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Remedial Action Work Plan/Remedial Design Report for the Stage 2 Remedial Action on the Surface Impoundments Operable Unit A and B at the Oak Ridge National Laboratory, Oak Ridge, Tennessee

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Radian International

contributed to the preparation of this document and should not be considered an eligible contractor for its review.

DOE/OR/01-1816&D1

Remedial Action Work Plan/Remedial Design Report for the Stage 2 Remedial Action on the Surface Impoundments Operable Unit A and B at the Oak Ridge National Laboratory, Oak Ridge, Tennessee

Date Issued–July 1999

Prepared by
Radian International
Oak Ridge, Tennessee
under subcontract 23900-SC-BV001-F

Prepared for the
U.S. Department of Energy
Office of Environmental Management

BECHTEL JACOBS COMPANY LLC
managing the
Environmental Management Activities at the
East Tennessee Technology Park
Oak Ridge Y-12 Plant Oak Ridge National Laboratory
Paducah Gaseous Diffusion Plant Portsmouth Gaseous Diffusion Plant
under contract DE-AC05-98OR22700
for the
U.S. DEPARTMENT OF ENERGY

PREFACE

This Remedial Action Work Plan/Remedial Design Report addresses Stage 2 remedial action of the Surface Impoundments Operable Unit (SIOU) at the Oak Ridge National Laboratory, Oak Ridge, Tennessee [U.S. Department of Energy (DOE)/OR/01-1816/D1]. It was prepared in accordance with the requirements of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980, as amended by the Superfund Amendments and Reauthorization Act of 1986, and in conformance with plans and the schedule of the Oak Ridge Reservation Federal Facility Agreement. Specifically, this document was developed for the implementation of the selected remedy, as approved in the Record of Decision for the SIOU (DOE/OR/02-1630&D2). This document provides the U.S. DOE Remediation Management Group with designs and specifications for the remediation subcontractor and a schedule for Stage 2 work and future submittal of remedial action documentation for stakeholders and regulatory review and approval. Additionally, this document provides a crosswalk for implementing applicable or relevant and appropriate requirements for performing and completing all restoration activities at the SIOU.

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ACRONYMS

ALARA	As Low As Reasonably Achievable
ARAR	Applicable or Relevant and Appropriate Requirement
BMP	Best Management Practice
CFR	Code of Federal Regulations
DOE	U.S. Department of Energy
DOT	Department of Transportation
ECP	Environmental Compliance Plan
EDE	Effective Dose Equivalent
EPA	U.S. Environmental Protection Agency
FFA	Federal Facility Agreement of 1992
FRFP	Fournier Rotary Filter Press
FWT	Feeder Weight Table
HEPA	High-Efficiency Particulate Air
LDR	Land Disposal Restriction
LWT	Liquid Waste Technology
LLW	Low-Level Radioactive Waste
NESHAP	National Emissions Standards for Hazardous Air Pollutants
NHPA	National Historic Preservation Act of 1966
NTS	Nevada Test Site
ORNL	Oak Ridge National Laboratory
ORO	Oak Ridge Operations
ORR	Oak Ridge Reservation
PEDE	Potential Effective Dose Equivalent
PPE	Personal Protective Equipment
ppm	parts per million
PVC	Polyvinyl Chloride
PWTP	Process Waste Treatment Plant
RA	Remedial Action
RAR	Remedial Action Report
RAWP	Remedial Action Work Plan
RCRA	Resource Conservation and Recovery Act of 1976
RCT	Radiological Control Technician
RDR	Remedial Design Report
RDWP	Remedial Design Work Plan
ROD	Record of Decision
RSP	Radiation Safety Plan
SIOU	Surface Impoundments Operable Unit
SSHP	Site Safety and Health Plan
TBC	To Be Considered

TDEC	Tennessee Department of Environment and Conservation
TEFC	Totally Enclosed Fan Cooled
TSCA	Toxic Substances Control Act of 1976
TSD	Treatment, Storage, and Disposal
USC	United States Code
WAC	Waste Acceptance Criteria
WMP	Waste Management Plan
WTF	Waste Treatment Facility

EXECUTIVE SUMMARY

This Remedial Action Work Plan (RAWP)/Remedial Design Report (RDR) presents the 90% design, specifications, and drawings for construction and operation of the Surface Impoundments Operable Unit (SIOU) Waste Treatment Facility (WTF) at the Oak Ridge National Laboratory (ORNL), Oak Ridge, Tennessee. The remedial action is being taken pursuant to Sect. 104 of the Comprehensive Environmental Response, Compensation, and Liability Act, as amended by the Superfund Amendments and Reauthorization Act of 1986 with implementing regulations under the National Oil and Hazardous Substances Contingency Plan.

The SIOU is located in the Bethel Valley watershed of ORNL in the south-central area of the laboratory's main plant area, north of White Oak Creek. The remedy as selected in the SIOU Record of Decision (ROD) will be implemented for removal of source low-level waste constituents and elimination of the potential for off-site migration of contaminants.

The SIOU originally consisted of four impoundments: A (3524), B (3513), C (3539), and D (3540). Remediation of the impoundments was separated into two stages. Stage 1 ROD requirements included consolidation of the sediment, surface water, and approximately 0.03 m (0.1 ft) of subimpoundment soil from Impoundments C and D to Impoundment B. Impoundments C and D were backfilled with clean engineering fill to provide an operations area for construction and remediation of Impoundments A and B. Stage 2 will be implemented in conformance with the ROD for remediation of Impoundments A and B. This document defines the processes and methods for retrieval and processing of impoundment soils and sediments to meet transportation and disposal requirements to a licensed treatment storage disposal facility. Impoundment waters will be pretreated, if necessary, and piped to the on-site National Pollutant Discharge Elimination System process waste treatment plant.

The RDR provides specification and design for construction of the WTF, for sludge retrieval and processing, for transportation, and for disposal at Nevada Test Site. The method of retrieval/removal of sediments from the impoundments will be accomplished with a Liquid Waste Technology, unmanned remote control floating dredge system. Soil and sediments will be pumped through pipes to aboveground mix tanks to provide batch processing. Upon optimizing the slurries in the tanks, the slurries will be pumped through double case pipes to a Fournier rotary filter press for dewatering the sludge to generate a dry filter cake. The cake will then be fed through a screw auger to a mixer and combined with Portland cement for further conditioning. The final waste form from the mixer will be packaged in a shielded Type 7A box for shipment and disposal.

The RAWP defines applicable requirements for removal, treatment, and disposal of impoundment sediments in compliance with all regulations. Specifically, a crosswalk of pertinent applicable or relevant and appropriate requirements is provided in the RAWP for ensuring all activities are conducted in accordance with the ROD. Additionally, the WTF has been designed to minimize environmental exposure and with specifications to address occupational exposures as low as reasonably achievable.

1. INTRODUCTION

This Remedial Action Work Plan (RAWP)/Remedial Design Report (RDR) addresses the implementation of the remedial action (RA) at the Surface Impoundments Operable Unit (SIOU) at Oak Ridge National Laboratory (ORNL), Oak Ridge, Tennessee. The SIOU restoration is initiated pursuant to the Comprehensive Environmental Response, Compensation, and Liability Act of 1989 (Public Law 96-510), as amended by the Superfund Amendments and Reauthorization Act of 1986 (Public Law 99-499), and the Oak Ridge Reservation (ORR) Federal Facility Agreement of 1992 (FFA), as amended. The SIOU is in the Bethel Valley watershed and consists of Impoundment A (3524) and Impoundment B (3513). Two previous impoundments [C (3539) and D (3540)] were remediated in 1998 as mandated in the Record of Decision (ROD) for Stage 1 RA activities at the SIOU [U.S. Department of Energy (DOE) 1997a]. The *Remedial Action Report on the Surface Impoundments Operable Unit C (3539) and D (3540) at the Oak Ridge National Laboratory, Oak Ridge, Tennessee* was issued March 1999 (DOE 1999) for completion of the Stage 1 RA.

Publication of this RAWP/RDR follows approval of the SIOU ROD signed September 27, 1997, for implementation of Stage 2 remediation of Impoundments A and B and disposal of contaminated media at an off-site DOE-approved disposal facility. The RAWP/RDR establishes the schedule for the documents to be submitted by DOE to the Tennessee Department of Environment and Conservation (TDEC) and the U.S. Environmental Protection Agency (EPA) (Region IV) regarding the Phase 2 design for the SIOU RA. Specifically, the RAWP includes a crosswalk of the applicable or relevant and appropriate requirements (ARARs) that are requisites for the design and implementation of each phase of the RA for construction, removal/treatment, transportation and disposal, and final remediation of the SIOU.

1.1 PURPOSE OF THE RAWP/RDR

The objectives of the Stage 2 RA are to minimize environmental risk through source removal of contaminants and to mitigate the transport of contaminants off-site from the SIOU. The purpose of this RAWP/RDR is to identify all work and design requirements to be implemented for prevention of environmental pollution during and as a result of construction and remediation of the SIOU Impoundments A and B in compliance with all ARARs.

1.2 SCOPE OF THE RAWP/RDR

The scope of Stage 2 remediation of the SIOU Impoundments A and B is to:

- remove sediments, subimpoundment soils, and debris from Impoundments A and B;
- construct waste treatment plant and transfer impoundment wastes to the facility as set forth in this RDR;
- dewater and treat/stabilize the waste into an acceptable form that meets the waste acceptance criteria (WAC) of the designated disposal facility, identified as the Nevada Test Site (NTS);
- package, label, and containerize the waste form to meet applicable Department of Transportation (DOT) regulations and the NTS WAC;

- transport the treated waste to NTS;
- pretreat water, as required, to meet the ORNL Process Waste Treatment Plant (PWTP) WAC;
- restore the site per the engineering drawings included in Appendix A (table of drawings in Sect. 4.1);
- demobilize, including removal of structures and associated equipment; and
- submit the RAR documenting the site remediation.

2. PROJECT SCHEDULE

The RAWP and RDR documents are identified in the FFA as the primary documents that require regulatory approval. The Stage 2 SIOU RAWP/RDR FFA milestone date for regulatory review is July 30, 1999. The field work is scheduled to be completed in 2001 and the RAR is scheduled for submission September 17, 2001.

Other significant activities and their approximate implementation dates include:

- mobilization to site, begin waste treatment facility construction (February 10, 2000);
- transfer of Impoundment A sediments to Impoundment B (March 9, 2000);
- operational testing for waste treatment (June 22, 2000); and
- treatment of Impoundment B sediments (September 14, 2000).

3. PLANS

The following key SIOU documents have been developed/approved: the SIOU ROD was signed on September 24, 1997 (DOE 1997a); a post-ROD sampling plan for Impoundments C and D was submitted to EPA and TDEC on November 25, 1997; the D2 Remedial Design Work Plan (RDWP) (DOE 1998a) was submitted on March 13, 1998; and the RAWP/RDR for Stage 1 at the SIOU (DOE 1998b) was submitted on May 7, 1998.

This section details the project- and program-level plans developed to meet regulatory requirements for safely and successfully remediating Impoundments A and B.

3.1 PROJECT-LEVEL PLANS

The project-level plans are developed to comply with the specifications, conditions, mitigation measures, and implementation for properly remediating SIOU A and B. The project-level plans and key items covered in each are as follows:

- Site Safety and Health Plan (SSHP)
  - Radiation Safety Plan (RSP)
  - Air Monitoring Procedures
  - Standard Operating Procedures
  - Training Compliance
- Environmental Compliance Plan (ECP)
  - All Appropriate Laws/Regulations and Permits/Licenses
  - Spill Control Plan
  - Work Smart Standards Matrix and Crosswalk
- Waste Management Plan (WMP)
  - Transportation Plan
  - Waste Certification Plan
- Auditable Safety Analysis
- Quality Assurance Project Plan
- RAWP/RDR
  - ARAR Crosswalk
  - Water Management Plan
  - Site Restoration Plan
  - Engineering Plans and Specifications

If a conflict arises between documents, the SSHP and ECP take precedence. At no time shall safety be superseded.

In addition to or in conjunction with the above plans, Radiological Work Permits will be issued and Radiological Control Technicians (RCTs) will be at the site during field activities. Radiological and ambient air monitoring will be performed as outlined in the above plans.

The combination of all these measures will ensure that the ROD is being fully and safely implemented.

3.2 PROGRAM-LEVEL PLANS

3.2.1 Best Management Practices Approach

This section describes the best management practice (BMP) measures taken to comply with the ARARs associated with federal and state regulations. The two key BMP areas associated with the SIOU A and B remediation project are:

- surface water management during construction and
- treatment and disposal of waters produced as a result of this RA.

Section 4.5.2 of this plan outlines the procedures to be implemented for managing the surface water during construction and methods used to prevent off-site sedimentation. As detailed in this section, all potentially contaminated waters will be diverted back into the impoundments.

As detailed in Sect. 4.4 of this plan, the impoundment water is to be circulated through the treatment facility and back into the impoundment until all the required soils and sediments are removed. Depending upon the constituents remaining in the water at the end of this process, the waters may require pretreatment before discharge into the ORNL permitted PWTP system.

3.2.2 Environmental Monitoring and Sampling Approach

Environmental monitoring and surveillance will be conducted through all phases of construction and remediation of the SIOU Impoundments A and B to ensure compliance with the ARARs as defined in Sect. 6 of this report. Specifically, monitoring specified in TDEC Rules 1200-3-11-.08, 1200-4-10-.05, and 1200-3-8-.01 for emissions of radionuclides, fugitive emissions, and surface water and storm water, respectively, will be implemented to meet the substantive requirements of these regulations.

3.2.2.1 Air monitoring and sampling

Site activities must comply with ambient air quality standards (TDEC Rule 1200-3-3) and TDEC requirements for fugitive dust (TDEC Rule 1200-3-8). Based on the very low levels of volatile organic compounds, semivolatile organic compounds, and toxic metals in site samples, the only applicable rules for hazardous air pollutants are associated with radionuclides (TDEC Rule 1200-3-11).

Rigorous dust and process controls will be implemented at the site due to the presence of radionuclides. Any discharge ports along the treatment train will be operated under negative pressure using forced ventilation that is vented through high-efficiency particulate air (HEPA) filters. Wastes (sludge or uncontainerized debris) with airborne release potential (i.e., due to exposure to drying conditions) will be covered or kept moist at all times. Because of the stringency of the radiological operational controls and the thorough radiological ambient and occupational air monitoring programs, no ambient or site perimeter monitoring for nonradiological constituents is needed.

Monitoring of radionuclide emissions is conducted in accordance with 40 Code of Federal Regulations (CFR) 61 Subpart H, TDEC Rule 1200-3-11-.08 and *Compliance Plan–National Emissions Standards for Hazardous Air Pollutants for Airborne Radionuclides at the ORR* (Lockeed Martin Energy Systems 1994). Specifically, sources at ORNL that discharge radionuclides in the air in quantities that could cause potential effective dose equivalent (PEDE) in excess of 1% of the standard (0.1 mrem/year) will be continuously sampled. The radionuclides (constituents of concern) that could contribute >10% of the resulting dose for a release point will be analyzed and the emission estimate submitted in the ORR

Annual National Emissions Standards for Hazardous Air Pollutants (NESHAP) Report. Additionally, ORNL fugitive and diffuse emissions are estimated by the ORR perimeter air monitoring stations and are reported separately.

3.2.2.2 Surface water and storm water monitoring

Engineering controls as provided in Sect. 4.5.2 identify the strategic locations where storm water control structures (silt fences, check dams, control dikes, hay bales, etc.) will be installed to control run-on and run-off. These systems will be visually monitored during significant storm events for water quality, such as turbidity and solids, to determine whether erosion controls are functioning properly. If control systems fail during a storm event, the method will be reevaluated and the structure upgraded or modified as necessary. Since run-off has contamination potential, it will be diverted into the impoundments for preliminary treatment, if necessary, in the Waste Treatment Facility (WTF) before final treatment by the PWTP. Monitoring and approach to ensure that waters meet the PWTP WAC are detailed in Sect. 4.4.1.

3.2.3 Waste Management Approach

This waste management approach is based on the site investigation data presented in the remedial investigation/feasibility study (DOE 1995) and most recent confirmation analytical results provided from the post-ROD sampling and analysis that was submitted to the regulators in March 1998. The waste characterization data presented in these reports indicate that the constituents of concern are elevated levels of radionuclides, thus classifying the SIOU media as low-level radioactive waste (LLW). Additionally, the post-ROD sampling results show that the impoundment sediments are not subject to the Resource Conservation and Recovery Act (RCRA). Sediment analytes (primarily metals) detected in the composite impoundment media were below the RCRA Toxicity Characteristic Leaching Procedure maximum concentration levels (DOE 1998b). Additionally, sporadic concentrations of PCBs detected in the sediments were not found at levels of concern as regulated by the Toxic Substances Control Act (TSCA).

In accordance with DOE Order 5820.2A (to be replaced by DOE Order 435.1), the approach for the SIOU RA includes segregating LLW from uncontaminated waste and minimizing the amount of LLW generated. The SIOU RA waste streams consist of the following categories:

- radioactively contaminated sediment,
- personal protective equipment (PPE),
- impoundment and decontamination water,
- other radioactive waste (i.e., impoundment debris),
- solid industrial uncontaminated waste, and
- hazardous waste.

This RA requires compliance with the following standards, regulations, and guidelines as they apply to waste management, storage, treatment, transportation, and disposal:

- 10 CFR 71, Packaging and Transportation of Radioactive Materials;
- 10 CFR 835, Occupational Radiation Protection;
- 40 CFR 61 (Subpart H), National Emission Standards for Radionuclides;
- 40 CFR 300, National Oil and Hazardous Substances Pollution Contingency Plan;

- 40 CFR 302, Designation, Reportable Quantities, and Notification;
- 49 CFR 107, Hazardous Materials Program Procedures;
- 49 CFR 172, Hazardous Materials Table, Special Provisions, Hazardous Materials Communications, Emergency Response Information and Training Requirements;
- 49 CFR 172 (Subpart F), Special Placarding Provisions;
- 49 CFR 173, Shippers—General Requirements for Shipments and Packaging;
- NTS WAC, Revision 1, August 1997;
- Oak Ridge Reservation Waste Certification Program, Bechtel Jacobs Company (in preparation);
- Oak Ridge Y-12 Plant Sanitary Landfill WAC, Bechtel Jacobs Company;
- WM-LWS-WAC, *Liquid Low-Level Waste System, Process Waste Treatment Complex—Bldg. 3544, and Process Waste Treatment Complex—Bldg. 3608 at ORNL* (WMRAD 1997);
- DOE Order 435.1, Radioactive Waste Management; and
- DOE Order 5400.5, Radiation Protection of the Public and the Environment.

In the unlikely event that hazardous waste is generated during construction and remediation, the following RCRA ARARs will also apply:

- Rules of TDEC, Division of Solid Waste Management, Chap. 1200-1-11, Hazardous Waste Management;
- 40 CFR 261, Identification and Listing of Hazardous Waste;
- 40 CFR 262, Standards Applicable to Generators of Hazardous Waste;
- 40 CFR 263, Standards Applicable to Transporters of Hazardous Waste;
- 40 CFR 265, Interim Status Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities; and
- 40 CFR 268, Land Disposal Restrictions (LDRs).

The following subsections describe the strategy for management, treatment, and disposal of each waste stream and provides references that ensure compliance with the above standards, regulations, and guidelines.

3.2.3.1 Radioactively contaminated sediment

Radioactively contaminated media will primarily consist of the impoundment sediments and subimpoundment soils. These materials have been characterized as LLW (DOE 1995). These sediments will be dewatered in an on-site treatment facility to approximately 55–75% solids by weight and dewatering agent (Portland cement) blended with the wastes to bind any remaining free liquid. The final waste form will be transferred to Type 7A waste containers with extra shielding added (as needed) to meet DOT requirements. The Type 7A boxes will be wiped down to remove any external surface contamination, surveyed, and moved to the project's on-site LLW storage area. A licensed carrier will transport the waste to NTS for disposal. The estimated final volume of this waste form slated for disposal is approximately 1000 yd^3.

The primary health risks associated with handling this waste stream are from radiation exposure. These risks are minimized by incorporating the as low as reasonably achievable (ALARA) philosophy into the treatment system design and operation. Details of the ALARA process for reducing radiation exposures are given in the RSP.

3.2.3.2 Used personal protective equipment

PPE worn during the SIOU RA will include coveralls, booties, respirators, gloves, or other items as deemed necessary to safely perform work. Used PPE will be included in the waste profile for the contaminated sediment waste stream and will be collected in plastic bags and placed on top of the final waste product inside the Type 7A waste containers before the boxes are closed. If ALARA concerns prevent placement or there is no room in the sediment waste containers, the used PPE bags will be placed in dedicated Type 7A boxes. The total estimated volume of used PPE is 20 yd^3.

3.2.3.3 Impoundment and decontamination waters

Several feet of water are maintained in the impoundments to serve as radiation shielding over the contaminated sediments. At the end of the project (and as needed during the RA), this waste will be discharged to the ORNL PWTP (Bldgs. 3544 and 3608) for treatment. Pretreatment may be necessary to meet the PWTP WAC. Impoundments A and B hold approximately 2.5 million gal of water.

Care will be taken when decontaminating equipment to minimize generation of wastewaters. If decontamination run-off occurs, the decontamination waters will be drained into an undredged area of the impoundment or, if no undredged area is available, into a holding tank. The holding tank will be tested to determine whether waters meet the PWTP WAC or require pretreatment before discharge into the PWTP. The total volume of decontamination waters drained into the impoundments is expected to be <5000 gal.

3.2.3.4 Other low-level radioactive waste

Other LLW, such as wipes or equipment that cannot be decontaminated for free release, will be packaged either in Type 7A boxes or by other appropriate manner (e.g., shrink-wrapping) and stored in the on-site storage area until it is ready for transportation to NTS. Approximately 200 yd^3 of LLW may be generated during the SIOU decontamination and decommissioning activities.

3.2.3.5 Solid and uncontaminated waste

Solid and uncontaminated waste generated in the nonradioactive material management areas includes items such as office/breakroom waste, sanitary waste, and uncontaminated items slated for disposal

(i.e., silt fence and empty sandbags). These waste streams will be maintained in the material management areas until sufficient quantity is accumulated to warrant shipment or pickup. The sanitary waste holding tanks will be emptied by a septic tank cleaning subcontractor, while solid wastes will be disposed of at the Oak Ridge Y-12 Plant Sanitary Landfill or other appropriate disposal facility. Approximately 40 yd^3 of solid waste and approximately 16,000 gal of sanitary waste may be generated during the SIOU RA.

3.2.3.6 Hazardous waste

Generation of hazardous waste is not anticipated to result from project activities. However, if any hazardous wastes are generated, they will be managed in accordance with TDEC Rule 1200-1, "Hazardous Waste Management." An accumulation area will be established to keep hazardous waste segregated from radioactive wastes. Hazardous waste will be manifested under the ORNL EPA ID number (TN189009003) with the appropriate certification to the disposal facility.

3.2.4 QA Program

Stage 2 activities will be conducted in compliance with the requirements of 10 CFR 830.120, "Quality Assurance Requirements," April 5, 1994, with the 10 criteria described in DOE Order 414.1. The project QA plan encompasses the ten criteria and the requirements of the NTS WAC.

4. REMEDIAL DESIGN REPORT

This RDR presents the design and specifications for implementing the selected remedy (Alternative 6) as defined in the SIOU ROD (DOE 1997a). This submittal represents the 90% design as reflected by the milestone schedule in Sect. 3. Essentially, this design provides details for removal of sediments and subsurface soils to ensure that the sediment is removed to the greatest extent possible. As described in this RDR, Impoundments A and B will be excavated to an elevation of 0.03 m (0.1 ft) below the as-built elevation of the floor of the impoundment, excluding refusal of bedrock and riprap. This design defines how the impoundment sediments will be removed, dewatered, and treated/stabilized into an acceptable form to meet the WAC of the NTS facility. It also summarizes the transportation plan for shipment to NTS. Upon approval of the 90% design, the final design document will be submitted by the October 1999 milestone date.

4.1 PLANS AND SPECIFICATIONS

Appendix A contains the drawings for this RA. Table 4.1 lists the drawings by title and number.

Table 4.1. SIOU RA Stage 2 drawing numbers and titles

Drawing number	Title
40633051G001	Cover and Index
40633051P101	Process Flow Diagram
40633051P102	Piping and Instrumentation Diagram
40633051M201	Piping Plan – Tank Area
40633051M202	Piping Plan – Process Bldg.
40633051M203	Equipment Arrangement
40633051M204	Sections and Details
40633051M205	Exhaust Duct Plan
40633051M206	Exhaust Duct Details
40633051C301	Overall Site Plan
40633051C302	Foundation Plan
40633051C303	Foundation and Support Details
40633051C304	Surface Impoundment Post Remediation Final Site Plan
40633051C305	Erosion Control and Surface Water Drainage
40633951E401	One Line Diagram MCC-1
40633951E402	MCC-1 Data Sheet, Elevations, Legend, and General Notes
40633951E403 to 7	Schematics (6 Sheets)
40633951E409	Building Lighting and Power Plans
40633951E410	Tanks Area Power Plan and Panel Schedule
40633951E411	Site Grounding Plan
40633051E412	Electrical Details
40633051I501	Instrument Block Diagram
40633051I502	Building and Tank Area Instrument Plan
40633051I503 to 4	PLC-1 Wiring Diagram (2 Sheets)
40633051I505	PLC-1 Cabinet Layout
40633051I506	Instrument Details

Appendix B contains the data sheets and specifications for the WTF.

4.2 RETRIEVAL PLAN

A remotely operated dredge will be used to retrieve Impoundment A and B sediments and subimpoundment soils. The dredge operator will be stationed on the shore, outside the radiological area, and will control the dredge via a hand-held remote. To control subimpoundment soil removal, a vertical control system (which uses a Bottom Sense™ positioning device designed by the manufacturer for the selected dredge) will be used to help ensure that the 0.1–0.2 ft removal criterion is met. The dredge will transfer the sediments through a flotation line to the shore, where the main line will then be double-contained to minimize spillage potential on unaffected areas. Section 4.2.1 provides details of the dredge and associated equipment to be used on this project.

Due to the uncertainties associated with the distribution of radionuclides in the impoundments, the transfer line will be monitored to help minimize the risk of developing an excessively radioactive batch that may require special shipping or may not meet the selected disposal facility's WAC. If sediment containing a higher concentration of radionuclides is detected, it can quickly be rerouted back into an undredged area of the impoundment for blending with material having lower concentration of radioactivity.

The following sections provide technical details and operational procedures on the above briefing.

4.2.1 Major Equipment Descriptions and Use

4.2.1.1 Dredge

The dredge selected for use during this project is a Liquid Waste Technology (LWT) Pit Hog "Runt." This particular dredge is designed with quality components to minimize maintenance associated with sensitive operations such as remediation projects. The LWT dredge was successfully used in remediation projects at Weldon Springs, Missouri, and Fernald, Ohio.

The dredge used on this project will be equipped with a flotation platform; an unmanned remote control (controls traverse winch, hoist winch for setting the elevation of the pump head, slurry pump flow rate, and auger head on/off control); a 4-ft auger cutting head; a 2-in. mesh intake screen for minimizing clogging potential of grinder/pump; a 7.5-hp slurry pump capable of passing a 3-in. sphere; an electrical system designed specifically for submersible applications; and a floating discharge system (designed to float the power cable and full transfer line weight). The auger-like cutting head will be designed to reject debris such as stumps or cables that could jam the cutting head. Figure 4.1 illustrates the dredge's dimensions and other key features, while Table 4.2 provides the detailed basic specifications of this system. The dredge and ancillary attachments will be operated and maintained in accordance with the manufacturer's instructions.

