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Permitting Strategy for Hanford Site Research, Development, and Demonstration Activities for Treatment, Storage, or Disposal of Hazardous Waste

Volume 4 — Westinghouse Hanford Company Technology Summaries

September 1993

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Permitting Strategy for Hanford Site Research, Development, and Demonstration Activities for Treatment, Storage, or Disposal of Hazardous Waste

Volume 4 — Westinghouse Hanford Company Technology Summaries

September 1993

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Executive Summary

As part of the Hanford Site RCRA Permitting Strategy Project, the Westinghouse Hanford Company (WHC) conducted a technology survey to determine what activities were ongoing or proposed that involved the treatment of hazardous wastes. The survey team contacted each of the organizations within WHC to determine if that organization was conducting or planned to conduct any activities within the scope of this project. Organizational contacts led to follow-up interviews with individual scientists who were involved in testing or developing technologies to treat wastes; in many cases, interviews with technologists generated other potential contracts, who were also interviewed.

This volume describes particular technologies and their applications, purpose, design, waste management details, location details, timetable, and possible permit options. It is important to note that the information included is necessarily tentative because of the inherent uncertainties associated with experimental variables, outcomes of competing projects, funding, and new projects or applications for current activities. This information is, therefore, a snapshot in time, not a depiction of the certain future. The survey thus illustrates the difficulty of describing research, development, and demonstration activities with the detail, specificity, and stability necessary for a Part B application.

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DW 127.16

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RD&D Project Description Format
RCRA Permitting Strategy Project

Company Westinghouse Hanford Company

Project Title Compact Processing Unit

Organization IPM Permitting/Regulatory Compliance

9411275.162

1. **Summary Description of the Technology and Application:** One test unit for the Initial Pretreatment Module (IPM), Project W-236B, is planned for the removal of cesium. This unit will operate using waste from Hanford Site tanks.

2. **Purpose, Experimental Design, and Ultimate Performance Goals:** The Compact Processing Unit will provide capabilities required to achieve the following goals:
   1) Demonstrate a cesium removal process on Hanford Site tank waste
   2) Provide design verification and instrumentation development for the full capacity Initial Pretreatment Module
   3) Demonstrate deployability of a Compact Processing Unit
   4) Begin initial treatment of tank waste

3. **What Hazardous Wastes Will Be Introduced to the Process:** The waste to be tested should be classified as RCRA hazardous waste and may include some listed waste and some dangerous waste. Specific information on the components of the waste will be available as technologies are selected during development work. The unit will operate on waste from Hanford Site tanks and currently has a planned throughput rate of 19 liters per minute (or ~ 9,000 kilograms per 8-hour day, assuming a specific gravity of 1). The waste is anticipated to be sludge and supernate in character.

4. **What Waste Streams Will Be Produced:** The waste stream produced is anticipated to have essentially the same characteristics as discussed under heading Number 3, with the exception of a reduction in Cesium concentration. An additional waste stream(s) may be produced in association with the Cesium removal activity.

5. **Location Details:** This work will take place in the 200 East Area, Tank 241-AW-101.

6. **Timetable:** Project W-236B is validated for a FY-94 design start. Operation of the Compact Processing Unit is anticipated to begin in December 1996.

7. **Possible Permit Options:** The current permitting option being pursued is to prepare a Notice of Intent and to incorporate the Compact Processing Unit into the Double-Shell Tank System Part A and Part B permit application documentation. This option was discussed with Ecology on September 9, 1993. This unit may also qualify for an RD&D permit, although the current estimated throughput rate may be much higher than the RD&D permitting guidance volumes.

8. **Westinghouse Hanford Company Contact:** R. C. Bowman, (509) 376-4876.

9413273.163

RD&D Project Description Format
RCRA Permitting Strategy Project

Company Westinghouse Hanford Company

Project Title Hot Test Facility

Organization IPM Permitting/Regulatory Compliance

1. **Summary Description of the Technology and Application:** One test unit for the Initial Pretreatment Module (IPM), Project W-236B, is planned for the destruction of organics and ferrocyanides. This unit will operate using waste from Hanford Site tanks.

2. **Purpose, Experimental Design, and Ultimate Performance Goals:** The Hot Test Facility will provide capabilities required to achieve the following goals:
   1) Demonstrate the organic and ferrocyanide destruction technology
   2) Provide design verification and instrumentation development for the full capacity Initial Pretreatment Module
   3) Demonstrate deployability of a Hot Test Facility
   4) Begin initial treatment of tank waste

   It is anticipated that some activities associated with this technology will be carried out as small-scale laboratory experiments. Larger-scale activities will be carried out at Hanford Site tank farm locality(ies).

3. **What Hazardous Wastes Will Be Introduced to the Process:** The waste to be tested should be classified as RCRA hazardous waste and may include some listed waste and some dangerous waste. Specific information on the components of the waste will be available as technologies are selected during development work. The unit will operate on waste from Hanford Site tanks and currently has a planned throughput rate of 7 to 19 liters per minute (or a maximum of ~ 9,000 kilograms per 8-hour day, assuming a specific gravity of 1). The waste is anticipated to be sludge and supernate in character.

4. **What Waste Streams Will Be Produced:** The waste stream produced is anticipated to have essentially the same characteristics as discussed under heading Number 3, with the exception of products of the organic and ferrocyanide destruction. An additional waste stream(s) may be produced in association with the destruction activity.

5. **Location Details:** The location is to be determined by December 1993. The location is anticipated to be associated with one or more of the Double Shell Tanks (located in both 200 East and 200 West Area).

6. **Timetable:** Project W-236B is validated for a FY-94 design start. Operation is anticipated to begin in December 1997.

