

**FINAL  
COMPLETION REVIEW REPORT**

FOR THE  
REMEDIAL ACTION

AT THE  
BURRELL, PENNSYLVANIA  
VICINITY PROPERTY/URANIUM MILL TAILINGS DISPOSAL SITE  
(CA-200)

MAY 1994

DIVISION OF WASTE MANAGEMENT  
U.S. NUCLEAR REGULATORY COMMISSION

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## LIST OF ABBREVIATIONS

<u>Abbreviations</u>	<u>Definition</u>
AEA	Atomic Energy Act of 1954
CR	Completion Report
CRR	Completion Review Report
DOE	U.S. Department of Energy
EPA	U.S. Environmental Protection Agency
LTSP	Long-Term Surveillance Plan
MOU	Memorandum of Understanding
NRC	U.S. Nuclear Regulatory Commission
RAC	Remedial Action Contractor
RAECOM	Radiation Attenuation Effectiveness and Cover Optimization with Moisture Effects
RAIP	Remedial Action Inspection Plan
RAP	Remedial Action Plan
REA	Radiological and Engineering Assessment
RRM	Residual Radioactive Material
STP	NRC Staff Technical Position
UMTRA	Uranium Mill Tailings Remedial Action
UMTRCA	Uranium Mill Tailings Radiation Control Act of 1978
VP	Vicinity Property
VPMIM	Vicinity Property Management and Implementation Manual

FINAL COMPLETION REVIEW REPORT  
BURRELL, PENNSYLVANIA VICINITY PROPERTY  
(CA-200)

## INTRODUCTION

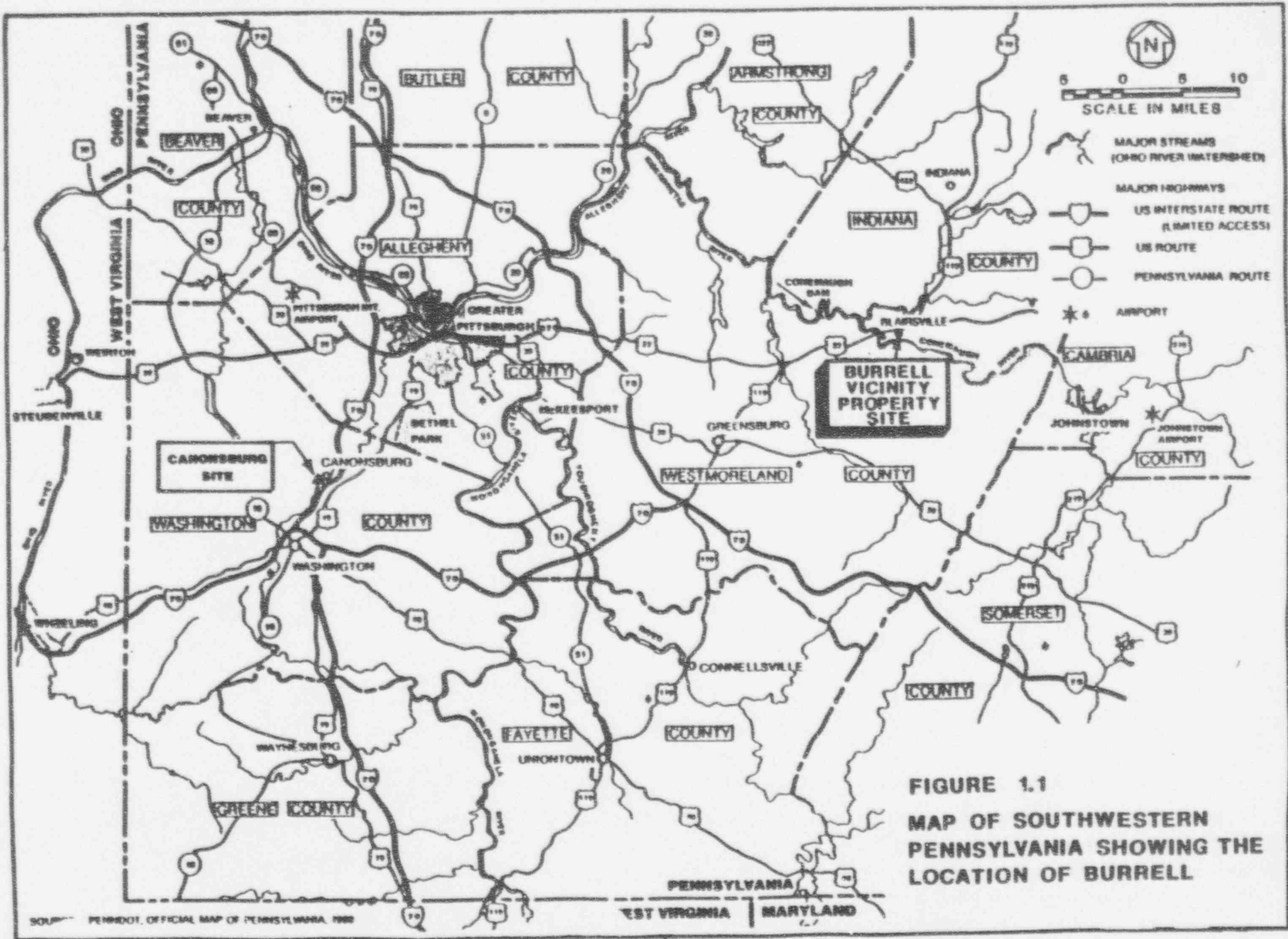
The Burrell vicinity property (VP), a fenced disposal site, designated by the U.S. Department of Energy (DOE), as CA-200, is located in Burrell Township (Figure 1.1), approximately one mile east of the City of Blairsville, in Indiana County in the Commonwealth of Pennsylvania. Although the Burrell site is not one of the 24 abandoned uranium mill tailings sites designated to be remediated by the DOE under the Uranium Mill Tailings Radiation Control Act of 1978 (UMTRCA), it was identified as one of the two disposal sites associated with the Canonsburg, Pennsylvania inactive uranium mill facility (DOE, 1984a). Some of the landfill refuse at the Burrell site originated from the Canonsburg site.

The DOE and the U.S. Nuclear Regulatory Commission previously reached agreement regarding the issuance of a license for the Burrell VP (CA-200) site. This is a vicinity property at which it was agreed that a license for a designed disposal cell with long-term surveillance requirements constituted a reasonable and prudent approach in keeping with the spirit of UMTRCA.