The traverse winch will be attached to a cable that spans from east to west for both impoundments. The dredge will be moved across a transit, the cable will be relocated to the next transit, and the process will be repeated until all sediments are removed. The current I-post used for the bird-wire will be used as a cable anchor. A large-looped chain will be anchored from north to south on the existing I-post with each loop available for hooking the dredge cable. This will allow for precise relocation of the dredge along a predetermined transit. Figure 4.2 illustrates this method.

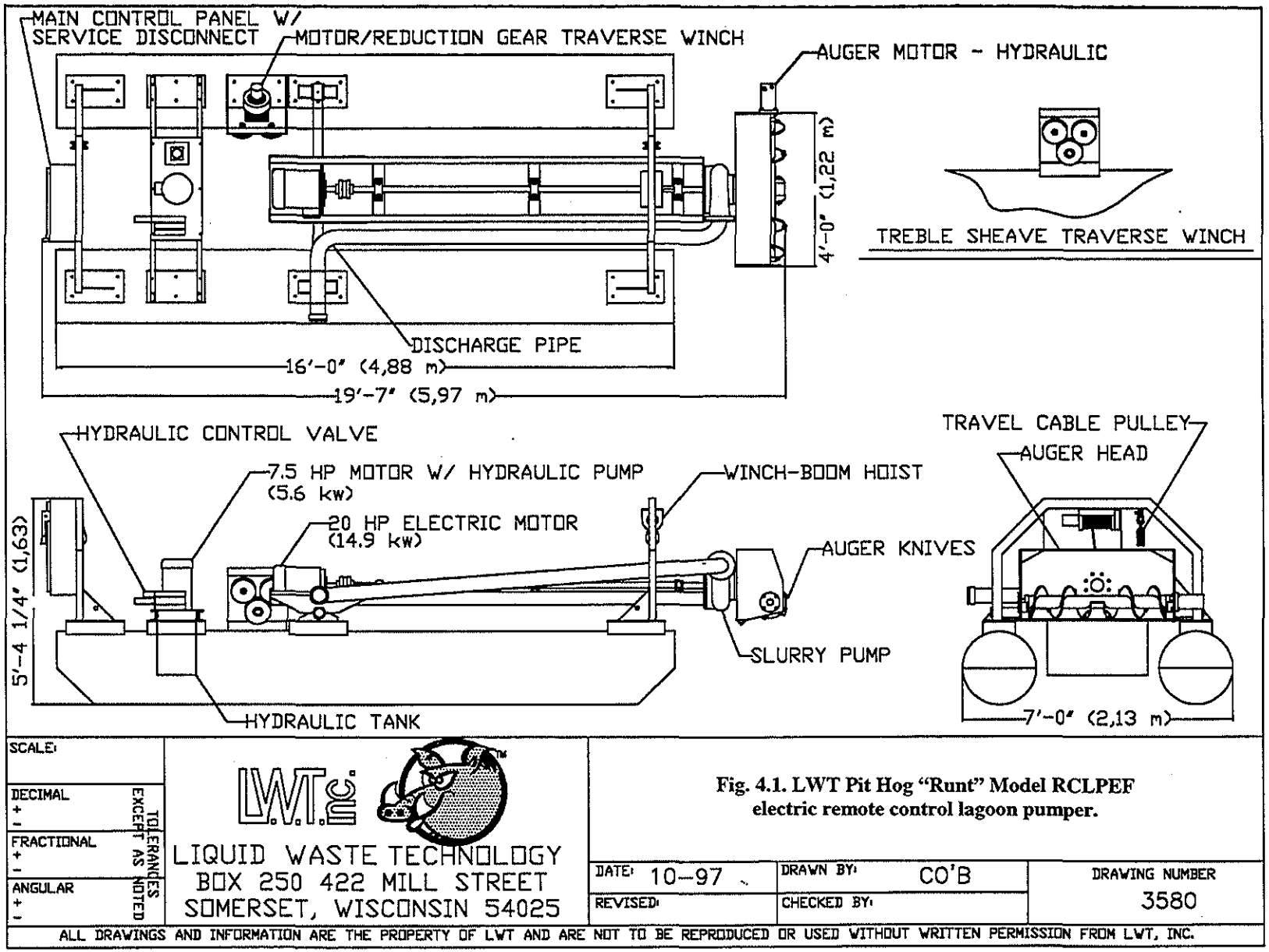

Fig. 4.1. LWT Pit Hog "Runt" Model RCLPEF electric remote control lagoon pumper.

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Table 4.2. Specifications for LWT Pit Hog "Runt" Model RCLPEF

SPECIFICATIONS
for
LWT Pit Hog "RUNT"
Model RCLPEF
Electric Radio Remote Control Lagoon Pumper

Physical:

Maximum working depth, feet 8' (2,44 m)
Flotation – Two Foam Filled Cylindrical Pontoons
{23" (584 mm) Dia. x 16'-0" (4,88 m) O.A.L x 12 gauge (2,7 mm) steel plate}
Weight 3,265 Lbs. (1481 kg)

Operational Draft 13" (330 mm)
Length, Overall 19'-7" (5,97 m)
Transport Width 7'-0" (2,13 m)
Height 5'-4 1/4" (1,63 m)

Power:

230/460 VAC, 3 Phase, 60 Hz Electric Power

Slurry Pump Motor – 20 HP (14.9 kw) TEFC
Hydraulic System Motor – 7-1/2 HP (5.6 kw) TEFC

Control:

Radio Remote Control for Speed and Direction
Hand Held Control Panel – 2,000' (610 m)
Minimum Operating Range

Slurry Pump:

Centrifugal, Enclosed Impeller Pump
Basic Construction – Cast Iron
Pump Speed – 1750 RPM
Suction & Discharge Diameters – 4-Inches (102 mm)
Impeller Diameter, inches - 9.5 (241 mm)
Sphere size, inches (max) 3 (76 mm)

Typical Head-Capacities:
900 GPM @ 55 ft. (56.8 l/sec @ 16.8 m) Head (Sp. G. 1.0)
600 GPM @ 72 ft. (37.8 l/sec @ 21.9 m) Head (Sp. G. 1.0)
300 GPM @ 84 ft. (18.9 l/sec @ 25.6 m) Head (Sp. Gr. 1.0)

Auger Head:

Auger with Shroud - Welded Steel Construction
Helix – 10" (254 mm) Dia. x 9" (229 mm) pitch – 3/8" (10 mm) thick Flighting
Length, Overall - 4'-0" (1,22 m)

Speed 50 RPM
Torque 3,000In.-Lbs. (339 x 10^7 dyne-cm))
Cutter Knives 10

Propulsion:

Treble Sheave Hydraulic Winch w/ 5/16" (8 mm) Diameter Wire Rope
Hydraulic Motor with Planetary Gear Reducer Drive - Traverse Speed Variable from 0 to 30 FPM (0 to 9.1 m/min.)

Hydraulics:

Three Circuits – Auger-Cutter, Traverse Winch and Hoist Winch
Flow Controls – 3-Position, 4-Way Directional Control Valves w/ Electronic Flow Control for Winch Speed
Hydraulic Pump Output @1,750 RPM - 10 GPM (6.3 l/sec)
Hydraulic Relief Pressure - 1,500 PSI (102 Bar)

Coating System:

All surfaces contacting the liquid in the pond shall be sand blasted and given two coats of coal tar epoxy coating with a film thickness of 12 mils (0.3 mm) minimum. All other surfaces shall be primed and coated with two coats of coal tar epoxy. Electric motors, hydraulic components etc. are installed as received with coatings applied by the original equipment manufacturer.

Liquid Waste Technology is an innovative leader in the design and manufacture of sludge handling equipment including Auger Dredges, Lagoon Pumpers, Submersible Chopper Pumps, Prop Agitators and Subsurface Land disposal Systems. Call 1-800-243-1406, 715-247-5464, e-mail at Info@lwtpithog.com or for more information, on the Internet at www.lwtpithog.com **or write to LWT, Inc., PO Box 250, Somerset, WI 54025.**

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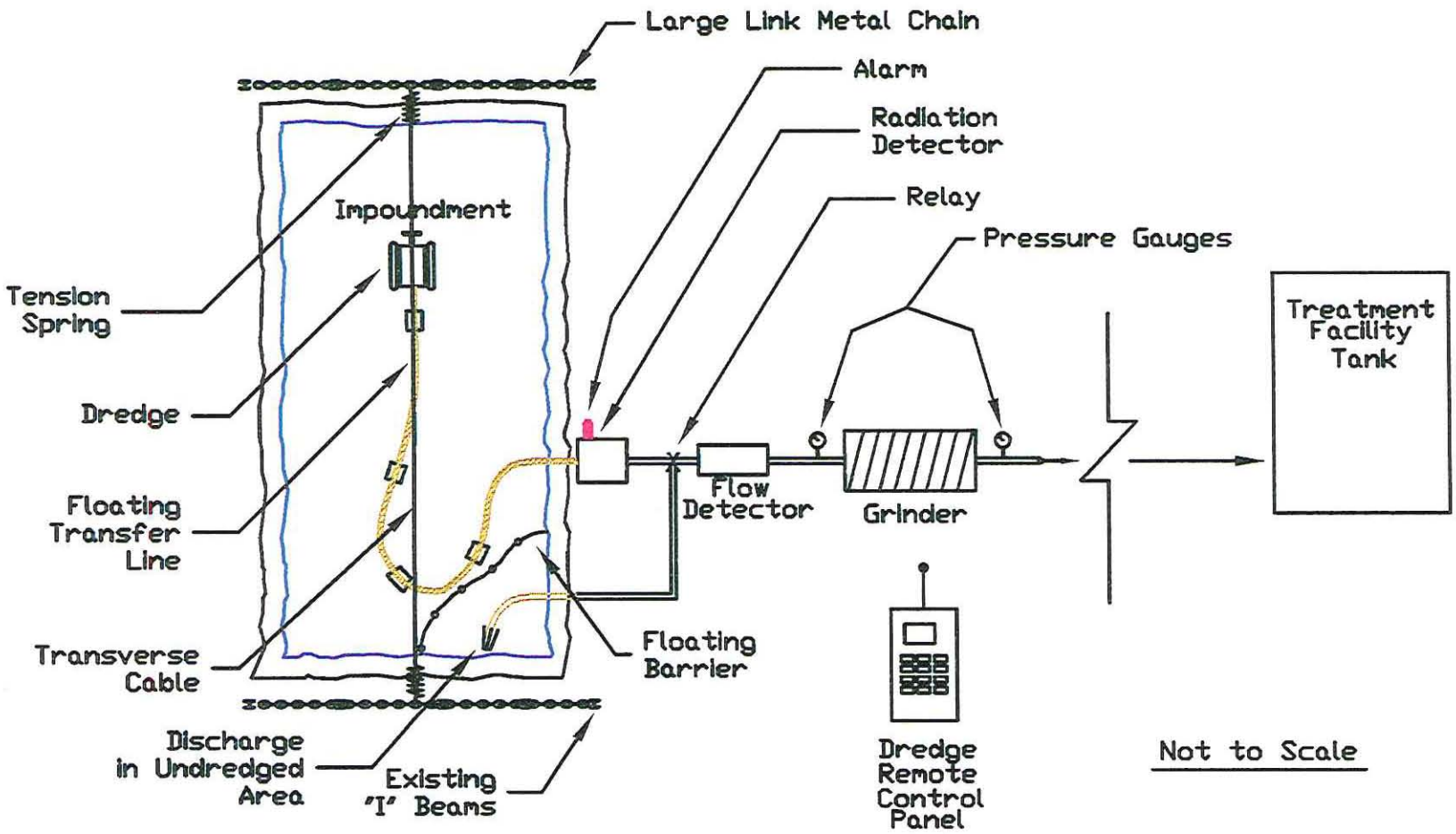

RADIAN INTERNATIONAL
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Fig. 4.2. Impoundment sediment/soil retrieval system.

Revision: 0
Date: March 12, 1999

Drawn By: G.Bird
Checked By: T.Moore

The dredge will be electronically driven with the power cable being a continuous (nonbroken) length from the dredge to the junction box. As recommended and provided by the manufacturer, the power cable shall be a Type-W grade. A certified electrician will perform all electrical work for connecting power to the dredge. The dredge power specifications are as follows:

- 230/460 VAC 3 Phase, 60 Hz Electric Power
- Slurry Pump Motor: 20 hp (14.9 kW) Totally Enclosed Fan Cooled (TEFC)
- Hydraulic System Motor, 7.5 hp (5.6 kW) TEFC

In addition to the basic dredge as detailed in Fig. 4.1 and Table 4.2, the dredger inlet will have a 2-in. mesh screen designed to prevent large rocks or debris from entering and clogging the system. Another added modification provided by the manufacturer is installation of a variable flow rate control. This will enable the operator to control the flow into the treatment facility or holding tanks.

The auger is designed for removing compact/dense soils. However, care must be taken to ensure that subimpoundment soil removal falls between the 0.1 and 0.2 ft removal criterion. To ensure that excessive removal does not occur, the auger head will be equipped with an LWT Bottom Sense™ system. The Bottom Sense system will automatically raise the auger head when the bottom is contacted and lower the head when it senses that the bottom is not present, following the bottom contour. The Bottom Sense system can be manually adjusted to the desirable height to follow along the existing impoundment bottom contour.

Upon completion of the removal of sediments and subimpoundment soils from the impoundment, a land survey of the bottom will be made to determine whether the removal criteria have been met. If <0.1 ft of subimpoundment soil has been removed, the area will be redredged until proper removal has occurred. If >0.2 ft of subimpoundment soil has been removed, the dredging process will be modified by raising the Bottom Sense system height to prevent further over-removal.

4.2.1.2 Transfer lines

Transfer lines (or pipe/hose) in the impoundment water will be equipped with flotation devices to keep the transfer line at the surface of the impoundment from being dragged along the impoundment bottom or cut by the auger head. These flotation transfer lines will be purchased from the dredge manufacturer to ensure that the recommended design criteria are met for proper sludge conveyance while in the water. The length of the floating pipeline will be such that it allows the dredge to reach the farthest point in the impoundment while suspending the transfer line to the shore.

A protective structure will be placed around any transfer line that must cross a roadway. The structure will be such that traffic may still pass safely along the roadway without harming the transfer line. The structure will be constructed with ramps used for smooth transverse to/from the high point of this structure. Posting will be placed ahead of the structure warning passing vehicles of the bump in the road.

Because the dredge is electrically driven, a power cord must cross the water. The power cable will be a Type-W grade (designed for use in water) and of continuous length such that the only connections are from the on-shore power supply port and the dredger main control panel. Electrical systems will be on a ground fault circuit interrupt.

Main transfer lines from the impoundment to the WTF will be double-contained by either placing an impermeable lined trench or by threading through polyvinyl chloride (PVC) or similar rigid pipe. Joints in

the secondary line will be sealed to minimize leakage onto unaffected areas. Due to the elevation of the treatment facility and tanks, all leaks will be gravity drained back into the impoundment. If a leak occurs, the leaking section will be shut down or bypassed. If a release occurs, the release area will be kept moist to prevent the spread of airborne contamination, and the leak will be fixed and cleaned immediately. Sandbags with UV inhibitors will be used to weigh down the transfer line. Bare main lines in a trench will have plastic wrapping placed around joints to minimize the risk of a leak that could spray onto areas outside of the trench.

4.2.1.3 Sediment/debris grinder

A Muffin Monster™ 30001-0804-DI-44 grinder will be placed in the transfer line before discharge of the waste to the treatment facility. The grinder will shred passing debris to a size suitable for treatment operations, eliminating the need for pre-screening and reducing the need for direct human contact. The Muffin Monster is a durable, highly reliable grinder capable of handling debris that passes the dredge's 2-in. mesh intake screen (gravel, leather gloves, cans, etc.). The grinder will be installed/maintained as required by the manufacturer's technical manual. Grinder wear will be dependent upon the type and amount of passing debris. Although unlikely to be needed due to the short field duration, an extra set of grinding blades will be kept on-site if the original set becomes damaged to the point that it warrants replacement.

Because of uncertainties associated with impoundment debris, the grinder may also become clogged. Pressure gauges will be placed and monitored at the inlet and outlet of the grinder. If substantial pressure difference between the two develops, the grinder will be checked for clogging debris.

As an extra precaution during dredge operations, the transfer line network will be equipped with a pressure relay that will direct flow back into the impoundment if line pressure exceeds 100 psi (Fig. 4.2). This precaution will prevent over-pressurization of the system if the grinder becomes clogged or a valve is accidentally closed.

4.2.1.4 Transfer line radiation monitor

The transfer line dose rate will be continuously monitored using an Eberline RMS-3 Area Monitor System equipped with an HP-300 probe and high alarm flashing strobe. The user can vary the alarm setting to a desirable trigger level. No check source is necessary with this unit, and it requires calibration only once a year. A dose limit can be determined that would indicate that the concentration of radioactive material in the transfer line could create radiation exposure concerns during processing or produce a waste form that could not be transported using the shielded B-25 boxes. Therefore, early detection of higher concentrated radioactivity during the retrieval process will allow enough time for altering the retrieval method and practice blending with lower activity material to ensure ALARA is maintained during waste treatment and a desirable waste form is developed.

To help protect the HP-300 probe, it will be placed in a sliced piece of PVC and strapped onto the transfer line. Openings will be sealed with caulk, and sandbags will be stacked around and on top of the sealed probe to reduce background. The RMS-3 monitor system will be mounted on a wooden frame placed beside the probe. This wooden frame will be covered to help keep the unit dry, and the flashing alarm strobe will be placed on top of the wooden support in a highly visible area.

When the RMS-3 alarm triggers, a transfer line relay will also trigger to reroute the dredged sediments back into Impoundment B (Fig. 4.2). The sediments will be discharged into an area of the impoundment that has not been dredged. Once the dose rate of the dredged sediments drops to a desirable treatment level, the system will be reset and the dredged sediments routed to the treatment facility.

The RMS-3 and ancillary equipment will be installed, maintained, and operated in accordance with the manufacturer's technical manual.

4.2.1.5 Crane work

The dredging apparatus will be moved using a crane. Crane work will be performed through a subcontractor with required training for properly performing on-site crane work. The dredging apparatus will require crane movement when it first arrives and when moved to another impoundment.

4.2.1.6 Large equipment

Transfer of rock fill to the site will be accomplished by subcontracting tandem dump trucks. The number of trucks will vary depending upon availability at the time, but may consist of six or more trucks used to fill the impoundments with rock. Once the impoundments are filled with rock, the voids are to be filled with flowable fill.

The flowable fill will also be subcontracted through a local vendor. The flowable fill will be transported in standard concrete trucks.

A dozer will be used to move and place received rock.

A roller will be used to seal the topsoil surface before placing erosion control blankets.

4.2.2 Remediation Sequence

Primarily due to the groundwater flow, it is preferable to clean and dewater the upgradient impoundment (A) first. This sequence will reduce groundwater infiltration during cleanup of the downgradient impoundment (B). Impoundment A can then be filled and used as additional storage space during the RA.

4.2.3 Biological Considerations

Vegetation and/or animal material could cause problems with dredging operations. To minimize clogging of the pump or intake, a growth inhibitor (Round-up or Rodeo) was applied to vegetation in early spring 1999. Periodic treatments will be applied through summer 1999 to help prevent weed growth (i.e., cattails). By the time actual dredging operations begin, the previous year's vegetative matter should be decayed enough to minimize clogging problems during the dredging operations.

4.2.4 Verification Survey

To verify the LWT Bottom Sense™ (detailed in Sect. 4.2.1.1) is working properly, a Tennessee licensed surveyor will perform a survey early in the removal phase upon dredging approximately one-fourth of Impoundment A's subimpoundment soil. Using a flotation platform (boat), radios, and transit stationed adjacent to the impoundment, an employee on the boat will locate the survey rod within 5 ft of previous reading taken before remedial activities. The previous survey locations will be entered electronically into the survey equipment that will prompt the on-shore operator to direct the location of the survey rod. Once a point is properly located, the survey rod will be placed lightly on the bottom (since all the sediments are removed at this point) and a reading will be obtained.

If a survey reading indicates that the required 0.1 ft removal did not occur, the area will be redredged until the required removal depth is achieved. Likewise, the dredge Bottom Sense™ may be adjusted to a lower position for removing more material to prevent the need for redredging of an area. If excessive removal has occurred, however, the dredge Bottom Sense™ will be adjusted to a higher retrieval height to prevent any additional over-cuts.

If adjustment to the Bottom Sense™ is necessary following the first check of the system, Impoundment A will be checked again upon dredging approximately one-fourth more of the subimpoundment soils. If no adjustment is necessary following the second check, the remaining dredging operations will be performed on Impoundment A before the final survey verification. However, if the Bottom Sense™ requires a second adjustment, additional checks will depend on the severity of the adjustment.

With the exception of some rough outcrops in a small portion of Impoundment A, both impoundments have roughly equivalent texture and density with respect to subimpoundment soils (Murray et al. 1998). Therefore, the Bottom Sense™ height determined for proper Impoundment A subimpoundment soil removal should be appropriate for Impoundment B subimpoundment soil removal, and removal verification will not be checked again until half of Impoundment B's subimpoundment soil has been removed. If removal has occurred outside the desirable range, the Bottom Sense™ will be adjusted accordingly to compensate.

4.3 SLUDGE TREATMENT PLAN

This treatment plan provides a summary and description of the WTF process control systems as provided in the engineering drawings and specifications. Specifically, it describes the process for solids transfer and dewatering, followed by blending and solidification, and transferring the solid waste into a shielded (as needed) Type 7A container that will be surveyed and approved before moving to and loading on a transport vehicle.

4.3.1 Major Equipment Descriptions and Use

The following provides a description of the planned major equipment items for use in treating Impoundment A and B sediments, subimpoundment soils, and water.

4.3.1.1 Waste treatment facility enclosure

As shown in drawing 40633051C302, a frame and fabric tent, about 80 by 30 ft, will enclose the process equipment. The enclosure will shelter the process equipment and provide a suitable skeleton for attachment of ventilation, wiring, and lighting. The floor will be sloped to drain to Impoundment B and have a substrate of 12 by 12 in. timber for subflooring. The timber "mats" will be covered with 80 mil geomembrane for ease of cleanability to aid in contamination control. The membrane selected will be of a type that provides good footing when wet.

4.3.1.2 Storage tanks

Storage for the sludge will be provided at the head end of the treatment train for the following reasons:

- The tanks provide a surge capacity (buffer) between the expected different rates of processing the dredge operations and waste treatment activities.

- It is intended that the dredge will fill two tanks (a day's throughput for the WTF) on the work day before processing by the WTF. This is planned so that at the end of the dredge work day a homogeneous mix will be ready for the next day's work at the WTF. This homogeneous "batch" will be measured using radiological scaling factors. If the slurry is out of the expected range (radionuclide concentrations), it can be blended with the contents of another tank or returned to the impoundment.

- Equalization of the slurry provides a more uniform solid product, simplifying the waste certification and QA process for shipment to NTS.

- During final dredging activities, pumped sludge is likely to have less than optimum solids content. If so, the sludge must be optimized by either mixing with another tank or pre-processing through the inclined plate clarifier (see Sect. 4.3.1.4). This optimization will be performed in order to achieve an acceptable slurry condition for introduction to the Fournier Rotary Filter Press (FRFP). The storage tanks will therefore be required for efficient slurry management during the final dredging.

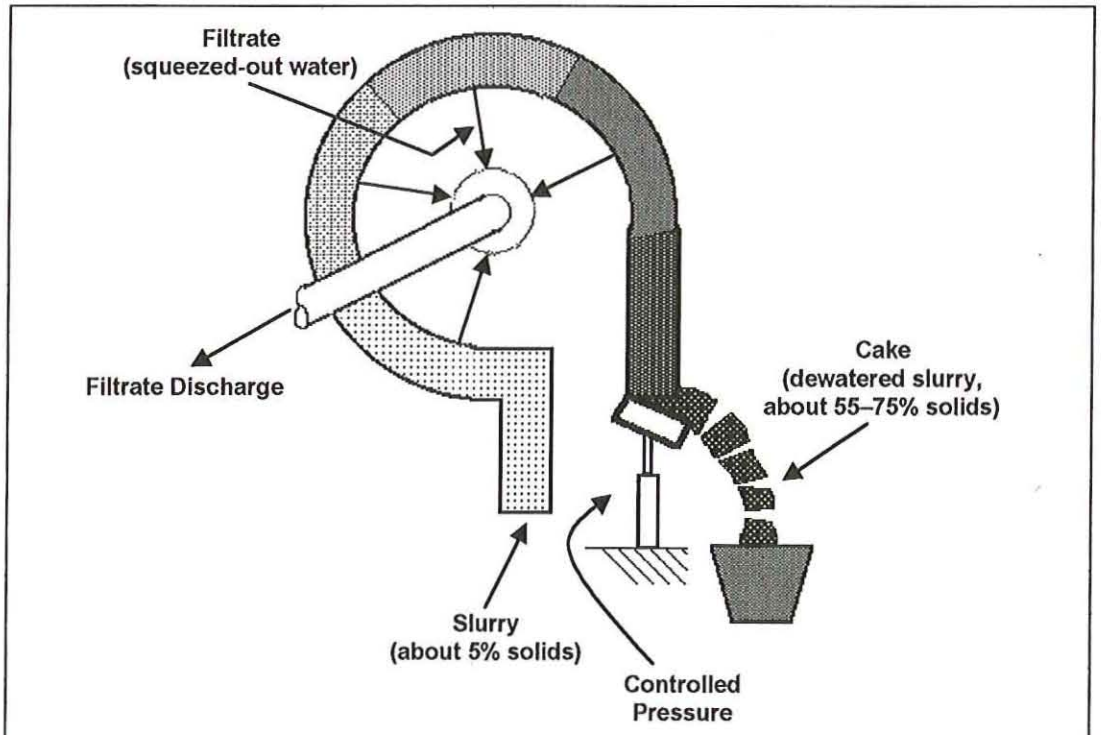
- The tanks may provide storage capacity during periods when the PWTP cannot receive flow from the SIOU (e.g., heavy rain events).

Sludge will be staged in six 18,000-gal, continuously stirred, low profile tanks. These tanks will be approximately 22 ft in diameter and have a fluid height limit of 7 ft. The tanks will be interconnected with pumps and piping so that transfers of a 5% slurry (the average percentage of solids of dredged or conditioned product) can be accomplished. Transfers will be available via remote valving to the tanks and from the impoundment, to the impoundment and from the tanks, between the tanks, to the tanks and from the facility, and to the facility from the tanks. The tanks will be equipped with overflow alarms, overflow return to the impoundment, and a level sensor. Tanks will have secondary containment designed such that liquid from a catastrophic tank failure will gravity drain to the impoundment via a diked and lined waterway. The six-tank cluster will be surrounded by no less than an approximately 6-in. thick sandbag or equivalent shielding for radiation control.

4.3.1.3 Dewatering equipment

Sludge from the tanks or the incline plate clarifier will be dewatered in the FRFP (Fig. 4.3). This fully enclosed unit has a proven track record for municipal and industrial dewatering applications. The enclosed design eliminates splash problems and will be negative pressure ventilated with a HEPA filtration system so that no hazardous off-gas will occur. As illustrated in Fig. 4.3, the principle of the rotary press is simple. Ideally, approximately 5% solids slurry is fed into a peripheral channel that has walls made up of rotating filtering elements that allow the liquid to pass through while retaining the solids. The wheel, as it moves the channel against a resisting door, generates a compressive and driving force on the sludge to form a cake. The compressive force coupled with a minimum inlet pressure and an outlet restrictive action results in a cake with a high level of dryness. Based on system design and results from the Engineering Support Studies, it is believed the FRFP will produce a cake containing approximately 55–75% solids. The FRFP will have six channels, will have an inlet slurry flow rate of about 150 gal/min, and will produce about 68 ft^3/hr of cake.

Photo of Fournier Rotary Filter Press in Operation.



Fournier Rotary Filter Press Schematic

Fig. 4.3. Overview of Fournier Rotary Filter Press.