7. **Possible Permit Options:** The current permitting option being pursued is to prepare a Notice of Intent and to incorporate the Hot Test Facility into the Double-Shell Tank System Part A and Part B permit application documentation. This option was discussed with Ecology on September 9, 1993. This unit may also qualify for an RD&D permit, although the current estimated throughput rate may be much higher than the RD&D guidance volumes.

8. **Westinghouse Hanford Company Contact:** R. C. Bowman, (509) 376-4876.

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RD&D Project Description Format
RCRA Permitting Strategy Project

Company Westinghouse Hanford Company

Project Title Radionuclide Separations Technology Development

Organization Tank Waste Remediation System (TWRS), Pretreatment Development
Interfaces: Chemical Engineering & Process Laboratories/Technology

1. **Summary Description of the Technology and Application:** This activity is being performed to test candidate Hanford Site tank waste sludge pretreatment processes for radionuclide separations on a laboratory and bench scale to determine applicability and effectiveness, and to establish process parameters and preliminary equipment design guidance. Testing will be performed by Westinghouse Hanford Company (WHC) personnel at the 222-S Laboratory Complex and is similar to that performed by Pacific Northwest Laboratory (PNL) at the 300 Area facilities. Initial tests will address individual treatment technologies; later tests will link technologies together in a manner that simulates an integrated flowsheet of a proposed treatment system. The types of technologies to be tested include chemical and electrochemical sludge dissolution, solid/liquid separations, solvent extraction, acidic system ion exchange, precipitation, crystallization, leaching, and nitrate destruction.

2. **Purpose, Experimental Design, and Ultimate Performance Goals:** A major portion of the Hanford Site tank waste is solid sludges which contain the bulk of the radionuclides. One bounding strategy for treatment of the sludges involves an extensive partitioning of the radionuclides and chemical constituents to minimize the volume of waste glass and grout produced in preparation for final disposition of the tank waste. Testing is needed to determine if proposed partitioning technologies will perform as desired for the different tank waste requiring treatment. Simulated and actual waste sludge samples will be used to test various partitioning technologies and equipment.

   Test scales are similar in size to present testing and planned future testing by PNL at the 300 Area for pretreatment development.

3. **What Hazardous Wastes Will Be Introduced to the Process:** The waste to be tested should be classified as RCRA hazardous waste and may include some listed waste and some dangerous waste. The waste is anticipated to be sludge in character. Waste is similar in nature and hazard to waste subject to present testing and planned future testing by PNL at the 300 Area for pretreatment development.

4. **What Waste Streams Will Be Produced:** The waste stream produced is anticipated to have essentially the same characteristics as discussed under heading Number 3, with the exception of products of the radionuclides separations processes. An additional waste stream(s) may be produced in association with the separations processes.

5. **Location Details:** The Radionuclide Separations Technology Development work will take place in the 222-S Laboratory Complex.

6. **Timetable:** Work on centrifugal contactor solids behavior testing and corrosion testing of filters using nonradioactive chemicals is going on now. The capability to perform tests using WHC facilities on simulated and actual tank waste is desired starting in October 1993.

7. **Possible Permit Options:** A viable permitting option is to include this work in the 222-S Laboratory Complex Part A and Part B permit application documentation. Dependent upon volume, it is possible that this work could also be covered as a small-scale treatability study or under a RD&D permit. This activity is an example of a progressive development activity that may involve several scales as technology development proceeds.

8. **Westinghouse Hanford Company Contact:** R. C. Bowman, (509) 376-4876.

9413273.167

RD&D Project Description Format
RCRA Permitting Strategy Project

Company Westinghouse Hanford Company

Project Title Organic Destruction Process Technology Development

Organization Tank Waste Remediation System (TWRS), Pretreatment Development
Interfaces: Chemical Engineering & Process Laboratories/Technology

9403273.168

1. **Summary Description of the Technology and Application:** This activity is being performed to test candidate Hanford Site tank waste organic destruction pretreatment processes on a laboratory and bench scale to determine applicability and effectiveness, and to establish process parameters and preliminary equipment design guidance. Testing will be performed by WHC personnel at the 222-S Laboratory Complex and is similar to that performed by PNL at the 300 Area facilities. Initial tests will address individual treatment technologies; later tests will link technologies together in a manner that simulates an integrated flowsheet of a proposed treatment system. The types of technologies to be tested include calcination, electrochemical oxidation, high and low temperature wet oxidation, and corona discharge.

2. **Purpose, Experimental Design, and Ultimate Performance Goals:** Hanford Site tank waste contain organic complexants and ferrocyanide compounds whose presence and degradation creates a safety problem. The strategy for resolution of the safety problem involves destruction of the organics and ferrocyanides. Testing is needed to determine if existing and attractive new technologies will perform as desired for the different tank waste requiring treatment. Simulated and actual waste sludge samples will be treated to determine the effectiveness of organic destruction.

3. **What Hazardous Wastes Will Be Introduced to the Process:** The waste to be tested should be classified as RCRA hazardous waste and may include some listed waste and some dangerous waste. The waste is anticipated to be sludge in character. Waste is similar in nature and hazard to waste subject to present testing and planned future testing by PNL at the 300 Area for pretreatment development.

4. **What Waste Streams Will Be Produced:** The waste stream produced is anticipated to have essentially the same characteristics as discussed under heading Number 3, with the exception of products of the organic destruction processes. An additional waste stream(s) may be produced in association with the destruction processes.

5. **Location Details:** The Organic Destruction Process Technology Development work will take place in the 222-S Laboratory Complex.

6. **Timetable:** The capability to perform tests using WHC facilities on simulated and actual tank waste is desired starting in October 1993.

7. **Possible Permit Options:** A viable permitting option currently being considered is to include this work in the 222-S Laboratory Complex Part A and Part B permit application documentation. Dependent upon volume, it is possible that this work could also be covered as a small-scale treatability study or under a RD&D permit. This activity is an example of a progressive development activity that may involve several scales as technology development proceeds.

