controls proposed will be enforceable for the time period necessary, in perpetuity. The NRC's own regulations under 10 CFR Part 61.59 state that institutional controls may not be rehed on for more than 100 years.

3. Do you believe the institutional controls will not impose undue burdens on the local community or other affected parties?

No. The institutional controls may well prevent the development of the rest of the SMC site, as well as surrounding properties. The DEP believes this presents an undue burden on the local and neighboring communities.

4. Do you believe SMC can provide sufficient financial assurance to enable an independent third party to assume responsibility for control and maintenance of the site?

No. SMC appears to be downsizing this operation. There is no value to the property with the slag pile present, only liability, possibly in the hundreds of millions of dollars. It appears that SMC is seeking the LTC option only to continue operating the facility for as long as SMC can profit from it. If SMC can not profit from their operation, abandonment of all radioactively contaminated materials appears likely.

SMC quotes that it currently has posted $5 milhon dollars in financial assurance for addressing the NRC regulated materials on the site. This amount was not posted in accordance with 10 CFR 20.1403(c) for license termination uuder restricted conditions, but rather in accordance with paragraph 16 of the March 26, 1997 Bankruptcy Settlement Agreement. This amount was posted as a "Predetermined Cost" in bankruptcy negotiations based licensing issues at that time and was not based on SMC's and NRC's current proposal for Long Term Control License. It is impossible for NJDEP to know if this amount will be sufficient for the current proposal since very few details have been made available to us.

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SMG left out the cost of long term monitoring of the environment, including groundwater and runoff in its cost estimate for the LTC.

5. In its decommissioning plan, SMC must present an assessment of the radiation dose potential associated with its planned decommissioning option for the following population groups: (1) on-site workers that do not have access to the capped area; (2) on-site workers that perform routine maintenance and inspection of the capped area; (3) trespassers; and (4) the nearest off-site resident. Are there other population groups that you think should be included in the dose assessment process?

Again, there is insufficient information on which to base a response. In the unfinished dose assessment chapter, it is stated that a suburban resident builds a house 100 yards from the pile. In the conference call regarding this chapter, the NRC wanted an explanation of why the resident could not be closer than 100 yards. Also, the NJDEP behoves that excavation of the cap, or complete failure of the engineering controls, in combination with the suburban resident should be modeled. While we agree that the resident farmer scenario is not realistic because a house eannot be placed directly on top of the slag pile, we believe that a more conservative realistic scenario should be assessed, namely a future resident who uses crushed slag as fill under a house. We believe this is certainly realistic, given the fact that it was done by SMC at this site, even having full knowledge of the radioactive content of the material.

Additional Concerns:

1. The Long Term Control License option has not been proposed as a regulation, as such, it has never been through the public comment period. The NRC is implementing this policy without proper public input. The SSAB forum does not give the public the opportunity to comment on the whole concept of a LTC license. It is clear from the SSAB meeting on September 21, 2005 that the public is not in favor of this option.

2. The cost estimate that was handed out at the September 21, 2005 SSAB meeting for license termination and disposal of the radioactive material may not have been the actual cost because of a disclosure agreement between SMC and Envirocare, according to SMC. This is unacceptable. How can an ALARA analysis be performed without a real cost for disposal?

3. The SSAB does not seem to be functioning as the NRC guidance suggests in NUREG 1757, Volume 1. Chapter 17 states that the SSAB should elect a chairperson and adopt a charter and operating procedures. According to NUREG 1757 the licensee is supposed to provide the SSAB with licensee studies and analyses that are pertinent to the decommissioning. The SSAB does not have a completed dose assessment or ALARA analysis. The SSAB should also have been provided with the TLD data from the fenceline near the slag pile along with a map of the locations. This would at least provide a point of reference when discussing regulatory dose limits. The work of the SSAB cannot be considered complete until these completed documents are distributed and a discussion is held among the members.

DRAFT

4. The Department believes that the SSAB should work to provide a consensus opinion to SMC. It is difficult for this to happen based on the way the SSAB meetings are currently being conducted.

5. When discussing institutional controls at the SSAB, SMC states that the controls will need to be relied on for 1000 years. This seems inappropriate given the half-life of the material that will be remaining at the site and the exposure rates when the engineering controls fail.

6. The NRC is allowing SMC to assume that engineering controls may or may not fail once institutional controls fail, or their effectiveness may degrade over time. Since we know this material will be present in perpetuity, the Department believes it is safe to assume that eventually there will be neither institutional nor engineering controls present. We understand that sometimes a degradation of engineering controls may be considered more conservative because erosion usually occurs irregularly, may focus the flow and allow contamination to be channeled and concentrated at a particular location, referred to as the "bathtub effect". According to SMC, the type of material present at this site is not readily soluble, so this type of degradation of engineering controls would not be considered conservative in our view. The Department believes that all scenarios should be assessed based on the failure of <u>both</u> institutional and engineering controls.

7. Commissioner Campbell pointed out to Chairman Diaz that the LTC is in essence an *ad hoc* low level radioactive waste facility without appropriate public involvement. The idea of storing any amount of radioactive waste was strongly rejected by the citizens of New Jersey when we attempted to site such a facility through the efforts of our Low Level Radioactive Waste Facility (LLRWF) Siting Board. We view the issuance of a LTC license in the same context; storage of radioactive waste with institutional and engineering controls. We realize and acknowledge that no other waste will be stored at this facility.

Only wastes that will decay to acceptable levels within 500 years are allowed to be disposed of at a LLRWF, and then only if they are placed at greater depths. The radioactivity in the SMC waste will remain in the SMC waste for more than *one billion years* and our understanding is that it will not be buried at all, but simply covered.

NRC's own LLRWF regulations state that institutional controls may not be relied on for more than 100 years (10 CFR61.59). How can a LTC NRC license be considered durable for the time period necessary (in perpetuity) with this type of long-lived radioactive waste?

This waste would be excluded from a LLRWF because of its long half life and the SMC site would be excluded from siting the LLRWF because of the presence of wetlands. Even the Assured Storage concept, which was proposed because of the limited success in siting a LLRWF, excluded long-lived radioactive waste. Why does issuance of a LTC license make it acceptable to store long-lived radioactive waste here now?

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8. The Health Physics Society recently revised their position statement on Low-Level Radioactive Waste Management. Position 1 states - "The goal of managing LLRW is to ensure the safety of workers and the public and to protect the environment. To achieve this goal, disposal, not long-term storage, is the best and safest long-term approach." We view the LTC license option as long-term storage, not disposal, and agree with the HPS that permanent disposal is the safest, long-term approach.

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This report was prepared under the direction of
Shieldalloy Metallurgical Corporation

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