Reference herein to any specific commercial product, process, or service by trade name, trademark, manufacturer, or otherwise, does not necessarily constitute or imply its endorsement, recommendation, or favoring by the United States Government or any agency thereof.

At the inlet, the original equipment manufacturer package includes inline polymer mixing columns for slurry conditioning preparatory to feed into the filter press channel. It is anticipated that a small polymer addition will be required to promote dewatering characteristics of the slurry solids. At the outlet during normal operation, the filtrate from this process will be returned to the impoundment. Water management toward the completion of the dredging activity will require that the filtrate go to the storage tanks to be staged for transfer to the PWTP or pretreated before discharge to the PWTP.

4.3.1.4 Low solids slurry conditioning equipment

Toward the end of dredging, the solids content of the slurry is expected to be somewhat below the optimum 5% range. The low solids content of retrieved soils and wastewaters during this stage of operations will be transferred from the storage tanks to an inclined plate clarifier (commonly referred to as a Lamella settling tank) where the suspended sediments will be allowed to settle out. HydroFlo™ Technologies, Inc. designed and developed the proposed unit. The inclined plate packs are made from ultra smooth corrugated fiberglass plates angled at 60° and spaced at 0.75 in. using stainless steel support rods with molded polypropylene spaces. A sludge collection chamber is located directly beneath the plate packs to provide a hindered sludge settling zone and storage capacity for the settled sludge. The sides of the chambers are steeply sloped at 60° to ensure proper settling and complete removal of the sludge. The unit comes with a standard stainless steel ribbon auger assembly in the settler bottom with converging flights for dewatering and efficient sludge evacuation to the FRFP. Provisions are included for inline polymer injection and mixing of the influent slurry before discharge into the clarifier proper.

4.3.1.5 Product blending equipment

After processing in the FRFP, the dewatered sludge product will exit into an enclosed, ventilated screw conveyor. An inline, approximately 10-hp paddle blender will be used to add and mix a predetermined percent by weight Portland cement (approximately 5–25%) to the sludge cake. The absorbant will be stored in a silo located outside the WTF and equipped with an auger feed for transferring the admixture to the blender. Once the absorbant is blended with the sludge cake, a dry final product will be generated that meets the NTS free liquid WAC. After blending, a pre-set weight of product will be discharged to the Type 7A box for packaging.

4.3.1.6 Product transfer

Two 6-ton, rubber tire, propane-fueled, skid-steer forklifts with changeable forks and buckets will be used to handle materials and containers. One forklift will operate within the radiological area of the treatment facility and the other in the nonradiological areas. This equipment will primarily be used for handling and transferring packaged product from the WTF to the storage area. Following certification of the containerized waste in the storage area, it will be loaded and shipped to NTS. The forklifts will also be used to carry heavy supplies to and from work areas, spread crusher-run (rock) to patch high traffic areas, and assist with the treatment facility construction.

The forklift outside the radiological control zone will place a clean, lined, and shielded container at the "empty" transfer table just inside the radiation zone of the WTF. The operator inside the WTF at the packaging area will pick up the lined, empty containers using the forklift confined within the radiological control zone and place the box (with the lid removed and set aside) on the feeder weight table (FWT). The product, after blending with Portland cement absorbant in the mixer, will empty into the container located on the FWT. The FWT and container are under continuous ventilation by means of a laminar flow hood to ensure that no dry material becomes airborne. Samples will be taken from the finished product stream as required at this time. The final product is evenly distributed into the Type 7A box until an electronic

load cell mounted in the table reaches the target weight (container load capacity). Once full, the forklift operator will place the lid on the box. At this point, laborers will latch the lid locks. The forklift operator will then transfer the filled waste container to the "outbound" table. Here the laborer(s) will wipe down the package and verify lid security.

The filled package will be ready to leave the outbound table after radiological checks and smears (checked off-site in low background area) confirm the container has no transferable contamination exceeding DOT limits. The forklift outside of the radiological control zone will then transfer the package to the staging area (filled Impoundment A pad).

4.3.1.7 Filtration

Two large, backwashable, sand media filter columns will be available for polishing water as required for transfer to PWTP. These units are approximately 2-ft diameter and about 8-ft tall. These units may be used intermittently before final operations, but the main use will be for processing filtrate from the FRFP and possibly supernate from the inclined plate clarifier.

4.3.2 Process Controls

4.3.2.1 Treatment additives

The surface impoundment wastes are currently classified as LLW and are not covered by RCRA; therefore, treatment for characteristically hazardous metals is not required. To meet the WAC of NTS and PWTP, however, additives may be used as follows:

- Coagulation and flocculation agent will be added to water if necessary to settle any suspended particles.

- Portland cement will be used to absorb any free liquid from the dewatered sludge. Portland cement hydrates in the presence of moisture to form a hardened mass. Approximately 120 calories of heat per gram of cement is released. Free lime is a by-product of hydration but is contained in the pore voids of the hardened mass. Cement is alkaline when in contact with moisture. Cement expands about 0.1 vol % during hydration but shrinks during the hardening stage by approximately the same amount. Planned waste form testing should establish a ratio of Portland cement to water for satisfactory product quality.

4.3.2.2 Physical and chemical reactions

No specific health or safety issues are associated with handling Portland cement or coagulant additives described in this section other than ensuring appropriate storage. The Material Safety Data Sheets will be readily available on-site for review.

4.3.2.3 Treatment system mass balance

Management controls for verification of volume input and output of the treatment facility will be maintained. The treatment facility is considered that portion of the operation that accepts the dredged material as slurry and processes it through the system until it exits the WTF. The treatment process flow diagram (drawing number 40633051P101 in Appendix A) illustrates the input/output pathways discussed in this section. The table in drawing number 40633051P101 shows the expected volumes and masses for

the sludge at key processing stages. The following are the expected treatment facility inputs and methods for volume determination:

- Dredged material: Volume into the facility is determined through volumetric (flowmeter) and density measurements made on the line from the dredge to the storage tanks (inlet to the storage tanks from the impoundments).

- Flocculent additive (when necessary): Volume into treatment systems determined through volumetric meter attached to injection line.

- Intermittent wash waters for cleaning the tanks, FRFP, and other WTF equipment: The volume entering the treatment stream will be determined by a volumetric meter attached to injection lines.

- Effluent from Settling Tank and FRFP: The settling tanks will have level sensors as part of the process control system. These sensors will be calibrated to determine tank volumes. With the tank volume information, volumes exiting or entering the tanks can be recorded.

- Dewatered Sediment: Volume is determined by (1) using load cell at the packaging table to collect empty and full container weight, (2) calculating treated weight by subtracting full container weight from tare (empty) weight, and (3) dividing treated weight by dewatered material's density to obtain dewatered volume. Note that this volume should be representative of the container's volumé.

The mass balance of the system can then be checked by calculation of the data collected in the description above. Ideally, the mass balance should be zero, but in practice small discrepancies are expected and are negligible. Mass balances will be calculated on a daily basis, and if totals do not fall within a permissible range, the system will be inspected and the source of error corrected. As a double check, the treated waste weight can be used with the treated waste average density to calculate a treated volume value. The treated waste weight is determined using a weigh table. Comparison of the container volume verses the calculated volume should help provide system checks. Also, if a visual check of the treated waste material appears moist, the system will be shut down until corrections can be made.

4.3.3 Meeting NTS WAC

As described in the ROD, the impoundments contain LLW and low concentrations of chemical contaminants, but these wastes are not classified as RCRA or TSCA-PCB wastes. Therefore, treatment for characteristically hazardous metals is not required. Laboratory analysis of representative samples has determined the concentration of various radionuclides required for NTS WAC reporting. These concentrations have been correlated with external gamma radiation measurements of ^{137}Cs to produce scaling factors. Measurements of external gamma radiation in the holding tank can be used to predict radiological compliance of the final waste form with NTS WAC and DOT shipping requirements. If these measurements indicate that either NTS or DOT requirements will not likely be met, the contents of the suspect tank will be discharged back into an undredged area of the impoundment or mixed with those of a lower concentration tank to generate a compliant final waste form.

Once results from a tank indicate that its final waste form will meet the NTS WAC and DOT shipping requirements, the tank will be processed through the WTF. To ensure the final product meets the NTS WAC of no free liquids, the dewatered product will be blended with an absorbent such as Portland cement. Although operational testing will confirm such, a 5–25% mix of absorbants is calculated to provide in excess the amount necessary for absorption of any liquids potentially released during transport.

The final product will be packaged in accordance with the NTS WAC. For this project, Type 7A containers will be used. Before adding the final waste product to the container, workers will prepare it by installing 3 in. of gypsum board in the top and on the sides and inserting a plastic liner designed specifically for the container. Shielding requirements were determined using Micro Shield model and ALARA criteria for exposure. Transportation and disposal will be performed as detailed in the following section.

4.3.4 Transportation and Disposal

Waste will be disposed of at NTS under DOE ORR contract. A licensed, insured radioactive material transporter will transport wastes to NTS. LLW will be packaged to meet Chap. IV of DOE G435.1-1 and DOT requirements as defined under 49 CFR 173.411–173.413 (for Type 7A packages). The sediment will be classified as "LSA-II" material per 49 CFR 173.403. Since the waste containers are expected to have an external radiation dose on contact of >50 mrem/hr but <200 mrem/hr, the containers will require a "Radioactive Yellow-III" DOT label. Two such labels will be required on opposite ends of each container in accordance with 49 CFR 172.403(f). A "Radioactive" placard will be required on each side and at each end of the transport vehicle in accordance with 49 CFR 172.516. The waste certification official will ensure that the packages meet Tennessee DOT requirements and that the final waste product meets NTS WAC before releasing waste for transport.

In the unlikely event that hazardous waste other than radiologically contaminated waste is generated, a RCRA treatment, storage, and disposal (TSD) facility that meets the requirements of 40 CFR 264 will be selected based on compliance with the state. Wastes that are not hazardous (municipal solid waste, garbage, and debris) will be contracted with a local sanitation company and transported to the Y-12 Plant Landfill or possibly the Chestnut Ridge Landfill. The RCT will screen solid waste to ensure that the solid waste dumpster is acceptable for disposal and that the wastes meet the landfill's WAC.

4.3.5 ALARA in Process Design

It has been well recognized (DOE 1997a) that processing of sludges and sediments from Impoundments A and B could present radiological hazards to personnel performing the processing operations. Risks come from external gamma radiation exposures and from potential inhalation of material that might become airborne. Hence, design of the waste treatment operations included engineering controls to keep all potential radiation exposures ALARA. Details of the ALARA program are given in the RSP.

Radiation doses to workers and the environment have been reduced by the following ALARA features incorporated into the facility design:

- large diameter, low profile sludge storage tanks instead of smaller diameter, tall tanks reduce external gamma radiation doses to workers and the environment;
- 0.5 to 1 ft shielding wall completely surrounding sludge storage tanks; height of the wall is equal to or higher than the maximum height of sludge in tanks further reduce external gamma radiation doses;
- remotely operated in lieu of manually operated control valves on sludge tanks reduce gamma radiation doses to workers;
- sensitive radiation detector in dredge piping to divert and blend sludges containing abnormally high concentrations of radionuclides avoiding gamma radiation exposure to workers;

- covering and containing the FRFP discharge, sludge transfer augers, sludge-cement mixer, and B-25 box filling operations prevent inhalation of radionuclides that could potentially become airborne from these processes (air flows from the processing area into the containment system);

- HEPA filtration of exhaust from the containment system avoids potential releases of airborne radionuclides to the environment;

- design of B-25 box filling area allows containment of potential airborne releases while also allowing remote replacement of shielded lid on boxes;

- gypsum or concrete board shielding in B-25 boxes of treated sludge reduce gamma radiation doses to workers during handling, lifting, radiation surveying, and transportation operations; and

- layout and shielding of transportation staging and storage area reduce gamma radiation doses to the environment.

Radiation doses to workers and the environment will be further reduced by ALARA measures (e.g., training and source avoidance) during waste treatment operations.

4.4 WATER MANAGEMENT PLAN

The water associated with the SIOU remediation project consists of the following streams: impoundment water, potable water, processed wastewater, and storm water. The following provides descriptions of each and details how the impoundment, potable, decontamination, sanitary waste, and storm waters are to be handled during the SIOU remediation activities.

4.4.1 Impoundment Water Management

Impoundment waters consist of any waters that are or have been in contact with the existing waters within the impoundments. The impoundment waters are necessary for shielding the radioactive sediments and for dredge operations. To minimize the need for adding new water from the ORNL potable water supply to the impoundments, the effluent waters from the SIOU WTF will be recycled to the impoundment rather than to the PWTP. This process will minimize the volume of water discharged to the PWTP.

As previously discussed, Impoundment A will be dredged during mobilization and filled early in the RA to be used as an additional staging area. During dredging of Impoundment A into Impoundment B, the water level will be maintained by pumping water from Impoundment B back into Impoundment A. When backfilling of Impoundment A begins, displaced water will be pumped to Impoundment B. Water levels in Impoundment B may become a concern during this period if the natural water level in Impoundment B is too high (i.e., due to heavy rainfall). In this case the water will be sent to the PWTP instead. Water will be tested before discharge to PWTP to determine whether pretreatment is necessary in order to meet the PWTP WAC. A portable filtration unit will be used (if necessary) before transfer to PWTP. This auxiliary method may become necessary if the WTF is not on-line at the time of filling activities for Impoundment A.

Near completion and from time to time on prior occasions in order to manage impoundment water level, water meeting the PWTP WAC will be pumped to PWTP from the WTF. Meters will be used to monitor the flow rate discharge into the PWTP. A 24-hr advance notice and the estimated quantity to be

discharged will be given before pumping into the PWTP system. Sampling will be performed on each batch of discharge water or 50,000 gal, whichever comes first. Discharge into the PWTP will be accomplished by transferring the waters via a flexible pipeline into the designated junction box north of Impoundment B. At no time will the flow rate be allowed to exceed 100 gal/min or the approved rate as determined by the PWTP. The discharge start/end time and flow rate during this activity will be logged so that total discharge volumes can be determined and proper sampling frequency can be maintained.

4.4.2 Potable Water Supply Setup/Use

The ORNL potable water supply will be used to clean equipment, showers, and drinking water and (if necessary) to raise the water level of the impoundments. Backflow preventers will be strategically placed to minimize risk of system backflow into any clean lines. At a minimum, backflow preventers will be placed at the two main connectors leading into the SIOU work area, at the inlet to the SIOU WTF, and at any hose hookup locations.

4.4.3 Decontamination Water Management

Equipment will be decontaminated using clean water from the ORNL potable water supply (see Sect. 4.5.3). Equipment will be cleaned using one or more of the following: pressure spray cleaning with clean water, spray cleaning with water and cleaning solution, brushes to remove attached dirt, and disposable cleaning towels with water and/or cleaning solutions. If run-off from spray cleaning should occur, the decontamination waters will be drained into an undredged area of the impoundment. Once the impoundments have been fully dredged, care will be taken to minimize generation of decontamination fluids. The decontamination fluids will be pumped to the WTF tank farm and sampled to ensure that the decontamination water meets the PWTP WAC. If necessary, the water will be pretreated before discharge to the PWTP. In other words, this decontamination water will be treated in the same manner as surplus impoundment water. Hand cleaning with cleaning solutions and disposable towels will be used when feasible to minimize generation of decontamination water.

4.4.4 Sanitary Wastewater Management

Sanitary wastewater will be generated from personal hygiene activities (showers and hand washing) in the on-site changehouse. These wastewaters can be considered free of contamination based on all employees having been surveyed as clean before exiting a contamination area/zone. Sanitary wastewater will be transferred into a holding tank, which will be emptied regularly by a septic tank cleaning subcontractor. At no time will sanitary wastewater be allowed to discharge into the SIOU or corresponding treatment system.

4.4.5 Storm Water Management

Storm water will be managed such that clean run-on is diverted around disturbed or potentially contaminated areas, while potentially contaminated run-off is diverted back into the impoundments. Any drainage pathway with potential for accepting eroded materials from the clean work areas will be equipped with straw bale check dams and/or silt fences to minimize off-site sedimentation resulting from such. See Sect. 4.5.2 of this plan for further details on erosion control and soil stabilization methods.

4.5 CONSTRUCTION AND SITE RESTORATION PLAN

The following provides highlights on methods to be implemented during the RA for maintaining existing and added critical SIOU engineering/institutional controls for protecting the worker and environment. Final plans for restoring the SIOU site are also included in this section.

4.5.1 Maintaining Engineering/Institution Controls and Berm Integrity

Work will be performed in a manner that will not degrade the integrity of the SIOU berms. At no time will work be performed on or immediately adjacent to a berm that could induce a release of surface water or cause seepage of sediments. Motorized transport equipment will be prevented from coming in contact with the berms. Berms will be inspected daily for leaks. If a leak does develop during field work, historic engineering control methods (i.e., spreading Bentonite along the influent side of the berm) will be applied to retard leakage.

Additional engineering/institutional controls to be maintained and implemented during this project include the following:

- installing a construction site boundary fence (before mobilization);
- maintaining animal intrusion lines and barriers (not to be removed until impoundment sediment retrieval is ready to begin);
- maintaining roadway integrity (i.e., filling in any potholes that may develop and keeping cleared for use);
- installing all required postings;
- protecting utilities, wells, and other structures not slated for removal (i.e., flagging structures and/or placing construction fence around item to be protected);
- protecting features and land resources as defined in the ECP (i.e., protecting trees not to be removed and stopping work in an area if historic resources are unveiled);
- installing and maintaining erosion/sediment control structures (see Sect. 4.5.2 for more details); and
- plugging abandoned underground piping encountered during sediment removal (i.e., removing piping to existing grade and plugging with flowable fill).

4.5.2 Erosion Control and Soil Stabilization Methods

The SIOU field work will be conducted on a site that is <5 acres, which excludes this action from development of a formal Storm Water Control Plan under TDEC Rule 1200-04-10-.05. However, the spirit of the regulations is considered ARAR, and engineering controls will be deployed during remediation activities to control and minimize sediments from entering White Oak Creek. At a minimum, the following will be installed: straw check dams in adjacent drainage pathways (especially upgradient to culvert/drain inlets), straw bale dams around the on-site SIOU storm drains, and a silt fence barrier along the southern boundary of the SIOU site. Drawing number 40633051C305 illustrates the SIOU storm water drainage and proposed locations for these engineering control structures.

As illustrated in drawing number 40633051C305, a majority of the surface run-on from areas outside of the contamination zone is currently diverted around the contaminated areas. Segregation of storm water run-on and run-off is a key BMP to minimize off-site sediment (and in this case, contaminant) transport from disturbed areas. During field activities, all waters that do not contact potentially contaminated soil will continue to follow current drainage pathways as depicted in drawing number 40633051C305. Any potentially contaminated storm waters will be diverted into the impoundments for processing during Phase IV treatment operations.

Inspections and surveillance are key BMPs emphasized on this remedial action, because regular checks of environmental control systems will help ensure that the systems are in proper working order and in top condition for protecting the environment. At a minimum, all control structures will be checked following precipitation events, and a weekly Erosion/Sediment Control Checklist will be used to ensure that control structures are properly installed and operational for the next rain event. Appendix C contains a copy of the Erosion/Sediment Control Checklist.

When sediment accumulates to the point that cleanout of the erosion control structures becomes necessary, any structure requiring cleaning within a controlled (contaminated) area will be disposed of as directed by the Site Manager (most likely bagged and disposed of with the process wastes). At a minimum, the SIOU straw bale dams and silt fences will require cleaning when accumulated sediments fill half of the available storage volume. If dry, the potentially contaminated sediments will be thoroughly dampened to ensure that no particulates become airborne during the cleaning process. In nonradiological areas, the sediment will be surveyed before removal to ensure that cross-contamination did not occur. If suitable, removed "clean" sediments may be used as fill in developed low points, or they will be stockpiled and used as appropriate during the SIOU filling operations.

Upon completion of the dredging activities and approval to proceed with filling activities, the impoundment will be filled with rock and flowable fill then capped with topsoil and seeded in accordance with Sect. 4.5.4. The topsoil will be protected from erosion through application of an erosion control blanket. Specifications/details for final grading, seeding, fertilizing, and matting operations are provided in Sect. 4.5.4.2.

Noncompliances with any of the control systems detected during inspections will be corrected immediately. Notification will be made of the corrective action and measures that are to be taken to prevent reoccurrence of the incident.

4.5.3 Contamination Control and Final Cleanup Decontamination Activities

4.5.3.1 Contamination control and final cleanup decontamination activities

During operations, a covered decon pad will be established with a plastic floor and, if required, sidewalls. The pad will be located so as to drain any cleanup water back into Impoundment B. This area will be used during operations to clean any small items (pumps, hoses, tools, etc.). Water spray from a garden sprayer, commercial cleaner, and wipes will be the main methods of cleanup.

After closure of Impoundment B, free drainage to the impoundment will no longer be available. Plans for dealing with small item cleanup and the demolition of the treatment facility take the following approach. The drainage system of the WTF will be blocked and replaced at the blockage with a small peristaltic pump which will convey any draining water into a drum. Most WTF cleanup will be performed as close to this pickup point as possible.

In order to reduce the amount of liquid waste produced, most decontamination of the WTF proper will be done with commercial cleaner (e.g., Formula 409) and paper wipes. The expended wipes will be disposed of as contaminated waste. Equipment that will clean up for free release using this method will be removed from the WTF enclosure and taken off-site.

Any equipment that will not meet free release criteria will be moved to the radiological boundary and wrapped in clean "shrink wrap" for transportation to a disposal facility or used elsewhere in other contaminated work. Small items that frustrate cleaning efforts will be placed in B-25 boxes for shipment to NTS. The enclosure itself will be salvaged (free release) if possible. Otherwise, it will be carefully dismembered and placed in B-25 boxes for disposal. The six tank structure and shield wall will be dismantled and disposed of as sanitary waste if releasable. Portions that do not clean up will be size reduced and placed in B-25 boxes for contaminated disposal.

4.5.3.2 Sanitary and contaminated demolition volumes

Every effort will be made to minimize sanitary and contaminated waste volumes, but the demolition generated waste will be substantial. One activity that will occur before demolition is a query to other remediation activities that might be able to use some of the equipment or material of the site and provide value to the government. Volumes resulting from demobilization/cleanup in beneficial reuse material, sanitary waste, and contaminated waste generated are estimated as follows:

- Beneficial reuse 100 yd^3
- Sanitary waste 40 yd^3
- Contaminated waste 200 yd^3

4.5.4 Backfilling Impoundments

4.5.4.1 Rock fill, flowable fill application, and dewatering

Although dependent upon weather conditions at the time, groundwater infiltration is expected to be a problem during fill placement. A French drain (perforated drainage pipe) may be installed at a low point in the impoundment before placement of rock fill to assist with impoundment dewatering while placing flowable fill. To minimize airborne potential, rock will be placed in the impoundment before complete dewatering. Once rock fill is in place, flowable fill will be applied to the design depth. Because the flowable fill will be denser than the impoundment water, the water will be pushed from the area. If the impoundment cannot be pumped dry before placement of the flowable fill, the flowable fill will be placed so that it directs the impoundment waters toward the French drain for retrieval (i.e., application of fill will begin at the farthest, highest elevation areas and work toward the French drain). The standpipe will be checked to ensure that the flowable fill has sealed this void.

Walking over large rock fills is considered a trip hazard, and care will be taken to minimize this hazard. To eliminate the risk of falls and serious injury to personnel struggling with an outlet hose over an exaggerated rough terrain (rock surface), the flowable fill may be applied by driving a concrete truck over the rock surface. Since the rock fill is clean, vehicles will not be contaminated.

The impoundment water level will be monitored during filling operations and maintained within the normal operating range. Waters will be pumped from the stand pipe and managed in accordance with the water management plan (see Sect. 4.4).

Once both impoundments are dewatered and filled, the treatment facility may be removed. The area will be covered with topsoil, seed, and matting as specified in the following section.

4.5.4.2 Topsoil/seeding/matting

Topsoil will be applied to Impoundments A and B and to the staging area (former Impoundments C and D area) as detailed in site restoration drawing number 40633051C04. Topsoil will be, at a minimum, 12 in. deep, and the area will be covered with the following seed mix:

- Kentucky 31 Fescue—70%
- English Rye—20%
- White Clover—10%

The seed mix will be spread evenly at a rate of 5 lb/1000 ft^2 area. Fertilizer will meet the Tennessee DOT Specification, Subsection 918.15 (i.e., guarantee of analysis conforming to a 5-15-15 formula) and be applied at a rate of not less than 20 lb/1000 ft^2. Limestone (no less than 85% calcium carbonate combined with magnesium carbonate) will be applied at a rate of at least 75 lb/1000 ft^2. The area will be raked and rolled before applying an erosion control blanket. An erosion control blanket meeting or exceeding the Tennessee DOT Subsection 918.28 will be used in this project. The area will be watered with a fine spray immediately following application of erosion control blankets and maintained until final acceptance.

5. GOALS ATTAINMENT

As detailed in the SIOU ROD (DOE 1997a), Alternative 6 was selected as the final action for source removal of the operable unit. The goal of the SIOU Stage 2 RA is to remove/treat contamination sources (i.e., the sediment and surface water) from Impoundments A and B, treat these wastes to meet the WAC for a proposed disposal facility, containerize the treated wastes, transport the containerized waste to the proposed disposal facility, and backfill the impoundments to restore the site in accordance with the ROD requirements. However, the Bethel Valley watershed ROD will determine the final land use designation for the entire watershed, including this site, and define additional actions for surrounding residual contamination as needed to ensure protectiveness for that land use.

Section 3 defines the plans developed for properly implementing Alternative 6 of the ROD. Section 4 specifies the design and remediation activities that will meet these goals. Section 4.2.4 also defines the method used to verify that removal of the contaminated media is adequate. Specifically, the bottoms of Impoundments A and B will be surveyed and compared to the pre-removal elevations of the top of the clay liner to ensure that 0.03 m (0.1 ft) of subimpoundment soil has been removed. This physical survey will be sufficient to verify that the remediation goal for these two impoundments has been met. In addition, a walkover radiation survey will be conducted and archival soil samples will be collected for support of the Bethel Valley watershed decision-making process. EPA and TDEC will be provided the opportunity to observe or participate in survey and sampling activities.

6. ARAR CROSSWALK

The following provides a crosswalk for implementing the ARARs identified in the SIOU ROD. This section lists each applicable ARAR, the regulations that drive the requirements, and the drawings or specifications that contractually implement the ARAR. Additionally, the ROD determination [i.e., either applicable or "to be considered" (TBC)] for each ARAR and/or citation has been noted in the crosswalks below.

Table 6.1 lists the pertinent ARARs required for proper Stage 2 implementation for completing the SIOU ROD requirements. Table 6.2 lists the ARARs identified in the ROD that are no longer pertinent to this project. This section also provides a justification why the ARAR is no longer pertinent.

Table 6.1. ARARs pertinent to Stage 2 actions

Actions Impacting Historic or Archaeological Resources (ROD Determination—Applicable): Action(s) that will affect such resources must adhere to the DOE/ORO Programmatic Agreement (May 6, 1994). When alteration or destruction of the resource is unavoidable, steps must be taken to minimize or mitigate the impacts and to preserve data and records of the resource.

Citation: National Historic Preservation Act of 1966 (NHPA) [16 United States Code (USC) 470a-w]; Executive Order 11593; 36 CFR 800; and DOE/ORO Programmatic Agreement (May 6, 1994) (TBC).

Addressed in: DOE issued a mitigation package (Moore 1995) to the Tennessee State Historic Preservation Office providing historical documentation of the SIOU site pursuant to Sect. 110(b) of the NHPA, 16 USC 470h-2(b). DOE and the Tennessee State Historic Preservation Office executed a Memorandum of Agreement, April 20, 1995 (Klima 1995), agreeing that DOE can proceed with remediation of SIOU. The April 25, 1995, cover letter from the advisory council on historic preservation (Klima 1995) verifies that DOE has fulfilled its responsibilities under Sect. 106 of the NHPA and the council's regulations.