In cases where residual radioactive material (RRM) is effectively removed from a VP, NRC exercises a generic concurrence under the certification by DOE that the provisions of the Vicinity Property Management and Implementation Manual (VPMIM) (DOE, 1988a) have been adhered to. However, in those cases where RRM is left in place, NRC reviews the selection and performance of the remedial action to ensure that the appropriate Federal standards are satisfied. These cases are referred to as requiring "separate" NRC concurrence under the provisions of the DOE/NRC Memorandum of Understanding (MOU) for the Uranium Mill Tailings Remedial Action (UMTRA) Project (NRC/DOE, 1985, 1987). Since RRM is stabilized on the Burrell site, this DOE remedial action requires the specific separate NRC concurrence.

When NRC reviews a DOE Completion Report (CR) substantiating the determination that remedial action at an inactive uranium mill tailings processing site has been completed in conformance with an NRC-acceptable Remedial Action Plan (RAP), the NRC documents its concurrence decision in a Completion Review Report (CRR). A CRR is not routinely prepared for a VP, but the hybrid nature of the Burrell site dictated a separate NRC analysis and documentation. Furthermore, unlike other VPs, the Burrell site (CA-200) has been acquired by the DOE and will be licensed by NRC for DOE perpetual care and surveillance.

This CRR documents the NRC staff's basis for its concurrence decision with respect to DOE's certification for the completion of remedial action at the Burrell VP (CA-200) site.



**FIGURE 1.1**  
**MAP OF SOUTHWESTERN**  
**PENNSYLVANIA SHOWING THE**  
**LOCATION OF BURRELL**

SOURCE: PENNDOT, OFFICIAL MAP OF PENNSYLVANIA, 1988

## 1.0 BACKGROUND

### 1.1 UMTRCA

Title I of UMTRCA provides for remedial action at abandoned uranium mill tailings sites and associated VPs. The purpose of this legislation is to protect the public health and safety and the environment from radiological and non-radiological hazards associated with the radioactive materials at these sites.

UMTRCA directs DOE to select and perform remedial actions at 24 abandoned uranium mill tailings sites to ensure compliance with the general environmental standards promulgated by the U.S. Environmental Protection Agency (EPA) under Section 275(a) of the Atomic Energy Act of 1954 (AEA), as amended by UMTRCA. UMTRCA also requires DOE to obtain NRC's concurrence with DOE's selection and performance of the remedial actions. Following completion of the remedial actions, UMTRCA directs NRC to license the long-term custody, maintenance, and monitoring of the disposal sites to ensure continued protection of the public health and safety and the environment. The provisions of UMTRCA do not require licensing of VPs. Since the Burrell VP is also a disposal site, DOE has acquired the property, and NRC will license DOE perpetual care and surveillance. Appendix B includes a more detailed discussion of this legislation.

#### 1.1.1 Site Disposal Standards

Under Section 275(a) of the AEA, as amended by UMTRCA, EPA promulgated general environmental standards for control and cleanup of RRM at inactive uranium mill sites and associated VPs. These standards were published in final form in January 1983 in 40 CFR Part 192, Subparts A, B, and C. The standards provided requirements for long-term stability and radiation protection, and implementation guidance for ground-water protection.

In response to several legal challenges, the Tenth Circuit Court of Appeals in 1985 upheld all portions of the standards except for the implementation guidance for ground-water protection in Subpart C. The Court remanded EPA to promulgate ground-water protection standards that treat toxic constituents in the tailings at inactive sites consistent with the EPA standards for tailings at active uranium mills in Subpart D of 40 CFR Part 192. As a result, in September 1987, EPA published proposed ground-water protection standards for inactive uranium mills as revisions to 40 CFR Part 192. In accordance with Section 275(a) of the AEA, these proposed ground-water protection standards are effective until EPA promulgates the final revisions. However, DOE's planned remedial action for ground-water protection at the Burrell site, as concurred with by NRC in January 1984, was consistent with the implementation guidance that was in effect prior to September 1985. UMTRCA, Title I, Section 108(a)(3) stipulates that in lieu

of final standards, the DOE should comply with proposed standards, until final standards are issued. Because of this provision of the law, DOE proceeded with remedial action in accordance with the standards in place prior to the September 1985 court remand.

### 1.1.2 Vicinity Property Standards

Subpart B of the EPA standards addresses cleanup of land and buildings contaminated with RRM from inactive uranium processing sites. This subpart specifically addresses criteria for cleanup of VPs, whether they consist of structures or of open areas contaminated as a result of natural processes or human intervention. The primary standards consist of acceptable concentrations above background in soil or in air, and of acceptable gamma radiation levels above background.

### 1.1.3 Supplemental Standards

The EPA conceded that the varied conditions at the designated UMTRA Project sites coupled with the limited experience with remedial actions made it necessary to allow for adjustments to the primary standards where circumstances dictated them. Furthermore, where RRM at off-site locations did not present clear hazards, and the cleanup cost was unreasonably high with respect to the benefit derived from the remedial action, the implementing agencies could use some flexibility in performing alternate remedial action, while still being protective. In several cases removing all, or even part, of the RRM would have caused significant disruption of municipal, county or state services. Therefore, the EPA provided criteria in Subpart C of 40 CFR Part 192 for using supplemental standards in situations where the primary standards could not reasonably be met. Applying supplemental standards allows the implementing agencies to account for practical, different circumstances in these off-site cleanups. The objective in applying supplemental standards, however, is still to "come as close to meeting the otherwise applicable standards as is reasonable under the circumstances."

## 1.2 CONCURRENCE PROCESS FOR THE SELECTION OF DOE'S REMEDIAL ACTIONS

To document its selection of the remedial action to be implemented at a particular processing site, DOE develops and issues a Remedial Action Plan (RAP). The RAP describes the series of cleanup activities and presents the design proposed by DOE to stabilize the RRM at the disposal site and to provide for the long-term protection of the public health and the environment. In addition, DOE issues a Remedial Action Inspection Plan (RAIP), which establishes the quality control program of testing and inspection that will be employed for the remedial action. In accordance with UMTRCA Section 108(a)(1), the NRC staff reviews and concurs with the RAP and RAIP, and any subsequent modifications. By its review and concurrence in the remedial action selection, the NRC staff

concludes that the planned remedial actions will comply with EPA's applicable standards in 40 CFR Part 192, Subparts A, B, and C.

For VPs, NRC agreed to provide a generic concurrence for all VPs, at which all of the RRM was removed according to the detailed procedures in the Vicinity Property Management and Implementation Manual (VPMIM). However, for those VPs where either RRM is left in place or for those VPs identified after the associated UMTRA Project disposal site remedial action has been completed, the DOE must seek NRC concurrence with selection and performance for each individual VP. The MOU identifies these VPs as "separate." In such cases, the NRC concurs with the Radiological and Engineering Assessment (REA) for each property rather than a RAP.

