DECLARATION FOR THE AMENDMENT TO THE RECORD OF DECISION

SITE NAME AND LOCATION

The Aluminum Company of America (ALCOA)
Massena Operations
Massena, New York

OPERABLE UNITS/AREAS OF CONCERN:

Soluble Oil Lagoon, Site NO. 6-45-005, OU No. 3, ALCOA Massena Operations, Massena, New York.

STATEMENT OF BASIS AND PURPOSE

This Amendment to the Record of Decision (ROD) presents the selected remedial actions for the above-listed ALCOA site developed in accordance with the New York State Environmental Conservation Law (ECL) and Technical Administrative Guidance Memoranda 4059. It is consistent with the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), 42 USL Section 9601, et seq., as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA). Section IX of the original ROD lists the documents that comprise the Administrative Records for the ALCOA site. The documents in the Administrative Records and the attached Amendment to the ROD are the basis for the selected remedial action.

ASSESSMENT OF THE SITE

Actual or threatened releases of hazardous substances from this site, if not addressed by implementing the response actions selected in this ROD, present a current or potential threat to public health, welfare and the environment.

DESCRIPTION OF THE AMENDMENT OF THE RECORD OF DECISION

The ROD amendment provides for treating the hydrogen gas generating soluble oil lagoon sludges with calcium sulfate, and treatment of other sludge with cement. Liberated volatile organic compounds will be collected and treated. The treated sludge will be placed in the on-site Secure Landfill constructed and operated specifically for remediation waste and treated residues.

The amendment will allow ALCOA to use this process to treat PCB contaminated materials in leiu of any of the remedies previously specified in the original Record of Decisions (ROD), such as solvent extraction or anaerobic thermal treatment process (ATP).

DECLARATION

This amendment to the ROD will be protective of human health and the environment, and will comply with applicable State Environmental Quality Standards and the Commissioner's Organization and Delegation memorandum 95-24. This amendment will satisfy the Department's preference for treatment of hazardous waste to reduce its toxicity, mobility, and/or volume.

5/18/00
DATE

Michael J. O'Toole, Jr.
Director
Division of Environmental Remediation

Department of Environmental Conservation

Division of Environmental Remediation

ALCOA - SOLUBLE OIL LAGOON
TOWN OF MASSENA, ST. LAWRENCE COUNTY, NEW YORK
Site No. 6-45-005, Operable Unit No. 3
April 30, 2000

AMENDMENT TO THE RECORD OF DECISION

Contents

List of Tables

Table

List of Figures

Figure

Section 1
Introduction

This amendment to the Record of Decision (ROD) for the Soluble Oil Lagoon (SOL) remediation at the Alcoa Inc., Massena, New York facility is based on new and significant information that has an impact on essential parts of the remedy. A number of changes have occurred since the March 1991 ROD was written that make an amendment to the ROD appropriate at this time. The information that lead to this ROD Amendment includes:

1. new site characterization data, including identification of a new health and safety threat of hydrogen gas generation posed by the waste materials in the sludge. This threat must be addressed first before any other material handling;

2. regulatory changes, including the 1998 changes to Toxic Substances Control Act (TSCA) (Volume 63 Federal Register [FR], page 35383, Disposal of Polychlorinated Biphenyls [PCBs]; Final Rule) and changes to the Resource Conservation and Recovery Act (RCRA) regulations since the ROD was signed; and

3. the ROD treatment technologies in their current form(s) are incompatible with the newly-identified hydrogen gas problem. An alternative treatment technology has been identified for treating the SOL materials. This alternative technology performs in a manner equivalent to the thermal treatment process for the removal of volatile organic compounds (VOCs) and is more cost-effective.

The existing ROD, as previously amended, calls for Anaerobic Thermal Process (ATP) treatment, with disposal of treated residuals in the Secure On-site Landfill.

The ROD Amendment remedial action plan provides for initially treating the hydrogen gas generating materials with calcium sulfate and the non-hydrogen gas generating materials with cement. During the in situ calcium sulfate/cement treatment process, mechanical aeration and heat from the exothermic reactions liberate VOCs to the air stream. Off-gases from the calcium sulfate/cement treatment process will be collected and treated. The treated materials will be excavated and placed in the onsite Secure Landfill (SLF). Confirmatory sampling will be performed to demonstrate that cleanup goals have been satisfied. Upon completion of excavation activities, the area will be backfilled and capped.

This ROD Amendment has been prepared in accordance with Technical and Administration Guidance Memorandum (TAGM) 4059, *Making Changes to Selected Remedies* (NYSDEC, May 4, 1998).

This Record of Decision change is available at the following locations for public review, from 8:00 AM to 4:00 PM:

NYSDEC - Region 6 Headquarters
Dulles State Office Building
317 Washington Street
Watertown, NY 13601
Phone: 315-785-2513

NYSDEC - ALCOA Field Office
Massena Operations
Building 65
Massena, NY 13662
Phone: 315-764-4581

Section 2
Site Location and Description

2.1 Site Location

Alcoa's Massena facility comprises over 2,700 acres in the Town of Massena, St. Lawrence County, New York, just north of New York State Route 37. The facility, which manufactures a variety of aluminum products, consists of a fabricating area (Area I), an ingot-extrusion area (Area II), and a smelting area (Area III). Significant features near the facility include the St. Lawrence River to the north, the Massena Power Canal to the west, and the Grasse River to the south. The village of Massena is west and south of the plant.

The NYSDEC issued a Record of Decision (ROD) for eight inactive hazardous waste sites in January 1991. The Soluble Oil Lagoon (SOL) site was included in the January 1991 ROD. A second ROD was signed in January 1992 for six additional sites. Since commencing remediation activities in 1991 for these 14 sites, four additional sites have been listed bringing the total number of inactive hazardous waste sites to 18 at the Massena facility. Alcoa has been actively implementing the remediation work since 1991 and to date has completed 14 site remedial action programs.

2.2 Site Description

The SOL is identified as Site No. 645005, Operable Unit 1 on the NYSDEC Registry of Inactive Hazardous Waste Sites. The SOL is located roughly in the center of the Massena facility, in an area referred to as the Central Valley. The SOL is bounded by the Central Impoundment (formerly the Sanitary Lagoon) to the north, the former Waste Lubricating Oil Lagoon (WLOL) to the east (remediation completed in 1997), an abandoned railroad spur to the south, and the former East Marsh to the west (remediation completed in 1994). Area I, Alcoa's fabricating area, is approximately 800 feet south of the SOL.

The SOL was operated from 1959 to 1986 as a disposal lagoon for waste oils, process water, spent caustics (sodium hydroxide), acids, wax emulsions, and chlorinated solvents.

The SOL is approximately 2.8 acres in size, a rectangular area measuring roughly 200 feet by 600 feet. The lagoon is divided by an earthen dike into an east cell and a west cell, both of which are surrounded by unpaved roads. The two cells contain a combined total of approximately 13,300 cubic yards (yd^3) of sludge, including 7,800 yd^3 in the east cell and 5,500 yd^3 in the west cell. The sludge material, based on physical properties testing performed during the feasibility study, can be described as watery (38 - 46 percent solids), oily (oil and grease concentrations ranging from 2 - 11 percent), alkaline (pH values 10.6 - 11.6), and exhibiting low density (bulk density of 69 lbs/ft^3). The contaminants of concern identified in the ROD included PCBs, phenols, VOCs, heavy metals and ammonia.

The unlined SOL was created by constructing earthen berms overlying the natural clays found in the Central Valley. The lagoon is underlain by Stratum IIA-L, lacustrine clay that ranges in thickness from about 2.0 to 6.7 feet in this vicinity. Below the lacustrine clay is Stratum IIA-M, a marine clay, which ranges from 14 to 39 feet in thickness. Vertical hydraulic conductivities in this underlying marine clay are quite low, and have been measured to range from 9.3×10^{-8} cm/sec to 1.0×10^{-7} cm/sec.

2.3 Nature and Extent of Contamination

Several site investigations were performed at the SOL prior to developing the ROD. These studies documented the presence of various compounds in sludge, soil, and groundwater in the area of the SOL, some of which exceed the relevant regulatory thresholds. The 1991 ROD was based on data collected during the Waste Site Investigation in 1986 and 1987. After the issuance of the ROD, a pre-design sampling and analysis program was conducted in 1992. This program focused on characterizing the underlying soils and groundwater rather than sludges. Concurrent with the sampling efforts, studies were performed by treatment technology vendors from 1992 to 1994. Additional characterization of the sludges was performed as part of bench-scale treatment studies in 1997, 1998 and 1999. The draft Conceptual Design Report (CDM, April 1999) presented the results of site investigations of the sludges, the soils, sediments from the nearby railroad drainage channel, and groundwater in the vicinity of the SOL.

2.4 Waste Material (Sludge)

Both the east and west cells of the SOL contain grey/black, fine grained sludges with small whitish granular solids. The sludges are the product of settled solids from waste oils and wastewater solutions from the rolling mills and saw operations, spent caustics, acid solutions, and spent wax emulsions. Site investigations performed prior to the ROD in 1987, identified sludge thicknesses ranging from 2.5-to 4.1-feet, with an average of 3.4 feet, in the east cell; and thicknesses of 1.8 feet to greater than 3.0 feet, with an average of 2.5 feet, in the west cell. Ten borings advanced in the lagoon in 1992 after the ROD measured sludge thicknesses ranging from 0.8-to 7.0-feet. The lagoon sludge thickness was altered in 1997 when a portion of the sludges in the east cell was consolidated to the west cell of the SOL. Due to this action, the sludge thicknesses have changed from what was reported in the ROD.