Point-Source Discharge of Radionuclides into the Ambient Air from a DOE Facility (ROD Determination—Applicable): Exposures to members of the public from all radiation sources released into the atmosphere shall not cause an effective dose equivalent (EDE) to be >10 mrem (0.1 mSv)/year.

Citation: 40 CFR 61.92 and TDEC Rule 1200-3-11-.08.

Addressed in: RAWP/RDR Sect. 3.2.2.1.

Point-Source Discharge of Radionuclides into the Ambient Air from a DOE Facility (ROD Determination—Applicable): Radiological emission measurements must be performed at all release points with a potential to discharge radionuclides into the air in quantities that could cause an EDE in excess of 1% of the standard (0.1 mrem/year) as measured at the facility boundary. All radionuclides that could contribute >10% of the standard (1 mrem/year) for the release point shall be measured.

Citation: 40 CFR 61.93 and TDEC Rule 1200-3-11-.08.

Addressed in: RAWP/RDR Sect. 3.2.2.1.

Table 6.1 (continued)

Release of Radionuclides into the Environment (ROD Determination—TBC): DOE will carry out all DOE activities to ensure that radiation doses to individuals are ALARA.

Citation: DOE Order 5400.5(I.4) and 10 CFR 834 (proposed).

Addressed in: RAWP/RDR Sect. 4. ALARA considerations have been incorporated into many aspects of the process design (e.g., double containment of slurry transfer lines, shielding of the storage tanks and waste containers, enclosure of sludge transfer equipment). In addition, operating procedures will incorporate ALARA principles.

Release of Radionuclides into the Environment (ROD Determination—TBC): Exposures to members of the public from all radiation sources shall not cause an EDE to be >100 mrem (1 mSv)/year.

Citation: DOE Order 5400.5(II.1a) and 10 CFR 834 (proposed).

Addressed in: RAWP/RDR Sects. 4 and 3.2.2.1. Implementation of ALARA principles, keeping exposed sludge moist, provision of a HEPA filter on the building exhaust, and air monitoring will help ensure that exposures are maintained well below allowable limits.

Control of Storm Water Discharges Associated with Construction Activities at Industrial Sites that result in a disturbance of >5 acres [ROD Determination—Relevant and Appropriate for site with < 2 ha (5 acres) Affected]: Implement good site planning and BMP to control storm water discharges, including:

- documentation of BMP in a storm water control plan or equivalent,
- minimal clearing for grading,
- removal of vegetation cover only within 20 days of construction,
- weekly erosion control inspections and maintenance,
- control measures to detain run-off, and
- discharges that do not cause erosion.

Citation: 40 CFR 122 and TDEC Rule 1200-4-10-.05.

Addressed in: RAWP/RDR Sects. 4.5.2, 3.2.2.2, and 4.4.

Nonpoint-Source Air Emissions (ROD Determination—Applicable): Take reasonable precautions to prevent particulate matter from becoming airborne; no visible emissions are permitted beyond property boundary lines for more than 5 min/hr or 20 min/day. Potential nonpoint-sources of fugitive emissions are included in the plantwide fugitive emissions plan.

Citation: TDEC Rule 1200-3-8-.01.

Addressed in: RAWP/RDR Sect. 3.2.2.1.

Table 6.1 (continued)

Generators of LLW (ROD Determination—TBC): LLW generators must characterize and segregate LLW from uncontaminated waste and otherwise minimize the amount of LLW generated. Subsequent management of LLW must be in accordance with DOE Order 5820.2A.

Citation: DOE Order 5820.2A(III.3).

Addressed in: RAWP/RDR Sect. 3.2.3.

Transportation of Hazardous and Radioactive Materials Above Exempt Quantities (ROD Determination—Applicable): The waste must meet packaging, labeling, marking, placarding, and pretransport requirements in accordance with DOT regulations.

Citation: 49 CFR 171, 172, 173, 174, 177, 178, and 179 and DOE Order 460.1 (TBC).

Addressed in: RAWP/RDR Sect. 4.3.4.

Packaging of Radioactive Materials Above Exempt Quantities for Public Transport (ROD Determination—Applicable): Waste must meet packaging requirements based on the maximum activity of radioactive material in a package.

Citation: 49 CFR 173.431, 173.433, 173.435, and 173.411.

Addressed in: RAWP/RDR Sect. 4.3.4.

Waste Shipped from One Field Organization to Another for Disposal (ROD Determination—TBC): Generators must certify before shipment that the waste meets the WAC of the receiving facility.

Citation: DOE Order 5820.2A(III).

Addressed in: RAWP/RDR Sects. 4.3.3 and 4.3.4.

Shipments of LLW (ROD Determination—TBC): LLW must be disposed of on-site; if off-site disposal is required because of lack of capacity, disposal must be to a DOE facility. Off-site disposal of LLW to a commercial facility requires an exemption from the on-site disposal requirements of DOE Order 5820.2A; requests for exemption must be approved by DOE-ORO. Must meet DOE Order and implementing procedural requirements for off-site shipments.

Citation: DOE Order 5820.2A.

Addressed in: RAWP/RDR Sects. 4.3.3 and 4.3.4.

Table 6.2. ARARs no longer pertinent to this project

Waste Generated During Activities Potentially Contaminated with RCRA-Characteristic Waste (ROD Determination—Applicable to Secondary Wastes from Remediation of Impoundments C and D if Further Sampling Indicates Wastes Are RCRA-Characteristic): A person who generates solid waste must determine whether that waste is hazardous using various methods, including application of knowledge of hazardous characteristics of the waste based on information about the materials or processes used. All RCRA-restricted waste generated during remedial activities must be treated to meet LDRs before land disposal.

Citation: 40 CFR 262.11, TDEC Rule 1200-1-11-.03(1)(b), 40 CFR 268.40, and TDEC Rule 1200-1-11-.10(3)(a).

Applicability: No longer pertinent. *Results of the Radiological and Chemical Characterization of Surface Impoundments 3539 and 3540 at ORNL, Oak Ridge, Tennessee* (Rose et al. 1998) verifies that wastes from Impoundments C and D are not RCRA-characteristic.

Wastes that are Determined to be RCRA-Characteristic (ROD Determination—Applicable to Remediation of Impoundments C and D If Further Sampling Indicates Wastes Are RCRA-Characteristic): Must treat to meet LDRs for those RCRA-characteristic wastes.

Citation: 40 CFR 268.

Applicability: No longer pertinent. Rose et al. 1998 verifies that wastes from Impoundments C and D are not RCRA-characteristic.

Hazardous Wastes (Soils) for Which the Technology Specified in 40 CFR 268 Is Inappropriate (ROD Determination—Applicable to Remediation of Impoundments C and D If Further Sampling Indicates Wastes Are RCRA-Characteristic): Where a treatment technology specified in 40 CFR 268 is not appropriate to the waste, the generator may apply for a treatability variance to comply with LDRs.

Citation: 40 CFR 268.44.

Applicability: No longer pertinent. Rose et al. 1998 verifies that wastes from Impoundments C and D are not RCRA-characteristic.

Disposal of PCB-Contaminated Soil and Sediment to Meet the Disposal Requirements of 40 CFR 761.60(a)(4) (ROD Determination—Applicable to Remediation of Impoundments C and D If Further Sampling Indicates Wastes Contain PCBs Above 50 Parts per Million (ppm): The regional administrator may approve an alternate disposal method that can achieve a level of performance equivalent to incineration or high-efficiency boilers.

Citation: 40 CFR 761.60(e).

Applicability: No longer pertinent. Rose et al. 1998 verifies that wastes from Impoundments C and D do not contain PCBs at concentrations >50 ppm.

Table 6.2 (continued)

Storage or Treatment of RCRA-Characteristic Waste in a Tank (ROD Determination—Applicable to Treatment of Impoundments C and D Wastes If Further Sampling Indicates Wastes Are RCRA-Characteristic): Ensure that existing and new tanks have sufficient structural strength and are compatible with the waste to prevent collapse or rupture. Ensure that waste is compatible with the tank material unless the tank is protected by a liner or by other means. Provide tanks with secondary containment and controls to prevent overfilling and maintain sufficient freeboard in open tanks to prevent overtopping by wave action or precipitation. Inspect the following: overfilling control, control equipment, monitoring data, waste level (for uncovered tanks), tank condition, aboveground portions of tanks (to assess their structural integrity), and the area surrounding the tank (to identify signs of leakage). Repair any corrosion, crack, or leak. At closure, remove all hazardous waste and hazardous waste residues from tanks, discharge control equipment, and discharge confinement structures.

Citation: 40 CFR 264.191–192; TDEC Rule 1200-1-11-.06(10)(b)–(h); 40 CFR 264.193, 194, and 196; and 40 CFR 264.197(a).

Applicability: No longer pertinent. Rose et al. 1998 verifies that wastes from Impoundments C and D are not RCRA-characteristic.

Closure of Surface Impoundments (ROD Determination—Relevant and Appropriate to Closure of Impoundments C and D If Further Sampling Indicates Wastes Are RCRA-Characteristic): Remove or decontaminate all waste residues, contaminated containment system components (liners, etc.), contaminated subsoils, and structures and manage them as hazardous wastes.

Citation: 40 CFR 264.228(a)(2)(1) and TDEC Rule 1200-1-11-.06(11).

Applicability: No longer pertinent. Rose et al. 1998 verifies that wastes from Impoundments C and D are not RCRA-characteristic.

Transportation of Hazardous Waste in Containers of 416 L (110 gal) or Less (ROD Determination—Applicable to Transport of Impoundments C and D Wastes If Further Sampling Indicates Wastes Are RCRA-Characteristic): Waste must be marked with hazardous waste marking, generator's name and address, and manifest docket number.

Citation: 40 CFR 262.32(b) and TDEC Rule 1200-1-11-.03(4).

Applicability: No longer pertinent. Rose et al. 1998 verifies that wastes from Impoundments C and D are not RCRA-characteristic.

Transportation of Hazardous Waste for Off-Site Treatment, Storage, or Disposal (ROD Determination—Applicable to Transport of Impoundments C and D Wastes If Further Sampling Indicates Wastes Are RCRA-Characteristic): Shipment must be manifested according to 40 CFR 262 and 263.

Citation: 40 CFR 262 Subpart B, 40 CFR 263 Subpart B, TDEC Rule 1200-1-11-.03, and TDEC Rule 1200-1-11-.04.

Applicability: No longer pertinent. Rose et al. 1998 verifies that wastes from Impoundments C and D are not RCRA-characteristic.

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GLOSSARY

sediment—the in situ sediments slated for removal from the Surface Impoundments Operable Unit

sludge—material created once the sediments enter the collection (dredge and ancillary pipelines) and treatment facility (holding tanks and process equipment)

sludge cake—the dewatered sludge following processing in the Fournier Rotary Filter Press

final product—sludge cake mixed with absorbent or other materials necessary to generate a waste that meets the Nevada Test Site waste acceptance criteria

APPENDIX A

DRAWINGS

This section of the document contains oversized drawings that the DOEIC cannot reproduce.

If you would like to view the drawings, please schedule an appointment at the DOEIC by telephone at 241-4780, Monday through Friday, from 8:00 a.m. to 5:00 p.m.

APPENDIX B

DATA SHEETS AND SPECIFICATIONS

OVERVIEW

PROJECT OVERVIEW

Surface Impoundment Project
Walk, Haydel Job 40633-051

JULY 8, 1999

This project will install waste treatment facilities necessary to remove radioactive sludge contained in two waste ponds, SIOU A and SIOU B. The project consists of four significant activities: the dredging operation; waste treatment; cleaning, removing, storage and shipment of B25 boxes; and demolition of the facility after remediation is complete. This project overview only includes details of the waste treatment. A remotely operated dredge will pump sludge and water in pond A to pond B. Pond A will be closed and landfilled. The dredge will then pump the material in pond B to the new waste treatment facility. Processing of the material occurs in two steps – processing the sludge bottoms, then processing the water left in the pond after the sludge is removed. The sludge is dewatered in a rotary press, combined with Portland cement, packaged in B25 boxes and prepared for transportation. Water removed from the sludge during dewatering is returned to the mix tanks. During the latter stage of remediation, the remaining pond water is pumped to the clarifier to remove any suspended sludge material, then sent to the process water treatment plant. Sludge removed in the clarifier is pumped to the rotary press.

The new waste treatment facility consists of the following major equipment items

- Six 23,500 gallon working capacity, modular, open top mix tanks
- One top, center mounted agitator for each mix tank
- One rotary press 5 to 6 tons per hour capacity, complete with six dewatering channels, inlet flocculator and polymer feed system, and horizontal screw conveyor
- One inclined screw conveyor
- One 32 cubic foot twin paddle counterpoise mixer
- One 20,000 pound capacity weigh scale
- One Portland cement silo, 15 cubic yards capacity, complete with air pads and horizontal screw conveyor
- One inclined plate clarifier 100 gallons per minute capacity, complete with polymer feed system, supernate pump, and sludge pump
- Two cell skid mounted, sand filter with automatic backwash capability
- Two rotary press feed pumps, 150 gallon per minute capacity
- One rotary press filtrate pump, 150 gallon per minute capacity
- One portable, ventilated building to house all equipment items except the mix tanks and hopper
- Negative pressure system to remove any dust generated by the press, twin paddle mixer, or conveyors and consists of a 7.5 hp, 1800 cfm blower, HEPA filters and ducting.
- One 40 cfm, 100 psig air compressor to supply instrument air to the press, twin paddle mixer, silo and automated valves.

Dredged pond sludge material is received into the new treatment facility as a uniform 5% solids slurry mixture. If the radiation level of the slurry is too high, the stream is automatically sent back to the pond. Normally the stream is pumped to the mix tanks where it is kept agitated, then sampled to ensure on specification radiation levels. Typically three of the six tanks are being processed, while the other three are awaiting sample results. The slurry is pumped from the tanks to the rotary press where it is dewatered. Filtrate from the press is normally recycled back to the mix tanks. The press filter "cake" drops from the press into the horizontal screw conveyor. From here it is transported to the twin paddle mixer by the inclined screw conveyor. In the mixer the filter cake is combined with Portland cement from the silo in a five to one ratio. The combination of filter cake and Portland cement gets mixed in a batch operation, then dumped into B25 boxes and weighed. After weighing, the box is closed, cleaned, and moved to temporary storage by forklift.

During the latter stage of processing, pond water with remaining suspended solids is pumped by the dredge into the mix tanks. Processing is the same as before except the material is pumped from the mix tanks to the clarifier. Clean water from the top of the clarifier (supernate) is pumped to the to the process water treatment plant via the sand filters. Sludge from the bottom of the clarifier is pumped to the press for dewatering.

Please refer to individual narratives and data sheets for equipment descriptions and functions.

TANKS

MIX TANKS

Surface Impoundment Project
Walk, Haydel Job 40633-051

JULY 6, 1999

The tank installation will consist of six modular mix tanks with vertically mounted Lightnin mixers. Each tank is 22.37' inside diameter by 10.8' high with a net working capacity of 23,500 gallons. This is based on 1.8' of freeboard and 1'0" heel. The tanks are manufactured and erected by A.O. Smith Engineered Storage Products, "Aquastore" tank model 2210 GFTT. The tanks are made of glass fused to carbon steel 5' by 9' bolted panels, steel wall thickness 0.099", with 11-14 mil glass coating inside and outside of the panels. Floor of the tank is made of triangular panels similar to the shell. The bolts are plastic encapsulated inside the tank and sealant is installed between panels during erection. Three internal baffles two feet wide, eight feet long, mounted six inches off of tank bottom and equally spaced around the inside perimeter of the tank prevent swirling. There is no tank roof. However the top rim of each tank has a 3" by 3" by 0.25" thick outside angle. This angle can be drilled for owner installation of a "tarp" cover if desired. No concrete foundation or ring wall is required. Tanks will rest on owner's foundation made of compacted gravel overlaid with "pug mix" to provide a smooth surface. On top of this, 0.5" asphalt impregnated fiberboard must be installed. This prevents chipping the glass coating or having an uneven surface across a floor joint, which could lead to possible leaks. There is no structure associated with the tanks. There will however be a structure independently supported from the tanks on which the mixers will be mounted. Three tank nozzles, all 150# steel ANSI flanged, will be provided with the tanks – one slurry in, 4"; one slurry out, 6"; and one overflow, 4". There will also be a 2-inch "dry-well" connection mounted two feet off the tank bottom for insertion of a radiation detector. No man-way will be provided.

Each tank will have one center mounted Lightnin mixer, model 16Q7.5, driven by a 7.5 horsepower motor and gearbox. Shaft speed is 56 rpm, shaft diameter is 2.5", turbine diameter is 57" and the mixer construction is manufacturers standard – carbon steel components coated with enamel. Installation of mixers and independent support structure is by the project construction contractor. No tank ladders walkways or platforms are provided for mixer access.

MIX TANK SPECIFICATION SHEET

Surface Impoundment Project
Walk, Haydel Job 40633-051

July 6, 1999

Location Oak Ridge, Tennessee

Equipment Tag Numbers T101 through T106

Number of tanks Six

Nominal size 22.37' diameter by 10.8' high

Nominal capacity 25,871 gallons

Net working capacity 23,500 gallons

Product stored Dredged sludge form SIOU pond B, slurry containing 5% solids

Pumping rate 150 gpm **S.G.** 1.03

Tank freeboard 1.8 feet

Tank heel 1.0 feet

Manufacturer A.O. Smith Engineered Storage Products, Aquastore Tank Model 2210 GFTT; OR EQUAL

Construction details

Shell Corrosion resistant glass fused to carbon steel panels inside and out, 5' by 9'; bolted design; steel wall thickness 0.099", glass coating thickness 11-14 mils; cobalt blue color; plastic encapsulated bolts inside of tank; sealant between panels.

Roof None

Bottom Glass fused to triangular carbon steel panels inside and out, bolted design similar to shell.

Structurals Independently supported steel framing across diameter of tank to support mixer; no ladders, walkways or platform to access mixer.

Foundation Compacted gravel. Install "pug mix" under tank to provide a smooth surface. On top, install 0.5" asphalt impregnated fiberboard

Nozzles – Type, number, size and height – centerline of nozzle to tank bottom

Slurry inlet	1	4"	18"
Slurry outlet	1	6"	12"
Overflow	1	4"	110.25"
Dry-well	1	2"	24"

Agitator

Manufacturer Lightnin Mixer
Model 16Q7.5
Construction Manufacturer's standard, carbon steel shaft and turbine coated with industrial enamel.
Horsepower 7.5

ROTARY FILTER PRESS SYSTEM

ROTARY FILTER PRESS

Surface Impoundment Project
Walk, Haydel Job 40633-051

July 6, 1999

The rotary press (PK-101A) consists of a Fournier six dewatering channel press, complete with a horizontal screw conveyor, flocculator and basic control panel. The cake handling system (PK-101B) consists of an inclined screw conveyor, one Portland cement silo with screw conveyor, and mixer. Sludge from mix tanks is delivered to the press flocculator by the rotary press feed pumps P-101 and P-102 at a maximum rate of 150 gpm at 5% solids. The sludge is mixed with polymer in the flocculator before it is continuously fed to the press channels for dewatering. The cake produced is approximately three tons per hour of about 65% dryness. The press horizontal conveyor delivers cake to the inclined press for delivery to the mixer. Here Portland cement delivered by the silo conveyor is mixed with the filter cake in a one to five ratio. After mixing in a batch operation, gates on the bottom of the mixer open to direct the blended filter cake into product boxes for disposal.

The press will be mounted close to grade to provide enough vertical clearance for the horizontal screw conveyor. The conveyors and mixer are covered to minimize possible dust problems. The mixer will have dust collector and connection for flexible ducting to the dust control system. The press, the horizontal screw conveyor and the inclined screw will also have connections for possible ducting to the dust control system.

Basic equipment consists of the following

- PK-101A - Fournier Rotary Press Model 6-1200/6000A equipped with six 48" diameter dewatering channels and driven by a 30 hp, 1800 rpm, TEFC motor through a gear reducer. The press is complete with polymer preparation and feed system, flocculator, horizontal screw conveyor and logic control panel. The dewatering channels are carbon steel with chrome plated stainless steel filtration elements. Each dewatering channel has one set of water spray nozzles to clean the inside and outside of the rotating wheel. A carbon steel cake outlet chute is supplied to deliver the cake to the horizontal screw conveyor at the base of the press. There are two one-inch connections per channel for discharge of filtrate. The flocculator accepts incoming sludge and mixes it with polymer. The flocculator tank is of carbon steel construction, rated for 60 psig and is complete with 4" tangential inlet and outlet connections; distribution manifold, valving and piping to each channel; 1.5 hp motor driven agitator; a manual sampler; and connections for instrumentation, wash water and polymer.
- PK-101B, which includes one 15 cubic yard Portland cement silo with air pads; variable speed screw conveyor; inclined screw conveyor; and mixer. The silo conveyor delivers Portland cement through a chute to the mixer. From this point the mixer delivers the blended filter cake and Portland cement mixture to B25 boxes for removal and interim storage.

The rotary press vendor will supply his own PLC control and DC control (for the flocculator). The PLC will be located in a vendor supplied control panel in the control room. Radian will furnish a circuit breaker (protected feeder to DC control of the flocculator) and a Variable Frequency Drive (for the press) in the MCC. A junction box for terminating PLC control wiring will be located on the equipment skid local to the equipment. Radian will supply the junction box. Malfunction alarms to be hardwired to the junction box. For motor starters supplied by Radian, a provision in the starter is provided for a digital output to start/stop the motor, and for a digital input indicating motor run status; signals are 120VAC powered by the starter control power transformer.

ROTARY PRESS SPECIFICATION SHEET

Surface Impoundment Project
Walk, Haydel Job 40633-051

JULY 6, 1999

Location Oak Ridge, Tennessee

Equipment Tag Numbers PK-101A
PK-101B

Number	**Capacity and Size**
PK-101A	
One Fournier six channel rotary press with horizontal screw conveyor	5 to 6 tons per hour
One flocculator / mixer, and polymer feed system	1' diameter X 6' high
Interconnecting piping between flocculator and press	
Basic logic control panel	
PK-101B	
Inclined screw conveyor	5.25 tons per hour
Portland cement silo with air pads and screw conveyor	15 yards^3
Mixer – Hayes and Stolz twin paddle counterpoise	32 ft^3 (~1.5 tons) of product per batch 50" wide, 73" long, 39" high

Construction – solid steel main shafts 4 7/16"diameter with heavy duty paddles mounted on 1 ½" solid steel cross arms, and each paddle hard faced on the leading edge. Body and ends of mixer are 1/4" steel plate. Top of mixer is 12 gauge steel with openings for the entering filter cake and Portland cement, access hatch, and mounting flange for dust collector. Blended product is discharged through four Salina Vortex 10" square pneumatic gate assemblies in the bottom of the mixer.
Power to the mixer is supplied by two 20 HP electric motors using variable frequency controllers.

Equipment and conveyor interconnecting chutes

Manufacturer Fournier Industries, Model 6-1200/6000A

Construction All components for both PK-101A and PK-101B are painted carbon steel; press filter elements are chrome plated stainless steel; interconnecting piping stainless steel; chutes are carbon steel; channel spray nozzles are brass.

Drive 30 horsepower, 1800 rpm directly coupled to gear reducer; press mounted on gear reducer output shaft.

WEIGH SCALES

WEIGH SCALE SPECIFICATION SHEET

Surface Impoundment Project
Walk, Haydel Job 40633-051

JULY 9, 1999

Location Oak Ridge, Tennessee

Equipment Tag Number WS-101

Number One programmable weigh scale

Size 5' wide by 7' long by 5" high

Capacities 20,000 pounds

Model DSL8460-20

Service Weigh individual B25 product boxes and control operation of upstream batch mixer

Manufacturer Weigh – Tronix, Inc.

Construction scale is low profile, carbon steel with ¼" top plate; 2 mil alkyd enamel over 3 mil epoxy primer finish; all cables and four alloy steel weigh bar sensors protected within the deck; 100% end loading, 150% overload protection; two lifting eyes; optional ramps and floor positioning plates. Scale has easy access to weigh bars and junction box and high pressure wash down will not affect the junction box or sensors. Adjustable leveling feet have a ¾" adjustment and are made of stainless steel.

Controls Weigh Tronix WI-130 digital weight indicator with internal programming to control loading of material and includes 25' of cable, dual communication ports, dot matrix display, NEMA 4X enclosure, various operational keys (zero, tare, print, units, select, enter, escape, clear, 0-9, decimal point and five soft keys labeled per selected operational routine). All keys have audio acknowledgment.

CLARIFIER AND FILTERS

CLARIFIER AND FILTER PACKAGE

Surface Impoundment Project
Walk, Haydel Job 40633-051

JULY 7, 1999

The clarifier package PK-103 consists of an inclined plate clarifier complete with integral flash mix tank and floc mix tank, both with mixers; polymer chemical metering pump and activation system; sludge collection and settling chamber; steep cone bottom sludge thickener tank; one supernate (clarifier effluent discharge) pump P-103; one sludge bottoms pump P-104; and system control panel. After nearly all of SIOU pond "B" sludge is processed, the clarifier will take water from the mix tanks to do a final separation of silt from the water. Water is sent to the Process Water Treatment Plant via filter F-101 and the bottoms of the clarifier is pumped to the rotary press.

Basic equipment consists of the following

- Clarifier – Hydro-Flo Model MaxiClarCIPC-400 or equal inclined plate clarifier (1.5" plate spacing), 400 square feet size, with corrugated fiberglass multi-plate pack angled at 60 degrees using stainless steel support rods and polypropylene spacers. The hydraulic loading rate to settling area ratio is 0.25 gpm per square foot. The sludge collection chamber directly below the plate pack has 60 degree sloped sides and provides a zone for settling, thickening, and intermediate storage of the sludge. Below this is a steep cone bottom sludge thickener tank, 2600 gallon capacity, and FRP construction.
- Mixer for the integral flash mix tank, 350 rpm; digital pH controller; and automatic chemical metering pump for caustic. The pH controller and automatic chemical metering pump may not be needed for this application.
- Mixer for the floc mix tank, variable speed 30 – 350 rpm; polymer chemical metering pump and polymer activation system. The polymer concentrate drum is not included.
- Supernate pump P-103 is end suction, top discharge centrifugal pump rated for 100 gpm at 70' total dynamic head, with schedule 80 PVC isolation plumbing, and driven by a 3 hp TEFC motor.
- Sludge bottoms pump P-104 is also and end suction, top discharge centrifugal pump rated for 35 gpm at 70' total dynamic head.

The filter package F-101 consists of a two-cell sand filter system, fully automatic, skid mounted, pre-plumbed and pre-wired. The filter receives clarifier effluent from the supernate pump and removes 99% of particulates down to 10-micron size. The filter has capability to automatically backwash using the filtered stream while maintaining flow to the PWTP. The filtration vessels are carbon steel, ASME rated. Clamp type manways are provided on each vessel to allow filter media loading and inspection. All influent and effluent distribution manifolds and plumbing are PVC complete with isolation valves. There is an automatic differential pressure sensing backwash system, with pneumatic flow control valves. Filters are Hydro-Flo Model HydroCell HCPF or equal.

Controls for the clarifier and filter are located in a remote "central system" control panel. This panel includes components for system control for all mechanical equipment, with manual override and safety power lockout. Input and output contacts are provided for indication of process start and ready to run.

The Clarifier vendor will supply his own PLC control. The PLC will be located in a vendor supplied control panel in the control room. Radian will furnish motor starters (flash mixer, supernate pump, sludge bottoms pump) and a Variable Frequency Drive (floc mixer) in the MCC. A junction box for terminating PLC control wiring will be located on the equipment skid local to the equipment. Radian will supply the junction box. Malfunction alarms to be hardwired to the junction box. For motor starters supplied by Radian, a provision in the starter is provided for a digital output to start/stop the motor and for a digital input indication motor run status; signals are 120VAC powered by the starter control power transformer.