### 1.3 CONCURRENCE PROCESS FOR THE PERFORMANCE OF DOE'S REMEDIAL ACTIONS

The remedial action work is performed by DOE contractors under Federal procurement regulations. During construction, DOE inspects and documents activities in accordance with the UMTRA Project Quality Assurance Plan, the RAIP, and the RAP. In addition, the NRC staff conducts independent on-site construction reviews.

Upon the completion of the remedial action at a processing site, DOE compiles construction records and prepares a CR to document that remedial actions were performed in accordance with the RAP, RAP modifications, and the RAIP. Based on this information, DOE certifies that all provisions of the RAP have been satisfied and, therefore, that the remedial actions comply with the applicable EPA standards in 40 CFR Part 192. Based on its review of DOE's documentation, and on its site visits and observations, NRC makes a concurrence decision with regard to DOE's remedial action completion determination for the sites, and then documents the basis for this concurrence decision in the CRR. By its review and concurrence in the remedial action performance, the NRC staff concludes that the remedial action has been completed in accordance with the concurred-in design. NRC's concurrence with DOE's completion determination fulfills the Commission's responsibility under UMTRCA Section 104(f)(1) to concur with DOE's determination of completion of remedial action.

For VPs, when the cleanup activities are completed, DOE provides a CR to document the performance of the remedial action at the VP. When the NRC reviews a CR and, based on the analysis of DOE's documentation and other available information, determines that DOE has completed the remedial action as established in the REA and NRC-approved REA modifications, then NRC concurs that the DOE has accomplished its responsibility for remediating the VP.

### 1.4 BURRELL SITE

The Burrell VP, designated as CA-200 by DOE, is a fenced disposal site. It is located in Burrell Township (Figure 1.1), approximately one mile



east of the City of Blairsville, in Indiana County in the Commonwealth of Pennsylvania. The Burrell site is not one of the 24 abandoned uranium mill tailings sites to be remediated by the DOE under the UMTRCA, but it is associated with the operations at the Vitro Corporation's uranium processing facility at Canonsburg, Pennsylvania approximately 51 miles west of the Burrell site.

#### 1.4.1 Relationship to Canonsburg, Pennsylvania UMTRA Project Site

As part of the Cooperative Agreement executed between the DOE and the Commonwealth of Pennsylvania, the Burrell site was identified as one of the two disposal sites associated with the Canonsburg inactive uranium mill facility (DOE, 1984a). The Canonsburg site is one of the 24 abandoned uranium mill tailings sites to be remediated by the DOE under the UMTRCA. During October 1956 through January 1957, approximately 11,000 metric tons of radioactive material were shipped from Canonsburg by railroad and dumped at the Burrell site.

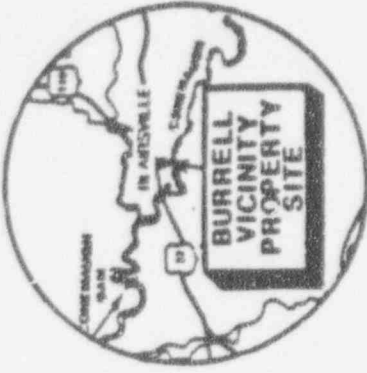
#### 1.4.2 Hybrid Nature of the Burrell Site

The Burrell site covers approximately 29 hectares and, at the time of disposal, was used as a landfill by the Pennsylvania Railroad. It has since been acquired by the Federal government. The site is located on the northern bank of the Conemaugh River. Under remedial action by the DOE, the property has been stabilized with the radioactive waste material encapsulated in the western portion of the site (Figure 1.2).

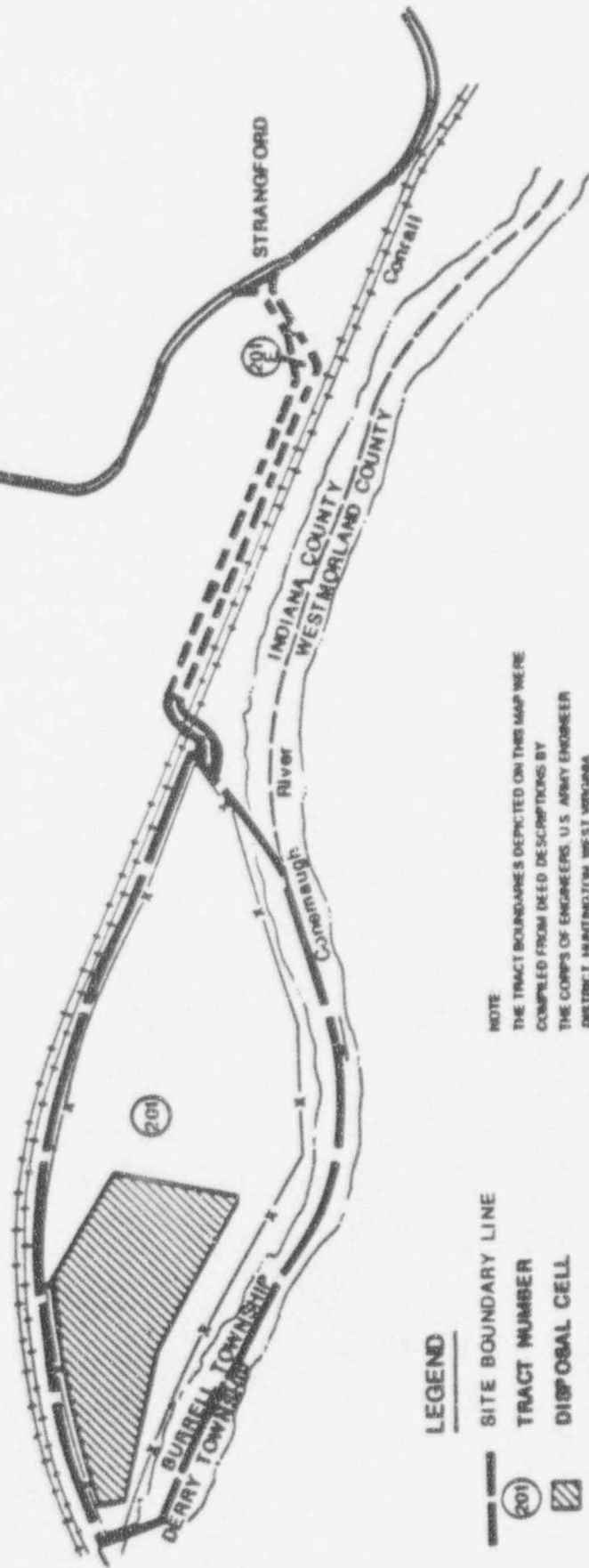
Since the Burrell site has been a landfill for various urban waste, the major responsibility for the Federal government was to stabilize the RRM-contaminated portion of the materials located at the site. The hybrid nature of this site lead DOE to propose the application of supplemental standards at the site, since removal of all the material was considered too costly for the benefit achieved. However, designing a stabilization strategy to rigidly comply with the primary processing/disposal site standards (40 CFR Part 192, Subpart A) was also considered too costly for the benefit achieved. Considering the fact that the DOE will care for the site under a perpetual NRC license, the remedial action was judged to come as close to meeting the otherwise applicable standards as is reasonable under the circumstances, as required by 40 CFR Part 192.22(a).