Chemical analyses were performed on the sludge during the 1987 site investigation and the 1997 and 1998 treatability studies. Pre-ROD testing in 1987 identified exceedances of the ROD cleanup goals for PCBs (up to 33,000 mg/kg), tetrachloroethylene (PCE) (up to 4 mg/kg), trichloroethylene (TCE) (up to 650 mg/kg), toluene (up to 2.4 mg/kg), and xylenes (up to 3.5 mg/kg). Post-ROD sludge characterization conducted during the treatability tests included analyses for PCBs, VOCs, polycyclic aromatic hydrocarbons (PAHs), phenols and RCRA metals. PCBs ranged in concentration from 86 to 2,400 mg/kg. Total PAH concentrations ranged from 11 to 53 mg/kg. TCE ranged in concentration from 0.99 to 630 mg/kg. Sludge samples had 1,1,1-trichloroethane (1,1,1-TCA) concentrations of up to 100 mg/kg. Cresols were measured at concentrations of up to 28 mg/kg. Concentrations of 1,2-dichloroethylene (1,2-DCE) ranged from nondetect to 330 mg/kg. Lead concentrations ranged from 175 to 575 mg/kg.

2.5 Results of 1990 RI/FS and Proposed Remediation Action Plan (PRAP)

A Feasibility Study (Engineering-Science, September 1990) was conducted to evaluate various response actions in terms of their ability to meet the established remedial action objectives. Five general response actions were considered: No Action, Containment (control and isolation), Source Removal (excavation), Treatment, and Disposal. These general response actions were used to identify and screen various remedial technologies that could meet the remedial objectives. Candidate technologies were then evaluated on their technical implementability.

Following this initial evaluation, process options were identified for the remaining technologies. These options were screened for effectiveness and implementability to select a single process option for each technology. The remaining technologies and process options were then assembled into remedial alternatives. For the SOL, four alternatives remained following these screenings: (1) No Action with long-term monitoring; (2) Dewater, Solidification, Slurry Wall, Cap, Treatment, Leachate Collection and Treatment, and Groundwater Recovery and Treatment; (3a) Excavation, Incineration, and Groundwater Recovery and Treatment; and (3b) Excavation, Solvent Extraction and Groundwater Recovery and Treatment.

A detailed analysis was then performed on these four remedial alternatives. The detailed analysis considered seven criteria:

1. Short-Term Impacts and Effectiveness
2. Long-Term Effectiveness and Permanence
3. Reduction of Toxicity, Mobility or Volume
4. Implementability
5. Compliance with Applicable or Relevant and Appropriate Requirements (ARARs)
6. Overall Protection of Human Health and the Environment
7. Cost

2.6 Remedy Selected in the ROD

Following the completion of the detailed analysis, the NYSDEC recommended that the SOL be remediated according to Alternative 3b - Excavation, Solvent Extraction and Groundwater Recovery and Treatment. Under this approach, the wastewater in the SOL would be treated at the existing treatment plant; the sludge and underlying soils would be excavated and treated by solvent extraction; the concentrated oil stream produced by the solvent extraction process would be incinerated offsite; and the treated soils would be placed in an onsite vault. Confirmatory sampling would be conducted following excavation to determine if the cleanup goals had been reached. The final step would include backfilling and capping the SOL. Groundwater recovery and treatment was not included in the initial feasibility study but was to be evaluated in a follow-up feasibility study.

The following rationale was provided by NYSDEC to justify the selection of Alternative 3b:

1. This alternative results in permanent treatment. Technologies that result in a permanent reduction in the toxicity, mobility, or volume of the wastes are preferred over non-permanent approaches per NYSDEC policy and the federal Superfund Amendments and Reauthorization Act (SARA) of 1986.

2. In-place solidification/stabilization has not proven effective at this site, making excavation and treatment a more effective option.

3. The alternative would not pose short-term risks to the community.

4. The approach is administratively and technically feasible (although further testing is required for solvent extraction).

5. The alternative complies with ARARs, assuming solvent extraction meets the treatment standards.

6. The alternative provides overall protection of human health and the environment.

2.7 1994 ROD Amendment

In 1994, an amendment to the ROD was issued by NYSDEC to add anaerobic thermal treatment process (ATP) for treatment of PCB contaminated materials as an option to the solvent extraction process specified in the 1991 ROD.

Section 3
Basis for ROD Amendment

Subsequent to the issuance of the March 1991 ROD and the 1994 ROD Amendment, Alcoa has obtained new and significant information that will impact essential parts of the previously selected remedy. The new and significant information includes:

- The 1998 TSCA Final Rule for disposal of PCB remediation wastes provides additional technology disposal methods that were not considered when the ROD was issued in 1991.
- New characterization data on the waste materials has determined that under alkaline conditions which are present in the SOL, the sludge has the potential to generate hydrogen gas. This poses a serious health and safety risk which must be addressed before any other steps are taken to manage the sludges.
- The ROD-specified treatment technologies cannot be implemented in their current configuration(s) because of the hydrogen gas problem. Also, there are problems/limitations with the availability of vendors offering these technologies. However, an alternative technology developed to effectively treat the hydrogen gas problem can be implemented in a manner that provides equivalent treatment of the SOL materials.

A brief description of each of these factors which form the basis for a ROD Amendment is included in the following subsections.

3.1 Current TSCA Regulations

On June 29, 1998, the EPA amended its TSCA rules governing the disposal of PCB wastes (63 FR 35383). Prior to these regulatory changes, the SOL materials were classified as industrial sludges with PCB content greater than 500 mg/kg. EPA policy required these sludges to be treated to the equivalent of incineration, reducing the PCB content to 2 mg/kg, prior to disposal in a TSCA-approved landfill. Under the current TSCA regulations, the SOL materials would be defined as a PCB Remediation Waste (40 CFR 761.3) and must be disposed of in accordance with 40 CFR 761.61. The 40 CFR 761.61 regulations provide for disposal of PCB remediation waste in a chemical waste landfill approved for disposal of PCBs in accordance with 40 CFR 761.75 regardless of PCB concentration. This disposal option was not available when the 1991 ROD was issued, and therefore has an impact on the scope of the remedy.

3.2 Hydrogen Gas Risk

While consolidating sludges from the east cell to the west cell of the SOL in August 1997, a brief flash fire occurred which lead to the need for further characterization of the SOL materials. A subsequent waste characterization program determined that the SOL sludges have the potential to generate highly explosive and flammable hydrogen gas. Hydrogen gas is a serious health and safety risk that was not known or addressed in the 1991 ROD or 1994 ROD Amendment. The hydrogen gas generation potential of the waste is a newly identified threat, and the scope of the remedial technology must be changed to control or eliminate the health and safety risk posed by the hydrogen gas.

3.3 Treatment Technology Applicability

The hazardous waste industry has been maturing with consolidation of many treatment technology vendors. SoilTech which was the exclusive US licensee of the ATP process, was purchased by Smith Technologies who filed for bankruptcy protection in 1997 under Chapter 11. No vendors are currently offering the ATP process in the US. Even if this thermal treatment technology were available, it may not be usable or would have to be significantly modified because of the hydrogen gas problem described above. Indirect fired thermal treatment processes offered by other vendors would also require similar alterations to address the hydrogen gas risks.

The Resource Conservation Company (RCC) solvent extraction process that served as the basis for the 1991 ROD remedy has been acquired by Ionics, Inc. RCC has still never implemented this technology on a full-scale basis. While the RCC process was pilot-scaled using SOL sludges, there were a number of process related concerns which led Alcoa to search for a more reliable technology. After extensive search, Alcoa explored the ATP process and secured a ROD amendment to allow its use.

Along with the additional waste characterization studies, treatability studies were completed to identify technologies to reduce and/or eliminate the hydrogen gas hazard. Testing results show that calcium sulfate treatment (at dosages of up to 30 percent by wet weight) was effective in preventing the generation of hydrogen gas from the sludges. This treatment technology also solidified the sludges and reduced VOC concentrations as a result of mechanical aeration and heat from the exothermic reaction. The amended remedial plan will collect and treat these VOC off-gases.

Section 4
Description of the Significant Differences and the Basis for the Differences

TAGM 4059 (NYSDEC, May 4, 1998) states that ROD Amendments are appropriate when new and significant information has become available (i.e., since the ROD was issued) that substantially supports the need to alter the remedy. In the case of the SOL, significant new information regarding the PCB regulatory requirements for treatment and disposal of the waste has become available since the ROD was amended in 1994. In addition to regulatory changes, new and significant information on the waste characteristics has been discovered. There have also been changes over the past several years to the availability of treatment technologies identified in the ROD.

The key justifications for amending the ROD, which were briefly presented in Section 3, are explained in detail below.

4.1 Land Disposal of SOL PCB-Containing Materials No Longer Prohibited

Modifications to TSCA constitute new and significant information that suggest revisiting of portions of the SOL remedial action plan. When the ROD was originally published, TSCA policy required that industrial sludges containing PCBs at 500 mg/kg or greater be incinerated or receive treatment equivalent to incineration. TSCA was amended on June 29, 1998, with the addition of a new section (40 CFR 761.61) to address PCB remediation wastes. This section allows industrial sludges that are included in the definition of "PCB Remediation Wastes" (40 CFR 761.3) to be disposed of in a permitted chemical waste landfill (40 CFR 761.75).