PUMPS AND VALVES

PUMPS

Surface Impoundment Project
Walk, Haydel Job 40633-051

JULY 7, 1999

Rotary Press Feed Pumps P-101, P-102

Feed pumps take suction on one manifold that comes from each grouping of three mix tanks. These are LaBour Model 2000, size 3 X 2 -9 end suction, top discharge centrifugal pumps, close coupled with design flow rate of 150 gpm at 70 feet total dynamic head. Pump construction is cast iron case and impeller, steel shaft with stainless steel shaft sleeve, non asbestos packing (instead of a mechanical seal), and 125# ANSI standard flanges. Driver is a 5 horsepower 1750 rpm motor. Close coupling eliminates any alignment problems and the need for a baseplate. These pumps can discharge to the pond, the rotary press (normal flow scheme), the clarifier, or back to the mix tanks. There will be one warehouse spare for both of these pumps.

Clarifier Supernate Pump P-103 and Clarifier Bottom Sludge Pump P-104 (Part of clarifier package PK-103)

Both pumps are supplied by the clarifier vendor. The supernate pump (filter feed) will be end suction, top discharge centrifugal pump, rated for a flow rate of 100 gpm at 70 feet total dynamic head. The bottoms sludge pump will also be a centrifugal pump rated at 35 gpm at 70 feet of head. The supernate pump can discharge to the PWTP via the sand filter (normal flow scheme), the pond or back to the mix tanks. The sludge pump can only discharge to the rotary press.

Rotary Press Filtrate Pump P-105

Since filtrate from the press will be gravity drained to an existing sump, this pump will be a vertical sump pump. It is a LaBour Model 1060-20, 3 X 2 – 10 Taber Series, single stage. Pump construction is cast iron case and suction strainer, steel shaft, stainless steel impeller, Teflon lineshaft sleeves, and 150 RF flanged discharge. Pump is rated for 150 gpm at 70 feet total dynamic head. It is mounted on a 32" round carbon steel baseplate and driven by a 7.5 hp motor. This sump pump can discharge to the mix tanks (normal flow scheme), the pond, the inlet to the sand filter, or back to the inlet to the clarifier. This pump will also have a warehouse spare.

WALK HAYDEL
Centrifugal Pump Data Sheet

CLIENT:	Oak Ridge National Laboratories		JOB/REQ:	40633 051
PROJECT:	Surface Impoundment Project		BY:	WBH
LOCATION:	Oak Ridge, TN		PAGE:	1 of 1
ITEM NO.:	P-101 P-102	SERVICE: Rotary Press Feed Pumps	UNIT:	

[X] PUMPS TO OPERATE IN PARALLEL PUMP CLASS: [X] ANSI [ ] API [ ] OTHER APPLICABLE TO: [X] PROPOSAL [ ] PURCHASE [ ] AS BUILT

NO. MOTOR DRIVEN:	3	NO. TURBINE DRIVEN:	PUMP MFG: LABOUR
PUMP ITEM NO.:		PUMP ITEM NO.:	MODEL: 2000
MOTOR ITEM NO.:		TURBINE ITEM NO.:	SIZE: 3 X 2-9
MOTOR PRVD. BY:	VENDOR	TURBINE PRVD. BY:	NO. STAGES: ONE
MOTOR MTD. BY:	VENDOR	TURBINE MTD. BY:	SERIAL NO.:

FLUID PUMPED			OPERATING CONDITIONS				
NAME:	5% water slurry		CAPACITY:	gpm			
PUMPING TEMP:	100	F	NORMAL:	RATED:	150.0	MIN:	B
SPECIFIC GRAV. @ NPT:	1.040	1.125 max	DISCH. PRES:	psig	31.2		B
SPECIFIC HEAT:	1	BTU/lb-F	SUCTION PRES:	RATED:	-0.3	MAX: 5	B
VAPOR PRESSURE:	0.95	psia	DIFF. PRES:	psi	31.5		B
VISCOSITY:	1.00	cP	DIFF. HEAD:	ft.	70		B
CORROSION/EROSION CAUSED BY:	Solids		NPSH AVAIL:	ft.	28		B
H2S CONCENTRATION (PPM):			HYDR. POWER:				B
FLAMMABLE: [ ] YES [X] NO	TOXIC:	[X] YES [ ] NO	DUTY:	[ ] CONTINUOUS	[X] INTERMITTENT		

REMARKS:

PERFORMANCE (BY MANUFACTURER)

SPEED (RPM):	1750	MIN. CONTINUOUS FLOW		NPSH REQD:	12
PROPOSAL CURVE NO.:		THERMAL:	STABLE:	SUCTION SPECIFIC SPEED:	
RATED IMPELLER DIAM:	9"	RATED POWER:	4.5 HP	RATED EFFICIENCY (%):	63
MAX. DIAM: 9"	MIN. DIAM:	NORMAL POWER:		NORMAL EFFICIENCY (%):	
MAX. HEAD RATED IMP:		MAX. POWER RATED IMP:	5.5 HP	HEAD @ NORMAL FLOW:	

REMARKS:

CASING CONNECTIONS

NOZZLES	SIZE	RATING	FACING	LOCATION	MISC CONNECTIONS	NUMBER	SIZE	TYPE
SUCTION:		125	FF		DRAIN	ONE	1/2"	
DISCHARGE:		125	FF		VENT	TWO	1/4"	
BALANCE DRUM:					GAUGE			

REMARKS

CONSTRUCTION AND SITE CONDITIONS

CASING MOUNT
[X] CENTERLINE [ ] FOOT
[ ] NEAR CENTERLINE [ ] BRACKET
[ ] VERTICAL [ ] INLINE
[ ] VERTICAL BARREL [ ] SUMP
CASING SPLIT: [ ] RADIAL [ ] AXIAL

CASING TYPE
[ ] SINGLE VOLUTE [ ] DOUBLE VOLUTE
[ ] BARREL [ ] DIFFUSER
[ ] STAGGERED VOLUTES [ ] VERT DBL CASING

SHAFT INFORMATION
L3/D4 RATIO:
ROTATION (FROM CPLG): [ ] CW [ ] CCW

IMPELLER MOUNT/TYPE
[ ] BETWEEN BEARINGS [X] OVERHUNG
[X] SINGLE SUCTION [ ] DOUBLE SUCTION
[ ] IMPELLERS INDIVIDUALLY SECURED

LUBRICATION
[ ] RING OIL [ ] GREASE
[ ] FLINGER [ ] PURGE OIL MIST
[ ] PURE OIL MIST [ ] API 610
[ ] PRESSURE [ ] API 614

BEARINGS

BEARINGS	TYPE	NUMBER
RADIAL		
THRUST		

SITE CONDITIONS
MIN AMBIENT TEMP: 10
MAX AMBIENT TEMP: 100
[X] INDOOR [X] HEATED
[ ] OUTDOOR [ ] UNHEATED

ELECTRICAL AREA CLASSIFICATION
[X] NON-HAZARDOUS [ ] HAZARDOUS
CLASS/GROUP/DIV:

UNUSUAL CONDITIONS
[ ] DUST [ ] FUMES [ ] OTHER

CASE MAWP @ MPT:
HYDRO. TEST PRESSURE:

REMARKS
1 Slurry particle size is less than 1/4"
2 Provide one warehouse spare B
3 Pump provided with packing, no mechanical seal B

REVISION	A	B	C		
ENGINEER/DATE					
DEPT. APPROVED/DATE					

WALK HAYDEL
Vertical Pump Data Sheet

CLIENT:	Oak Ridge National Laboratories		JOB/REQ:	40633 051
PROJECT:	Surface Impoundment Project		BY:	WBH
LOCATION:	Oak Ridge, TN		PAGE:	1 of 1
ITEM NO.:	P-105	SERVICE: Rotary Press Filtrate Pump	UNIT:	

[X] PUMPS TO OPERATE IN PARALLEL PUMP CLASS: [ ] ANSI [ ] API [X] OTHER APPLICABLE TO: [X] PROPOSAL [ ] PURCHASE [ ] AS BUILT

NO. MOTOR DRIVEN:	2	NO. TURBINE DRIVEN:	PUMP MFG: LaBour Taber Series
PUMP ITEM NO.:		PUMP ITEM NO.:	MODEL: 1060-20
MOTOR ITEM NO.:		TURBINE ITEM NO.:	SIZE: 3 X 2-10
MOTOR PRVD. BY:	Vendor	TURBINE PRVD. BY:	NO. STAGES: ONE
MOTOR MTD. BY:	Vendor	TURBINE MTD. BY:	SERIAL NO.:

FLUID PUMPED		OPERATING CONDITIONS		
NAME:	Water	CAPACITY: gpm		
PUMPING TEMP:	100 F	NORMAL:	RATED: 150	MIN:
SPECIFIC GRAV. @ NPT:	0.980	DISCH. PRES: psig	30.0	
SPECIFIC HEAT:	1 BTU/lb-F	SUCTION PRES:	RATED: 0.0	MAX: 5
VAPOR PRESSURE:	0.95 psia	DIFF. PRES: psi	30.0	
VISCOSITY:	1.00 cP	DIFF. HEAD: ft.	70	
CORROSION/EROSION CAUSED BY:		NPSH AVAIL: ft.	27	
H2S CONCENTRATION (PPM):		HYDR. POWER:	2.6	
FLAMMABLE: [ ] YES [X] NO	TOXIC: [X] YES [ ] NO	DUTY: [ ] CONTINUOUS	[X] INTERMITTENT	

REMARKS:

PERFORMANCE (BY MANUFACTURER)

SPEED (RPM):	1750	MIN. CONTINUOUS FLOW	NPSH REQD: 4'
PROPOSAL CURVE NO.:		THERMAL: STABLE:	SUCTION SPECIFIC SPEED:
RATED IMPELLER DIAM:		RATED POWER: 4.8	RATED EFFICIENCY (%): 56
MAX. DIAM: 10"	MIN. DIAM:	NORMAL POWER:	NORMAL EFFICIENCY (%):
MAX. HEAD RATED IMP:		MAX. POWER RATED IMP: 6	HEAD @ NORMAL FLOW:

REMARKS:

CASING CONNECTIONS

NOZZLES	SIZE	RATING	FACING	LOCATION	MISC CONNECTIONS	NUMBER	SIZE	TYPE
SUCTION:					DRAIN			
DISCHARGE:	2	150	FF		VENT			
BALANCE DRUM:					GAUGE			

REMARKS

CONSTRUCTION AND SITE CONDITIONS

CASING MOUNT
[ ] CENTERLINE [ ] FOOT
[ ] NEAR CENTERLINE [ ] BRACKET
[X] VERTICAL [ ] INLINE
[ ] VERTICAL BARREL [X] SUMP

CASING SPLIT: [ ] RADIAL [ ] AXIAL

CASING TYPE
[ ] SINGLE VOLUTE [ ] DOUBLE VOLUTE
[ ] BARREL [ ] DIFFUSER
[ ] STAGGERED VOLUTES [ ] VERT DBL CASING

SHAFT INFORMATION
L3/D4 RATIO:
ROTATION (FROM CPLG): [ ] CW [ ] CCW

IMPELLER MOUNT/TYPE
[ ] BETWEEN BEARINGS [ ] OVERHUNG
[ ] SINGLE SUCTION [ ] DOUBLE SUCTION
[ ] IMPELLERS INDIVIDUALLY SECURED

LUBRICATION
[ ] RING OIL [ ] GREASE
[ ] FLINGER [ ] PURGE OIL MIST
[ ] PURE OIL MIST [ ] API 610
[ ] PRESSURE [ ] API 614

BEARINGS

BEARINGS	TYPE	NUMBER
RADIAL		
THRUST		

SITE CONDITIONS
MIN AMBIENT TEMP: 10
MAX AMBIENT TEMP: 100
[ ] INDOOR [ ] HEATED
[X] OUTDOOR [X] UNHEATED

ELECTRICAL AREA CLASSIFICATION
[X] NON-HAZARDOUS [ ] HAZARDOUS
CLASS/GROUP/DIV:

UNUSUAL CONDITIONS
[ ] DUST [ ] FUMES [ ] OTHER

CASE MAWP @ MPT:
HYDRO. TEST PRESSURE:

REMARKS Provide one warehouse spare

REVISION	A	B	C		
ENGINEER/DATE					
DEPT. APPROVED/DATE					

WALK HAYDEL A DAMES & MOORE GROUP COMPANY	CONTROL VALVE				SHEET 1 OF 2		
CLIENT: RADIAN INTERNATIONAL	No.	BY	DATE	REVISION	SPEC No. 40633-34-507		REV
PROJECT: OAK RIDGE / SIOU WASTE TREATMENT FACILITY					P.O. No.		DATE
JOB No.: 40633-051-02IE					BY KPB	CHK'D	APPR

A. GENERAL NOTES - The following Notes or Comments apply to all instruments specified on the attached sheets

1. Vendor shall clearly state all exceptions and variations offered in his quotation in a separate section labeled "Exceptions and Clarifications". Failure to do this shall imply total compliance with the intent of this specification.

2. All automated control valves shall be furnished with a permanently attached Stainless Steel tag, engraved or stamped with Tag Number, Service, Manufacturer's Model and Serial Number.

3. Vendor shall provide protection adequate for shipment and storage of the specified instruments. All openings and exposed moving parts shall be protected to prevent dirt from entering. All flanges and threaded connections shall be protected against damage using wood, steel, and/or plastic protectors .

4. Atmospheric pressure at the job site is 14.7 psia. Ambient Temperature varies from 20 to 120 degrees F.

5. Vendor shall verify actuator sizing and valve wetted parts material selection.

6. Instruments shall be Year 2000 Compliant.

7. Control valves and all accessories shall be completely assembled and tested. Pneumatic accessories shall be tubed using SS tubing and SS swagelok fittings.

B. SPECIFIC NOTES - Notes, which do not apply to all Instruments, are on the Sheet with the applicable instrument(s).

WALK HAYDEL
A DAMES & MOORE GROUP COMPANY

CONTROL VALVE

CLIENT: RADIAN INTERNATIONAL

PROJECT: OAK RIDGE / SIOU WASTE TREATMENT FACILITY

JOB No.: 40633-051-02IE

No.	BY	DATE	REVISION

SPEC No.	REV
40633-34-507	
P.O. No.	DATE
BY KPB	CHK'D / APPR

GEN	1.	TAG NUMBER		FV-101							
	2.	SERVICE		CLOW CONTROL TO ROTARY PRESS P-101A							
	3.	LINE No. (or Vessel No.)									
	4.	LINE SIZE	SCHEDULE	4"	PVC						
BODY	5.	Type of Body		PINCH VALVE							
	6.	Body Size	Port Size	4"	4"						
	7.	Body Material		DUCTILE IRON							
	8.	Guiding	No. of Ports	MFR STD							
	9.	End Conn & Rating		150# FF FLG							
	10.	Packing Material									
	11.	Lubricator	Iso Valve								
	12.	Bonnet Type		MFG STD							
	13.	Trim Form									
	14.	Trim Material	Seat/Plug								
			Shaft Matl								
	15.	Required Seat Tightness		DROP TIGHT							
	16.	Max Allow. Sound Level (dBA)									
ACTUATOR	17.	Model No. & Size		MFR STD							
	18.	Type of Actuator		PNEUMATIC							
	19.	Closes at	Opens at	0 Psig	30 Psig						
	20.	Flow Action to									
	21.	Fail Position		CLOSED							
	22.	Handwheel & Location		NONE							
POSIT		Positioner Tag No.		FY-101							
	23.	Make & Model No.		MFR STD							
	24.	Filter Regulator	Gages	YES	YES						
	25.	Input signal	Bypass Req'd	4-20 mA	no						
	26.	Output Signal		3-30 Psig							
	27.	Air Supply Pressure		60 Psig							
I/P	28.	Input Signal									
	29.	Output Signal									
	30.										
OPT	31.	Position Switch		NONE							
	32.	Position Sw Tag No. & Model No.									
	33.										
SERVICE	34.	P&ID NUMBER		001P							
	35.	Fluid		WATER SLURRY							
	36.	Max flow	Cv	100 GPM							
	37.	Operating Flow	Cv	100 GPM							
	38.	Valve Cv	Valve FL								
	39.	Normal Inlet Press (Psig) / Dp (Psi)		60 Psig							
	40.	Max Inlet Press (Psig)		60 Psig							
	41.	Max Shutoff Press (dP)		60 Psig							
	42.	Max Temp	Operating Temp	120 F	80 F						
	43.	Oper Sp. Gr.	Mol. Wt.	1							
	44.	Oper Visc (cP)	% Flash								
	45.	% Superheat	% Solids								
	46.	Vapor Press	Crit Press (Psia)								
	47.	Predicted Sound Level - dBA									
	48.	Manufacturer		RED VALVE							
	49.	Model Number		4" SERIES 5400							

NOTES:

WALK, HAYDEL	ORIFICE PLATES				SHEET 1 OF 2		
CLIENT: RADIAN INTERNATIONAL	No.	BY	DATE	REVISION	SPEC. NUMBER 40633-34-506		REVISION
PROJECT: OAK RIDGE / SIOU WASTE TREATMENT FACILITY					P.O. NUMBER		DATE 4/8/1999
JOB No.: 40633-051-02IE					BY. KPB	CHKD.	APPR.

A. GENERAL NOTES - The following Notes or Comments apply to all Instruments specified on the attached sheets

1. Vendor shall clearly state all exceptions and variations offered in his quotation in a separate section labeled "Exceptions and Clarifications". Failure to do this shall imply total compliance with the intent of this specification.

2. The upstream side of the orifice paddle shall be engraved or stamped with "INLET", Tag No., Orifice diameter "d", and Service.

3. Vendor shall provide protection adequate for shipment and storage of the specified instruments. All openings and exposed moving parts shall be protected to prevent dirt from entering. All flanges and threaded connections shall be protected against damage using wood, steel, and/or plastic protectors .

4. Atmospheric pressure at the job site is 14.7 psia. Ambient Temperature varies from 20 to 120 degrees F.

B. SPECIFIC NOTES - Notes, which do not apply to all Instruments, are on the Sheet with the applicable instrument(s).

WALK, HAYDEL

ORIFICE PLATES | **SHEET 2 OF 2**

CLIENT: RADIAN INTERNATIONAL

PROJECT: OAK RIDGE / SIOU WASTE TREATMENT FACILITY

JOB No.: 40633-051-02IE

No.	BY	DATE	REVISION

SPEC. NUMBER	REVISION
40633-34-506	
P.O. NUMBER	DATE 04/08/99
BY. KPB / CHKD.	APPR.

ORIFICE PLATES

1. [X] Concentric [ ] Other
2. [X] ISA Standard [ ] Other
3. Bore: [X] Maximum Rate [ ] Nearest 1/8"
4. Material: [ ] 304 SS [X] 316 SS [ ] Other
5. Ring Material & Type:
6. Mfr. & Model Number:

ORIFICE FLANGES

7. Taps: [X] Flange [ ] Vena Contracta [ ] Pipe [ ] Other
8. Tap Size: [X] 1/2" NPT [ ] Other
9. Type: [X] Weld Neck [ ] Slip on [ ] Threaded
10. Material: [X] Steel [ ] Other
11. Flanges: [ ] Included [X] By Others
12. ANSI Rating: [ ] 150 [X] 300 [ ] Other

	13.	TAG NUMBER		FE-101		RO-100		RO-101			
	14.	SERVICE		FLOW FROM F-101		Flocculator Recirc to AM103		Flocculator Recirc to P-101A			
	15.	LINE SIZE	SCHEDULE	4"	PVC	4"	PVC	4"	PVC		
F	16.	FLUID		WATER		WATER		WATER			
L	17.	FLUID STATE		LIQUID		LIQUID		LIQUID			
U	18.	MAXIMUM FLOW		150 GPM		150 GPM		150 GPM			
I	19.	NORMAL FLOW		100 GPM		100 GPM		100 GPM			
D	20.	PRESSURE		30 Psig		30 Psig		30 Psig			
	21.	TEMPERATURE		80 F		80 F		80 F			
D	22.	SPECIFIC GRAVITY AT BASE		1		1		1			
A	23.	OPERATING SPEC. GRAVITY		0.9978		0.9978		0.9978			
T	24.	SUPERCOMP. FACTOR									
A	25.	MOL. WEIGHT	Cp/Cv	32.50	0.22 cp	32.50	0.22 cp	32.50	0.22 cp		
	26.	OPERATING VISCOSITY		0.8578 Cps		0.8578 Cps		0.8578 Cps			
	27.	QUAL % OR DEG SUPEREAT									
	28.	BASE PRESS	BASE TEMP	14.73 Psia	60 Deg F	14.73 Psia	60 Deg F	14.73 Psia	60 Deg F		
		OPERATING DENSITY		62 lb/cf		62 lb/cf		62 lb/cf			
		P&ID NUMBER		001P		001P		001P			
		PROCESS FLOW DIAGRAM STREAM #									
	29.	TYPE OF METER		dP Transmitter		dP Transmitter		dP Transmitter			
M	30.	DIFF. RANGE - DRY		100" wc		100" wc		100" wc			
E	31.	SEALSP. GR. AT 60 DEG F									
T	32.	STATIC RESS RANGE									
E	33.	CHART OF SCALE RANGE									
R	34.	CHART MULTIPLIER									
	35.	BETA = d/D		0.41153							
P F	36.	ORIFICE BORE DIAMETER		1.679							
L L	37.	LINE I.D. (INCHES)		4.08"		4.08"		4.08"			
A A	38.	FLANGE RATING		ANSI Class 150		ANSI Class 150		ANSI Class 150			
T N	39.	VENT OR DRAIN HOLE		Vent 0.0938"		Vent 0.0938"		Vent 0.0938"			
E O	40.	PLATE THICKNESS		0.125"		0.125"		0.125"			
E		MANUFACTURER		DANIEL		DANIEL		DANIEL			
S		MODEL NUMBER									

9. SPECIFIC NOTES:

WALK HAYDEL A DAMES & MOORE GROUP COMPANY	PINCH VALVE				SHEET 1 OF 5		
CLIENT: RADIAN INTERNATIONAL	No.	BY	DATE	REVISION	SPEC No.		REV
	A	KPB	4/5/1999	INQUIRY	40633-34-502-01		A
PROJECT: OAK RIDGE / SIOU WASTE TREATMENT FACILITY					P.O. No.		DATE 04/05/99
JOB No.: 40633-051-02IE					BY KPB	CHK'D	APPR

A. GENERAL NOTES - The following Notes or Comments apply to all instruments specified on the attached sheets

1. Vendor shall clearly state all exceptions and variations offered in his quotation in a separate section labeled "Exceptions and Clarifications". Failure to do this shall imply total compliance with the intent of this specification.

2. All automated control valves shall be furnished with a permanently attached Stainless Steel tag, engraved or stamped with Tag Number, Service, Manufacturer's Model and Serial Number.

3. Vendor shall provide protection adequate for shipment and storage of the specified instruments. All openings and exposed moving parts shall be protected to prevent dirt from entering. All flanges and threaded connections shall be protected against damage using wood, steel, and/or plastic protectors .

4. Atmospheric pressure at the job site is 14.7 psia. Ambient Temperature varies from -10 to 120 degrees F.

5. Instruments shall be Year 2000 Compliant.

B. SPECIFIC NOTES - Notes, which do not apply to all Instruments, are on the Sheet with the applicable instrument(s).

WALK HAYDEL
A DAMES & MOORE GROUP COMPANY

PINCH VALVE

CLIENT: RADIAN INTERNATIONAL

PROJECT: OAK RIDGE / SIOU WASTE TREATMENT FACILITY

JOB No.: 40633-051-02IE

No.	BY	DATE	REVISION
A	KPB	4/5/1999	INQUIRY

SPEC No. 40633-34-502-01 REV A
P.O. No.
DATE 04/05/99
BY KPB CHK'D APPR

GEN	1.	TAG NUMBER		HV-100A		HV-101A		HV-101B		HV-102A	
	2.	SERVICE		GRINDER BYPASS VALVE		TK-101 FILL VALVE		TK-101 FEED VALVE		TK-102 FILL VALVE	
	3.	LINE No. (or Vessel No.)									
	4.	LINE SIZE	SCHEDULE	4"	PVC	4"	PVC	4"	PVC	4"	PVC
BODY	5.	Type of Body		STRAIGHT THRU		STRAIGHT THRU		STRAIGHT THRU		STRAIGHT THRU	
	6.	Body Size	Port Size	4"	FULL	4"	FULL	4"	FULL	4"	FULL
	7.	Body Material		SPUN ALUMINUM		SPUN ALUMINUM		SPUN ALUMINUM		SPUN ALUMINUM	
	8.	Lining		RUBBER		RUBBER		RUBBER		RUBBER	
	9.	End Conn & Rating		4" 150# FF FLG		4" 150# FF FLG		4" 150# FF FLG		4" 150# FF FLG	
	10.	Check Valve		NO		NO		NO		NO	
	11.	Stem Material		NONE		NONE		NONE		NONE	
	12.	Indicator		NONE		NONE		NONE		NONE	
	13.	Bonnet Type & Material		NONE		NONE		NONE		NONE	
	14.	Compressor Material		NONE		NONE		NONE		NONE	
	15.	Required Seat Tightness		DROP TIGHT		DROP TIGHT		DROP TIGHT		DROP TIGHT	
	16.	Max Allow. Sound Level (dBA)									
ACTUATOR	17.	Manufacturer and Model No.									
	18.	Type of Actuator		DIRECT AIR		DIRECT AIR		DIRECT AIR		DIRECT AIR	
	19.	Closes at	Opens at	100Psig	0Psig	100Psig	0Psig	40Psig	0Psig	40Psig	0Psig
	20.	Flow Action to									
	21.	Fail Position		OPEN		OPEN		OPEN		OPEN	
	22.	Handwheel & Location		NONE		NONE		NONE		NONE	
SOL	23.	TAG NUMBER		HY-100A		HY-101A		HY-101B		HY-102A	
	24.	Make & Model No.		ASCO		ASCO		ASCO		ASCO	
	25.	Type		3 WAY		3 WAY		3 WAY		3 WAY	
	26.	Input Voltage		120Vac 60Hz		120Vac 60Hz		120Vac 60Hz		120Vac 60Hz	
	27.	Air Supply Pressure		100 Psig		100 Psig		100 Psig		100 Psig	
SW	28.	TAG NUMBER		ZSO/ZSC-100A		ZSO/ZSC-101A		ZSO/ZSC-101B		ZSO/ZSC-102A	
	29.	Type		Pressure Switch		Pressure Switch		Pressure Switch		Pressure Switch	
	30.	Contact Rating		SPDT 120Vac 60Hz 2A		SPDT 120Vac 60Hz 2A		SPDT 120Vac 60Hz 2A		SPDT 120Vac 60Hz 2A	
	31.	Function		Position Status		Position Status		Position Status		Position Status	
SERVICE	32.	Filter, Gauge		YES		YES		YES		YES	
	33.										
	34.										
	35.	P&ID NUMBER		001P		001P		001P		001P	
	36.	Fluid / Units		SLURRY		SLURRY		SLURRY		SLURRY	
	37.	Max flow	Cv								
	38.	Operating Flow	Cv								
	39.	Valve Cv	Valve FL								
	40.	Normal Inlet Press (Psig) / Dp (Psi)		30		30		30		30	
	41.	Max Inlet Press (Psig)		30		30		30		30	
	42.	Max Shutoff Press (dP)		30		30		30		30	
	43.	Max Temp	Operating Temp	120 F	AMBIENT	120 F	AMBIENT	120 F	AMBIENT	120 F	AMBIENT
	44.	Oper Sp. Gr.	Mol. Wt.								
	45.	Oper Visc (cP)	% Flash								
	46.	% Superheat	% Solids								
	47.	Vapor Press	Crit Press (Psia)								
	48.	Predicted Sound Level - dBA									
	49.	Manufacturer		RED VALVE		RED VALVE		RED VALVE		RED VALVE	
	50.	Model Number		4" SPUN ALUMINUM		4" SPUN ALUMINUM		4" SPUN ALUMINUM		4" SPUN ALUMINUM	