8. **Westinghouse Hanford Company Contact:** R. C. Bowman, (509) 376-4876.

9413273.169

RD&D Project Description Format
RCRA Permitting Strategy Project

Company Westinghouse Hanford Company

Project Title Supernate/Saltcake Pretreatment Process Technology Development

Organization Tank Waste Remediation System (TWRS), Pretreatment Development
Interfaces: Chemical Engineering & Process Laboratories/Technology

1. **Summary Description of the Technology and Application:** This activity is being performed to test candidate Hanford Site tank waste supernate/saltcake pretreatment processes on a laboratory and bench scale to determine applicability and effectiveness, and to establish process parameters and preliminary equipment design guidance. Testing will be performed by WHC personnel at the 222-S Laboratory Complex and is similar to that performed by PNL at the 300 Area facilities. Initial tests will address individual treatment technologies; later tests will link technologies together in a manner that simulates an integrated flowsheet of a proposed treatment system. The types of technologies to be tested include sludge washing, solid/liquid separations, solvent extraction, alkaline system ion exchange, and nitrate destruction.

2. **Purpose, Experimental Design, and Ultimate Performance Goals:** Hanford Site tank waste contain supernatant liquids and salts which contain the some soluble and mobile radionuclides. The strategy for treatment of the supernate/saltcake involves removal of the radionuclides to at least NRC Class C limits (and potentially to NRC Class A limits) and routing the radionuclides for incorporation into glass. The low activity liquid streams will then be suitable for incorporation into grout. Testing is needed to determine if existing and attractive new technologies will perform as desired for the different tank waste requiring treatment. Various technologies will be tested using simulated and actual waste samples.

3. **What Hazardous Wastes Will Be Introduced to the Process:** The waste to be tested should be classified as RCRA hazardous waste and may include some listed waste and some dangerous waste. The waste is anticipated to be sludge in character. Waste is similar in nature and hazard to waste subject to present testing and planned future testing by PNL at the 300 Area for pretreatment development.

4. **What Waste Streams Will Be Produced:** The waste stream produced is anticipated to have essentially the same characteristics as discussed under heading Number 3. An additional waste stream(s) may be produced in association with the destruction processes.

5. **Location Details:** The Supernate/Saltcake Pretreatment Process Technology Development work will take place in the 222-S Laboratory Complex.

6. **Timetable:** The capability to perform tests using WHC simulated and actual tank waste is desired starting in October 1993.

7. **Possible Permit Options:** A viable permitting option currently being considered is to include this work in the 222-S Laboratory Complex Part A and B permit application documentation. Dependent upon volume, it is possible that this work could also be covered as a small-scale treatability study or under a RD&D permit. This activity is an example of a progressive development activity that may involve several scales as technology development proceeds.

8. **Westinghouse Hanford Company Contact:** R. C. Bowman, (509) 376-4876.

9413273.117

RD&D Project Description Format
RCRA Permitting Strategy Project

Company Westinghouse Hanford Company

Project Title Supernate/Saltcake Pretreatment Process Non-Radioactive Pilot Plant

Organization Tank Waste Remediation System (TWRS), Waste Retrieval & Pretreatment
Interfaces: To be determined

9427S.172

1. **Summary Description of the Technology and Application:** This activity is being performed to test candidate Hanford Site tank waste supernate/saltcake pretreatment processes on a pilot scale to demonstrate integrated process performance and confirm process parameters and final equipment design guidance. Information from development testing will be used to prepare design criteria for construction of a pilot scale process. The process will be housed in an existing or new facility depending on suitability and availability of locations. Design and construction will be handled as a WHC project. Testing will be performed by WHC personnel. The types of technologies to be tested include sludge washing, solid/liquid separations, solvent extraction, alkaline system ion exchange, and nitrate destruction.

2. **Purpose, Experimental Design, and Ultimate Performance Goals:** Hanford Site tank waste contains supernatant liquids and salts which contain some soluble and mobile radionuclides. The strategy for treatment of the supernate/saltcake involves removal of the radionuclides to at least NRC Class C limits (and potentially to NRC Class A limits) and routing the radionuclides to glass. The low activity liquid streams will then be suitable for incorporation into grout. Testing is needed to determine if selected technologies will perform as desired on a pilot scale for the different tank waste requiring treatment. Simulated waste will be tested.

3. **What Hazardous Wastes Will Be Introduced to the Process:** The waste to be tested should be classified as RCRA hazardous waste and may include some listed waste and some dangerous waste. Specific information on the components of the waste will be available as technologies are selected during development work. The waste is anticipated to be supernate and saltcake in character.

4. **What Waste Streams Will Be Produced:** The waste stream produced is anticipated to have essentially the same characteristics as discussed under heading Number 3. An additional waste stream(s) may be produced in association with the pretreatment processes.

5. **Location Details:** The pilot scale process will be housed in an existing or new facility depending on suitability and availability of locations.

6. **Timetable:** Construction is desired to start in October 1995. The capability to perform tests using WHC simulated and actual tank waste is desired starting in October 1997.

7. **Possible Permit Options:** Dependent upon volume, it is possible that this work could be covered as a small-scale treatability study or under a RD&D permit. This activity is an example of a progressive development activity that may involve several scales as technology development proceeds.

8. **Westinghouse Hanford Company Contact:** R. C. Bowman, (509) 376-4876.

9413273.1173

RD&D Project Description Format
RCRA Permitting Strategy Project

Company Westinghouse Hanford Company

Project Title Solvent Extraction Non-Radioactive Pilot Plant

Organization Tank Waste Remediation System (TWRS), Waste Retrieval & Pretreatment
Interfaces: To be determined

1. **Summary Description of the Technology and Application:** This activity is being performed to test the application of solvent extraction on a pilot scale in support of Hanford Site tank waste sludge cleanup. The tests are needed to demonstrate integrated process performance and confirm process parameters and final equipment design guidance. Information from development testing will be used to prepare design criteria for construction of a pilot scale solvent extraction process. The pilot scale process will be housed in an existing or new facility depending on suitability and availability of locations. Design and construction will be handled as a WHC project. Testing will be performed by WHC personnel. The types of technologies to be tested include sludge dissolution, solvent extraction, and acidic system ion exchange.