#### 1.4.3 The Pennsylvania Railroad Right-of-Way

This area of the Burrell VP, designated as CA-800 by DOE, consists of two contaminated areas of the railroad tracks on the north side of the former Burrell landfill site. As indicated by DOE (DOE, 1993), a separate supplemental standards application would be submitted for NRC review and concurrence for the Burrell CA-800



TO US 227



NOTE  
 THE TRACT BOUNDARIES DEPICTED ON THIS MAP WERE  
 COMPILED FROM DEED DESCRIPTIONS BY  
 THE CORPS OF ENGINEERS U.S. ARMY ENGINEER  
 DISTRICT, HUNTINGTON, WEST VIRGINIA

**LEGEND**

SITE BOUNDARY LINE

TRACT NUMBER

DISPOSAL CELL

FENCE BOUNDARY

EASEMENT

ACCESS RIGHT-OF-WAY

NOT TO SCALE

**FIGURE 1.2**  
**AREA BOUNDARIES**  
**BURRELL SITE, PENNSYLVANIA**

site. NRC's decision regarding completion of remedial action at the Burrell CA-800 site will be reviewed and concurred separately, and is excluded from the scope of this CRR.

#### 1.5 COMPLETION REVIEW REPORT ORGANIZATION

The purpose of this CRR is to document the NRC staff review of DOE's Burrell (CA-200) CR (DOE, 1988d, 1992, 1993, 1994). Section 2 of this CRR presents the analysis of remedial action performance. This section is organized by technical discipline and addresses geologic stability, geotechnical engineering, surface water hydrology, ground-water hydrology, and radiation protection aspects of the remedial action. Appendix A provides a listing of the NRC staff visits to, and on-site construction reviews of, the Burrell site. A detailed description of the UMTRCA, the EPA Standards, and the Phased UMTRA Project is provided in Appendix B.

## 2.0 ANALYSIS OF DOE REMEDIAL ACTION PERFORMANCE

### 2.1 PREVIOUS ACTIONS

The NRC staff reviewed a draft REA dated November 1984, a Final REA dated January 1985, and revised REAs dated September 1986 and May 1988 (DOE, 1984b, 1985, 1986c, and 1988b), and provided evaluations of these documents to DOE (NRC, 1986a, 1986c-d, 1988a-b, and 1989). The staff also performed site visits in support of its evaluations (Appendix A). The staff concurred with DOE's decision to stabilize the RRM in place (NRC, 1985). The staff also concurred with the application of supplemental standards, in lieu of the EPA primary standards in 40 CFR Part 192, Subpart A. The specific supplemental standards were not explicitly identified by the DOE until the May 1988 revision of the REA. The supplemental standards proposed for the Burrell site consisted of work practice standards and reliance on long-term, multi-faceted monitoring. The staff concluded that DOE had demonstrated that this course of action came as close to meeting the otherwise applicable standards (40 CFR Part 192, Section 192.22) as reasonable under the circumstances.

The reviews of DOE's documentation and its selection of remedial action at the Burrell site included assessment in the areas of geology, geotechnical engineering, surface water hydrology and erosion protection, ground-water hydrology, and radiation protection and site cleanup. In addition, the staff concurred with DOE's RAIP on December 27, 1985. This concurrence was the NRC staff's agreement that the quality control program, i.e., the plan for testing and inspections, was acceptable.

As part of a review of adequacy of rock quality and placement at the Canonsburg UMTRA Project site, the Burrell site encapsulation and stabilization construction was revisited for similar concerns on a field survey performed on August 23, 1988. As a result of that survey, the NRC staff concluded that there were no apparent flaws sufficient to jeopardize the site's stability (NRC, 1988c).

### 2.2 REVIEW OF REMEDIAL ACTION PERFORMANCE

The NRC staff's primary objective in reviewing DOE's certification of remedial action completion is to determine whether the remedial actions have been performed in a manner consistent with specifications provided in the approved REA, REA revisions, and the RAIP. If, in the course of construction, some deviations from these specifications become necessary, the DOE consults NRC with regard to the need for an REA modification. If such deviations do not significantly affect compliance with the otherwise applicable EPA standard, the NRC may not require an REA modification, but does require DOE to document the change(s) and justification(s) in the final DOE CR. In support of this action, the NRC staff participated in on-site construction reviews (Appendix A), field observations, assessments of on-site data and records, and reviews

of DOE Site Audit Reports. The following sections present specific analyses of remedial action performance by individual technical discipline.

### 2.2.1 Geologic Stability Review

Geologic aspects of the site were evaluated in conjunction with the geology and seismology review at Canonsburg. Based on review of the Canonsburg RAP, the staff concluded that, with one exception, the natural geologic conditions and processes did not raise significant concerns with respect to stability of the disposal site and to compliance with the EPA standards in Subpart A of 40 CFR Part 192. The exception deals with contingency inspection criteria following seismic events. In response to NRC's concerns regarding the contingency inspection criteria (expressed as earthquake magnitude on the Richter Scale), DOE committed to more conservative criteria for the Burrell site; **these criteria will be included in the DOE final Long-Term Surveillance Plan (LTSP).** Due to the soft-fill nature of the sediment layers beneath the encapsulation, using more conservative criteria appears to be justified. Other geologic considerations were factored into the geotechnical stability (section 2.2.2) and erosion protection (section 2.2.3) analyses.

The NRC staff conducted site visits and on-site construction reviews during performance of remedial actions at Burrell (Appendix A). These visits did not yield any new observations of geologic or geomorphic conditions or processes that would compromise the expected performance of the encapsulation cell.

### 2.2.2 Geotechnical Engineering Review

The NRC staff reviewed the Burrell CR to determine whether the geotechnical engineering aspects of the remedial action were completed in accordance with the REA, all the REA revisions, the RAIP, and the applicable construction specifications in the final design. Items reviewed included descriptions of construction operations, as-built drawings, laboratory and field testing data, Remedial Action Contractor (RAC) inspection reports, and DOE and RAC Quality Assurance Audits. In addition, the evaluation was based on staff observations and review of records during on-site construction reviews. During its review, the NRC staff observed the following:

1. Appropriate tests (gradation and Atterberg limits) and inspections were performed by DOE or its agents to assure that the proper type of material was placed for each feature of the construction. The loose thickness of the lifts was verified periodically to ensure compliance with the specifications for that material. Placement and compaction operations were routinely inspected and tested to verify

that the moisture and density requirements were met and that soil moisture was uniform throughout the compacted lifts.