The original TSCA policy requiring treatment of PCBs in industrial sludges was a primary regulatory rationale of the remedial action plan selected in the ROD. The changes to TSCA remove this rationale, thereby permitting disposal of the SOL materials in the SLF without treatment of the PCBs. Because there no longer exists a regulatory requirement under TSCA for incineration, solvent extraction, ATP, or other equivalent treatment of the SOL wastes, it is appropriate to reconsider portions of the remedy selected for the SOL.

4.2 Newly Identified Threat of Hydrogen Gas

In 1997, Alcoa became aware of significant health and safety issues related to the waste material in the SOL, which warranted a re-evaluation of the approved remediation methodology. In August 1997, the Waste Lubricating Oil Lagoon (WLOL), which is adjacent to the SOL, was being excavated as part of its remediation program. To prevent liquid waste from the SOL from infiltrating into the WLOL, and as a way to enhance natural dewatering of the SOL sludge, wastes from the east cell of the SOL were being consolidated to the west cell of the SOL. During this sludge consolidation effort, a brief flash fire occurred.

A series of investigations conducted during 1997, 1998, and 1999 determined that aluminum fines, in the presence of caustic conditions, can cause the generation and release of hydrogen gas. The following chemical formula is a simplified representation of the reaction (aluminum plus sodium hydroxide and water yields sodium aluminate and hydrogen):

$$Al + NaOH + H_2O \dashrightarrow NaAlO_2 + 1.5\ H_2(g)$$

The SOL wastes contain many additional constituents that may add to and/or alter the simplified reaction shown above.

Test results have shown that portions of the SOL sludges can produce up to 50 liters of hydrogen gas per kilogram of sludge. While the additional waste characterization data indicates that the hydrogen generating sludges are primarily located in the east cell of the SOL, the heterogeneous nature of the waste necessitates that contingency plans be in place at any location where additives other than calcium sulfate are used.

Hydrogen is a highly explosive and flammable gas that poses a significant risk of serious injury or death if present in concentrations in the explosive range, which can occur if the sludges are not handled properly. The hydrogen gas generation potential of this waste is a newly identified threat, which must be addressed in a responsible manner. The ROD selected treatment technologies (solvent extraction and ATP) both agitate and heat the sludge which would exacerbate the hydrogen generation problem and lead to unsafe conditions unless specific alterations/modifications were made in the treatment processes.

Alcoa conducted treatability tests in 1997, 1998 and 1999 to identify treatment technologies that could effectively address the hydrogen gas risk. Technologies considered in the evaluation included chemical treatment, pH adjustment, oxidation and encapsulation. These studies determined that calcium sulfate treatment functions as an effective agent to minimize or eliminate the potential for hydrogen gas generation by binding the water before it has a chance to react with the aluminum to form hydrogen. Thus, calcium sulfate provides a remedial treatment technology that safely and effectively addresses the hydrogen gas threat posed by SOL materials.

The calcium sulfate treatment technology also provides two other significant benefits. Calcium sulfate treatment improves the handling characteristics and strength properties of the sludge. Calcium sulfate treatment also reduces VOC concentrations because of the release of VOCs to the air as a result of mechanical aeration and heat from exothermic reactions. The amended remedy will include steps to collect and treat VOC off-gases.

4.3 Treatment Technologies

The remedial technology identified in the 1991 ROD, solvent extraction offered by RCC, a division of Ionics, Inc., has still not been implemented on a full-scale basis and would have to be re-evaluated to determine if it is still viable with the hydrogen gas conditions posed by the SOL materials. The remedial technology identified in the 1994 ROD Amendment, ATP, is not currently offered by a treatment technology vendor in the US. SoilTech had an exclusive US license for the ATP technology and has since gone into bankruptcy. While there are a few other indirect fired thermal treatment vendors who offer similar processes, their viability for handling the hydrogen gas hazard would have to be determined.

The lack of commercialization of the solvent extraction and ATP processes severely undermines the cost effectiveness of the ROD remedial action plan. If further consideration were to be given to the solvent extraction and ATP processes, it would require that they be tested at the bench-scale and pilot-scale to evaluate their viability when handling the hydrogen gas generating sludge material in the SOL. It is believed that previous pilot-scale testing was not adequate to be certain that hydrogen generation will not cause significant, potentially catastrophic, disruptions during the treatment process.

Calcium sulfate treatment was amended as an alternative to the treatment technologies identified in the ROD. Not only does calcium sulfate treatment effectively address the newly-identified hydrogen gas hazard as described above, but it also results in VOC reductions in a manner equivalent to thermal treatment by transferring the VOCs from the solids to the air phase where they can be collected and treated.

4.4 Other Supporting Factors

Amendments to the ROD for SOL remediation must comply with the substantive requirements of current RCRA regulations governing the handling, management and disposal of hazardous wastes. The remediation program regulated by 6 NYCRR Part 375, the LDRs (6 NYCRR 376), and the disposal facility requirements under 6 NYCRR 373-2, call for treatment technologies to be considered in the decision making process. The ROD Amendment includes a specific VOC treatment process in the remedy, thereby addressing the RCRA preference for permanent treatment technologies for F001 wastes. Therefore, the ROD Amendment can be accomplished in compliance with the substantive requirements of RCRA.

Section 5
Amended Remedial Action Plan

5.1 Description of the Amended Remedy

Based on the new and significant information described in Section 3 and Section 4, Alcoa has requested that the ROD be amended with the following remedial action plan for the SOL:

Initially, the wastewater will be decanted and treated to satisfy the facility's discharge requirements. Sludges that have the potential to generate hydrogen gas will be treated with calcium sulfate and non-hydrogen gas generating areas will be treated with cement. During the in situ treatment process, VOC off-gases will be collected and treated in accordance with New York State air requirements. The treated materials will be excavated and placed in the onsite SLF. Any vapor phase treatment residuals would be properly disposed of. Confirmatory sampling will be performed after the initial excavation to determine if cleanup goals have been satisfied. If the goals are not met, a decision will be made regarding the need for additional work to protect public health and the environment in accordance with the Preliminary Engineering Plan (PEP), which is an element of the 1992 ROD. Upon completion of excavation activities, the area will be backfilled and capped.

A complete description of the amended remedial action plan for the SOL includes the following general steps:

- decant the standing water from the SOL and treat it at the Building 79C wastewater treatment plant;
- in situ treatment of the SOL sludges. Treat hydrogen generating sludges via the in

situ addition of calcium sulfate as the treatment agent. Treat other non-hydrogen generating sludge and VOC contaminated soil in situ using cement with contingency plans to switch to calcium sulfate if hydrogen generation occurs at unsafe levels;

- collect and treat the VOCs liberated during in situ mixing of treatment agents. The vapor phase treatment process for VOCs would be developed during the remedial design, consistent with 6 NYCRR Part 212 and with Air Guide-1 (NYSDEC, 1991 Edition) requirements;
- after curing, excavate the treated lagoon sludge and up to 1-foot of contaminated underlying soil;
- excavate additional contaminated soil to meet soil cleanup goals or follow the decision-making process given in the PEP. Underlying soils with elevated VOC concentrations will receive the in situ treatment and off-gas collection and treatment described above for sludges;
- excavate, as necessary, sediment and contaminated soil from the adjacent railroad drainage channels and berms;
- transport and dispose the treated materials and contaminated soil in the onsite SLF;
- perform post-excavation confirmatory sampling in the SOL to determine whether the soil remaining onsite after excavation meets the cleanup goals for the contaminants of concern established in the ROD;
- backfill, cover and cap the SOL; and
- perform post-closure monitoring of groundwater near the site.

The removal of the sludge and the underlying contaminated soil from the SOL area will eliminate or significantly reduce the future discharge of contaminants to groundwater. Backfilling and capping the site after excavation will significantly reduce the potential for future groundwater contamination. Based on the amended remedial approach for the SOL, extended groundwater management is not likely to be necessary.

The remedial approach of the SOL includes remediation of the former drainage channels along the railroad tracks to the south of the SOL. The channels were impacted by surface water runoff from the area surrounding the SOL. The remedial approach also includes the remediation of the SOL berms and the berm separating the SOL and WLOL.

5.1.1 Calcium Sulfate Treatment

Following the August 1997 flash fire, Alcoa completed testing to further characterize the nature of the SOL sludges and treatability studies to evaluate additives that would reduce and/or eliminate the hydrogen gas generation problem. Test results have shown:

- Aluminum fines under caustic conditions (pH >9) can generate hazardous levels of hydrogen gas. Testing has shown that the SOL sludges can produce up to 50 liters of hydrogen gas per kilogram of sludge. Testing has also shown that this hydrogen gas generation potential is primarily located in the east cell of the SOL but the non-homogeneous nature of the waste could result in hydrogen gas generation at other locations.

- Calcium sulfate can be used to effectively treat the SOL sludges without generating hydrogen gas.

- Strength criteria required for disposal of material in the SLF can be achieved with both calcium sulfate and cement.

- The calcium sulfate treatment technology and the cement treatment technology resulted in significant reductions of VOC concentrations as a result of the mechanical aeration and heat from the exothermic reactions as shown in Table 1.

5.1.2 VOC Treatment

An important component of the amended remedial action plan is the means for providing permanent treatment for VOCs. During the in situ treatment step using calcium sulfate or cement, VOCs are released from the solids to the air phase by mechanical aeration and by the heat generated from the exothermic reactions. Table 1 provides a comparison of the raw sludge VOC concentrations and the treated sludge VOC concentrations. The raw sludge samples were selected to be representative of the highest concentrations in each cell. Treated sludge samples were analyzed using different dosages and combinations of treatment additives.