2. **Purpose, Experimental Design, and Ultimate Performance Goals:** A major portion of the Hanford Site tank waste is solid sludges which contain the bulk of the radionuclides. One bounding strategy for treatment of the sludges involves an extensive partitioning of the radionuclides and chemical constituents to minimize the volume of waste glass and grout produced in preparation for final disposition of the tank waste. Solvent extraction is a dominant technology for accomplishing extensive radionuclide separations. However, testing is needed to verify that proposed solvents and equipment will perform as expected to provide the desired separation factors and processing capacities. Simulated nonradioactive waste will be tested.

3. **What Hazardous Wastes Will Be Introduced to the Process:** The waste to be tested should be classified as RCRA hazardous waste and may include some listed waste and some dangerous waste. Specific information on the components of the waste will be available as technologies are selected during development work. The waste is anticipated to be sludge in character.

4. **What Waste Streams Will Be Produced:** The waste stream produced is anticipated to have essentially the same characteristics as discussed under heading Number 3. An additional waste stream(s) may be produced in association with the pretreatment processes.

5. **Location Details:** The pilot scale process will be housed in an existing or new facility depending on suitability and availability of locations.

6. **Timetable:** The capability to perform tests using WHC simulated and actual tank waste is desired starting in October 1999.

7. **Possible Permit Options:** Dependent upon volume, it is possible that this work could be covered as a small-scale treatability study or under a RD&D permit. This activity is an example of a progressive development activity that may involve several scales as technology development proceeds.

8. **Westinghouse Hanford Company Contact:** R. C. Bowman, (509) 376-4876.

SW7273.175

RD&D Project Description Format
RCRA Permitting Strategy Project

Company Westinghouse Hanford Company

Project Title Non-Solvent Extraction Pretreatment Process Non-Radioactive Pilot Plant

Organization Tank Waste Remediation System (TWRS), Waste Retrieval & Pretreatment
Interfaces: To Be Determined

9127.176

1. **Summary Description of the Technology and Application:** This activity is being performed to test the application of non-solvent extraction processes on a pilot scale in support of Hanford Site tank waste cleanup. The tests are needed to demonstrate integrated process performance and confirm process parameters and final equipment design guidance. Information from development testing will be used to prepare design criteria for construction of a pilot scale process. The pilot scale process will be housed in an existing or new facility depending on suitability and availability of locations. Design and construction will be handled as a WHC project. Testing will be performed by WHC personnel. The types of technologies to be tested include chemical and electrochemical sludge dissolution, solid/liquid separations, acidic system ion exchange, precipitation, and nitrate destruction.

2. **Purpose, Experimental Design, and Ultimate Performance Goals:** A major portion of the Hanford Site tank waste is solid sludges which contain the bulk of the radionuclides. One bounding strategy for treatment of the sludges involves an extensive partitioning of the radionuclides and chemical constituents to minimize the volume of waste glass and grout produced in preparation for final disposition of the tank waste. Non-solvent extraction technologies are needed for extensive radionuclide separations because specialized separations are to be performed to minimize secondary waste generation. Testing is needed to verify that proposed processes and equipment will perform as expected to provide the desired separation factors and processing capacities. Simulated nonradioactive waste will be tested.

3. **What Hazardous Wastes Will Be Introduced to the Process:** The waste to be tested should be classified as RCRA hazardous waste and may include some listed waste and some dangerous waste. Specific information on the components of the waste will be available as technologies are selected during development work. The waste is anticipated to be sludge in character.

4. **What Waste Streams Will Be Produced:** The waste stream produced is anticipated to have essentially the same characteristics as discussed under heading Number 3. An additional waste stream(s) may be produced in association with the pretreatment processes.

5. **Location Details:** The pilot scale process will be housed in an existing or new facility depending on suitability and availability of locations.

6. **Timetable:** The capability to perform tests using WHC simulated and actual tank waste is desired starting in October 1999.

7. **Possible Permit Options:** Dependent upon volume, it is possible that this work could be covered as a small-scale treatability study or under a RD&D permit. This activity is an example of a progressive development activity that may involve several scales as technology development proceeds.

8. **Westinghouse Hanford Company Contact:** R. C. Bowman, (509) 376-4876.

9413273.1177

RD&D Project Description Format
RCRA Permitting Strategy Project

Company Westinghouse Hanford Company

Project Title Extensive Separations Radioactive Pilot Plant

Organization Tank Waste Remediation System (TWRS), Waste Retrieval & Pretreatment
Interfaces: To be determined

9427S.178

1. **Summary Description of the Technology and Application:** This activity is being performed to test the application of proposed separation processes on a pilot scale in support of Hanford Site tank waste cleanup. The tests are needed to demonstrate integrated process performance and confirm process parameters for processing radioactive solutions. Information from development testing will be used to prepare design criteria for construction of a pilot scale process. The pilot scale process will be housed in an existing or new facility depending on suitability and availability of locations. Design and construction will be handled as a WHC project. Testing will be performed by WHC personnel. The types of technologies to be tested include chemical and electrochemical sludge dissolution, solid/liquid separations, acidic system ion exchange, precipitation, crystallization, leaching, and nitrate destruction.