2. Documented results of laboratory and field testing indicate that they were conducted in accordance with acceptable test procedures and by trained and qualified personnel.
3. The CR shows that, with the exception of the in-place field density tests on the contaminated material, frequencies of materials testing and inspection complied with the frequencies specified in the RAIP and in the NRC Staff Technical Position on Testing and Inspection Plans (STP) that was in place at that time. The frequency of field density tests on the contaminated material was 1 test in 575 cubic yards of material placed and fell short of the specified 1 test in 500 cubic yards. Subsequently, the STP was revised in 1990; one of the revisions changed the density test requirement to 1 test per 1000 cubic yards of contaminated material placed. Therefore, the NRC staff concluded that the frequency used at the Burrell site was acceptable.
4. As-built drawings adequately document that the completed remedial action is consistent with the NRC-approved design.
5. Settlement and lateral displacement monitoring beginning in Autumn of 1986 indicated that maximum settlement did not exceed 0.08 inch; maximum lateral displacement did not exceed 0.06 inch (DOE, 1988d: Appendix H of the Final CR).

Based on the above observations, and on the results of site visits (Appendix A) performed by the NRC staff during construction, the NRC staff concludes that the geotechnical engineering aspects of construction were performed in accordance with the specifications identified in the REA and the RAIP.

### 2.2.3 Surface Water Hydrology and Erosion Protection Review

The NRC staff reviewed the surface water hydrology and erosion protection aspects of remedial actions at Burrell to ensure that they were constructed in accordance with the applicable construction specifications as stipulated in the REA, REA revisions, the contracting design document, the RAIP, and the final design. Areas of review included construction operations, laboratory and field testing, and quality assurance audits. In addition, the review was based on the staff's observations of the remedial actions and reviews of records and testing during several NRC on-site construction reviews (Appendix A).

The remedial action design included riprap erosion protection in several specific areas, including (1) the top and side slopes of

the encapsulation cell, and (2) the diversion ditch discharging to the Conemaugh River. The erosion protection on the top and side slopes of the cell was designed to prevent long-term erosion and gulying of the cell cover, in addition to preventing erosion caused by severe flooding of the Conemaugh River. The erosion protection in the diversion ditch was engineered to provide armored pathways for conveyance of surface water flows away from the encapsulation cell and lower slopes.

The NRC staff reviewed each of these features and determined that their testing, placement, and configuration complied with specifications in the REA, REA revisions, the final design specifications and the RAIP. During its review, the NRC staff observed the following:

1. Tests (gradation and durability) and inspections were performed by DOE to assure that erosion protection materials for the encapsulation cell, and the diversion ditch were properly selected. Placement of materials was routinely inspected by DOE to assure that the rock size and gradation specifications were met. The thicknesses of the rock layers were verified periodically by DOE to ensure compliance with the specifications for the particular type of material.
2. Laboratory and field testing was conducted by DOE in accordance with specified test procedures.
3. Testing and inspection frequencies for materials used at the site for erosion protection were documented by DOE as complying with the frequencies specified in the RAIP.
4. After the rock was initially placed, the NRC staff observed that rock placement appeared to be inadequate (NRC, 1988a). DOE subsequently brought in additional rock and made additional efforts to replace the rock to an adequate thickness and gradation. Visual observations by the NRC staff of the completed work, including subsequent repairs, indicated that the rock riprap was placed in a manner which assured adequate areal coverage.

Based on the preceding observations, the NRC staff concludes that the required durability and gradation tests were performed during the remedial action. The riprap is of adequate quality and has been acceptably placed. The NRC staff concurs that remedial action has been adequately completed at Burrell, with respect to erosion protection.

#### 2.2.4 Water Resources Protection Review

The NRC staff reviewed ground-water protection aspects of DOE's Burrell Completion Report with respect to applicable sections of

the REA and subsequent revisions. Areas of review included ground-water monitoring, encapsulation cell construction, residual radioactive materials characterization, construction operations, and appropriate quality assurance audits. The EPA implementation guidance in Subpart C of 40 CFR Part 192 was remanded by the Tenth Circuit Court of Appeals in September 1985 after NRC concurred with the REA for Burrell in 1984. Furthermore, the EPA standards prior to September 1985 did not specify ground-water protection standards for vicinity properties.

However, DOE proceeded to characterize the ground-water conditions at the Burrell site, in order to evaluate the potential impact to ground-water from the encapsulated RRM. DOE performed the remedial action under a hybrid set of criteria, because of the nature of the Burrell site. DOE proposed a supplemental standard approach (DOE, 1988b) provided under 40 CFR 192.21 (a) and (c). DOE, using the available ground-water protection guidelines proceeded to install a down-gradient and cross-gradient monitoring system to monitor the performance of the encapsulation.

It should be noted that the Burrell site served in the past as a gravel pit, a waste disposal dump for the Pennsylvania Railroad, and has been affected by nearby coal mining activities in the late 1920's. Due to the heterogeneous nature of the subsurface conditions, as well as the debris therein, the DOE proposed to: 1) rely on the radon cover layer to limit infiltration of precipitation; 2) rely on a drainage channel to convey surface and ground water offsite (also to lower the ground water under the encapsulated material); and 3) install, maintain, and monitor the aforementioned down- and cross-gradient ground-water monitoring system. Given the waste landfill past use of the Burrell site, the NRC concurred with the DOE approach to dealing with ground-water protection.

The NRC staff concludes that the encapsulation cell appears to have been designed and constructed to limit potential adverse impacts on surface water quality in Conemaugh River from the RRM at Burrell. Furthermore, the past and present land and water use in proximity to the site supports DOE's decision to limit ground-water protection efforts to the monitoring as discussed in the CR (DOE, 1988d, 1993). Therefore, the NRC staff concurs with DOE's determination that remedial actions have been completed such that the ground-water protection provisions of the applicable EPA standards are met.

#### 2.2.5 Radiation Protection Review

The NRC staff reviewed radiation protection aspects of remedial actions at Burrell to ensure that cleanup of RRM was performed in accordance with specifications in the REA and REA revisions, the RAIP, and the final design. Areas of review included contaminated



material excavation, verification of cleanup, laboratory and field testing, and quality assurance audits. The evaluation was partially based on the NRC staff observations and review of on-site records during the remedial actions, as well as assessment of the verification results presented in the DOE CR. In addition, NRC geotechnical engineering staff reviewed the design and construction of the site to ensure compliance with the final design for limiting radon releases.