The amended remedial action plan includes the collection and treatment of off-gases from the in situ treatment process. Details of the collection air treatment systems will be developed as part of the remedial design. Typical equipment that has been used to collect off-gases at other sites has included items such as hoods or shrouds that operate under a slight vacuum. Typical air treatment equipment may include a cyclone to remove large particulates, bag filters to remove fine particulates and then vapor phase carbon to remove organics. A thermal oxidizer may be used in lieu of vapor phase carbon. Collection and air treatment equipment is readily available and has been used for these types of applications at several hazardous waste sites (e.g., Hileah Superfund Site, McColl Superfund Site, WR Grace Acton, McKin Superfund Site). The air treatment system would be designed to meet the requirements of Part 212 and Air Guide-1 (NYSDEC, 1991 Edition).

5.1.3 Disposal

The sludges in the SOL have been assigned a F001 code for listed hazardous waste containing spent halogenated solvents. Additionally, the waste carries the New York State waste listing code of B007 for PCBs. Toxicity Characteristic Leaching Procedure (TCLP) tests have shown the untreated sludge exhibits the toxicity characteristic for TCE (D040). The SOL waste does not fail the other hazardous waste characteristic criteria of ignitability, reactivity or corrosivity.

Following the calcium sulfate treatment process (or the in situ cement treatment), which includes the VOC treatment component, the physical and chemical nature of the sludges and soils will be significantly altered. To evaluate its disposal properties, three criteria were evaluated: the total constituent concentrations; the leachability as measured by TCLP; and the compatibility with the SLF liner components.

Table 2 lists the raw and treated sludge concentrations along with the F001 LDR treatment standards. The F001 LDR treatment standard consists of concentration levels, in terms of total constituent analysis, for 30 constituents which the waste must be below. Table 2 includes only those constituents found in the SOL materials. Bench-scale tests indicate that the treated wastes from the west cell are below the F001 LDRs. The treated sample results from the east cell sample ES-1 are below the F001 LDRs. The treated sample results for the east cell sample E-1 are below the F001 LDRs for all constituents except TCE and 1,1,1-TCA. The E-1 treated sample showed 72 percent to 86 percent reductions in TCE and 1,1,1-TCA, respectively.

Treatment of the SOL materials using the appropriate treatment additives of calcium sulfate or cement significantly alters the waste matrix and results in a distinctly different disposal product than the initial sludge. Table 3 provides an evaluation of the toxicity characteristic levels in the treated sludge samples. The treated sludge samples for the recommended treatment processes do not exhibit any toxicity characteristics with the exception of a single constituent in the east cell sample E-30P. Sample E-30P, treated with 30 percent calcium sulfate, had a TCLP level of 0.81 mg/l for TCE which has a toxicity characteristic level of 0.5 mg/l.

The disposal evaluation also considered the compatibility of the treated sludges with the SLF liner components. Table 4 compares the leachable constituent level of the treated samples as measured by the TCLP method with the compatibility testing data developed during the design of the SLF. As shown in Table 4, the treated sludge TCLP levels are all less than or equal to the SLF liner compatibility testing concentrations. Therefore, disposal of the treated SOL materials in the SLF is compatible with the landfill liners.

Based on the above, disposal of the treated materials in the onsite SLF, can be performed in compliance with all current RCRA requirements for most of the SOL materials. For the portion of the SOL exceeding LDRs, the 6 NYCRR Part 375 and Part 373-2 requirements are still met.

5.2 Description of the Original Remedy

The solvent extraction treatment process selected in the 1991 ROD was offered by RCC and was known as the Basic Extractive Sludge Treatment (B.E.S.T.) process. This solvent extraction process accepts oily sludge, soil, or both and separates it into three fractions: an oil-free water fraction, a product oil fraction, and a dry, oil-free solid fraction. The organic contaminants in the sludge or soil, such as PCBs, PAHs and VOCs, are concentrated into the product oil fraction.

The first step (cold extraction), which is conducted at temperatures below 40 degrees F, involves adding the solvent triethylamine (TEA) to the contaminated sludge/soil. TEA is soluble in water at this temperature, and the TEA separates the bonded water from the solids. Subsequently, a hot extraction step takes place at a temperature of approximately 130 degrees F. At this temperature, the oil and organic contaminants dissolve in the TEA. The TEA is then separated from the mixture via steam stripping and recycled, leaving the three fractions described above (water, solid, and product oil fractions). The product oil stream would then be destroyed by incineration offsite.

5.3 Description of the 1994 ROD Amendment

The ROD was amended in 1994 to allow for the SoilTech ATP as a treatment technique for the SOL materials in addition to solvent extraction.

The SoilTech ATP is a thermal desorption process that heats and mixes contaminated materials in a special anaerobic rotary kiln that uses indirect heat for processing. Contaminants including PCBs, hydrocarbons and others, are desorbed from the solids (sludge/soil) and volatilized into the vapor phase; the vapors are then collected under vacuum; the contaminant vapors are recondensed by lowering the temperature; and the condensed oil is separated into its constituents parts. The ROD Amendment called for the condensed oil to then be incinerated or treated offsite.

5.4 Comparison of the Amended Remedy and the ROD

Scope - A primary difference between the amended remedial action plan and the 1991 ROD or the 1994 amended ROD, is the replacement of the SOL treatment technology with calcium sulfate treatment and vapor phase VOC treatment. Under both the amended remedy and the former ROD remedies, the final treatment residuals (solids) will be disposed of in the SLF.

The ROD remedial technologies (solvent extraction and ATP) would involve excavation of the sludge, and underlying contaminated soils, processing the excavated materials to separate volatile and semi-volatile contaminants from the solid matrix, followed by incineration of the condensed contaminants waste streams. This approach would result in the destruction of both volatile and semi-volatile contaminants. Processed soil/sludge would then be placed in the onsite SLF.

In the amended remedy, a treatment agent (calcium sulfate or cement) will be mixed with the sludge/underlying contaminated soils in situ and allowed to cure. Off-gases containing only volatile organics will be collected and then treated. Curing allows the treated material to attain sufficient compressive strength to meet the SLF criteria for placement. Once the mixture has cured, the treated material will be excavated and placed in the SLF.

Under both the ROD remedy and the amended remedial action plan, off-gases are collected and treated, but semi-volatile contaminants will not be included in the off-gases under the amended remedy. The other steps enumerated in Section 5.1 are substantially the same for the former and amended remedial action plans.

Performance - Under the former ROD remedy, volatile and semi-volatile contaminants in the sludge and soil would have been separated from the sludge/soil and then destroyed by incineration. Under the amended treatment plan, semi-volatile and inorganic contaminants identified in the sludge and soil will be chemically fixated in the treated matrix, thereby reducing their toxicity and mobility, and placed in the SLF. The use of calcium sulfate as a treatment agent addresses the hydrogen gas risk. Landfill disposal of the PCB-containing remediation waste is specifically allowed by TSCA pursuant to the June 29, 1998 Final Rule. Under RCRA, the amended remedial plan will be in compliance with LDRs for most of the SOL treated materials.

Cost - The 1991 ROD cost estimate for the solvent extraction process of \$9,650,000 included only 13,300 yd^3 of sludge and 5,800 yd^3 of contaminated soils. Additional characterization studies completed after the ROD indicate that the volume of soils exceeding soil cleanup goals may be as much as 34,900 yd^3. Adjusting the ROD solvent extraction cost estimate for this additional soil yardage results in a ROD solvent extraction cost estimate of \$23,334,000 (Note, inflationary costs have not been included in this number). The estimated cost of the ATP process is approximately \$21,643,000. The total estimated cost of the amended remedial action plan including allowances for additional underlying soil is \$9,750,000.

Section 6
Evaluation of Remedy Amended for the SOL

6.1 Summary of Amended Remedy

The amended remedy is similar in many respects to the former remedy. The same volume of waste will be removed from the SOL and both approaches meet the remedial objectives in the ROD for the SOL. The basic steps for the amended remedial action plan include pumping off the standing water from the SOL and treating it at the onsite wastewater treatment plant. Then treat the SOL sludges via the in situ addition of calcium sulfate or cement, while collecting and treating VOCs released during mixing. After the mixture cures, excavate the stabilized material and up to 1-foot of underlying contaminated soil, and additional contaminated soil depending on residual contamination levels in accordance with the PEP. Also, excavate and treat sediment and contaminated soil from the railroad drainage channels and berms surrounding the SOL. Then, dispose of the treated material in the onsite SLF. The final step is to backfill, cover and cap the SOL.

This approach meets the substantive requirements of the various regulations (TSCA and RCRA) and is fully protective of human health and the environment.

6.2 Compliance with New York State Standards, Criteria, and Guidelines

This criterion evaluates how well the alternative addresses existing New York State Standards, Criteria and Guidelines (SCGs) for the remediation of the Soluble Oil Lagoon (SOL).

The amended remediation approach will be accomplished in substantive compliance with the applicable regulations. TSCA was amended in 1998 which removed the previous requirement that industrial sludges containing PCBs at concentrations greater than 500 mg/kg be incinerated or receive equivalent treatment prior to being landfilled. Therefore, direct disposal of this PCB remediation waste in the SLF is allowed and appropriate.