2. **Purpose, Experimental Design, and Ultimate Performance Goals:** A major portion of the Hanford Site tank waste is solid sludges which contain the bulk of the radionuclides. One bounding strategy for treatment of the sludges involves an extensive partitioning of the radionuclides and chemical constituents to minimize the volume of waste glass and grout produced in preparation for final disposition of the tank waste. Technologies are needed for chemical separations to minimize the volume of high level waste glass and low level waste grout. Testing is needed to verify that proposed processes and equipment will perform as expected to provide the desired separation factors and processing capacities. Simulated nonradioactive waste will be tested.

3. **What Hazardous Wastes Will Be Introduced to the Process:** The waste to be tested should be classified as RCRA hazardous waste and may include some listed waste and some dangerous waste. Specific information on the components of the waste will be available as technologies are selected during development work. The waste is anticipated to be sludge in character.

4. **What Waste Streams Will Be Produced:** The waste stream produced is anticipated to have essentially the same characteristics as discussed under heading Number 3. An additional waste stream(s) may be produced in association with the pretreatment processes.

5. **Location Details:** The pilot scale process will be housed in an existing or new facility depending on suitability and availability of locations.

6. **Timetable:** The capability to perform tests using WHC simulated and actual tank waste is desired starting in October 2003.

7. **Possible Permit Options:** Dependent upon volume, it is possible that this work could be covered as a small-scale treatability study or under a RD&D permit. This activity is an example of a progressive development activity that may involve several scales as technology development proceeds.

8. **Westinghouse Hanford Company Contact:** R. C. Bowman, (509) 376-4876.

SW4277.119

RD&D Project Description Format
RCRA Permitting Strategy Project

Company Westinghouse Hanford Company

Project Title Minimum Sludge Separations Process Development

Organization Tank Waste Remediation System (TWRS), Pretreatment Development
Interfaces: Chemical Engineering & Process Laboratories/Technology

9413273.1180

1. **Summary Description of the Technology and Application:** This activity is being performed to develop proposed sludge separation processes for Hanford Site tank waste cleanup. The tests are needed to select candidate processes, identify key operating parameters, and provide preliminary equipment design information. Testing will be performed by WHC personnel at the 222-S Laboratory Complex and is similar to that performed by PNL at the 300 Area facilities. Initial tests will address individual treatment technologies; later tests will link technologies together in a manner that simulates an integrated flowsheet of a proposed treatment system. The types of technologies to be tested include sludge washing and sludge leaching.

2. **Purpose, Experimental Design, and Ultimate Performance Goals:** A major portion of the Hanford Site tank waste is solid sludges which contain the bulk of the radionuclides. One bounding strategy for treatment of the sludges involves performing a minimum amount of pretreatment and vitrifying the bulk of the waste. This minimizes the capital cost of pretreatment facilities. Testing is needed to verify that proposed processes and equipment will perform as expected to provide the desired separation factors and processing capacities. Simulated and actual waste sludge samples will be dissolved and various partitioning technologies and equipment tested.

3. **What Hazardous Wastes Will Be Introduced to the Process:** The waste to be tested should be classified as RCRA hazardous waste and may include some listed waste and some dangerous waste. The waste is anticipated to be sludge in character. Waste is similar in nature and hazard to waste subject to present testing and planned future testing by PNL at the 300 Area for pretreatment development .

4. **What Waste Streams Will Be Produced:** The waste stream produced is anticipated to have essentially the same characteristics as discussed under heading Number 3. An additional waste stream(s) may be produced in association with the pretreatment processes.

5. **Location Details:** The Minimum Sludge Separations Process Development work will take place in the 222-S Laboratory Complex.

6. **Timetable:** The capability to perform tests using WHC facilities on simulated and actual tank waste is desired starting in October 1993.

7. **Possible Permit Options:** A viable permitting option currently being considered is to include this work in the 222-S Laboratory Complex Part A and B permit application documentation. Dependent upon volume, it is possible that this work could also be covered as a small-scale treatability study or under a RD&D permit. This activity is an example of a progressive development activity that may involve several scales as technology development proceeds.

8. **Westinghouse Hanford Company Contact:** R. C. Bowman, (509) 376-4876.

9413273.118

RD&D Project Description Format
RCRA Permitting Strategy Project

Company Westinghouse Hanford Company

Project Title Non-Radioactive In-Tank Processing Pilot Plant

Organization Tank Waste Remediation System (TWRS), Waste Retrieval & Pretreatment
Interfaces: To be determined

9427.182

1. **Summary Description of the Technology and Application:** This activity is being performed to test the application of proposed sludge separation processes on a pilot scale in support of Hanford Site tank waste cleanup. The tests are needed to demonstrate integrated process performance and confirm process parameters for processing radioactive solutions. Information from development testing will be used to prepare design criteria for construction of a pilot scale process. The pilot scale process will be housed in an existing or new facility depending on suitability and availability of locations. Design and construction will be handled as a WHC project. Testing will be performed by WHC personnel. The types of technologies to be tested include sludge washing and sludge leaching.

2. **Purpose, Experimental Design, and Ultimate Performance Goals:** A major portion of the Hanford Site tank waste is solid sludges which contain the bulk of the radionuclides. One bounding strategy for treatment of the sludges involves performing a minimum amount of pretreatment and vitrifying the bulk of the waste. This minimizes the capital cost of pretreatment facilities. Testing is needed to verify that proposed processes and equipment will perform as expected to provide the desired separation factors and processing capacities. Simulated nonradioactive waste will be tested.

3. **What Hazardous Wastes Will Be Introduced to the Process:** The waste to be tested should be classified as RCRA hazardous waste and may include some listed waste and some dangerous waste. Specific information on the components of the waste will be available as technologies are selected during development work. The waste is anticipated to be sludge in character.

4. **What Waste Streams Will Be Produced:** The waste stream produced is anticipated to have essentially the same characteristics as discussed under heading Number 3. An additional waste stream(s) may be produced in association with the pretreatment processes.

5. **Location Details:** The pilot scale process will be housed in an existing or new facility depending on suitability and availability of locations.