NOTES:

WALK HAYDEL
A DAMES & MOORE GROUP COMPANY

PINCH VALVE

CLIENT: RADIAN INTERNATIONAL

PROJECT: OAK RIDGE / SIOU WASTE TREATMENT FACILITY

JOB No.: 40633-051-02IE

No.	BY	DATE	REVISION
A	KPB	4/5/1999	INQUIRY

SPEC No. 40633-34-502-01 REV A
P.O. No.
DATE 04/05/99
BY KPB CHK'D APPR

GEN	1.	TAG NUMBER		HV-102B		HV-103A		HV-103B		H4-104A
	2.	SERVICE		TK-102 FEED VALVE		TK-103 FILL VALVE		TK-103 FEED VALVE		TK-104 FILL VALVE
	3.	LINE No. (or Vessel No.)								
	4.	LINE SIZE	SCHEDULE	4"	PVC	4"	PVC	4"	PVC	4" PVC
BODY	5.	Type of Body		STRAIGHT THRU		STRAIGHT THRU		STRAIGHT THRU		STRAIGHT THRU
	6.	Body Size	Port Size	4"	FULL	4"	FULL	4"	FULL	4" FULL
	7.	Body Material		SPUN ALUMINUM		SPUN ALUMINUM		SPUN ALUMINUM		SPUN ALUMINUM
	8.	Lining		RUBBER		RUBBER		RUBBER		RUBBER
	9.	End Conn & Rating		4" 150# FF FLG		4" 150# FF FLG		4" 150# FF FLG		4" 150# FF FLG
	10.	Check Valve		NO		NO		NO		NO
	11.	Stem Material		NONE		NONE		NONE		NONE
	12.	Indicator		NONE		NONE		NONE		NONE
	13.	Bonnet Type & Material		NONE		NONE		NONE		NONE
	14.	Compressor Material		NONE		NONE		NONE		NONE
	15.	Required Seat Tightness		DROP TIGHT		DROP TIGHT		DROP TIGHT		DROP TIGHT
	16.	Max Allow. Sound Level (dBA)								
ACTUATOR	17.	Manufacturer and Model No.								
	18.	Type of Actuator		DIRECT AIR		DIRECT AIR		DIRECT AIR		DIRECT AIR
	19.	Closes at	Opens at	100Psig	0Psig	100Psig	0Psig	100Psig	0Psig	100Psig 0Psig
	20.	Flow Action to								
	21.	Fail Position		OPEN		OPEN		OPEN		OPEN
	22.	Handwheel & Location		NONE		NONE		NONE		NONE
SOL	23.	TAG NUMBER		HY-102B		HY-103A		HY-103B		HY-104A
	24.	Make & Model No.		ASCO		ASCO		ASCO		ASCO
	25.	Type		3 WAY		3 WAY-		3 WAY		3 WAY
	26.	Input Voltage		120Vac 60Hz		120Vac 60Hz		120Vac 60Hz		120Vac 60Hz
	27.	Air Supply Pressure		100 Psig		100 Psig		100 Psig		100 Psig
SW	28.	TAG NUMBER		ZSO/ZSC-102B		ZSO/ZSC-103A		ZSO/ZSC-103B		ZSO/ZSC-104A
	29.	Type		Pressure Switch		Pressure Switch		Pressure Switch		Pressure Switch
	30.	Contact Rating		SPDT 120Vac 60Hz 2A		SPDT 120Vac 60Hz 2A		SPDT 120Vac 60Hz 2A		SPDT 120Vac 60Hz 2A
	31.	Function		Position Status		Position Status		Position Status		Position Status
SERVICE	32.	Filter, Gauge		YES		YES		YES		YES
	33.									
	34.									
	35.	P&ID NUMBER		001P		001P		001P		001P
	36.	Fluid / Units		SLURRY		SLURRY		SLURRY		SLURRY
	37.	Max flow	Cv							
	38.	Operating Flow	Cv							
	39.	Valve Cv	Valve FL							
	40.	Normal Inlet Press (Psig) / Dp (Psi)		30		30		30		.30
	41.	Max Inlet Press (Psig)		30		30		30		30
	42.	Max Shutoff Press (dP)		30		30		30		30
	43.	Max Temp	Operating Temp	120 F	AMBIENT	120 F	AMBIENT	120 F	AMBIENT	120 F AMBIENT
	44.	Oper Sp. Gr.	Mol. Wt.							
	45.	Oper Visc (cP)	% Flash							
	46.	% Superheat	% Solids							
	47.	Vapor Press	Crit Press (Psia)							
	48.	Predicted Sound Level - dBA								
	49.	Manufacturer		RED VALVE		RED VALVE		RED VALVE		RED VALVE
	50.	Model Number		4" SPUN ALUMINUM		4" SPUN ALUMINUM		4" SPUN ALUMINUM		4" SPUN ALUMINUM

NOTES:

WALK HAYDEL
A DAMES & MOORE GROUP COMPANY

PINCH VALVE

CLIENT: RADIAN INTERNATIONAL

PROJECT: OAK RIDGE / SIOU WASTE TREATMENT FACILITY

JOB No.: 40633-051-02IE

No.	BY	DATE	REVISION
A	KPB	4/5/1999	INQUIRY

SPEC No. 40633-34-502-01 REV A
P.O. No.
DATE 04/05/99
BY KPB CHK'D APPR

GEN	1.	TAG NUMBER		HV-104B		HV-105A		HV-105B		HV-106A	
	2.	SERVICE		TK-104 FEED VALVE		TK-105 FILL VALVE		TK-105 FEED VALVE		TK-106 FILL VALVE	
	3.	LINE No. (or Vessel No.)									
	4.	LINE SIZE	SCHEDULE	4"	PVC	4"	PVC	4"	PVC	4"	PVC
BODY	5.	Type of Body		STRAIGHT THRU		STRAIGHT THRU		STRAIGHT THRU		STRAIGHT THRU	
	6.	Body Size	Port Size	4"	FULL	4"	FULL	4"	FULL	4"	FULL
	7.	Body Material		SPUN ALUMINUM		SPUN ALUMINUM		SPUN ALUMINUM		SPUN ALUMINUM	
	8.	Lining		RUBBER		RUBBER		RUBBER		RUBBER	
	9.	End Conn & Rating		4" 150# FF FLG		4" 150# FF FLG		4" 150# FF FLG		4" 150# FF FLG	
	10.	Check Valve		NO		NO		NO		NO	
	11.	Stem Material		NONE		NONE		NONE		NONE	
	12.	Indicator		NONE		NONE		NONE		NONE	
	13.	Bonnet Type & Material		NONE		NONE		NONE		NONE	
	14.	Compressor Material		NONE		NONE		NONE		NONE	
	15.	Required Seat Tightness		DROP TIGHT		DROP TIGHT		DROP TIGHT		DROP TIGHT	
	16.	Max Allow. Sound Level (dBA)									
ACTUATOR	17.	Manufacturer and Model No.									
	18.	Type of Actuator		DIRECT AIR		DIRECT AIR		DIRECT AIR		DIRECT AIR	
	19.	Closes at	Opens at	100Psig	0Psig	100Psig	0Psig	100Psig	0Psig	100Psig	0Psig
	20.	Flow Action to									
	21.	Fail Position		OPEN		OPEN		OPEN		OPEN	
	22.	Handwheel & Location		NONE		NONE		NONE		NONE	
SOL	23.	TAG NUMBER		HY-104B		HY-105A		HY-105B		HY-106A	
	24.	Make & Model No.		ASCO		ASCO		ASCO		ASCO	
	25.	Type		3 WAY		3 WAY		3 WAY		3 WAY	
	26.	Input Voltage		120Vac 60Hz		120Vac 60Hz		120Vac 60Hz		120Vac 60Hz	
	27.	Air Supply Pressure		100 Psig		100 Psig		100 Psig		100 Psig	
SW	28.	TAG NUMBER		ZSO/ZSC-104B		ZSO/ZSC-105A		ZSO/ZSC-105B		ZSO/ZSC-106A	
	29.	Type		Pressure Switch		Pressure Switch		Pressure Switch		Pressure Switch	
	30.	Contact Rating		SPDT 120Vac 60Hz 2A		SPDT 120Vac 60Hz 2A		SPDT 120Vac 60Hz 2A		SPDT 120Vac 60Hz 2A	
	31.	Function		Position Status		Position Status		Position Status		Position Status	
SERVICE	32.	Filter, Gauge		YES		YES		YES		YES	
	33.										
	34.										
	35.	P&ID NUMBER		001P		001P		001P		001P	
	36.	Fluid / Units		SLURRY		SLURRY		SLURRY		SLURRY	
	37.	Max flow	Cv								
	38.	Operating Flow	Cv								
	39.	Valve Cv	Valve FL								
	40.	Normal Inlet Press (Psig) / Dp (Psi)		30		30		30		30	
	41.	Max Inlet Press (Psig)		30		30		30		30	
	42.	Max Shutoff Press (dP)		30		30		30		30	
	43.	Max Temp	Operating Temp	120 F	AMBIENT	120 F	AMBIENT	120 F	AMBIENT	120 F	AMBIENT
	44.	Oper Sp. Gr.	Mol. Wt.								
	45.	Oper Visc (cP)	% Flash								
	46.	% Superheat	% Solids								
	47.	Vapor Press	Crit Press (Psia)								
	48.	Predicted Sound Level - dBA									
	49.	Manufacturer		RED VALVE		RED VALVE		RED VALVE		RED VALVE	
	50.	Model Number		4" SPUN ALUMINUM		4" SPUN ALUMINUM		4" SPUN ALUMINUM		4" SPUN ALUMINUM	

NOTES:

WALK HAYDEL
A DAMES & MOORE GROUP COMPANY

CLIENT: RADIAN INTERNATIONAL

PROJECT: OAK RIDGE / SIOU WASTE TREATMENT FACILITY

JOB No.: 40633-051-02IE

PINCH VALVE

SHEET 5 OF 5

No.	BY	DATE	REVISION
A	KPB	4/5/1999	INQUIRY

SPEC No.	REV
40633-34-502-01	A
P.O. No.	DATE 04/05/99
BY KPB	CHK'D / APPR

GEN	1.	TAG NUMBER		HV-106B		HV-100B		HV-107				
	2.	SERVICE		TK-106 FEED VALVE		TK-101 FILL VALVE		P-104 OUTPUT				
	3.	LINE No. (or Vessel No.)										
	4.	LINE SIZE	SCHEDULE	4"	PVC	4"	PVC	4"	PVC			
BODY	5.	Type of Body		STRAIGHT THRU		STRAIGHT THRU		STRAIGHT THRU				
	6.	Body Size	Port Size	4"	FULL	4"	FULL	4"	FULL			
	7.	Body Material		SPUN ALUMINUM		SPUN ALUMINUM		SPUN ALUMINUM				
	8.	Lining		RUBBER		RUBBER		RUBBER				
	9.	End Conn & Rating		4" 150# FF FLG		4" 150# FF FLG		4" 150# FF FLG				
	10.	Check Valve		NO		NO		NO				
	11.	Stem Material		NONE		NONE		NONE				
	12.	Indicator		NONE		NONE		NONE				
	13.	Bonnet Type & Material		NONE		NONE		NONE				
	14.	Compressor Material		NONE		NONE		NONE				
	15.	Required Seat Tightness		DROP TIGHT		DROP TIGHT		DROP TIGHT				
	16.	Max Allow. Sound Level (dBA)										
ACTUATOR	17.	Manufacturer and Model No.										
	18.	Type of Actuator		DIRECT AIR		DIRECT AIR		DIRECT AIR				
	19.	Closes at	Opens at	100Psig	0Psig	100Psig	0Psig	100Psig	0Psig			
	20.	Flow Action to										
	21.	Fail Position		OPEN		OPEN		OPEN				
	22.	Handwheel & Location		NONE		NONE		NONE				
SOL	23.	TAG NUMBER		HY-106B		HY-100B		HY-107				
	24.	Make & Model No.		ASCO		ASCO		ASCO				
	25.	Type		3 WAY		3 WAY		3 WAY				
	26.	Input Voltage		120Vac 60Hz		120Vac 60Hz		120Vac 60Hz				
	27.	Air Supply Pressure		100 Psig		100 Psig		100 Psig				
SW	28.	TAG NUMBER		ZSO/ZSC-106B		ZSO/ZSC-100B		ZSO/ZSC-107				
	29.	Type		Pressure Switch		Pressure Switch		Pressure Switch				
	30.	Contact Rating		SPDT 120Vac 60Hz 2A		SPDT 120Vac 60Hz 2A		SPDT 120Vac 60Hz 2A				
	31.	Function		Position Status		Position Status		Position Status				
SERVICE	32.	Filter, Gauge		YES		YES		YES				
	33.											
	34.											
	35.	P&ID NUMBER		001P		001P		001P				
	36.	Fluid / Units		SLURRY		SLURRY		SLURRY				
	37.	Max flow	Cv									
	38.	Operating Flow	Cv									
	39.	Valve Cv	Valve FL									
	40.	Normal Inlet Press (Psig) / Dp (Psi)		30		30		30				
	41.	Max Inlet Press (Psig)		30		30		30				
	42.	Max Shutoff Press (dP)		30		30		30				
	43.	Max Temp	Operating Temp	120 F	AMBIENT	120 F	AMBIENT	120 F	AMBIENT			
	44.	Oper Sp. Gr.	Mol. Wt.									
	45.	Oper Visc (cP)	% Flash									
	46.	% Superheat	% Solids									
	47.	Vapor Press	Crit Press (Psia)									
	48.	Predicted Sound Level - dBA										
	49.	Manufacturer		RED VALVE		RED VALVE		RED VALVE				
	50.	Model Number		4" SPUN ALUMINUM		4" SPUN ALUMINUM		4" SPUN ALUMINUM				

NOTES:

WALK HAYDEL A DAMES & MOORE GROUP COMPANY	GATE VALVE				SHEET 1 OF 2		
CLIENT: RADIAN INTERNATIONAL	No.	BY	DATE	REVISION	SPEC No. 40633-34-502-02		REV
PROJECT: OAK RIDGE / SIOU WASTE TREATMENT FACILITY					P.O. No.		DATE 04/07/99
JOB No.: 40633-051-02IE					BY KPB	CHK'D	APPR

A. GENERAL NOTES - The following Notes or Comments apply to all instruments specified on the attached sheets

1. Vendor shall clearly state all exceptions and variations offered in his quotation in a separate section labeled "Exceptions and Clarifications". Failure to do this shall imply total compliance with the intent of this specification.

2. All valves shall be furnished with a permanently attached Stainless Steel tag, engraved or stamped with Tag Number, Service, Manufacturer's Model and Serial Number.

3. Vendor shall provide protection adequate for shipment and storage of the specified instruments. All openings and exposed moving parts shall be protected to prevent dirt from entering. All flanges and threaded connections shall be protected against damage using wood, steel, and/or plastic protectors .

4. Atmospheric pressure at the job site is 14.7 psia. Ambient Temperature varies from 20 to 120 degrees F.

5. Instruments shall be Year 2000 Compliant.

B. SPECIFIC NOTES - Notes, which do not apply to all Instruments, are on the Sheet with the applicable instrument(s).

WALK HAYDEL
A DAMES & MOORE GROUP COMPANY

GATE VALVE

SHEET 2 OF 2

CLIENT: RADIAN INTERNATIONAL

PROJECT: OAK RIDGE / SIOU WASTE TREATMENT FACILITY

JOB No.: 40633-051-02IE

No.	BY	DATE	REVISION

SPEC No.	REV
40633-34-502-02	
P.O. No.	DATE ######
BY KPB	CHK'D / APPR

GEN	1.	TAG NUMBER		HV-100C							
	2.	SERVICE		GRINDER RECIRC FLOW CONTROL							
	3.	LINE No. (or Vessel No.)									
	4.	LINE SIZE	SCHEDULE	4"							
BODY	5.	Type of Body		GATE - RISING STEM							
	6.	Body Size	Port Size	4"	FULL						
	7.	Body Material		CAST IRON							
	8.	Guiding	No. of Ports	MFG STD							
	9.	End Conn & Rating		150# FF FLG							
	10.	Packing Material		MFG STD							
	11.	Lubricator	Iso Valve	NO	NO						
	12.	Bonnet Type		MFG STD							
	13.	Sleeve Material		Pure Gum Rubber							
	14.	Gate Material		316SS							
	15.	Required Seat Tightness									
	16.	Max Allow. Sound Level (dBA)		N/A							
ACTUATOR	17.	Model No.		NONE							
	18.	Type of Actuator									
	19.	Closes at	Opens at								
	20.	Flow Action to									
	21.	Fail Position									
	22.	Handwheel & Location		YES, TOP							
POSIT		Positioner Tag No.		NONE							
	23.	Make & Model No.									
	24.	Filter Regulator	Gages								
	25.	Input signal	Bypass Req'd								
	26.	Output Signal									
	27.	Air Supply Pressure									
I/P	28.	Make & Model No.		NONE							
	29.	Input Signal									
	30.	Output Signal									
OPT	31.	Solenoid Valve									
	32.	Position Switch									
	33.	Air Filter Regulator									
SERVICE	34.	P&ID NUMBER		001P							
	35.	Fluid / Units		WATER							
	36.	Max flow	Cv								
	37.	Operating Flow	Cv								
	38.	Valve Cv	Valve FL								
	39.	Normal Inlet Press (Psig) / Dp (Psi)		30	30						
	40.	Max Inlet Press (Psig)		30							
	41.	Max Shutoff Press (dP)		60							
	42.	Max Temp	Operating Temp	120 F	AMBIENT						
	43.	Oper Sp. Gr.	Mol. Wt.	1							
	44.	Oper Visc (cP)	% Flash								
	45.	% Superheat	% Solids								
	46.	Vapor Press	Crit Press (Psia)								
	47.	Predicted Sound Level - dBA									
	48.	Manufacturer		RED VALVE							
	49.	Model Number		FLEXGATE 4"							

NOTES:

HVAC

HVAC AND DUCT COLLECTION SYSTEM

Surface Impoundment Project **July 12, 1999**
Walk Haydel Job 40633-051

The dust collection system will include the following:

- A pick up duct from the bag filter mounted on top of the mixer.
- A pick up duct from the top of the hood enclosing the product box and the weigh scale.
- Pick up ducts from the cement and filter cake transfer conveyors.

The outlets shall be ducted to a filter housing outside the building consisting of a bank of HEPA filters and a bank of pre filters. The filters shall be replaceable from the sides of the filter housing. The filter outlets shall be ducted to an exhaust fan located outside of the building. The total flow is 1800 CFM with a duct velocity of approximately 4500 FPM.

The Building Manufacturer shall furnish a ventilating system designed for 4 air changes per hour consisting of fans and intake louvers. The ventilating fan equipment No. is BE-115.

The Operators Room will be cooled and heated by a 1-ton window unit with electric strip heat.

Electric receptacles will be located in the building for portable electric spot heaters.

DUST COLLECTION EQUIPMENT SPECIFICATION SHEET

Surface Impoundment Project **July 12,1999**
Walk Haydel Job 40633-051

Blower PV-114

Twin City Fan and Blower Co.
Type RBO, Size 911 Material Handling Fan

- Open radial fan wheel.
- All steel construction.
- 200000 hr. pillow block bearings.
- Steel shaft.
- V-belt drive.
- Factory finish.
- Outlet angled down 45 deg.
- Outlet manual damper.
- Factory installed motor: 7.5 hp. 460V, 3phase, 60 hz. TEFC.
- 1800 CFM @ 8" S.P. W.G.

Filters

Airguard Tri-Guard filter housing with one DPGT-405 pre filter and one Micro-V 2000 high capacity HEPA filter. Carbon steel housing and transition with prime coat finish. Designed for 1800 cfm with 9" dia. inlet/outlet. Clean filter pressure drop 2.53" w.c.

Ductwork

Spiral steel duct with elbow cleanouts or steel duct with clamp together fittings for ease of cleaning. Manual balancing dampers at pick up points.

Product Box Hood

Hood shall be constructed of 12 ga. carbon steel, with 2" angle support at seams. All continuous welded construction. The front of the hood shall have 8' wide X 7' high chain operated roll up service door for box removable. The top of the box shall have openings with collars for connection to mixer discharge ducts and an opening for the dust collection duct. Refer to drawings for details of the hood and dimensions.

Mixer Bag Filter

AeroPulse Series EDC Model 6-2.5 dust collector with filters enclosed in a housing with mounting flange.

- 54 ft. square of filter area with glazed polyester filter bags.
- Control panel mounted on unit with timers and solenoid air valves.
- All welded steel construction with factory finish.
- 4 cfm of air required at 70-90 psig.
- A 1hp. 460V, 3ph. 60hz. 200CFM blower shall be furnished mounted on the unit sized to overcome bag pressure drops.

INSTRUMENTATION

WALK HAYDEL A DAMLS & MOORE GROUP COMPANY	PRESSURE GAUGES				SHEET 1 OF 2		
CLIENT : RADIAN INTERNATIONAL	NO.	BY	DATE	REVISION	SPEC. NO. 40633-34-503		REV.
PROJECT OAK RIDGE / SIOU WASTE TREATMENT FACILITY					P. O. NUMBE	DATE 4/7/1999	
JOB NO.: 40633-051-02IE					BY KPB	CHK'D	APPR.

A. GENERAL NOTES - The following Notes or Comments apply to all instruments specified on the attached sheets

1. Vendor shall clearly state all exceptions and variations offered in his quotation in a separate section labeled "Exceptions and Clarifications". Failure to do this shall imply total compliance with the intent of this specification.

2. All instruments shall be furnished with a permanently attached Stainless Steel tag, engraved or stamped with "Tag No." and "Service".

3. Vendor shall provide protection adequate for shipment and storage of the specified instruments. All openings and exposed moving parts shall be protected to prevent dirt from entering. All flanges and threaded connections shall be protected against damage using wood, steel, and/or plastic protectors .

4. Atmospheric pressure at the job site is 14.7 psia. Ambient Temperature varies from 20 to 120 degrees F.

6. Instruments shall be rated for full vacuum service.

B. SPECIFIC NOTES - Notes, which do not apply to all Instruments, are on the Sheet with the applicable instrument(s).

WALK HAYDEL
A DAMES & MOORE GROUP COMPANY

PRESSURE GAUGES

SHEET 2 OF 2

CLIENT: RADIAN INTERNATIONAL

PROJECT: OAK RIDGE / SIOU WASTE TREATMENT FACILITY

JOB No.: 40633-051-02IE

No.	BY	DATE	REVISION

SPEC No.	REV
40633-34-503	
P.O. NUMBER	DATE 04/07/99
BY KPB / CHK'D	APPR

1. TYPE [X] Direct Reading [ ] 3-15 Psig Receiver [ ] Other
2. MOUNTING [ ] Surface [X] Local [ ] Flush
3. DIAL Diameter 4" Color WHITE Markings BLACK
4. CASE [ ] Cast Iron [X] Polyamid [ ] Aluminum [ ] Other
5. RING [ ] Screwed [ ] Hinged [ ] Slip [X] Std [ ] Other
6. BLOWOUT PROTECTION [ ] None [X] Back [ ] Disk [ ] Solid Front [ ] Other
7. LENS [X] Glass [ ] Plastic
8. OPTIONS [ ] Siphon - Material [ ] Snubber [ ] Pressure Limit Valve [X] Movement Damping
9. NORMAL ACCURACY REQUIRED
10. MFR, & MODEL No. REO-TEMP PT-45-P-1-A-2-T18-G
11. PRESSURE ELEMENT [X] Bourdon [ ] Bellows [ ] Other
12. ELEMENT MATERIAL [X] Bronze [ ] Steel [ ] 316 SS [ ] Other
13. SOCKET MATERIAL [ ] Bronze [ ] Steel [ ] 316 SS [ ] Other MFR STD
14. CONN [ ] 1/4" NP [X] 1/2" NP [ ] Other [X] Bottom [ ] Back
15. MOVEMENT [X] Brass [ ] Nylon [ ] SS [ ] Other MFR STD
16. DIAPHRAGM SEAL
    Model No. W51522SFC
    Upper Part Matl Carbon Steel
    Diaphragm Matl 316 SS
    Lower Part Material 304 SS
    Fill Fluid Silicone DC200
    Process Connect 1/2" FNPT
    Gage Connection 1/2" FNPT
    Options

TAG No.	RANGE (Units)	Operating Pressure	Operating Temp (Deg F)	SERVICE	Range Code, Fill, Notes	P&ID DWG No.
PI-101	0 - 100 Psig	30 Psig	80 F	Slurry from P-101	D, SF	001P
PI-102	0 - 100 Psig	30 Psig	80 F	Slurry from P-102	D, SF	001P
PI-103	0 - 100 Psig	30 Psig	80 F	Slurry from P-103	D, SF	001P
PI-104	0 - 100 Psig	30 Psig	80 F	Slurry from P-104	D, SF	001P
PI-105	0 - 100 Psig	30 Psig	80 F	Slurry from P-105	D, SF	001P

NOTES:
1. Vendor shall provide complete model number, dimensional drawings, catalog information and best delivery schedule in quotation.

WALK HAYDEL A DAMES & MOORE GROUP COMPANY	ULTRASONIC LEVEL INSTRUMENTS				SHEET 1 OF 3		
CLIENT: RADIAN INTERNATIONAL	No.	BY	DATE	REVISION	SPEC No. 40633-34-501		REV
PROJECT: OAK RIDGE / SIOU WASTE TREATMENT FACILITY					P.O. No.		DATE 04/05/99
JOB No.: 40633-051-02IE					BY KPB	CHK'D	APPR

A. GENERAL NOTES - The following Notes or Comments apply to all instruments specified on the attached sheets

1. Vendor shall clearly state all exceptions and variations offered in his quotation in a separate section labeled "Exceptions and Clarifications". Failure to do this shall imply total compliance with the intent of this specification.

2. All Instruments shall be furnished with a permanently attached Stainless Steel tag, engraved or stamped with Tag Number, Service, Manufacturer's Model and Serial Number.

3. Vendor shall provide protection adequate for shipment and storage of the specified instruments. All openings and exposed moving parts shall be protected to prevent dirt from entering. All flanges and threaded connections shall be protected against damage using wood, steel, and/or plastic protectors .