During its review of remedial actions at Burrell, the NRC staff observed the following:

1. DOE documentation indicated that DOE performed the remedial actions in accordance with the Ra-226 and Th-230 cleanup criteria provided in the REA. The established criteria accounted for the gradual ingrowth of Ra-226 as a result of Th-230 decay. The EPA criterion for Ra-226 concentration in earthen materials over any 100 square-meter area for any 15-cm thick layer that is at least 15 cm (six inches) below the land surface is 15.0 pCi/g above background (40 CFR 192.12(a)(2)). Due to the elevated ratio of Th-230 to Ra-226, the excavation control standard for Ra-226 was set at 3.6 pCi/g (CR Appendix J). The criterion for Th-230 was 35 pCi/g. It was chosen so that total concentrations of Ra-226 in the soil, including ingrowth of Ra-226 as a result of Th-230 decay, did not exceed the 15.0 pCi/g Ra-226 criterion in 1000 years.

One verification sample exceeded the EPA radium criterion; the sample measured 16.9 pCi/g Ra-226. Such a small variation above the 16.2 pCi/g (15 pCi/g plus 1.2 pCi/g background) Ra-226 criterion does not present a concern, since the property has restricted access and will be maintained by DOE under license from NRC.

One soil sample indicated that the Th-230 value (40 pCi/g) exceeded the 35 pCi/g cleanup criterion. In 1000 years the corresponding Ra-226 concentration would be 16.7 pCi/g. Since this location was backfilled with 6 to 8 feet of clean soil, the resulting Ra-226 value approximates the EPA standard, and the area has restricted access, the NRC staff concurs with the DOE's decision to leave the material in place.

2. The techniques, which DOE states to have used for verifying radiological cleanup at the Burrell VP disposal site, complied with DOE's summary protocols and the VPMIM procedures (DOE, 1988a). In addition, DOE's radiological survey records support compliance with EPA's cleanup standards in Subpart B of 40 CFR Part 192.

3. DOE estimated the radon flux from the disposal cell cover using the Radiation Attenuation Effectiveness and Cover Optimization with Moisture Effects (RAECOM) computer code. The latest estimation used some measured values obtained during cell construction, and demonstrated that the three-foot thick radon barrier was adequate to attenuate the expected radon. Because many of the samples of contaminated material had Th-230 levels higher than Ra-226, the amount of radon resulting from the decay of Th-230 due to this disequilibrium, was factored into the computer model.

The NRC staff concludes that DOE has demonstrated that the radiation protection aspects of remedial action at the Burrell VP disposal site (CA-200) ensures that cleanup of RRM was performed by DOE in accordance with the REA and REA revisions.

### 3.0 SUMMARY

The NRC staff concludes that DOE has demonstrated, in its CR, completion of surface remedial action performed at the Burrell VP disposal site (CA-200) meeting the criteria for application of supplemental standards provided in 40 CFR Part 192.21(a) and (c).

Since the completion report review process for the Burrell site has been long and complicated, we feel it appropriate to document its history herein. A draft CR was provided by DOE for NRC review in July 1988. Progress on the review of DOE's determination of completion was initially delayed, because the specific supplemental standards in the REA had not been explicitly identified by the DOE. Supplemental standards, consisting of work practice standards and reliance on long-term, multi-faceted monitoring, were proposed, and the NRC staff subsequently concurred with the application of these supplemental standards, in lieu of the EPA primary standards of Subpart A in 40 CFR Part 192.

In the meantime, DOE transmitted, with its letter dated December 1, 1988, a certification package as evidence of completion of all remedial action at the Burrell VP site. The package included the August 1988 version of the combined final CR and final Audit Report, and the DOE Certification Summary. Additional delay occurred, because NRC and DOE staff were negotiating a streamlining agreement during 1988 and 1989, which would in part have significantly changed the completion concurrence mechanism for the UMTRA Project. During this process, completion report reviews, including the Burrell CR, were put on hold. However, NRC notified DOE by its letter dated September 19, 1989, that the completion reviews would resume without the benefit of the streamlining process in this area.

Although there was no longer a hold on CR reviews, the Burrell CR was not reviewed for many months due to priorities established by DOE. Remedial Action Plans for many of the sites were given higher priority.

When the review was resumed, a request for additional information was sent in our letter of November 22, 1991. This request was for additional information on completion of remedial action for a northern portion of the Burrell VP, referred to in the CR as either the conrail property, the Pennsylvania Railroad Right-of-Way, or CA-800, its vicinity property designation. Although DOE had included this additional property in the Burrell CR, the NRC staff had never reviewed CA-800. DOE transmitted to NRC a revision to the Burrell CR by letter dated April 10, 1992, but it still lacked this information. A meeting was held with DOE staff in Albuquerque New Mexico, on September 10, 1992, to discuss this issue. Since, DOE will maintain control of CA-200 as a fenced disposal site, but will treat CA-800 as a standard vicinity property, NRC and DOE agreed that they should be handled separately. Subsequently, DOE transmitted page changes for the CR with its letter dated August 26, 1993. These page changes primarily deleted reference to the vicinity property CA-800, and reflected DOE's separate treatment of the two properties CA-200 and CA-800.

In a telephone discussion with DOE staff on November 18, 1993, a few items needing clarification were identified. DOE's draft response was received by telephone and by fax on January 6, 1994. With these final changes, as presented in the DOE March 1994 revised version of Volumes 1, 2, and 2A of the CR (DOE, 1994), the CR is acceptable.