6. **Timetable:** Construction is desired to be initiated in October 1996. The capability to perform tests using WHC simulated and actual tank waste is desired starting in October 1998.

7. **Possible Permit Options:** Dependent upon volume, it is possible that this work could be covered as a small-scale treatability study or under a RD&D permit. This activity is an example of a progressive development activity that may involve several scales as technology development proceeds.

8. **Westinghouse Hanford Company Contact:** R. C. Bowman, (509) 376-4876.

9443273.183

RD&D Project Description Format
RCRA Permitting Strategy Project

Company Westinghouse Hanford Company

Project Title Minimum Sludge Separations Radioactive Pilot Plant

Organization Tank Waste Remediation System (TWRS), Waste Retrieval & Pretreatment
Interfaces: To be determined

9417273.1184

1. **Summary Description of the Technology and Application:** This activity is being performed to test the application of proposed sludge separation processes on a pilot scale in support of Hanford Site tank waste cleanup. The tests are needed to demonstrate integrated process performance and confirm process parameters for processing radioactive solutions. Information from development testing will be used to prepare design criteria for construction of a pilot scale process. The pilot scale process will be housed in an existing or new facility depending on suitability and availability of locations. Design and construction will be handled as a WHC project. Testing will be performed by WHC personnel. The types of technologies to be tested include sludge washing and sludge leaching.

2. **Purpose, Experimental Design, and Ultimate Performance Goals:** A major portion of the Hanford Site tank waste is solid sludges which contain the bulk of the radionuclides. One bounding strategy for treatment of the sludges involves performing a minimum amount of pretreatment and vitrifying the bulk of the waste. This minimizes the capital cost of pretreatment facilities. Testing is needed to verify that proposed processes and equipment will perform as expected to provide the desired separation factors and processing capacities. Simulated waste with radioactive spikes and actual waste will be tested.

3. **What Hazardous Wastes Will Be Introduced to the Process:** The waste to be tested should be classified as RCRA hazardous waste and may include some listed waste and some dangerous waste. Specific information on the components of the waste will be available as technologies are selected during development work. The waste is anticipated to be sludge in character.

4. **What Waste Streams Will Be Produced:** The waste stream produced is anticipated to have essentially the same characteristics as discussed under heading Number 3. An additional waste stream(s) may be produced in association with the pretreatment processes.

5. **Location Details:** The pilot scale process will be housed in an existing or new facility depending on suitability and availability of locations.

6. **Timetable:** Construction is desired to be initiated in October 1996. The capability to perform tests using WHC simulated and actual tank waste is desired starting in October 1998.

7. **Possible Permit Options:** Dependent upon volume, it is possible that this work could be covered as a small-scale treatability study or under a RD&D permit. This activity is an example of a progressive development activity that may involve several scales as technology development proceeds.

8. **Westinghouse Hanford Company Contact:** R. C. Bowman, (509) 376-4876.

6H-4274.185

RD&D Project Description Format
RCRA Permitting Strategy Project

Company Westinghouse Hanford Company

Project Title Waste Water Pilot Plant (WWPP)

Organization Liquid Effluents, Liquid Waste Disposal

1. **Summary Description of the Technology and Application:** This activity is being conducted to perform pilot-scale treatability testing of the 242-A Evaporator process condensate. Testing of mixed and dangerous waste will be conducted in the 1706-KE Building. The initial set of tests will address individual treatment technologies; later tests will link the technologies together in a manner that simulates the flowsheet of a proposed treatment system. The types of technologies that will be tested in the WWPP include pH adjustment, organic removal (e.g., reverse osmosis and ion exchange), and suspended solids removal (e.g., filtration). Waste will be transported to and from the 1706-KE Building by two 18,927 liter tanker trucks. Limited filtration testing of mixed waste will be conducted at the Liquid Effluent Retention Facility (LERF). The LERF receives process condensate from the 242-A Evaporator.

2. **Purpose, Experimental Design, and Ultimate Performance Goals:** One of the first waste water treatment systems to be constructed on the Hanford Site is the 200 Area Effluent Treatment Facility (ETF). The ETF will treat process condensate from the 242-A Evaporator and possibly other waste streams. The design of the ETF system will need to be tested to verify that the treatment methods selected are effective. Testing usually will be performed in two phases: the first phase will use synthetic waste and the second phase will use actual waste that might be a dangerous or a mixed waste. The throughput of any operation at the WWPP will be nominally 19 liters per minute which is the equivalent to 1,136 liters per hour. The test program will be structured to accommodate up to one 18,927 liter batch per week (75,708 liters per month). Testing will be used to evaluate treatment technologies needed to attain soil discharge conditions set forth in a delisting petition submitted to the U.S. Environmental Protection Agency.

3. **What Hazardous Wastes Will Be Introduced to the Process:** The 242-A Evaporator process condensate stream will be the waste tested in the WWPP. Constituents can be classified as suspended solids, organics, and dissolved solids. Suspended solids include colloids, grit, and organic debris (e.g., algae). Organics include compounds such as acetone, butanol, methyl isobutyl ketone, methylene chloride, and tributyl phosphate. Dissolved solids include inorganics and radionuclides.

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4. **What Waste Streams Will Be Produced:** The waste stream produced is anticipated to have essentially the same characteristics as discussed under heading Number 3.

5. **Location Details:** The Waste Water Pilot Plant is located in 1706-K East.

6. **Timetable:** The projected start-up date is February 1994.

7. **Possible Permit Options:** A draft RD&D permit for the WWPP is scheduled to be issued for public comment in the fall of 1993.

8. **Westinghouse Hanford Company Contact:** R. C. Bowman, (509) 376-4876.