4. Atmospheric pressure at the job site is 14.7 psia. Ambient Temperature varies from -20 to 120 degrees, F.

5. Instruments shall be Year 2000 Compliant.

B. SPECIFIC NOTES - Notes, which do not apply to all Instruments, are on the Sheet with the applicable instrument(s).

WALK HAYDEL
A DAMES & MOORE GROUP COMPANY

ULTRASONIC LEVEL INSTRUMENTS

CLIENT: RADIAN INTERNATIONAL

PROJECT: OAK RIDGE / SIOU WASTE TREATMENT FACILITY

JOB No.: 40633-051-02IE

No.	BY	DATE	REVISION

SPEC No. 40633-34-501 | REV
P.O. No. | DATE 04/05/99
BY KPB | CHKD | APPR

GENERAL	1.	TAG NUMBER		LT-101		LT-102		LT-103		LT-104	
	2.	SERVICE		TK-101 LEVEL		TK-102 LEVEL		TK-103 LEVEL		TK-104 LEVEL	
	3.	Line / Vessel No.									
	4.	P&ID Number		001P		001P		001P		001P	
	5.	Application		Liquid level		Liquid level		Liquid level		Liquid level	
	6.	Function		Indicator/Transmitter		Indicator/Transmitter		Indicator/Transmitter		Indicator/Transmitter	
	7.	Enclosure Material		PC/ABS FR		PC/ABS FR		PC/ABS FR		PC/ABS FR	
	8.	Orientation		Vertical		Vertical		Vertical		Vertical	
SENSOR	9.	Style or Type		Ultrasonic		Ultrasonic		Ultrasonic		Ultrasonic	
	10.	Mounting		Integral		Integral		Integral		Integral	
	11.	Process Connection		1-1/2" MNPT		1-1/2" MNPT		1-1/2" MNPT		1-1/2" MNPT	
	12.	Adjustable Range (Max)		0.8ft to 13.1ft		0.8ft to 13.1ft		0.8ft to 13.1ft		0.8ft to 13.1ft	
	13.	Set Range		0-10 FT		0-10 FT		0-10 FT		0-10 FT	
	14.	Blocking Distance		0.8 ft		0.8 ft		0.8 ft		0.8 ft	
	15.	Material		PVDF		PVDF		PVDF		PVDF	
	16.	Ultrasonic Frequency		70 KHZ		70 KHZ		70 KHZ		70 KHZ	
	17.	Enclosure Class		NEMA 6, Plastic Housing		NEMA 6, Plastic Housing		NEMA 6, Plastic Housing		NEMA 6, Plastic Housing	
AMPL & XMTR	18.	Transmitter Tag No.									
	19.	Location		Local		Local		Local		Local	
	20.	Enclosure Class (At Sensor)									
	21.	Conduit Connection		1/2" NPT		1/2" NPT		1/2" NPT		1/2" NPT	
	22.	Cable from Transmitter		Std, Shld 2 Wire		Std, Shld 2 Wire		Std, Shld 2 Wire		Std, Shld 2 Wire	
	23.	Output		4-20 mA		4-20 mA		4-20 mA		4-20 mA	
	24.	Power		2 Wire Loop Powered		2 Wire Loop Powered		2 Wire Loop Powered		2 Wire Loop Powered	
	25.	Enclosure Class (Remote)		N/A		N/A		N/A		N/A	
	26.	Local Indicator		NONE		NONE		NONE		NONE	
	27.	Signal Lights		NONE		NONE		NONE		NONE	
	28.	Accuracy (System)		0.25% for Max Measured Span		0.25% for Max Measured Span		0.25% for Max Measured Span		0.25% for Max Measured Span	
	29.										
SWITCH	30.	Type		NONE		NONE		NONE		NONE	
	31.	Quantity	Form								
	32.	Contact Rating: Volts									
	33.	Contact Rating: Amps (or Hp)									
	34.	Load Type (Resistive?)									
	35.	Contact Action	Open on Level ?								
	36.		Close on Level ?								
SERVICE	37.	Upper Fluid (or Medium)		AIR		AIR		AIR		AIR	
	38.	Wet or Dry	Density	DRY		DRY		DRY		DRY	
	39.	Lower Fluid (or Medium)		Slurry, Mostly Water		Slurry, Mostly Water		Slurry, Mostly Water		Slurry, Mostly Water	
	40.	Surface Type		Agitated		Agitated		Agitated		Agitated	
	41.	Density									
	42.	Pressure: Max	Normal								
	43.	Temp: Max	Normal	100 F	AMBIENT	100 F	AMBIENT	100 F	AMBIENT	100 F	AMBIENT
	44.	Viscosity	Upper								
	45.		Lower								
	46.	Material Buildup		NONE		NONE		NONE		NONE	
	47.	Agitation	Moisture	YES	YES	YES	YES	YES	YES	YES	YES
	48.	Manufacturer		Endress + Hauser		Endress + Hauser		Endress + Hauser		Endress + Hauser	
	49.	Model Number		FMU 230A-A-A-2-1		FMU 230A-A-A-2-1		FMU 230A-A-A-2-1		FMU 230A-A-A-2-1	

B: SPECIFIC NOTES:

WALK HAYDEL
A DAMES & MOORE GROUP COMPANY

CLIENT: RADIAN INTERNATIONAL

PROJECT: OAK RIDGE / SIOU WASTE TREATMENT FACILITY

JOB No.: 40633-051-02IE

ULTRASONIC LEVEL INSTRUMENTS

No.	BY	DATE	REVISION

SHEET 3 OF 3

SPEC No.	REV
40633-34-501	
P.O. No.	DATE 04/05/99
BY KPB	CHK'D / APPR

GENERAL	1.	TAG NUMBER	LT-105	LT-106	LT-107	
	2.	SERVICE	TK-101 LEVEL	TK-102 LEVEL	P-105 SUMP LEVEL	
	3.	Line / Vessel No.				
	4.	P&ID Number	001P	001P	001P	
	5.	Application	Liquid level	Liquid level	Liquid level	
	6.	Function	Indicator/Transmitter	Indicator/Transmitter	Indicator/Transmitter	
	7.	Enclosure Material	PC/ABS FR	PC/ABS FR	PC/ABS FR	
	8.	Orientation	Vertical	Vertical	Vertical	
SENSOR	9.	Style or Type	Ultrasonic	Ultrasonic	Ultrasonic	
	10.	Mounting	Integral	Integral	Integral	
	11.	Process Connection	1-1/2" MNPT	1-1/2" MNPT	1-1/2" MNPT	
	12.	Adjustable Range (Max)	0.8ft to 13.1ft	0.8ft to 13.1ft	0.8ft to 13.1ft	
	13.	Set Range	0-10 FT	0-10 FT	0-10 FT	
	14.	Blocking Distance	. 0.8 ft	0.8 ft	0.8 ft	
	15.	Material	PVDF	PVDF	PVDF	
	16.	Ultrasonic Frequency	70 KHZ	70 KHZ	70 KHZ	
	17.	Enclosure Class	NEMA 6, Plastic Housing	NEMA 6, Plastic Housing	NEMA 6, Plastic Housing	
AMPL & XMTR	18.	Transmitter Tag No.				
	19.	Location	Local	Local	Local	
	20.	Enclosure Class (At Sensor)				
	21.	Conduit Connection	1/2" NPT	1/2" NPT	1/2" NPT	
	22.	Cable from Transmitter	Std, Shld 2 Wire	Std, Shld 2 Wire	Std, Shld 2 Wire	
	23.	Output	4-20 mA	4-20 mA	4-20 mA	
	24.	Power	2 Wire Loop Powered	2 Wire Loop Powered	2 Wire Loop Powered	
	25.	Enclosure Class (Remote)	N/A	N/A	N/A	
	26.	Local Indicator	NONE	NONE	NONE	
	27.	Signal Lights	NONE	NONE	NONE	
	28.	Accuracy (System)	0.25% for Max Measured Span	0.25% for Max Measured Span	0.25% for Max Measured Span	
	29.					
SWITCH	30.	Type	NONE	NONE	NONE	
	31.	Quantity / Form				
	32.	Contact Rating: Volts				
	33.	Contact Rating: Amps (or Hp)				
	34.	Load Type (Resistive?)				
	35.	Contact Action: Open on Level ?				
	36.	Contact Action: Close on Level ?				
SERVICE	37.	Upper Fluid (or Medium)	AIR	AIR	AIR	
	38.	Wet or Dry / Density	DRY	DRY	DRY	
	39.	Lower Fluid (or Medium)	Slurry, Mostly Water	Slurry, Mostly Water	Slurry, Mostly Water	
	40.	Surface Type	Agitated	Agitated	Agitated	
	41.	Density				
	42.	Pressure: Max / Normal				
	43.	Temp: Max / Normal	100 F AMBIENT	100 F AMBIENT	100 F AMBIENT	
	44.	Viscosity / Upper				
	45.	Viscosity / Lower				
	46.	Material Buildup	NONE	NONE	NONE	
	47.	Agitation / Moisture	YES YES	YES YES	YES YES	
	48.	Manufacturer	Endress + Hauser	Endress + Hauser	Endress + Hauser	
	49.	Model Number	FMU 230A-A-A-2-1	FMU 230A-A-A-2-1	FMU 230A-A-A-2-1	

B: SPECIFIC NOTES:

WALK HAYDEL A DAMES & MOORE GROUP COMPANY	DIFFERENTIAL PRESSURE INSTRUMENTS				SHEET 1 OF 3		
CLIENT : RADIAN INTERNATIONAL	NO.	BY	DATE	REVISION	SPEC. NO. 40633-34-504		REV.
PROJECT OAK RIDGE / SIOU WASTE TREATMENT FACILITY					P. O. NUMBER	DATE	
JOB NO.: 40633-051-02IE					BY KPB	CHK'D	APPR.

A. GENERAL NOTES - The following Notes or Comments apply to all instruments specified on the attached sheets

1. Vendor shall clearly state all exceptions and variations offered in his quotation in a separate section labeled "Exceptions and Clarifications". Failure to do this shall imply total compliance with the intent of this specification.

2. All instruments shall be furnished with a permanently attached Stainless Steel tag, engraved or stamped with Tag No." and "Service".

3. Vendor shall provide protection adequate for shipment and storage of the specified instruments. All openings and exposed moving parts shall be protected to prevent dirt from entering. All flanges and threaded connections shall be protected against damage using wood, steel, and/or plastic protectors .

4. Atmospheric pressure at the job site is 14.7 psia. Ambient Temperature varies from 20 to 120 degrees F.

5. Instruments shall be rated for full vacuum service.

B. SPECIFIC NOTES - Notes, which do not apply to all Instruments, are on the Sheet with the applicable instrument(s).

WALK HAYDEL
A DAMES & MOORE GROUP COMPANY

DIFFERENTIAL PRESSURE INSTRUMENTS

SHEET 2 OF 3

CLIENT: RADIAN INTERNATIONAL

PROJECT: OAK RIDGE / SIOU WASTE TREATMENT FACILITY

JOB No.: 40633-051-02IE

No.	BY	DATE	REVISION

Spec No.	REV.
40633-34-504	
P. O. NUMBER	DATE
BY KPB	CHK'D / APPR.

1. TAG NO. SEE SHEET 3 — SERVICE SEE SHEET 3

GENERAL

2. FUNCTION: [ ] Record [ ] Indicate [ ] Control [ ] Blind [X] Transmit [ ] Integrate [ ] Othe
3. CASE SIZE: [X] MFR. STD. [ ] Other - Nom Size:
   COLOR: [X] MFR. STD. [ ] Othe
4. MOUNTING: [ ] Flush [ ] Surface [X] 2" pipe [ ] Other
5. ENCLOSURE CLASS: [ ] Gen Purpose [X] Weather Proof [ ] Explosion Proof - Cla Class 1, Div 2. Grp B, C, D; [ ] For Use in Intrinsically Safe System [ ] Other
6. POWER REQUIRED: [ ] 117V 60 Hz AC [ ] Other A [X] DC Loop Power 24 Volts
7. CHART: [ ] 12 in. Circ [ ] Othe NA [ ] Range No.
8. CHART DRIVE: [ ] 24 Hr. [ ] Othe NA [ ] Electric [ ] Spring [ ] Other
9. SCALE: Type GPM Range SEE SHEET 3

XMT

10. TRANSMITTER OUTPUT: [X] 4-20 Ma [ ] 10-50 Ma [ ] 3-15 Psig (21-103 Kpa) [ ] Other

CONTROL

11. CONTROL MODES: [ ] Proportional [ ] Prop + Integral [ ] Prop + Derivative [ ] Prop + Integral + Derivative [ ] Fast; [ ] Integral [ ] Derivative [ ] Other [ ] Slow
12. ACTION: As Input Increases [ ] Output Increases [ ] Output Decreases
13. AUTO-MANUAL SWITCH: [ ] None [ ] MFR. STD. [ ] Other
14. SET POINT ADJUST: [ ] Manual [ ] External [ ] Other
15. MANUAL REGULATION: [ ] None [ ] MFR. STD. [ ] Other
16. OUTPUT: [ ] 4-20 Ma [ ] 10-50 Ma [ ] 3-15 Psig (21-103 Kpa) [ ] Other

ELEMENT

17. SERVICE: [X] Flow [ ] Level [X] Differential Pressure [ ] Other
18. TYPE: [X] Diaphragm [ ] Bellows [ ] Mercury [ ] Other
19. MATERIAL: Body 316SS Element 316SS
20. PRESSURE RATING: Body 3000Psig DP Overrange 3000Psig
21. DP RANGE: [ ] Fixed [X] Adjustable Range 0-20 TO 0-400" WC Set At SEE SHEET 3
22. OFFSET: Elevation 0 Suppression 100% OF SPAN
23. PROCESS: Fluid WATER Normal DP SEE SHEET 3 Max. DP SEE SHEET 3; Sp. Gr. 1 Max. Temp 120 F Max. Press 30Psig
24. PROCESS CONN.: [ ] 1/4" NPT [X] 1/2"NPT [ ] Other; Location

ALARM

25. ALARM SWITCHES: Qunatity Form Rating
26. FUNCTION: [ ] High [ ] Low [ ] Deviation; Contacts To: [ ] Open [ ] Close On Increase in Imput

OPTIONS

27. OPTIONS: [ ] Pressure Element - Ran Material; [ ] Temperature Element - Ran Type; [ ] Filter Regulator [ ] Supply Gage [ ] Output Gage Charts; [ ] Valve Manifold Type; [ ] Condensing Pots [X] Adjustable Damper [ ] Output is SQ Root of Input; [ ] Othe

MFR. & MODEL NUMBER: HONEYWELL MODEL STD924-E1H-00000-S2.SB.TGF1D3

B. SPECIFIC NOTES:

WALK HAYDEL
A DAMES & MOORE GROUP COMPANY

CLIENT: RADIAN INTERNATIONAL

PROJECT: OAK RIDGE / SIOU WASTE TREATMENT FACILITY

JOB No.: 40633-051-02IE

DIFFERENTIAL PRESSURE INSTRUMENTS

SHEET 3 OF 3

No.	BY	DATE	REVISION	Spec No. 40633-34-504	REV.
				P. O. NUMBER	DATE
				BY KPB	CHK'D / APPR.

EV	TAG NO.	FLUID	Sp. Gr.	NORMAL dP	MAX dP	MAX TEMP	MAX PRESSURE	Range (Units)	Set Range (Units)	Represent FLOW of	Service	P&ID Number
0	FT-101	WATER	1.00			120 F	30 Psig	0-400" WC	0-100" WC	100 gpm	FLOW FROM F-101	001P

C. SPECIFIC NOTES:

ELECTRICAL

SCOPE OF WORK
ELECTRICAL AND INSTRUMENTATION

SIOU CORPORATION
WASTE TREATMENT FACILITY

ELECTRICAL

Electrical will receive power at 200kVA, 480V at southwest corner of plot. From there it will go on sleeper in plastic conduit or overhead to MCC building located at southwest corner of process building.

MCC building will be a prefabricated building measuring 10'6" x16'6".

Motor control center will be used to supply all motors and loads necessary. Lighting will be at 120/240 volt and will be distributed from panel board located in MCC building.

Lighting will consist of low-bay fixtures in the building and floodlights around the perimeter of the building. Floodlights will be located on the building frame. No lighting will be added around the tanks.

Grounding will be minimal and will consist of a grid around the building and MCC.

INSTRUMENTATION & CONTROLS

Instrumentation and controls will operate the facility in semi-automatic mode.

A control room will be provided as a prefabricated building measuring 8'6"x16'6".

Controls for normal operation of the facility will be accomplished via a PLC located in MCC building. Motor control functions, instrumentation inputs and outputs and status signals will be handled by means of computer monitor, keyboard and a mouse located at the operator's station within the control room. Signals from the dredge equipment will be brought into the PLC and monitored by the operator (i.e. Radiation level and density). The main PLC will control the normal operation of the facility.
Each tank will have inlet and outlet solenoid operated valves with status feedback for open and closed. In addition each tank will have level controls brought to the PLC. Alarms will be generated via software and signals will be sent to the dredge controls for their monitoring of the level of each tank.

Recirculation between various tanks will be done manually by lining up pumps and switching manual valves.

Packaged equipment such as Clarifier, Rotary Press and Vibrator/Compactor will be provided with remote control panels. Control panels for these equipment will be located in the control room so as to minimize the operation/maintenance personnel from having to operate the equipment locally.

Telephone system will utilize cellular technology. Therefore there will be no need for telephone lines at the facility.

WALK, HAYDEL & ASSOCIATES INC.	480V MOTOR CONTROL CENTER
CLIENT: OAK RIDGE NATIONAL LABORATORY	
PROJECT: SIOU WASTE TREATMENT FACILITY	DATA SHEET
JOB NO.: 40633-051	Data Sheet No.: 20-001-A1 Rev.: A

1. RATINGS

TAG NUMBER: MCC-1
SYSTEM VOLTAGE RATING: 480 Volts
PHASE: 3
FREQUENCY: 60 Hz
SERVICE ELEVATION: [X] Less Than 3300 Feet [ ] Other _____

TYPE: [X] Solidly Grounded [ ] Resistance Gnd. [ ] 4 Wire
[ ] Ungrounded [X] 3 Wire [ ] Other _____

MOTOR CONTROL CENTER
HORIZONTAL POWER BUS RATING: 600 Amps
VERTICAL POWER BUS RATING: 600 Amps
RMS SYM POWER BUS BRACING: 65 KAmps
RMS SYM CIRCUIT BREAKER INTERRUPT: 65 KAmps
MOTOR CIRCUIT PROTECTION TYPE: HMCP

INCOMING LINE POWER CIRCUIT BREAKERS
QUANTITY: 1
FRAME RATING: 400 Amps
CONTINUOUS CURRENT RATING: 300 Amps
RMS SYM CURRENT INTERRUPTING RATING: 65 KAmps
CIRCUIT BREAKER TYPE: [X] Air-Break [X] Stored Energy Type
[X] Manually Operated [ ] Electrically Operated

2. CONSTRUCTION

LOCATION: [X] Indoor [ ] Outdoor
AREA CLASSIFICATION: [X] None Cl _____ Div _____ Gp _____
SEISMIC CONDITION: NONE

ENCLOSURE: [X] NEMA 1 [ ] NEMA 3R [ ] Walk-In
[ ] NEMA 2 [ ] NEMA 12 [ ] Non Walk-In
[ ] Gasketed [ ] Other _____
[X] Front Only [ ] Back-To-Back

INCOMING FEEDER TYPE: [X] Cable [ ] Bus Duct [ ] Close Coupled
INCOMING CABLE PER PHASE: 1-350 kcmil
BUS DUCT RATING: _____
INCOMING CABLE ENTRY: [X] Top [ ] Bottom
FEEDER CABLE ENTRY: [X] Top [ ] Bottom

WIRING ARRANGEMENT: [X] NEMA Class I [ ] NEMA Class II
[ ] Type A [X] Type B [ ] Type C

CONTROL WIRING: [X] Tinned Copper [ ] SIS [X] MTW

GROUND BUS: [X] Copper [ ] Aluminum [ ] Top
[ ] Tin Plated [ ] Silver Plated [X] Bottom

POWER BUS: [X] Copper [ ] Aluminum [X] Fully Rated
[X] Tin Plated [ ] Silver Plated

WALK, HAYDEL & ASSOCIATES INC.	480V MOTOR CONTROL CENTER
CLIENT: OAK RIDGE NATIONAL LABORATORY	
PROJECT: SIOU WASTE TREATMENT FACILITY	DATA SHEET
JOB NO.: 40633-051	Data Sheet No.: 20-001-A1 Rev.: A

3. MCC EQUIPMENT LIST

EACH INCOMING BREAKER SHALL BE PROVIDED AS A MINIMUM WITH THE FOLLOWING ASSOCIATED EQUIPMENT:

QTY.	DESCRIPTION
[ ]	Current Transformers
[1]	Solid State RMS Trip Unit with Sensor (LSIG Protection)
[2]	Normally Open Spare Auxiliary Contacts
[2]	Normally Closed Spare Auxiliary Contacts
[ ]	Digital Voltmeter
[1]	Digital Ammeter (integral to Solid State RMS Trip Unit)
[ ]	Voltmeter Switch
[ ]	Ammeter Switch
[ ]	Potential Transformer with Primary and Secondary Fuses (480-120 V, Single Phase)
[1]	Set of Lugs for Termination of Copper Incoming Feeder

EACH COMBINATION STARTER SHALL BE PROVIDED WITH THE FOLLOWING ASSOCIATED EQUIPMENT:

QTY.	DESCRIPTION
[1]	Control Transformer with Primary and Secondary Fuses (480-120 V, Single Phase)
[1]	Solid State Overload Relay with Resetable Push Button
[1]	Red Indicating Light for "Running" Indication
[1]	Green Indicating Light for "Power Available" Indication
[1]	Surge Suppressor (MOV)
[2]	Normally Open Auxiliary Contacts
[2]	Normally Closed Auxiliary Contacts

4. ACCESSORIES

[ ] Short Circuiting Type Terminal Blocks for Current Transformers
[ ] Fans
[ ] Space Heaters
[ ] Single Pole, 120V Circuit Breakers for Space Heater Protection
[X] Spare Set of Fuses of Each Different Type and Rating
[X] Extra Terminal Blocks for Connection of Exterior Equipment
[X] Provisions for Adding Future MCC sections
[X] Stainless Steel Nameplate
[X] Rodent Proof Enclosure
[X] Compression Lugs for Power Copper Cable On All Terminals
[X] Splice Plates and Hardware
[ ] Interposing Relays for Size 3 Starters and Above (120 VAC Coil)
[X] Ground Fault Relay and Zero Sequence CT for Size Four Starter and Larger
[X] Shunt Trip, Fused 120 VAC CPT and Ground Fault Relay with Sensor for Thermal Mag Breakers Rated Above 125 Amps
[ ] Other Accessories Recommended by Vendor : _____

WALK, HAYDEL & ASSOCIATES INC.	480V MOTOR CONTROL CENTER
CLIENT: OAK RIDGE NATIONAL LABORATORY	
PROJECT: SIOU WASTE TREATMENT FACILITY	DATA SHEET
JOB NO.: 40633-051	Data Sheet No.: 20-001-A1 Rev.: A

5. FINISH PAINT

[X] Manufacturer's Std. [ ] Otdr. Crsn. Resistantant [ ] Other _____

6. TESTING

[X] Mechanical Operation and Alignment
[X] Equipment Rating Check
[X] Circuit Continuity
[X] Control Wiring Verification
[X] Circuit Breaker Tripping and Functional Test
[ ] Current Transformer Polarity and Ratio Verification
[X] Polarity and Phase Relation Tests
[X] Insulation Resistance (Megger) Tests
[ ] Other Tests Recommended by Vendor:

7. NOTES

NOTE 1: FOR EACH UNIQUE TYPE OF MCC UNIT, PROVIDE A PRICE PER UNIT TO ADD ADDITIONAL UNITS AND A PRICE PER UNIT TO DEDUCT EXISTING UNITS.

NOTE 2: PROVIDE A PRICE PER VERTICAL SECTION TO ADD ADDITIONAL VERTICAL SECTIONS AND A PRICE PER VERTICAL SECTION TO DEDUCT EXISTING VERTICAL SECTIONS.

WALK, HAYDEL & ASSOCIATES INC.	ADJUSTABLE FREQUENCY DRIVE DATA SHEET (TYPICAL)
CLIENT: OAK RIDGE NATIONAL LABORATORY	
PROJECT: SIOU WASTE TREATMENT FACILITY	
JOB NO.: 40633-051	Data Sheet No. 20-001-A2 Rev.: A

1. CONDITIONS OF SERVICE AND CONSTRUCTION FEATURES

QUANTITY: (SEE NOTE 1)
TAG NUMBERS: (SEE NOTE 1)
APPLICATION: [ ] Petro-chem. [ ] Food Processing [ ] HVAC
[ ] Pulp & Paper [X] Other
MECHANICAL SYSTEM BEING DRIVEN: [ ] Centrifugal [ ] Pump [ ] Compressor
[ ] Fan [ ] Conveyor [ ] Other: _____
MOTOR HORSEPOWER: (SEE NOTE 1) HP
MOTOR FULL LOAD AMPS: _____ AMPS
MOTOR VOLTAGE: 480 VOLTS
CABLE LENGTH FROM DRIVE TO MOTOR: _____ FEET
ENCLOSURE: [X] NEMA 1 [ ] NEMA 12 [ ] NEMA 4
[ ] NEMA 4X (SST) [ ] NEMA 4X (Fbrgl.) [ ] Wall Mounted
[X] MCC Mounted [ ] Free-standing [ ] Other: _____
DRIVE INPUT VOLTAGE: [ ] 208V [ ] 240V [X] 480V
DRIVE INPUT PHASE: [ ] Single Phase [X] Three Phase
DRIVE INPUT FREQUENCY: 60 Hz
AVAILABLE SHORT CKT. CURRENT (RMS SYM.): 65 kAMPS
UNUSUAL CONDITIONS: [ ] Power Dips [ ] Interruptions [ ] Voltage Spikes
[ ] Other: _____
SEISMIC REQUIREMENT: NONE
ALTITUDE: 1400 Feet
AREA CLASSIFICATION: [X] None Class _____
Div _____
Group _____
INCOMING POWER CABLE: Size _____ Cndct./Phase _____
INCOMING CABLE ENTRY: [X] Top [ ] Bottom
OUTGOING POWER CABLE: Size _____ Cndct./Phase _____
OUTGOING CABLE ENTRY: [X] Top [ ] Bottom

2. AFD EQUIPMENT LIST

OPTIONAL FEATURES / ACCESSORIES

[ ] MAIN CONTACTOR
[ ] BYPASS CONTACTOR WITH MOTOR OVERLOAD RELAYS
[X] CONTROL POWER TRANSFORMER
[ ] BUILT IN DISCONNECT SWITCH
[X] HARDWIRE CONTROL INTERFACE BOARD [X] 120VAC [ ] 24VDC
[ ] DOOR MOUNTED PUSHBUTTONS Purpose: _____ Quantity: _____
[X] DOOR MOUNTED CONTROLLER/PROGRAMMER W/ DIGITAL SPEED POTENTIOMETER (H.I.M.)
[ ] REMOTE I/O COMMUNICATION/CONTROL
[X] PILOT LIGHTS [X] Green for Stop [X] Red for Running [ ] Other _____
[ ] STOP SIGNAL CONTACT Contact Type: _____

4. DATA SUPPLIED BY MANUFACTURER OR VENDOR

MANUFACTURER: Allen-Bradley (or equal)
MODEL NO.: 1336 PLUS (or equal)
NET WEIGHT: _____ LBS
DIMENSIONS: HEIGHT _____ WIDTH _____ DEPTH _____

NOTES
NOTE 1 - REFERENCE 480V MOTOR CONTROL CENTER ONE LINE DIAGRAM.

40633-20-001
Rev. A

SPECIFICATION
FOR
480V MOTOR CONTROL CENTER
AND
ADJUSTABLE FREQUENCY DRIVES

OAK RIDGE NATIONAL LABORATORY
SIOU WASTE TREATMENT FACILITY

Prepared by: _____
W. D. Wetzel

Checked by: _____
N. G. Malek, P.E.

Approval: _____

Client Approval: _____

Walk Haydel Job No. 40633-051
March 1999

SPECIFICATION
FOR
480V MOTOR CONTROL CENTER
AND
ADJUSTABLE FREQUENCY DRIVES

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1.0 SCOPE

This specification, together with the attachments, defines the requirements for design, construction, testing and delivery of one 480V Motor Control Center (MCC) and MCC-mounted Adjustable Frequency Drives (AFDs) with related equipment and devices for Oak Ridge National Laboratory's SIOU Waste Treatment Facility located in Oak Ridge, Tennessee, U.S.A.

1.1 The data sheet and drawing in Section 8.0 cover specific requirements of each lineup.

1.2 Where the requirements of this specification conflict with the data sheet and drawing, the data sheet and drawing shall govern.

1.3 All equipment and components shall be of recent manufacture and design for which replacement parts and service are readily available.

1.4 The following items of equipment, facilities and work will be provided by others and are excluded from the scope of this specification:

1.4.1 Foundation and anchor bolts.

1.4.2 All conductors, cables, conduit and wiring external to the equipment.

1.5 Vendor shall provide a complete, coordinated and interconnected MCC lineup. This shall include but not be limited to power and ground busses and power and control wiring.