Calcium sulfate treatment with control of VOC laden off-gases satisfies the remediation treatment criteria in 6 NYCRR Part 375. Based on treatability studies, the treated sludge will meet the 6 NYCRR Part 376.4 treatment standards for all listed constituents except for some contaminants in one location in the East Cell. At this location, treatability studies have shown that 1,1,1-Trichloroethane and Trichloroethylene are reduced by approximately 80% but do not achieve the Part 376 standards. However, these standards do not apply provided the treated material is placed in a Corrective Action Management Unit (CAMU).
In the 1991 Record of Decision, the concept of an on-site secure landfill for remediation waste was approved. As part of that conceptual approval, it was specifically noted that the landfill must comply with all design specifications contained in 6 NYCRR Part 373 Land Burial Facility requirements. 6NYCRR Part 373-2.19(a), (CAMU), provides that the Department may waive treatment requirements provided that the corrective actions meet all criteria contained in that Section, and that requirements for excavation, removal, treatment, and containment of remediation waste are specified. The 1991 ROD and this amendment to that ROD meets all those criteria, and the treated sludges from the Soluble Oil Lagoon which will be placed in the Secure Landfill also satisfies the criteria to use treatment technologies to enhance the long-term effectiveness of remedial actions. Therefore, the SLF would be considered a CAMU, as specified in 373-2.19(a) for this purpose.

Finally, the amended approach includes collection and treatment of VOC off-gases in accordance with 6NYCRR Part 212 and Air Guide-1. The solvent extraction and ATP processes also meets the SCGs.

6.3 Overall Protection of Human Health and the Environment

The amended remedial approach of calcium sulfate treatment and disposal in the SLF is protective of human health because it addresses the hydrogen gas generation problem. Treatability test results shown that by adding calcium sulfate as the treatment agent, the amended approach avoids the potential generation of explosive hydrogen gas. The 1997 flash fire is indicative of the potential for serious injury or death that could result if the hydrogen gas generation issue is not addressed first. In contrast, both the solvent extraction and the SoilTech processes agitate and heat the sludge, which may increase the potential for hydrogen generation under the proper conditions. Both the ROD treatment technologies would have to be modified (if possible) to address the explosion potential of the sludge.

The amended approach is protective of the environment. Like the solvent extraction and SoilTech processes, calcium sulfate treatment will achieve each of the remedial objectives established in the ROD: direct exposure to sludges will be eliminated, biota will not be impacted, and groundwater and surface water will be protected from adverse impacts.

6.4 Short-term Effectiveness

Short-term effectiveness refers to risks that may be posed to the workers, the community and the environment during implementation of the remedial action and the time frame until the alternative is fully implemented.

The calcium sulfate treatment alternative, incorporating collection and treatment of VOC off-gases, will not pose any significant short-term risks to workers, the community, or the environment during implementation. Based on the results of the treatability studies, the use of calcium sulfate to treat the sludge will not result in the generation of potentially-explosive hydrogen gas. The volatile organic solvents released during mixing will be captured and treated in accordance with Air Guide-1, addressing a potential environmental risk. The ultimate placement of the treated materials in the SLF will not include any significant risks. The time to completion of this alternative is estimated to be four months.

Both the solvent extraction and the SoilTech ATP could involve the risk of hydrogen generation through the reaction of aluminum fines with sodium hydroxide in the presence of water. Hydrogen is highly explosive and a hydrogen explosion or flash fire could be considered extremely dangerous. Both treatment processes mix and heat the sludge, which could exacerbate the propensity for hydrogen formation. Both treatment processes would not pose undue risks to the environment, assuming that an effective design modification could be achieved to address the hydrogen gas issue. The time to completion of this alternative is estimated to be six months.

6.5 Long-term Effectiveness and Permanence

This evaluation criterion takes into account the nature and quantity, and the risk posed by waste or residual remaining at the site after the remedial objectives have been met. Preference is given to alternatives that involve treatment versus land disposal; that are considered permanent; that result in no or non-hazardous residuals; and require no, or minimal, environmental controls or monitoring.

Calcium sulfate treatment of the SOL materials and disposal in the SLF is an effective and permanent land disposal remedial approach. The SLF is a state-of-the-art facility that was designed specifically to accept remediation wastes from the various areas of concern at the Massena facility. The treated waste is compatible with the SLF liner components and will contain them securely through an engineered process that incorporates a cap, an underdrain system and long-term monitoring.

The solvent extraction and ATP processes separate the contaminants from the solid matrix, concentrating the contaminants into an oily waste stream. The oil stream is then incinerated, constituting an effective and permanent remedy via treatment.

6.6 Reduction in Toxicity, Mobility or Volume

This criterion assesses the degree to which the remedial action employs treatment technologies that reduce the toxicity, mobility, or volume of the hazardous waste. The evaluation protocols favor techniques that, among other criteria, permanently treat or destroy wastes; result in no or non-hazardous residuals; involve onsite disposal or offsite treatment or destruction of treatment residuals; and are irreversible.

In the amended alternative (calcium sulfate treatment), the toxicity of the waste materials will be reduced through the chemical fixation process or through removal, collection, and treatment of the VOCs from the waste materials. The mobility of the wastes will also be reduced by virtue of the treatment process and placement into the SLF, where the wastes will be protected in a secure, engineered landfill rather than in an open lagoon, where they currently remain. The treatment process will not result in a reduction of volume.

The solvent extraction and SoilTech processes, through waste stream removal and incineration, would have resulted in a reduction in the toxicity, mobility and volume of the SOL wastes via destruction of the PCB's, VOC's, and SVOC's.

6.7 Implementability

Implementability refers to the technical and administrative feasibility of an alternative and the availability of goods or services necessary to implement the remedy.

The calcium sulfate treatment alternative, including vapor phase treatment, will be highly feasible both technically and administratively. The technology to perform this work is currently widely-available and relatively straightforward to implement. Construction would involve standard equipment. Administratively, there do not appear to be significant objections because the approach can be accomplished in compliance with the existing regulations and guidance.

The solvent extraction process is still offered by RCC, a division of Ionics. SoilTech, the licensee for North America for the ATP process, has gone out of business since the ROD was amended. The availability of other vendors to license the process and then perform the work is uncertain. Technically, both of these treatment processes would have to be re-evaluated to address the hydrogen gas generating potential in the waste. Administratively, there are limitations on the availability of experienced vendors to implement the solvent extraction and ATP processes.

6.8 Costs

Adjusting the 1991 ROD estimated cost of the solvent extraction process for the additional yardages of contaminated soil results in a cost of $23,334,000. The estimated cost of the ATP process would be $21,643,000. The total estimated cost of the amended remedial action plan including allowances for additional underlying soil is $9,750,000.

Section 7
Summary of Justification to Amend the ROD

The remedial action plans selected in the 1991 ROD and the 1994 ROD Amendment were designed to be protective of human health and the environment, to comply with state regulatory standards and to be cost effective. However, new and significant information has been obtained that has a significant impact on essential parts of the SOL remedy.

With these objectives in mind, the Department has prepared the ROD Amendment that will meet the remedial goals for the SOL in light of the new data. The request incorporates new and significant information and developments since the 1991 ROD and 1994 ROD Amendment were issued. The ROD Amendment is based on:

- Additional site characterization data which identified the health and safety risks of hydrogen gas generation from the waste.
- Regulatory changes to TSCA.
- The ROD treatment technologies are incompatible with the newly-identified hydrogen gas problem in their current forms. An alternative treatment technology has been identified for treating the SOL materials. This alternative technology performs in a manner equivalent to the thermal treatment process for the removal of VOCs and is more cost-effective.

The amended remedy is more protective of human health than the former remedy because it addresses the hydrogen gas generation concern. The amended remedy is equally protective of the environment due to excavation and placement of waste in the SLF, which reduces the mobility of the contaminants.

The current TSCA regulations provide new disposal options for the SOL wastes. The amended remedy described in this request is consistent with the current TSCA regulations. However, ALCOA will still need approval from USEPA TSCA to use the Secure On-site Landfill for disposal of this waste material. Calcium sulfate treatment with collection and treatment of VOC off-gases is an approach that can be performed in compliance with current 6 NYCRR Part 375 regulations, and substantively meets land disposal restriction requirements for VOC's.

The amended remedy is easily implementable and much more cost effective than the former remedy. Due to changes in the vendor market, the former remedy may not have been implementable.

Based on this evaluation of the new and significant information, the Department has amended the ROD to include the following:

Initially, the wastewater will be decanted and treated to satisfy the facility's discharge requirements. Sludges that have the potential to generate hydrogen gas will be treated with calcium sulfate and non-hydrogen gas generating areas will be treated with cement. During the in situ treatment process, VOC off-gases will be collected and treated in accordance with New York State air requirements. The treated materials will be excavated and placed in the onsite SLF. Any vapor phase treatment residuals would be properly disposed of. Confirmatory sampling will be performed after the initial excavation to determine if cleanup goals have been satisfied. If the goals are not met, a decision will be made regarding the need for additional work to protect public health and the environment in accordance with the PEP. Upon completion of excavation activities, the area will be backfilled and capped. Post-closure groundwater monitoring and site maintenance will be initiated at this point.

APPENDIX A
RESPONSIVE SUMMARY

On March 24, 2000, the public was notified of ALCOA's request to amend the Record of Decision for the Soluble Oil Lagoon. The public was given the opportunity to review the document locally and to discuss the document with Department staff. No public comments or inquiries were received during the 30 day public comment period.