9W3273.187

RD&D Project Description Format
RCRA Permitting Strategy Project

Company Westinghouse Hanford Company

Project Title Co-disposal

Organization Waste Minimization, and Environmental Restoration

1. **Summary Description of the Technology and Application:** The Technology Development Department has developed a waste minimization concept termed "co-disposal" that will use various forms of solidified waste material for purposes of stabilization. The material would be used primarily as a void fill in packages and containers prior to disposal; void fill of vaults, caissons, and other facilities prior to disposal; and as a backfill instead of clean soil in landfills and trenches during disposal. The solidified waste material will be tested and qualified using appropriate/applicable performance standards, including TCLP, compressive strength, phase separation, bio-degradation, etc. A phased approach that includes pilot scale testing and qualification of waste material formulations in the laboratory, limited scale cold and hot field testing, and appropriate engineering mock-up testing is envisioned.

2. **Purpose, Experimental Design, and Ultimate Performance Goals:** The objective of the test program is to demonstrate the ability to produce a stable waste formulation for the application of co-disposal using sediment fines from the 100 and 300 Areas remediation activities. In addition, the development of specific waste formulations that blend waste materials from other waste streams into acceptable products that can be disposed will be pursued. In so doing, contaminated sediments will be mixed or blended with bonding agents (cementitious material, polymers, etc.) to form stable/solidified waste forms. A test plan is being prepared that will use contaminated bi-products form the 100 and/or 300 Areas soil wash demonstration (100-DR-1100-FR-1300-FF-1), along with purge water, and power plant ash (bottom fly) to prepare these formulations. Laboratory testing and pilot scale demonstrations are included within the scope of this treatability test plan. The goal is to produce formulations/waste forms that satisfy a litany of acceptance tests and testing protocols that presently exist, i.e., compressive strength, bleed water, paint filter, TCLP, radiation degradation, immersion, etc.

3. **What Hazardous Wastes Will Be Introduced to the Process:** Testing will be conducted using 20-kilogram batches of material. Material from various waste streams that exist across the Hanford Site will be used. Constituents will more than likely include small quantities of inorganic hazardous materials, primarily metals, and low-level radioactivity. Testing with radioactive material will be performed in certified laboratories such as the 377 Building. Disposal of waste material will comply with existing Hanford Site requirements.

DW 377-188

4. **What Waste Streams Will Be Produced:** The waste stream produced is anticipated to have essentially the same characteristics as discussed under heading Number 3.

5. **Location Details:** Testing will be located in the 377 Building Laboratory.

6. **Timetable:** Laboratory testing, and pilot-scale testing in support of soil wash demonstrations is scheduled during the first half of FY 1994. Engineering scale "hot demonstration" is anticipated during FY 1995.

7. **Possible Permit Options:** Dependent upon volume, it is possible that this work could be covered as a small-scale treatability study or under a RD&D permit. This activity is an example of a progressive development activity that may involve several scales as technology development proceeds.

8. **Westinghouse Hanford Company Contact:** R. C. Bowman, (509) 376-4876.

9H4273.189

RD&D Project Description Format
RCRA Permitting Strategy Project

Company Westinghouse Hanford Company

Project Title In Situ Chemical Treatment

Organization Technical Integration, and Environmental Engineering Support

1. **Summary Description of the Technology and Application:** Testing and field demonstration activities are to be conducted to evaluate the in situ chemical treatment of contaminated soils and groundwater. This approach is based on the ability of certain chemical agents to reduce and/or immobilize metal and radionuclide constituents (e.g., hexavalent chromium and uranium). This approach would be applied by introduction of the agent in the form of a gas or solution to a region of contaminated soil or to an aquifer. The metal or radionuclide contaminant is then immobilized by precipitation and thus migration from the site or through the aquifer is eliminated.

2. **Purpose, Experimental Design, and Ultimate Performance Goals:** A number of waste sites are located at DOE and industrial facilities that contain soils contaminated with hexavalent chromium and uranium. These constituents are also frequently found in associated aquifers that have become contaminated as a result of the leaching of these contaminants from the waste sites. These constituents are relatively mobile in the oxidized state but potentially less mobile in the reduced state or in the presence of certain chemical constituents. Thus introduction of treatment or reducing chemical agents to the soils or aquifers is a means of potentially immobilizing the contaminants. Laboratory bench scale tests have been completed that demonstrate the viability of this approach. Future developmental activities include additional laboratory tests and field demonstrations. Tests will include synthetic waste and actual chemical/radioactive contaminated soils and groundwaters. The laboratory waste is anticipated to be of low volume and of low concentration or radiation levels. A field demonstration of soil treatment is anticipated to take place within several years. This demonstration will involve the use of hazardous chemical agents (gases), but is not anticipated to generate waste since the treatment gases will be purged from the soils after reactions have reached completion. The performance goal of these testing activities is to demonstrate that an acceptable level of immobilization can be attained (based on solution concentrations relative to, for example, drinking water standards or TCLP guidelines).

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3. **What Hazardous Wastes Will Be Introduced to the Process:** Laboratory testing activities involve soils or groundwater contaminated with metals and radionuclides at low concentrations and must be disposed of as waste after treatment. In some cases the treated materials are less hazardous than the original contaminated media. The treatment process does not increase the hazardous properties of the media. The field demonstrations are not anticipated to result in the generation of waste.

4. **What Waste Streams Will Be Produced:** The waste stream produced is anticipated to have essentially the same characteristics as discussed under heading Number 3.

5. **Location Details:** The field testing location has not yet been determined.

6. **Timetable:** Laboratory testing activities are underway using nonhazardous materials and will continue for at least several years. A field demonstration could take place as early as FY 1995.

7. **Possible Permit Options:** Dependent upon volume, it is possible that this work could be covered as a small-scale treatability study or under a RD&D permit. This activity is an example of a progressive development activity that may involve several scales as technology development proceeds.

8. **Westinghouse Hanford Company Contact:** R. C. Bowman, (509) 376-4876.