#### 4.0 REFERENCES

- DOE (U.S. Department of Energy), 1984a. DOE/Pennsylvania Cooperative Agreement. No. DE-FC04-82AL19487. Modification No. A003. Effective August 2, 1984.
- DOE, 1984b. Draft Radiological and Engineering Assessment (REA), Burrell Vicinity Property CA-200, Volumes I and II, November 1984.
- DOE, 1985. Final REA, Burrell Vicinity Property CA-200, Volumes I and II, January 1985.
- DOE, 1986a. Letter from D'Antonio, J. (DOE/AL) to Gnugnoli, G. (NRC) transmitting Burrell design documentation, July 3, 1986.
- DOE, 1986b. Letter from Themelis, J. (DOE/AL) to Knapp, M. (NRC) on approach to the Burrell remedial action and commitment to the NRC licensee, August 6, 1986.
- DOE, 1986c. Draft Surveillance and Maintenance (S & M) Plan for the Burrell Vicinity Property, September 1986.
- DOE, 1986d. Revised Final REA, Burrell Vicinity Property CA-200, Volume I, September 1986.
- DOE, 1988a. "Vicinity Properties Management and Implementation Manual (VPMIM)," UMTRA-DOE/AL-050601, Revision D, March 1988.
- DOE, 1988b. Revised Final REA, Burrell Vicinity Property CA-200, Volume I, May 1988.
- DOE, 1988c. Burrell Vicinity Property S & M Plan, June 1988.
- DOE, 1988d. Burrell, Pennsylvania Vicinity Property Completion Report (Volumes 1, 2, 2A, 3, 3A, 3B, 3C, August 1988 Version), December 1, 1988.
- DOE, 1988e. Letter from Arthur, W. (DOE/AL) to Lohaus, P. (NRC) transmitting revised Burrell S & M Plan with addendum responding to NRC August 1988 questions -- also DOE requests concurrence with Burrell completion, December 12, 1988.
- DOE, 1992. Letter from Chernoff A. (DOE/Alb) to Surmeier J. (NRC) transmitting Revisions to the Burrell, Pennsylvania Vicinity Property Completion Report (Page Changes), April 10, 1992.
- DOE, 1993. Burrell, Pennsylvania Vicinity Property Completion Report, Page Changes, August 1993.
- DOE, 1994. Burrell, Pennsylvania Vicinity Property Completion Report, Revised Volumes 1, 2, and 2A, March 1994 (transmitted with DOE's letter dated April 7, 1994).

- JEG (Jacobs Engineering Group), 1987. Letter from Longmire, P. (TAC/JEG) to Young, M. (NRC) transmitting ground-water monitoring completion details, February 4, 1987.
- MK (M.K.Ferguson), 1986. Letter from Oldham, J. (RAC/MK) to Gnugnoli, G. (NRC) transmitting Burrell remedial action support documentation to date, May 2, 1986.
- NRC (U.S. Nuclear Regulatory Commission), 1985. Letter from R. G. Page (NRC) to D. Ball (DOE) concurring with the use of supplemental standards in the remedial action for the Burrell Site VP, January 3, 1985.
- NRC, 1986a. Letter from Knapp, M. (NRC) to Themelis, J. (DOE/AL) transmitting NRC review Burrell Remedial Action Plan and Design to date, June 25, 1986.
- NRC, 1986b. Letter from Martin, D. (NRC) to Themelis, J. (DOE/AL) on supplemental standards implementation and further radiological surveys, September 15, 1986.
- NRC, 1986c. Letter from Martin, D. (NRC) to Themelis, J. (DOE/AL) requesting additional ground-water information, October 22, 1986.
- NRC, 1986d. Letter from Martin, D. (NRC) to Themelis, J. (DOE/AL) transmitting NRC review of draft S & M Plan and of REA and October 1986 specifications, December 4, 1986.
- NRC, 1988a. Letter from Lohaus, P. (NRC) to Arthur, W. (DOE/AL) transmitting concerns about rock quality and placement, March 24, 1988.
- NRC, 1988b. Letter from Lohaus, P. (NRC) to Arthur, W. (DOE/AL) transmitting NRC review of the Burrell S & M Plan; includes consideration of May 1988 revised REA and preliminary VP Completion Report, August 23, 1988.
- NRC, 1988c. Trip Report, NRC Staff Visit to Burrell Site on August 23-24, 1988
- NRC, 1988d. Trip Report, NRC Staff Visit to Burrell Site on September 30, 1988
- NRC, 1989. Letter from Lohaus, P. (NRC) to Matthews, M. (DOE/AL) on prerequisites for NRC concurrence with completion of Burrell VP remedial actions, January 30, 1989.
- NRC, 1991. Letter from Surmeier J. (NRC) to Chernoff, A. (DOE/AL) regarding completion report issues, November 22, 1991.
- NRC 1994. Letter from Holonich J. (NRC) to Chernoff, A. (DOE/AL) regarding completion report issues, February 1, 1994.
- NRC/DOE, 1985. "Memorandum of Understanding," July 1985.
- NRC/DOE, 1987. "Memorandum of Understanding," Modification 1, May 12, 1987.

APPENDIX A  
NRC SITE VISITS TO THE  
BURRELL VP SITE

APPENDIX A - NRC SITE VISITS TO THE BURRELL VP SITE

DATE	STAFF	DISCIPLINE	PURPOSE
4/8-9/86	S. Smykowsky T. Johnson G. Gnugnoli	Geotechnical Eng Hydraulic Eng Project Mgmt	Conduct on-site construction review at Canonsburg and Burrell.
7/23/86	S. Smykowsky J. Kane T. Johnson M. Young	Geotechnical Eng Geotechnical Eng Hydraulic Eng Hydrogeology	Conduct on-site construction review at Canonsburg and Burrell.
11/6/86	M. Young	Hydrogeology	Locate and review integrity of groundwater and to monitor wells used in S & M Plan. Initiate study of groundwater resources of site and vicinity.
6/17/87	T. Johnson	Hydraulic Eng	Observe site conditions and inspection activities.
8/23/88	T. Johnson G. Gnugnoli	Hydraulic Eng Project Mgmt	Observe rock placement at Burrell.
11/6/89	M. Fliegel T. Johnson G. Gnugnoli	Management Hydraulic Eng Project Mgmt	NRC staff accompaniment of DOE Phase I inspection.
10/8/92	J. Surmeier D. Gillen T. Johnson E. Brummett M. Haque	Management Management Hydraulic Eng Health Physics Project Mgmt	Completion issues at Canonsburg and Burrell.

APPENDIX B

UMTRCA, THE EPA STANDARDS, AND THE PHASED UMTRA PROJECT



## APPENDIX B - UMTRCA, THE EPA STANDARDS, AND THE PHASED UMTRA PROJECT

Title I of the Uranium Mill Tailings Radiation Control Act (UMTRCA) defines the statutory authority and roles of the U.S. Department of Energy (DOE), the U.S. Nuclear Regulatory Commission, and the U.S. Environmental Protection Agency (EPA) with regard to the remedial action program for inactive uranium mill tailings sites. To fulfil its obligations under UMTRCA, DOE established the Uranium Mill Tailings Remedial Action (UMTRA) Project.

### The Standards

UMTRCA charged the EPA with the responsibility for promulgating remedial action standards for inactive uranium mill sites. The purpose of these standards is to protect the public health and safety and the environment from radiological and non-radiological hazards associated with radioactive materials at the sites. UMTRCA required that EPA promulgate these standards by no later than October 1, 1982. After October 1, 1982, if the EPA had not promulgated standards in final form, DOE was to comply with the standards proposed by EPA under Title I of UMTRCA until such time as the EPA had promulgated its standards in final form.