TABLE 1

Sample Location	West Cell Sample W-1 (mg/kg)				East South Sample ES-1 (mg/kg)			East Cell Sample E-1 (mg/kg)			
	Raw Sludge Sample [1]	Treated Sludge Samples			Raw Sludge Sample	Treated Sludge Samples		Raw Sludge Sample [1]	Treated Sludge Samples		
Client Sample ID		W-20C [2]	W-20P/20C	W-30P/10C		ES-30P [2]	ES-25P/5C		E-30P [2]	E-10C	E-25P/5C
Treatment Additive Dosage(s		20% Cement	20%CaSO4/ 20%Cement	30%CaSO4/ 10%Cement		30%CaSO4	25%CaSO4/ 5%Cement		30%CaSO4	10% Cement	25%CaSO4/ 5%Cement
Lab Sample ID[3]	90-08001	98-06067	98-07996	98-07995	90-08004	98-06069	98-07836	90-08005	98-07834	98-06068	98-07835
Hydrogen Gas Potential	0 - trace ml/g[4]	0 ml/g[5]	---	---	6 - 24 ml/g[4]	0 ml/g[5]	---	0 - 53 ml/g[4]	0 ml/g[5]	---	---
F001 Constituents[6]											
Acetone	1.5 U	18 U	1.1	1.2	1.25 U	15 U	16 U	21 U	32 U	16 U	32 U
Benzene	0.625	0.910 U	0.035 U	0.036 U	0.625	0.760 U	0.800	2.50	1.600	0.790 U	1.600
Carbon Disulfide	0.625 U	4.6 U	0.19	0.330	0.625 U	3.8 U	4.0 U	3.3 U	8.0 U	3.9 U	8.0 U
Carbon tetrachloride	0.625	0.910 U	0.035 U	0.036 U	0.625	0.760 U	0.800	3.30	1.600	0.790 U	1.600
Chlorobenzene	0.625	0.910 U	0.035 U	0.042	0.625	0.760 U	0.800	3.30	1.600	0.790 U	1.600
o-Cresol	1 UJ	2.5 U	1.4 UR	1.5 UR	0.6	2.1 U	4.200 UR	0.8	2.200 UR	21 U	11.000 UR
m-Cresol	[7]	[7]	[7]	[7]	[7]	[7]	[7]	[7]	[7]	[7]	[7]
p-Cresol	[7]	[7]	[7]	[7]	[7]	[7]	[7]	[7]	[7]	[7]	[7]
Cresol mixed isomers	1 UJ	2.80	3.6 J	6.4 J	18.0	4.100	6.200 J	21 - 23 J	2.200 UR	28 J	12 J
Ethylbenzene	1.30	0.91 U	0.190	0.180	1.40	0.760	0.800	3.3 U	1.600	0.79 U	1.600
Methylene chloride	0.625	4.700 U	0.180 U	0.180 U	0.625	4.000	4.100	3.30	8.400	4.100	8.400
Methyl ethyl ketone	1.25 U	18.0 U	0.700 U	0.710 U	1.25 U	15.0 U	16.00	8.3 U	32.00	16.0 U	32.00
Methyl isobutyl ketone	1.25 U	18 U	0.700 U	0.710 U	1.25 U	15 U	16.00	8.3 U	32.00	16 U	32.00
Nitrobenzene	0.100	2.500 U	12.0 U	12.0 U	0.100	2.100 U	4.200	0.010	2.200	21 U	11.00
Tetrachloroethylene	3.5	0.910 U	0.035 U	0.036 U	2.4	0.760 U	0.800	3.3	1.600	0.790 U	1.600
Toluene	2.00	0.91 U	0.200	0.150	1.90	0.760	0.800	3.3 U	1.600	0.79 U	1.600
1,1,1-Trichloroethane	0.625	0.91 U	0.035 U	0.036 U	3.80	0.760 U	0.800	100	14	0.79 U	6.6
1,1,2-Trichloroethane	0.625 U	0.91 U	0.035 U	0.036 U	0.625 U	0.760 U	0.800	3.3	1.600	0.79 U	1.600
Trichloroethylene	76 D	1.5	0.037	0.036 U	340 D	4.9	16	460	130	13.0	81
Xylenes (total)	10.00	0.91 U	1.510	1.350	8.40	0.760	2.800	9.10	6.700	2.570	6.300

Notes:

1. Samples W-1 and E-1 were selected to be representative of worst-case conditions in each cell. See the Conceptual Design Report for the results from all samples.
2. The noted additive blend is the most likely dosage to be used at this location.
3. All lab sample IDs begin with the prefix A820-. Sample dates are April 23-24, 1998.
4. Estimated gas generation for these locations based on 1999 testing. Gas results generated by samples over a 16 hour period during the 1999 bench-scale testing program.
5. Samples from these areas treated with additive produced no gas during 1997 testing.
6. The following compounds were not analyzed for since they are not associated with Alcoa's product stream: n-Butyl alcohol, Cyclohexanone, o-Dichlorobenzene, Ethyl actetate, Ethyl ether, Isobutyl alcohol, Methanol, Pyridine, 1,1,2-Trichloro-1,2,2-trifluoroethane and Trichloromonofluoromethane.
7. Laboratory could not differentiate between m and p isomers.

Key:

J	Estimated
U	Not detected at concentration listed
--	No LDR value
D	Diluted sample
R	Rejected result

TABLE 2

Sample Location Client Sample ID Treatment Additive Dosage(s Lab Sample ID[3]	F001 Treatment Standard 6 NYCRR 376.4/ 40CFR 268.40 (mg/kg)	West Cell Sample W-1 (mg/kg)		East South Sample ES-1 (mg/kg)		East Cell Sample E-1 (mg/kg)	
		Raw Sludge[1]	Treated Sludge W-20C [2] 20% Cement	Raw Sludge	Treated Sludge ES-30P [2] 30%CaSO4	Raw Sludge[1]	Treated Sludge E-30P [2] 30%CaSO4
		90-08001	98-06067	90-08004	98-06069	90-08005	98-07834
Hydrogen Gas Potential	---	0 - trace ml/g[4]	0 ml/g[5]	6 - 24 ml/g[4]	0 ml/g[5]	0 - 53 ml/g[4]	0 ml/g[5]
F001 Constituents[6]							
Acetone	160	1.5 U	18 U	1.25 U	15 U	21 U	32 U
Benzene	10.0	0.625	0.910 U	0.625	0.760 U	2.50	1.600
Carbon Disulfide	--	0.625 U	4.6 U	0.625 U	3.8 U	3.3 U	8.0 U
Carbon tetrachloride	6.0	0.625	0.910 U	0.625	0.760 U	3.30	1.600
Chlorobenzene	6.0	0.625	0.910 U	0.625	0.760 U	3.30	1.600
o-Cresol	5.6	1 UJ	2.5 U	0.6	2.1 U	0.8	2.200 UR
m-Cresol	5.6	[7]	[7]	[7]	[7]	[7]	[7]
p-Cresol	5.6	[7]	[7]	[7]	[7]	[7]	[7]
Cresol mixed isomers	11.2	1 UJ	2.80	18.0	4.100	21 - 23 J	2.200 UR
Ethylbenzene	10.0	1.30	0.91 U	1.40	0.760	3.3 U	1.600
Methylene chloride	30.0	0.625	4.700 U	0.625	4.000	3.30	8.400
Methyl ethyl ketone	36.0	1.25 U	18.0 U	1.25 U	15.0 U	8.3 U	32.00
Methyl isobutyl ketone	33.0	1.25 U	18 U	1.25 U	15 U	8.3 U	32.00
Nitrobenzene	14.0	0.100	2.500 U	0.100	2.100 U	0.010	2.200
Tetrachloroethylene	6.0	3.5	0.910 U	2.4	0.760 U	3.3	1.600
Toluene	10.0	2.00	0.91 U	1.90	0.760	3.3 U	1.600
1,1,1-Trichloroethane	6.0	0.625	0.91 U	3.80	0.760 U	100	14
1,1,2-Trichloroethane	6.0	0.625 U	0.91 U	0.625 U	0.760 U	3.3	1.600
Trichloroethylene	6.0	76 D	1.5	340 D	4.9	460	130
Xylenes (total)	30.0	10.00	0.91 U	8.40	0.760	9.10	6.700

Notes:

1. Samples W-1 and E-1 were selected to be representative of worst-case conditions in each cell. See the Conceptual Design Report for the results from all samples.
2. The noted additive blend is the most likely dosage to be used at this location.
3. All lab sample IDs begin with the prefix A820-. Sample dates are April 23-24, 1998.
4. Estimated gas generation for these locations based on 1999 testing. Gas results generated by samples over a 16 hour period during the 1999 bench-scale testing program.
5. Samples from these areas treated with additive produced no gas during 1997 testing.
6. The following compounds were not analyzed for since they are not associated with Alcoa's product stream: n-Butyl alcohol, Cyclohexanone, o-Dichlorobenzene, Ethyl actetate, Ethyl ether, Isobutyl alcohol, Methanol,

Key:

J	Estimated
U	Not detected at concentration listed
--	No LDR value
D	Diluted sample
R	Rejected result