9413273.1191

RD&D Project Description Format
RCRA Permitting Strategy Project

Company Westinghouse Hanford Company

Project Title Z-9 Decontamination

Organization Operation & Transition Programs/Plutonium Process Support Laboratories

1. **Summary Description of the Technology and Application:** The Plutonium Process Support Laboratories (PPSL) has demonstrated that silver persulfate is a very effective dissolvent leachant for plutonium bearing materials, either as concentrated plutonium materials or as plutonium dispersed in other bulk materials. It was proposed that the "process" be applied to "Z-9 soil". The Z-9 soil is the soil which as "mined" from the Z-9 crib about fifteen years ago to alleviate a possible criticality hazard from contained plutonium. The soil from the mining of the crib, which was completed in July 1978, was placed into 653 fifty five gallon drums. On the basis of nondestructive assay measurements, it was determined that the drums contained 58 kilograms of plutonium.

2. **Purpose, Experimental Design, and Ultimate Performance Goals:** A program was initiated in FY 1991 to process Z-9 soil to yield a plutonium-rich material suitable for recovery processing and/or long term storage, and a non-transuranic (TRU) residue which could be directly buried at the Hanford site. The PPSL laboratory work was limited to a single small (one pound) sample of Z-9 soil, the only sample available. Material availability has limited the work completed thus far.

   Work would include, but not be limited to: material characteristic determination, e.g., Pu content and distribution, particle size distribution, etc.; processing temperature; number of contact leaching; material pretreatment; material post-treatment; affect of leachant quality; material comminution during leaching, etc. The initial goal was to demonstrate decontamination of one drum of soil in the period ending September 30, 1991. The ultimate goal would conclude with the development of a pilot plant capable of processing all 653 drums, plus additional soil if mined. To date, no drums have been retrieved; consequently, material availability is non-existent.

3. **What Hazardous Wastes Will Be Introduced to the Process:** The total throughput rate is designed for 1-fifty five gallon drum, at 10 liters per day (< 50 kg/day, dependant upon specific gravity) when operating. The project is scheduled to last one year. If successful, only two material streams are currently anticipated in the silver persulfate process: the plutonium rich "product" stream, and; the non-TRU waste stream. This cleansing/reclamation process would be less costly than disposing the Pu contaminated soil via the Waste Isolation Pilot Plant.

4. **What Waste Streams Will Be Produced:** The waste stream produced is anticipated to have essentially the same characteristics as discussed under heading Number 3.

5. **Location Details:** Z Plant, 200 West Area, Building 2345, Glovebox 46.

6. **Timetable:** The timetable is dependent on the waste drum retrieval schedule.

7. **Possible Permit Options:** If the Z-9 soil is regulated as a dangerous waste upon excavation, the Small-scale Treatability Study or the RD&D permit are considered to be viable options.

8. **Westinghouse Hanford Company Contact:** R. C. Bowman, (509) 376-4876.

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PROJECTS BY PERMIT OPTION AND PROGRAM

PROGRAM TECHNOLOGY	LOCATION OF THE EXPERIMENT (NOW)	KG WASTE/ STUDY (NOW)	LOCATION OF THE EXPERIMENT (FUTURE)	KG WASTE/ STUDY (FUTURE)
PERMIT OPTION: Part B				
Initial Pretreatment Module				
Compact Processing Unit	NA	NA	200 East Area	NA
Initial Pretreatment Module				
Hot Test Facility	NA	NA	200 East Area	NA
PERMIT OPTION: RD&D				
Process Labs and Technology				
Waste Water Pilot Plant (WWPP)	NA	NA	1706-K East	NA
PERMIT OPTION: RD&D/Treatability Study				
Pretreatment Development				
Supernate/Saltcake Pretreatment Process Non-Radioactive Pilot Plant	NA	NA	TBD	NA
Pretreatment Development				
Solvent Extraction Non-Radioactive Pilot Plant	NA	NA	TBD	NA

PROJECTS BY PERMIT OPTION AND PROGRAM

PROGRAM TECHNOLOGY	LOCATION OF THE EXPERIMENT (NOW)	KG WASTE/ STUDY (NOW)	LOCATION OF THE EXPERIMENT (FUTURE)	KG WASTE/ STUDY (FUTURE)
PERMIT OPTION: RD&D/Treatability Study				
Pretreatment Development				
Non-Solvent Extraction Pretreatment Process Non-Radioactive Pilot Plant	NA	NA	TBD	NA
Pretreatment Development				
Extensive Separations Radioactive Pilot Plant	NA	NA	TBD	NA
Pretreatment Development				
Minimum Sludge Separations Radioactive Pilot Plant	NA	NA	TBD	NA
Waste Minimization				
Co-disposal	NA	NA	337	NA
Office of Technical Integration				
In Situ Chemical Treatment	NA	NA	TBD	NA
Plutonium Process Support				
Z-9 Decontamination	NA	NA	Z Plant, 200 West	NA
Pretreatment Development				
Minimum Sludge Separations Process Development	NA	NA	TBD	NA
Pretreatment Development				
Non-Radioactive In-Tank Processing Pilot Plant	NA	NA	TBD	NA

PROJECTS BY PERMIT OPTION AND PROGRAM

PROGRAM TECHNOLOGY	LOCATION OF THE EXPERIMENT (NOW)	KG WASTE/ STUDY (NOW)	LOCATION OF THE EXPERIMENT (FUTURE)	KG WASTE/ STUDY (FUTURE)
PERMIT OPTION: Treatability Study				
Pretreatment Development Radionuclide Separations Technology Development	NA	NA	222-S	NA
Pretreatment Development Organic Destruction Process Technology Development	NA	NA	222-S	NA
Pretreatment Development Supernate/Saltcake Pretreatment Process Technology Development	NA	NA	TBD	NA

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