The final EPA standards were promulgated with an effective date of March 7, 1983 (48 FR 602; January 5, 1983); see 40 CFR Part 192 - Standards for Remedial Actions at Inactive Uranium Processing Sites, Subparts A-C. These regulations may be summarized as follows:

1. The disposal site shall be designed to control the tailings and other residual radioactive materials for up to 1000 years, to the extent reasonably achievable, and, in any case, for at least 200 years [40 CFR 192.02(a)].
2. The disposal site design shall provide reasonable assurance that releases of radon-222 from residual radioactive material to the atmosphere will not exceed an average release rate of 20 picocuries per square meter per second, or increase the annual average concentration of radon-222 in air, at or above any location outside the disposal site, by more than one-half picocurie per liter [40 CFR 192.02(b)].
3. The remedial action shall be conducted so as to provide reasonable assurance that, as a result of residual radioactive materials from any designated processing site, the concentrations of radium-226 in land averaged over any area of 100 square meters shall not exceed the background level by more than 5 picocuries/gram averaged over the first 15 centimeters of soil below the surface, and 15 picocuries/gram averaged over 15 centimeter thick layers of soil more than 15 centimeters below the surface [40 CFR 192.12(a)].
4. The objective of remedial action involving occupied or habitable buildings shall be, and reasonable effort shall be made to achieve, an annual average (or equivalent) radon decay product concentration (including background) not to exceed 0.02 WL, and the level of gamma radiation shall not exceed the background level by more than 20 microrentgens per hour [40 CFR 192.12(b)].

The portion of the EPA standards dealing with ground water requirements, 40 CFR 192.20(a)(2)-(3) were remanded by the Tenth Circuit Court of Appeals on September 3, 1985. Based on this court decision, EPA was directed to promulgate new groundwater standards. EPA proposed these standards in the form of revisions to Subparts A-C of 40 CFR Part 192 in September 1987, and now is in the process of completing action to promulgate the final groundwater standards.

As mandated by Section 108(a)(3) of UMTRCA, however, the remedial action at the inactive uranium processing sites is to comply with EPA's proposed standards until such time as the final standards are promulgated. DOE continues to perform remedial action at the inactive processing sites in accordance with NRC's concurrence with the remedial action approach based on the proposed EPA groundwater standards (52 FR 36000; September 24, 1987). Delaying implementation of the remedial action program would be inconsistent with congressional intent of timely completion of the program. Modifications of disposal sites after completion of the remedial action to comply with EPA's final ground water protection standards may be unnecessarily complicated and expensive and may not yield commensurate benefits in terms of human and environmental protection. Therefore, the Commission believes that sites where remedial action has been essentially completed prior to EPA's promulgation of final groundwater standards will not be impacted by the final groundwater standards. Although additional effort may be appropriate to assess and clean up contaminated groundwater at these sites, the existing designs of the disposal sites should be considered sufficient to provide long-term protection against future groundwater contamination. NRC does not view UMTRCA as requiring the reopening of those sites that have been substantially completed when NRC concurred with the selection of remedial action in accordance with applicable EPA standards, proposed or otherwise, in place at the time such NRC concurrence was given.

#### DOE Selection (Design) Phase

For each site, UMTRCA requires that DOE select a plan of remedial action that will satisfy the EPA standards and other applicable laws and regulations, and with which the NRC will concur. For each site, this phase includes preparation by DOE of an Environmental Assessment or an Environmental Impact Statement, and a Remedial Action Plan (RAP). The RAP is structured to provide a comprehensive understanding of the remedial actions proposed at that site and contains specific design and construction requirements. To complete the first phase, NRC and the appropriate State or Indian tribe review the RAP and then concur that the RAP will meet the EPA standards.

#### The Performance (Construction) Phase

In this phase, the actual remedial action (which includes decontamination, decommissioning, and reclamation) at the site is done in accordance with the Remedial Action Plan. The NRC and the State/Indian tribe, as applicable, must concur in any changes to the concurred-in plan that arise during construction.

At the completion of remedial action activities at the site, NRC concurs in DOE's determination that the activities at the site have been completed in accordance with the approved plan and, therefore, that the remedial action complies with the provisions of the EPA standards in 40 CFR Part 192,

Subparts A-C. NRC concurrence in the DOE determination that remedial action at a processing site has been accomplished may occur in two steps where residual radioactive material is not being moved from the processing site to a different disposal site. The Uranium Mill Tailings Remedial Action Amendments Act of 1988 allows for a two-step approach for Title I disposal sites. The Amendments Act allows DOE to do all remedial actions (surface cleanup and site stabilization), other than groundwater restoration, for the first step. The second step, which can go on for many years, is groundwater restoration. When groundwater restoration is completed, the LTSP required under the licensing phase will be appropriately amended. For sites that are being moved, licensing will occur in one step because there is no groundwater restoration at the disposal site and the processing site will not be licensed after completion of remedial action.

Prior to licensing, title to the disposed tailings and contaminated materials must be transferred to the United States, and the land upon which they are disposed of must be in Federal custody to provide for long-term Federal control. Disposal sites on Indian land will remain in the beneficial ownership of the Indian tribe.

#### The Licensing Phase

Title I of UMTRCA requires that, upon completion of the remedial action program by DOE, the permanent disposal sites be cared for by the DOE or other Federal agency designated by the President, under a license issued by the Commission. NRC has provided a general license under 10 CFR 40.27, and each disposal site will become subject to the general license following: (1) NRC concurrence in the DOE determination that the disposal site has been properly reclaimed, and (2) the formal receipt by NRC of an acceptable Long-Term Surveillance Plan (LTSP). There is no termination date for the general license.

Public involvement has been and will continue to be provided through DOE's overall remedial action program for Title I sites. The local public will have an opportunity to comment on the remedial action or closure plans proposed and implemented by DOE and to raise concerns regarding final stabilization and the degree of protection achieved. NRC fully endorses State/Indian tribe and public input in all stages of the program. At the time the LTSP is submitted, the NRC will consider the need for a public meeting in response to requests and public concerns.

#### The Surveillance and Monitoring Phase

In this phase, DOE and NRC periodically inspect the disposal site to ensure its integrity. The LTSP will require the DOE to make repairs, if needed.

One of the requirements in the EPA standards is that control of the tailings should be designed to be effective for up to 1000 years without active maintenance. Although the design of the stabilized pile is such that reliance on active maintenance should be minimized or eliminated, the NRC license will require emergency repairs, as necessary. In the event that significant repairs are necessary, a determination will be made on a site specific basis regarding the need for additional National Environmental Policy Act actions, and health and safety considerations based on 10 CFR Parts 19, 20, and 21.