TABLE 3

Waste Code	Sample Location Sample ID Lab Sample ID[2]	Maximum Concentration for the Toxicity Characteristic 6 NYCRR 371.3/ 40 CFR 261.24 (mg/l TCLP)	Treated West Cell Samples (mg/l TCLP)					Treated East South Samples (mg/l TCLP)				Treated East Cell Samples (mg/l TCLP)		
			WW		W-1[1]			ES		ES-1		E-1[1]		
			WW-20P	WW-20C	W-20C 98-06060	W-30P/10C 98-07997 98-07999	W-20P/20C 98-07998 98-08000	ES-20P	ES-20C	ES-30P 98-06039	ES-25P/5C 98-07879,70 98-07876	E-10C 98-06058	E-30P 98-07871 98-07869	E-25P/5C 98-07878,73 98-07875
	Characteristic List[3]													
D004	Arsenic	5.0	0.0084	0.0054	0.005 U	0.028 U	0.028 U	0.074	0.013	0.005	0.028	0.005	0.028	0.028
D005	Barium	100.0	0.22	0.52	0.55	0.19	0.28	0.20	0.18	0.11	0.049	0.35	0.310	0.260
D018	Benzene	0.5	0.006 U	0.006 U	0.0025 U	0.002 U	0.002 UR	0.006 U	0.006 U	0.005 U	0.005 U	0.010 U	0.012	0.012 U
D006	Cadmium	1.0	0.00090	0.00050 U	0.001	0.006 U	0.006 U	0.0027	0.00050 U	0.0034	0.006	0.001 U	0.007	0.010
4	Calcium	4	194	145	1900	1,100	1,300	164	111	1600	2,400	2100	2,500	2,100
D019	Carbon tetrachloride	0.5	0.008 U	0.008 U	0.0025 U	0.002 U	0.002 UR	0.008 U	0.008 U	0.005 U	0.005 U	0.010 U	0.012	0.012 U
D022	Chloroform	6.0	0.005 U	0.005 U	0.012 U	0.010 U	0.010 U	0.005 U	0.005 U	0.025	0.025	0.050	0.062	0.062
D007	Chromium	5.0	0.0020 U	0.050	0.021	0.044	0.085	0.0020 U	0.0061	0.026	0.033	0.0097	0.028	0.028
D023	o-Cresol	200.0	0.016 U	0.16 U	0.530 U	0.110 U	0.140 UR	0.008 J	0.014 J	0.05 U	0.063 U	0.2 U	0.064	0.130 U
D024	m-Cresol	200.0	0.016 U	0.027	5	5	5	0.12	0.430	5	5	5	5	5
D025	p-Cresol	200.0	0.016 U	0.027	5	5	5	0.12	0.430	5	5	5	5	5
D026	Cresol-mixed isomers	200.0	-	-	0.530 U	0.22	0.34 J	-	-	0.11	0.17	0.520	0.220	0.38
D027	1,4-Dichlorobenzene	7.5	0.010 U	0.010 U	0.001	0.010	0.001	0.010 U	0.010 U	0.005	0.005	0.010	0.012	0.012
D028	1,2-Dichloroethane	0.5	0.008 U	0.008 U	0.0025 U	0.002 U	0.002 U	0.008 U	0.008 U	0.005	0.005	0.010	0.012	0.012
D029	1,1-Dichloroethene	0.7	0.008 U	0.008 U	0.0025 U	0.002 U	0.002 U	0.008 U	0.008 U	0.005	0.063	0.010 U	0.064	0.130
D030	2,4-Dinitrotoluene	0.13	0.010 U	0.010 U	0.530 U	0.110 U	0.140 U	0.010 U	0.010 U	0.050 U	0.063 U	0.200	0.064 U	0.130 U
D032	Hexachlorobenzene	0.13	0.010 U	0.010 U	0.530 U	0.110 U	0.140 U	0.010 U	0.010 U	0.050 U	0.063	0.200	0.064	0.130
D033	Hexachlorobutadiene	0.5	0.010 U	0.010 U	0.530 U	0.110 U	0.140 U	0.010 U	0.010 U	0.050 U	0.063	0.200	0.064	0.130
D034	Hexachloroethane	3.0	0.010 U	0.010 U	0.530 U	0.110 U	0.140 U	0.010 U	0.010 U	0.050 U	0.063	0.200	0.064	0.130
D008	Lead	5.0	0.015	0.014	0.005	0.028	0.028 U	0.49	0.0024 U	0.58	0.028	0.005	0.57	0.40
D009	Mercury	0.2	0.00020 U	0.00024	0.0002	0.0002 U	0.0002 U	0.00020 U	0.00020 U	0.0002	0.00037	0.0002	0.0002	0.0002
D035	Methyl ethyl ketone	200.0	0.020 U	0.020 U	0.050 U	0.120 U	0.100 UR	0.020 U	0.020 U	0.100 U	0.110 U	0.200 U	0.250 U	0.250
D036	Nitrobenzene	2.0	0.010 U	0.010 U	0.530 U	0.110 U	0.140 UR	0.010 U	0.010 U	0.050 U	0.063 U	0.200 U	0.064	0.130
D037	Pentachlorophenol	100.0	0.050 U	0.050 U	2.6 U	0.560 U	0.710 U	0.050 U	0.050 U	0.250 U	0.320	1.0 U	0.320	0.650
D010	Selenium	1.0	0.012	0.0088	0.010	0.056	0.056 U	0.014	0.0082	0.010	0.056	0.010	0.056	0.056
D011	Silver	5.0	0.0020 U	0.0020	0.0088	0.028 U	0.032	0.037	0.0020 U	0.0072	0.029	0.009	0.045	0.034
D039	Tetrachloroethylene	0.7	0.008 U	0.008 U	0.0025 U	0.002 U	0.002 UR	0.008 U	0.008 U	0.005 U	0.005 U	0.010 U	0.012	0.012
D040	Trichloroethylene	0.5	0.086	0.02	0.055	0.002 U	0.0027 UR	2.400 D	0.610	0.27	0.41	0.690	0.810	0.960
D041	2,4,5-Trichlorophenol	400.0	0.025 U	0.025 U	0.530 U	0.110 U	0.140 U	0.025 U	0.025 U	0.050 U	0.063	0.200 U	0.064	0.130
D042	2,4,6-Trichlorophenol	2.0	0.016 U	0.016 U	0.530 U	0.110 U	0.140 U	0.016 U	0.016 U	0.050 U	0.063	0.200 U	0.064	0.130
D043	Vinyl chloride	0.2	0.010 U	0.010 U	0.0025 U	0.002 U	0.002 U	0.010 U	0.010 U	0.005	0.005	0.010	0.012	0.012

Notes:

1. Samples with highest total constituent concentrations submitted for treatment testing and TCLP analyses.
2. All lab sample IDs began with the prefix AE20-. Sample dates are April 23-24, 1998.
3. The following compounds were not analyzed for because they are not associated with the Alcoa product stream: Chlordane, 2,4-D, Endrin, Heptachlor, Lindane, Methoxychlor, Pyridine, Toxaphene and 2,4,5-TP.
4. Calcium concentration must be less than 2,940 mg/l to meet Secure Landfill limits.
5. Analysis could not differentiate between the m and p isomers.

Key:
J Estimated
U Not detected at concentration listed
-- No LDR value
D Diluted sample
R Rejected result

ALCOA REMEDIATION PROJECTS ORGANIZATION
SOLUBLE OIL LAGOON

Table 4 *(Continued)*

Compatibility of Treated Samples with Secure Landfill Liners

Sample Location Client Sample ID Lab Sample ID[1]	Maximum Tested SLF Compatibility Concentrations[2] (mg/l)	Treated TCLP (mg/l)		
		W-1[3] W-20C 98-06067	ES-1 ES-30P 98-06069	E-1[3] E-30P 98-07834
Calcium	2,940	1,900	1,600	2,500
VOCs				
Benzene	0.01	0.001	0.005	0.012
Methylene Chloride	0.01	0.005	0.025	---
Xylene	0.01	0.0097	0.01	0.012
Tetrachloroethylene	0.5	0.002	0.005	0.012
1,1,1 Trichloroethane	0.01	0.001	0.005	---
Acetone	0.01	0.270	0.100	---
4-Methyl-2-Pentanone	0.01	0.020	0.100	---
Trichloroethylene	4.0	0.066	0.270	0.810
PCBs				
Aroclor 1248	2.0	0.001	0.001	0.001
PAHs				
Acenaphthene	0.02	0.005	0.005	0.006
Acenaphthylene	0.005	0.005	0.005	0.006
Anthracene	0.005	0.005	0.005	0.006
Benzo[a]anthracene	0.005	0.005	0.005	0.006
Benzo[b]fluoranthene	0.005	0.005	0.005	0.006
Benzo[k]fluoranthene	0.005	0.005	0.005	0.006
Benzo[ghi]perylene	0.005	0.005	0.005	0.006
Benzo[a]pyrene	0.005	0.005	0.005	0.006
Chrysene	0.005	0.005	0.005	0.006
Dibenzo[a,h]anthracene	0.005	0.005	0.005	0.006
Fluoranthene	0.005	0.005	0.005	0.006
Fluorene	0.005	0.005	0.005	0.006
Indeno[1,2,3-cd]pyrene	0.005	0.005	0.005	0.006
Naphthalene	0.005	0.005	0.005	0.006
Phenanthrene	0.005	0.005	0.005	0.006
Pyrene	0.02	0.005	0.005	0.006

Phenols				
4-chloro-3-methylphenol	0.05	0.011	0.010	0.013
2-chlorophenol	0.005	0.005	0.005	0.006
o-Cresol	0.005	0.005	0.05 UJ	0.006
m-Cresol	0.005	---^{4}	---^{4}	---^{4}
p-Cresol	0.6	0.53 E^4	0.110^4	0.0089^4
2,4-dichlorophenol	0.005	0.005	0.005	0.006
2,4-dimethylphenol	0.7	0.028	0.033	0.043
4,6-dinitro-2-methylphenol	0.005	0.026	0.025	0.032
2,4-dinitrophenol	0.005	0.026	0.025	0.032
2-nitrophenol	0.005	0.005	0.005	0.006
4-nitrophenol	0.005	0.026	0.025	0.032
Pentachlorophenol	0.07	0.026	0.025	0.032
Phenol	4.0	2.300 E	1.500	0.065
2,4,5-trichlorophenol	0.005	0.005	0.005	0.006
2,4,6-trichlorophenol	0.005	0.005	0.005	0.006

Notes:

1. All lab samples IDs begin with the prefix A820-. Sample dates are April 23-24, 1998.
2. Leachate concentration used for testing 60 mil HDPE. Three spiked solutions were tested; highest concentrations are presented here. Results reported in *Chemical Compatibility Testing of Geosynthetics for Waste Containment Applications*, April 1993, TRI/Environmental, Inc.
3. Samples W-1 and E-1 were selected to be representative of worst-case conditions in each cell. See the Conceptual Design Report for the results from all samples.
4. Analysis could not differentiate between the m and p isomers. Total of m and p cresols reported here as p-cresol.

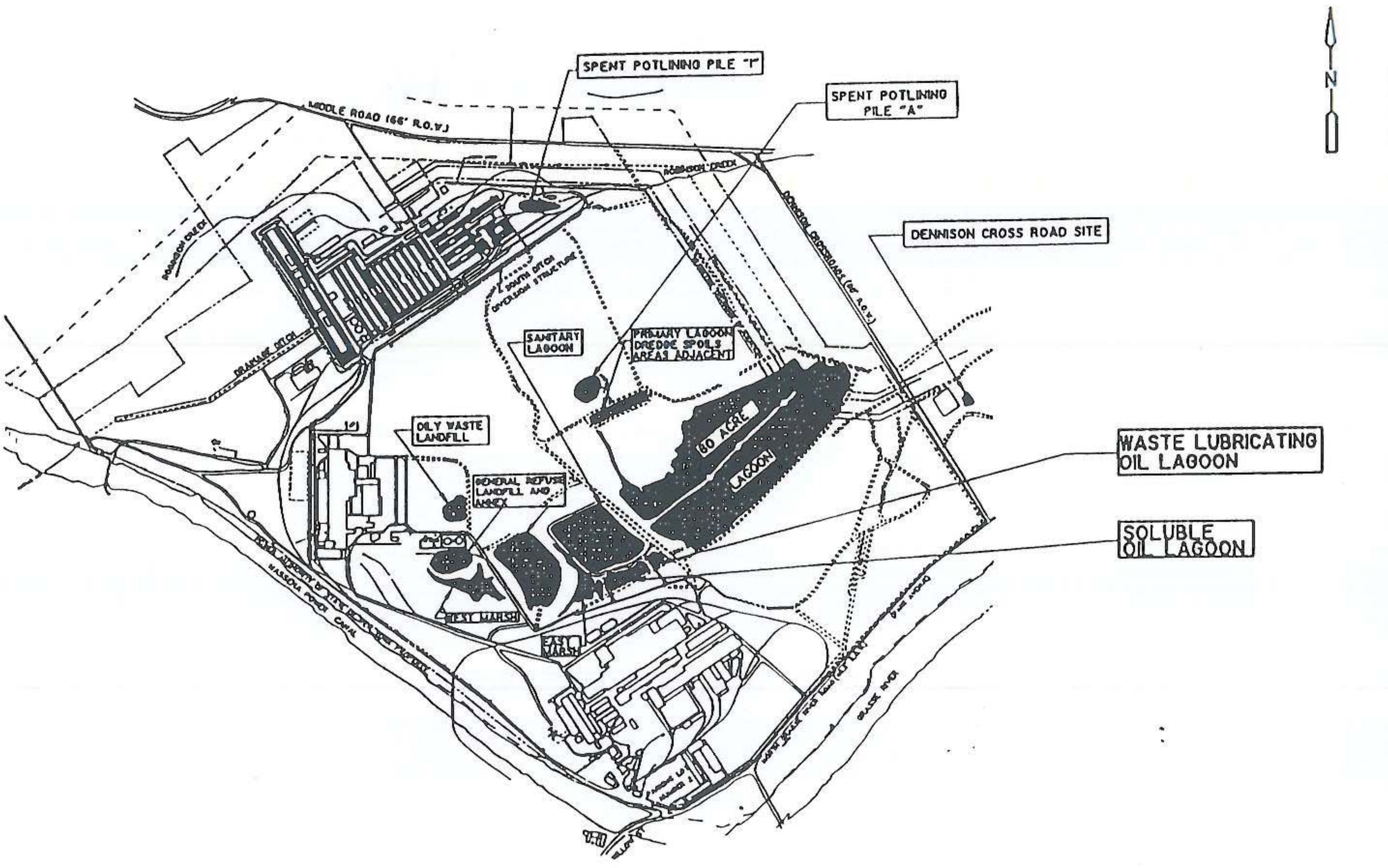
Key:

U = not detected at concentration listed

E = outside instrument calibration range

J = estimated

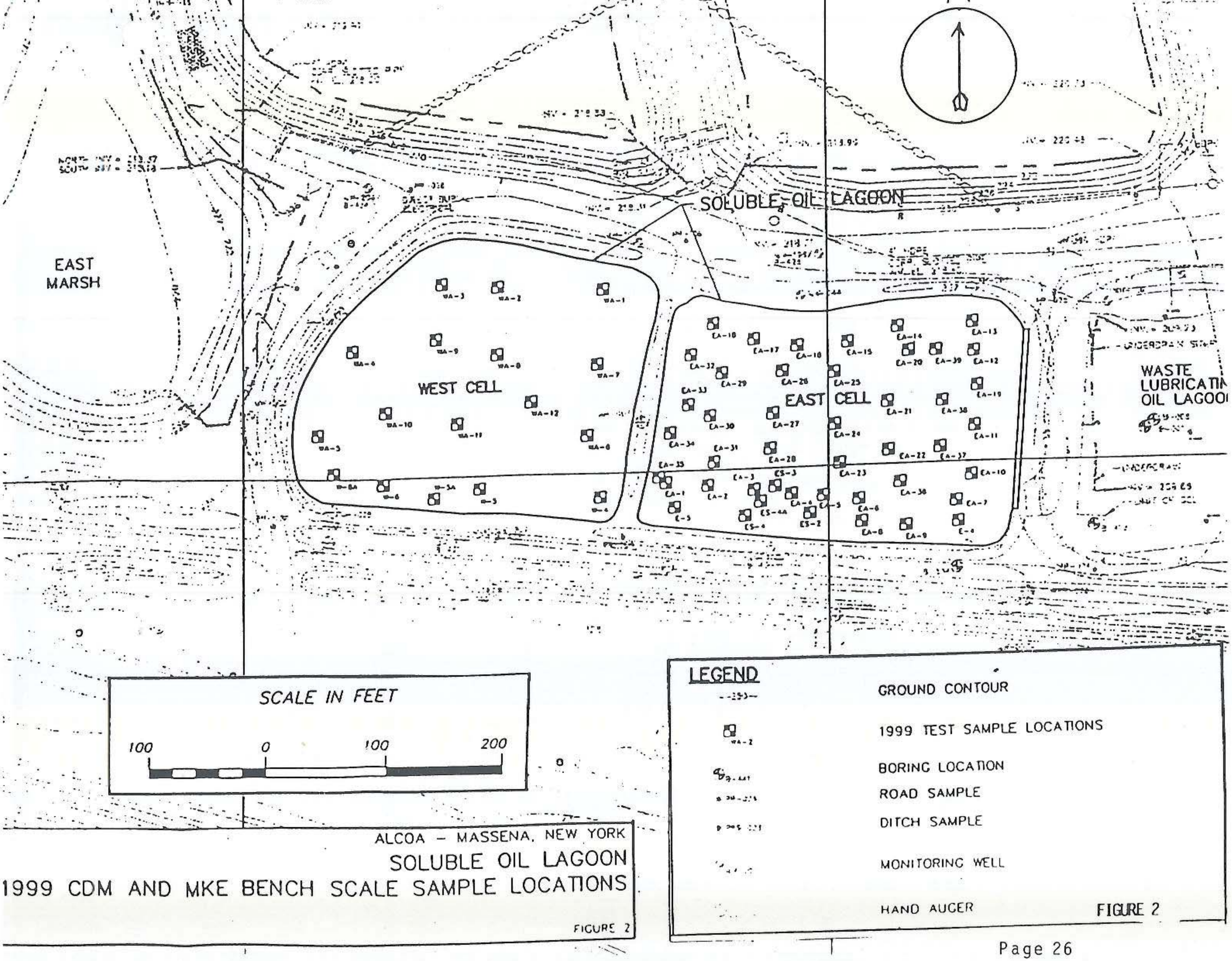
FIGURE1



ALCOA - MASSENA, NEW YORK

SOLUBLE OIL LAGOON AND
WASTE LUBRICATING OIL LAGOON
SITE LOCATION PLAN

JRE 1



ALCOA – MASSENA, NEW YORK

SOLUBLE OIL LAGOON

1999 CDM AND MKE BENCH SCALE SAMPLE LOCATIONS

FIGURE 2