1.6 The Vendor shall be responsible for making the necessary modifications to his standard equipment in order to guarantee full conformance to the specified arrangements and ratings.

2.0 REFERENCE CODES, STANDARDS AND SPECIFICATIONS

2.1 All equipment shall be designed, constructed, wired and tested in accordance with the applicable sections of the latest listed editions in effect at the time of purchase order award of the following standards and codes:

ANSI - American National Standards Institute
IEEE - Institute of Electrical and Electronic Engineers
NEC - National Electrical Code (NFPA 70)
NEMA - National Electrical Manufacturers Association
OSHA - Occupational Safety and Health Administration
UL - Underwriters Laboratory

2.2 It shall be the Vendor's responsibility to be knowledgeable of the requirements of the above standards and codes. Any changes or alterations to the equipment to make it meet standards and code requirements shall be at the expense of the Vendor.

2.3 Whenever equipment proposed by the Vendor cannot fully meet the requirements of the specification, such exceptions must be clearly stated. No exceptions are allowed unless approved by SIOU in writing.

2.4 The American National Standards Institute (ANSI) device function numbers shall be used to denote all protective devices, circuit breakers, breaker's auxiliary contacts, etc., on all applicable drawings.

2.5 When two standards differ, the stricter shall take precedence. Any conflicts or ambiguity among the listed standards and this specification and its attachments shall be referred to SIOU for resolution.

3.0 GENERAL REQUIREMENTS

3.1 The equipment will be installed in the environmental conditions stated in this specification and on the data sheet. Vendor shall be responsible for providing equipment designed to operate under these conditions.

3.2 The MCC shall be in service twenty-four (24) hours a day, seven (7) days a week and three hundred and sixty-five (365) days a year. The equipment shall be designed for indoor application and will be

installed in a dry, clean and well ventilated electrical room.

3.3 The lineup shall be labeled with the designated equipment tag number and on manufacturer's nameplate in accordance with ANSI standards. All nameplates shall be made of acrylic. Nameplates shall be in English.

3.4 Where shipping splits are required, all necessary hardware shall be supplied for assembly of equipment. Coordination of mechanical and electrical connections for the MCC assemblies shall be the responsibility of the Vendor.

4.0 TECHNICAL REQUIREMENTS

4.1 General

4.1.1 The MCC configuration shall be as shown on the data sheet and drawing in Section 8.0.

4.1.2 The arrangement of equipment shall conform to the attached data sheet and drawing in Section 8.0, except for minor rearrangement of components to suit physical assembly requirements, which should be proposed by the Vendor and submitted for SIOU's approval in writing.

4.1.3 The MCC shall be designed for a solidly grounded, 480 volt, 3 phase, 3 wire, 60 Hz system. The MCC equipment shall be installed indoors in a "non-hazardous" electrical classification area.

4.1.4 The MCC shall be of a "Dead Front" construction and shall incorporate horizontal and vertical power buses. The MCC shall be a "Front Only" construction. The MCC equipment shall be composed of several structures or grouping of structures with a power bus and various types of units with specific requirements as shown on the drawing and data sheet in Section 8.0.

4.1.5 MCC vertical sections shall be bolted together to form a rigid free standing assembly and shall be so designed as to permit future additions of vertical sections and interchanging of units. The MCC shall be so constructed as to meet or exceed the requirements of the latest published standards of NEMA Publication No. ICS 2-322 and UL 845 for MCCs.

4.1.6 All current carrying parts of the MCC shall be fully rated for the maximum current rating at a maximum ambient temperature of 40°C.

4.2 Nameplates

4.2.1 Each MCC shall be provided with a master nameplate showing MCC manufacturer, shop order number, rated voltage, rated current, maximum fault rating, and place of manufacture. Master nameplate dimensions shall be 6" x 2". Master nameplate colors shall be white with black engraved characters.

4.2.2 Unit identification shall be provided. Unit nameplate dimensions shall be 3 5/8" x 1 1/8" with characters of 3/16". Unit nameplate colors shall be white with black characters and shall accommodate 3 lines of 15 characters per line. In addition, each unit shall have an identification label to indicate catalog or serial numbers, starter or feeder size and all maximum ratings and shall be located inside each compartment.

4.2.3 All nameplates are to be attached using two steel self-tapping screws.

4.2.4 Each vertical section shall have an identification nameplate, indicating the serial number or catalog number, maximum bus bar voltage and current rating and vertical section reference number. The nameplate shall be mounted on the vertical wireway door of each section.

4.3 Enclosure

4.3.1 Each MCC shall consist of totally enclosed, dead front, NEMA 1, freestanding, metal modular units arranged for front access only as shown on the data sheet and drawing in Section 8.0. Equipment shall be mounted and wired from the front and so arranged that field connections can be readily made from the front only.

4.3.2 Standard vertical sections of the MCC shall be approximately 90" high, 20" wide and 20" deep, with a minimum of six (6) size 1 unit compartments in each vertical section. Each size 1 unit compartment shall be 12" in height. The layout and design of equipment shall be as shown on the data sheet and drawing in Section 8.0.

4.3.3 The manual operating handles of the individual modules shall have provisions for padlocking when they are in the OFF position.

4.3.4 Removable end plates shall be used to cover the horizontal power bus and horizontal wireway openings on each end of the MCC. Each section shall be equipped with removable onepiece top plate.

4.4 Main Incoming Compartment

4.4.1 Main Circuit Breaker

4.4.1.1 When indicated on the data sheet and drawing in Section 8.0, the incoming line shall be a main circuit breaker.

4.4.1.2 The main circuit breaker compartment shall be thermal magnetic type and front accessible.

4.4.1.3 The main circuit breaker shall be suitable for service entrance equipment.

4.4.2 Main Lug

4.4.2.1 When indicated on the data sheet and drawing in Section 8.0, the incoming line shall be a main lug.

4.4.2.2 The main lug compartment shall be crimp compression lugs and front accessible.

4.4.2.3 NEMA 2 hole spacing (1 3/4" between centers) and lugs for copper conductors shall be used.

4.4.3 Metering

4.4.3.1 When indicated on the data sheet and drawing in Section 8.0, each MCC shall be provided with one set of metering equipment to indicate the total main incoming current consumption. The metering equipment shall include current transformers with the proper ratios, a 3 phase transducer, a 3 phase ammeter switch and a 3 phase analog ammeter.

4.5 Bus Bars

4.5.1 The power busing system shall be made of pure copper, supported, braced and isolated by several bus supports molded of high strength, non-tracking glass polyester material. Vertical and horizontal buses shall be fastened together with a bus clamp assembly.

4.5.2 The MCC shall have all bus connections tin-plated to minimize contact resistance.

4.5.3 Horizontal Bus

4.5.3.1 The horizontal bus shall be mounted in a vertical plane to provide maximum resistance to magnetic stresses. The horizontal bus shall be braced continuously within each section and shall be continuous in each block shipped.

4.5.3.2 The horizontal power bus ampere ratings and minimum bus bracing shall be as shown on the data sheet and drawing in Section 8.0.

4.5.3.3 Connections from the main breaker terminals to the horizontal bus shall have the same ampere ratings as the horizontal bus and shall be as shown on the data sheet and drawing in Section 8.0.

4.5.3.4 The splicing of horizontal buses shall be accomplished using a splice kit of the same ampere rating as the horizontal power bus. These assemblies shall provide a minimum of two (2) bolted connections to each side of the splice. The splice connections shall be front accessible for servicing with a torque wrench. A label located on the inside of the vertical wireway door shall indicate location of all splices.

4.5.4 Vertical Bus

4.5.4.1 Each vertical bus shall be flat and shall provide optimum contact with the unit plug-in stabs. The vertical bus shall be braced continuously and sandwiched in a high strength, non-tracking glass polyester

molding with a polycarbonated molded cover.

4.5.4.2 Furnish the vertical power busses as shown on the data sheet and drawing in Section 8.0.

4.5.5 Ground Bus

4.5.5.1 A horizontal continuous ground bus shall be located in the bottom wireway of each MCC lineup and extend the entire length of each MCC. The horizontal ground bus shall be sized and rated as required.

4.5.5.2 A pressure type ground lug shall be mounted on the ground bus in the incoming line section. Ground lugs shall be provided on each end of the ground bus sized to accommodate the power copper cable ground. The ground bus shall be provided with connectors (one for each compartment) and the feeder ground cables shall be tied to them.

4.5.5.3 Provide ground bus as shown on the data sheet in Section 8.0.

4.6 Starters

4.6.1 Starters shall be furnished in Full Voltage Non-Reversing (FVNR) or Full Voltage Reversing (FVR) types as specified on the data sheet and drawing in Section 8.0. The design shall meet or exceed the applicable requirements of UL and NEMA standards. Coils shall be of the hot molded construction design for protection against mechanical and environmental damage. Coils shall also be protected from overheating.

4.6.2 All starter units shall be of the combination type with readily accessible components. Each starter shall be furnished with a three pole, molded case motor circuit protector with an adjustable magnetic trip, sized as shown on the data sheet and drawing in Section 8.0.

4.6.3 Combination motor starter units up to Size 4 shall be of the draw out type, connected to the vertical bus by means of a self-aligning "stab-on" connector to insure positive contact with both sides of the bus. Units of the same size and service shall be interchangeable. Means shall be provided in the stationary structure for supporting and aligning the starter units during their removal or replacement.

4.6.4 Each starter shall be supplied with a solid state overload relay of Class 20 operation. These relays shall provide basic overcurrent and phase loss protection. These overload units shall be equipped with external reset buttons. The relays shall be sized based on motor horsepower data and furnished by the MCC Vendor.

4.6.5 MCC Vendor shall furnish a starter with a current transducer, when required by the data sheet and drawing in Section 8.0.

4.6.6 The transducer shall provide a 4-20mA current indication signal, representing the motor load current value, to the PLC.

4.6.7 Units furnished with pushbuttons, selector switches and pilot lights shall be provided with a door mounted control station. The control station shall be removable for the purpose of mounting and wiring the pilot devices and shall be held in place with captive mounting screws. If space permits, the contact blocks of the pilot devices shall be mounted in a recessed housing to minimize

the hazard of accidental contact when the unit door is opened.

4.6.8 Terminal blocks shall be mounted within the unit insert in a horizontal plane up front for accessibility. Control terminal blocks shall be pull-apart on plug-in units and fixed on non plug-in factory mounted units.

4.6.9 A pull-apart terminal block assembly shall consist of male and female components held together with captive screws. The assembly shall be designed to withstand the effects of vibration, yet able to be pulled apart without any difficulty. The terminals of both portions of the assembly shall be recessed to isolate them from accidental contact when withdrawn apart. Terminal marking shall be provided to identify terminations.

4.6.10 Power pull-apart blocks shall be 3-pole rated 60 Amps, 600 Volts, 90 degrees C and shall be supplied on NEMA Size 1 and 2 starters with a maximum wire size of #4 AWG. A non pull-apart block rated 195 Amps, 600 V shall be supplied for Size 3 starters 90 degrees C with a maximum wire size of 1/0 AWG. Power terminal blocks shall not be supplied on Size 4 or larger unit starters.

4.6.11 Spaces marked "Space" shall be provided with a vertical bus, a gasketed blank cover plate, guide rails and any other hardware necessary to permit future addition of combination starters or feeder circuit breakers.

4.7 Circuit Breakers

4.7.1 Circuit breakers up to 400 Amps frame size shall be stab connected to the vertical bus. Feeder circuit breakers shall be the thermal magnetic type, sized as shown on the data sheet and drawing in Section 8.0.

4.7.2 The interrupting capacity of feeder circuit breakers at 480 Volts shall be as specified on the data sheet and drawing in Section 8.0.

4.7.3 Combination starter circuit breakers shall be magnetic type motor circuit protectors (MCP).

4.7.4 Motor circuit protectors shall be manually operated, trip free, molded case, sized as shown on the data sheet and drawing in Section 8.0.

4.8 Wiring

4.8.1 Power wiring shall be, 90 degrees C, copper, size No. 12 AWG minimum. Control wiring shall be, 90 degrees C, copper, size No. 16 AWG minimum (MTW), rated 600 Volts, single conductor, with moisture and flame resistant insulation. Wiring shall be NEMA Class I Type B, protected and supported. Conductors for hinged panels shall be bundled and arranged so that they twist instead of bending during panel movement.

4.8.2 Wiring shall terminate on terminal blocks or equipment with ring type insulated terminals. All connections to external circuits shall be brought to conveniently located terminal blocks having marking strips.

4.8.3 Terminal blocks shall be provided for all controls and devices requiring external connections. The terminal blocks shall be rated 600 Volts, 20 Amps, minimum.

4.8.4 A continuous vertical wireway shall be provided from top to bottom in each vertical section, and a continuous horizontal wireway shall be provided for the entire length of each MCC lineup for wiring between sections.

4.8.5 A top horizontal wireway shall extend the full length of the MCC. The wireway shall not be less than 6″ high with a minimum of 25 square inch opening between sections. The wireways shall be isolated from all busses.

4.8.6 The horizontal wireway of an incoming line section shall be 6″ high and 7″ deep extending across the incoming line section and isolated from the incoming line compartment with a barrier.

4.8.7 A full height vertical wireway shall be provided in each standard vertical section and shall be isolated from the horizontal and vertical bus. Vertical wireways shall be an integral part of each section and shall be independent of plug-in units. A removable hinged door shall cover the vertical wireway, and provide access to wiring without disturbing energized control units. In each section the vertical and horizontal wireways open to the front to allow wires to be laid in place.

4.8.8 The MCC shall be wired in accordance with the required NEMA Class and Type as defined by NEMA Standard ICS 2-322.

4.8.9 Wiring shall be NEMA Class I. Standard, individual unit wiring diagrams, consisting of drawings that identify electrical devices, connections, and terminal number designations shall be supplied for each unit.

4.8.10 Wiring shall be NEMA Type B with pull-apart terminal blocks supplied for user control termination.

4.9 Controls

4.9.1 Control terminal blocks shall be installed and wired in each starter cubicle.

4.9.2 Control power shall be provided in each starter by a control power transformer, rated 480 Volts primary to 120 Volts secondary with a secondary fuse. One side of the secondary winding in the transformer shall be fused and the other side shall be grounded in all cases. In addition to the secondary winding fuse for the power transformer, both sides of the primary winding shall be fused.

4.9.3 Starters controlling motors of 75 HP or larger, shall have enough capacity for the control power transformer to feed a motor space heater of at least 350 watts. Vendor shall indicate on his drawings the VA rating of each control power transformer.

4.9.4 Controls, control circuitry, extra auxiliary contacts and other accessories shall be provided in some starters and large units as specified by the data sheet and drawing in Section 8.0.

4.10 Adjustable Frequency Drives

4.10.1 General

4.10.1.1 The AFD shall produce an adjustable frequency, adjustable voltage output by the use of a Pulse Width Modulated (PWM) system.

4.10.1.2 The AFD shall limit harmonic distortion reflected onto the A.C. supply system to meet IEEE 519 for general system applications.

4.10.1.3 The AFD shall be designed to operate satisfactorily under the following conditions:

A. Minimum Efficiency at Full Load 96%

B.	Minimum Power Factor	95%
C.	Ambient Temperature	0°C-40°C
D.	A.C. Line Voltage Variation	±10%
E.	A.C. Line Frequency Variation	±2 Hz
F.	Relative Humidity (Non-Condensing)	0% - 95%
G.	Minimum Ride through voltage dip	15mS

4.10.2 Enclosure

4.10.2.1 The AFD enclosure shall be of the NEMA class indicated in the data sheet.

4.10.2.2 The enclosure shall be designed for the mounting style indicated in the data sheet. Regardless of mounting style, all internal equipment shall be totally accessible from the front.

4.10.2.3 Freestanding enclosures shall be provided with a minimum 1 1/2 inch channel base frame. Enclosure paneling shall start directly above the channel base.

4.10.2.4 The enclosure shall have input and output cable entry as specified in the data sheet. The cable entry shall have knockouts or predrilled openings with gasketed cover plates.

4.10.2.5 The power unit door shall be interlocked to cause power to

be disconnected if the door is opened. The door shall swing a minimum of 90 degrees and shall include a locking means in the closed position.

4.10.2.6 The enclosure panels and door shall be constructed of steel sheet metal not less than NEMA standard thickness.

4.10.2.7 All exposed handles, screws, and hinges shall be made of corrosion-resistant material or finished for corrosion resistance.

4.10.3 Controls

4.10.3.1 The AFD shall have provisions for control inputs and outputs as specified in the data sheet.

4.10.3.2 The AFD shall include the following operation adjustments with adjustable settings:

A.	Acceleration Time	Range In Seconds
B.	Deceleration Time	Range In Seconds
C.	Volts per Hertz	Variable Ratio
D.	Minimum Frequency	Range in Hertz
E.	Maximum Frequency	Range in Hertz

4.10.3.3 The AFD shall be furnished with a door-mounted diagnostic panel displaying operating data, settings, protection parameters and causes of trips. Additional door-mounted

devices shall be furnished when specified in the data sheet.

4.10.3.4 When specified in the data sheet, Vendor shall furnish single phase 480-120V control power transformer with primary fused leads.

4.10.4 Protection

4.10.4.1 The AC power input to the AFD shall be short circuit protected by a circuit breaker mounted in the motor control center.

4.10.4.2 The AFD shall be capable of withstanding the available short circuit fault current at its output terminals without damage to power and control circuits until the fault is cleared. The short circuit rating shall be based on the available fault current at the AFD as specified in the data sheet.

4.10.4.3 The AFD shall include the necessary components and circuits to protect the AFD from internal faults and disturbances in the A.C. supply. The following conditions shall cause the AFD to shut down:

A. Detection of a fault condition in any of the power modules

B. Overvoltage condition at any of the power modules

C. Voltage dip or single phasing on the A.C. supply

D. Overtemperature of any component in the AFD

4.10.4.4 An unplated copper horizontal ground bus and a vertical steel plug-in ground bus shall be provided for grounding the motor and internal equipment.

4.10.5 Power, Control and Ground Wiring

4.10.5.1 All factory power, control and ground wiring shall be copper conductors, 600V insulation type THHN/THWN. The minimum wire sizes shall be No. 16 AWG (MTW) for control and No. 12 AWG for power. All C.T. wiring shall be No. 14 AWG minimum.

4.10.5.2 All wiring shall be continuous from terminal to terminal without splices.

4.10.5.3 Low voltage analog and digital control circuits shall be properly shielded so that the power circuit does not induce error.

4.10.5.4 Wire markers shall be provided on both ends and labeled in accordance with elementary and wiring diagrams.

4.10.5.5 Provisions shall be made for connection of the main power cables. Lugs or terminations suitable for use with the cable size specified in the data sheet shall be provided.

4.10.5.6 Terminals for power circuits shall be grouped separately from control circuits. The minimum rating for terminal blocks shall be 600 volts, 20 amps.

4.10.5.7 Adequate wireways shall be provided for connection of field wiring from cable entry to location of terminal blocks.

4.10.6 Miscellaneous Features

4.10.6.1 A bypass contactor shall be provided if specified in the data sheet. It shall permit isolation of the AFD when the unit is in the bypass mode. A motor overload relay shall be provided for motor protection when in the bypass mode. The bypass and normal contactor shall be electronically interlocked to prevent simultaneous operation.

4.10.7 Finish

4.10.7.1 The enclosure shall be primed and chemically treated to prevent rust and painted inside and outside.

4.10.8 Nameplates

4.10.8.1 An acrylic nameplate for the AFD shall be provided and shall indicate catalog number, factory order number, kVA, amps, HP, supply voltage, phase and frequency and location in MCC.

4.10.9 Test and Inspection

4.10.9.1 Equipment shall be completely assembled, wired, and tested at the factory. Factory tests shall be in accordance with this specification and the standards referenced in Section 2.0.

4.10.9.2 Testing shall be performed under simulated conditions as close to actual operating conditions as possible. The AFD shall be run and tested under all load conditions for a minimum of 24 continuous hours prior to shipment.

4.10.9.3 The Vendor shall supply SIOU with certified copies of all test reports.

4.10.9.4 SIOU's representative shall have the right to witness tests. At least two weeks advance notice of each test shall be given to SIOU and as many units as possible shall be tested at the same time.

4.10.9.5 Equipment furnished under this specification shall be subject to inspection at the factory by an SIOU representative, given reasonable notice.

4.11 Fabrication and Assembly

4.11.1 The MCC shall be equipped with provisions for handling and lifting including internal channel base and lifting angle with lifting eyes in top for field installation.

4.11.2 All external retainers and fasteners shall be cadmium plated.

4.11.3 Each vertical section shall be arranged to contain individual combination starter units of standard interchangeable construction having isolated metal barriers surrounding each unit.

4.11.4 Unit doors shall be hinged to the MCC structure.

4.11.5 All enclosures shall be rigid, freestanding and constructed of minimum 14 gauge steel. Internal mounting angles in the base shall be provided for the full length of the MCC to facilitate installation without special floor steel other than anchor bolts.

4.11.6 All current carrying components shall be made of pure high conductivity tin plated copper to assure smooth operation, reduce galling, and provide low contact resistance.

4.11.7 All enclosure metal work shall have rounded edges and be tightly fitted with no visible air gaps. Enclosures shall be designed and built according to NEMA Standards.

4.11.8 The vertical sections shall be rigid, freestanding structures with heavy duty internal mounting angles running continuous within the shipping block. Two clearance holes shall be provided in each section for bolting or welding to the prepared mounting site. A removable steel lifting means shall be provided with each shipping block.

4.12 Mounting

4.12.1 A plug-in unit shall consist of a unit assembly, a unit support pan and a unit door assembly. Each plug-in unit shall be supported and guided by a removable unit support pan, so that different unit arrangements are easily accomplished. The rearrangement of a unit support pan from one location to another shall be accomplished without the use of tools.

4.12.2 After insertion, each plug-in unit shall be held in place by two or more multi-turn latches, located at the front of the unit. At least one latch shall be located at the top of the insert and one at the bottom, for front accessibility and installation convenience.

4.12.3 A test position shall be provided with the unit and supported in the structure but disengaged from the bus. Padlocking is possible in this position.

4.13 Power Stabs

4.13.1 The unit plug-in power stab assemblies shall be electrolytically tin plated copper for a low resistance connection and designed to tighten during heavy current surges.

4.13.2 Spring steel clips to provide and maintain a high pressure, two-point connection to the vertical bus, shall back the stabs. They shall be free floating and self-aligning during plug-in. Wiring from the unit disconnecting means to the plug-in stabs shall not be exposed at the rear of the unit. The power cable termination at the plug-in stab shall be a maintenance free crimp type and shall be mounted in a two piece support assembly. This support shall provide a separate isolated pathway for each phase minimizing the probability of a unit fault condition reaching the power bus system.

4.14 Handle

4.14.1 An industrial, heavy duty, flange mounted handle mechanism shall be supplied for the control of each disconnect switch or circuit breaker. This mechanism shall be engaged with the disconnect device at all times as an integral part of the unit regardless of unit door position.

4.14.2 The operator handles shall pivot up/down, with the down position as OFF. The ON-OFF condition of the disconnecting means shall be indicated by the handle position, Red and Green colored indicators which include the words ON and OFF, and the international symbols I and O along with a pictorial indication of the handle position. It shall be

possible to lock the handle in the OFF position with up to three (3) 3/8" diameter shackle padlocks. TRIP indication on circuit breaker handles, rated through 400 Amps, shall be included.

4.14.3 Each starter or breaker unit compartment door shall be interlocked with its circuit breaker handle so that the door cannot be opened with the breaker in the closed position. The handle shall have an indicator to positively show the position of the breaker and a locking device to lock the breaker in the open position.

4.14.4 The operator handle of all units shall be interlocked with the unit door so that the disconnect means cannot be switched ON unless the unit door is closed. A means shall be provided for purposely defeating this interlock during maintenance or testing. This interlock shall also prevent opening the unit door unless the disconnecting means is in the OFF position. An externally operated defeater requiring the use of a tool shall provide access to the unit without interrupting service.

4.14.5 The operator handle shall be interlocked with the unit, so that the unit cannot be inserted or withdrawn with the operator handle in the ON position.

4.15 Finishing

4.15.1 The MCC shall be painted with a suitable corrosion-resistant coating over a well-prepared surface applied to the inside and outside of the cubicle.

4.15.2 The Vendor's standard paint system shall be acceptable.

4.15.3 All structural metal parts shall undergo a multi-step cleaning, rinsing, and painting process resulting in a complete

coverage of uniform thickness. This process shall be maintained and controlled by rigid quality control standards.

4.15.4 All unpainted parts shall be plated for corrosion resistance.

4.16 Testing

4.16.1 Factory Testing

4.16.1.1 The MCC shall be tested in accordance with IEEE and NEMA standards and in particular with reference to the National Electrical Testing Association (NETA).

4.16.1.2 The MCC shall be completely assembled, wired, adjusted and tested at the factory. After assembly, each complete MCC will be tested for operation under simulated service conditions to assure the accuracy of the wiring and the functioning of all equipment. A dielectric withstand test shall be performed on all bus work, cables and units. These components shall be tested the equivalent of one minute at 2200 volts from phase-to-phase and phase-to-ground.

4.16.1.3 Manufacturer shall perform all ANSI Production Tests. A certified test report of all standard production tests shall be submitted to SIOU before shipment.

4.16.1.4 Equipment furnished under this specification shall be subject to inspection at the factory. SIOU's representative shall have the right to witness the above tests. One week notice

shall be given to SIOU and as many assemblies as possible shall be tested at the same time.

4.16.2 Field Testing

4.16.2.1 When required by the purchase agreement, complete functional testing shall be made in the field before the MCC equipment is put in service for all components to check proper operation of relays, current transformers, potential transformers, polarities, lights, switches, interlocks, and controls.

4.16.2.2 When field testing is required by the purchase agreement, field testing shall be in accordance with IEEE and NEMA standards in the presence of a Vendor representative.

5.0 DOCUMENTATION

5.1 Vendor shall supply all items listed on Form SDODR, (Schedule of Drawing and Other Document Requirements) sheet with his quotation.

5.2 Vendor shall supply all drawings and data listed in Form SDODR within the schedule shown. All drawings, data and transmittals shall be in accordance with the instructions in Form SDODR sheet.

5.3 The Vendor shall list his exceptions to the specification and submit such exceptions with his proposal. The Vendor shall be responsible for the completeness of the exceptions taken. If no exceptions are listed it will be assumed that the specification as written shall be complied with in its entirety.

5.4 Vendor shall provide a list of all special tools required for installation, operation and maintenance of the equipment.

5.5 Vendor shall provide a complete and priced list of spare parts as recommended by the equipment manufacturer. Spare part recommendations are to be dependent on wearing parts, failure rates and availability of material.

6.0 SHIPPING

6.1 Packing, preparation for shipment and shipping shall be in accordance with the following:

6.1.1 After specified tests have been completed, and before equipment is shipped from the factory, each completed unit shall be cleaned thoroughly to remove all foreign matter. Any damage to surfaces that have been previously painted shall be satisfactorily repaired.

6.1.2 The equipment shall be match-marked, tagged or otherwise identified and assembled and packaged for shipment.

6.1.3 The Vendor shall prepare all articles for shipment in a manner to protect finished surfaces and assembled parts from damage in transit and handling, recognizing the requirements for transport. Vendor shall be responsible for, and shall replace at its own expense, any equipment damaged due to improper or inadequate preparation for shipment. Bolts of different sizes and types shall be bagged separately.

6.1.4 All machined surfaces shall be protected against corrosion and/or surface treated in accordance with specified requirements. Exposed machine surfaces shall, in addition, be covered with a protective wood or composite cover to protect against physical damage. Plastic sheets or other similar

materials shall keep the cover from contacting the coated surface.

6.1.5 The shipment of loose, individual components is not permitted.

6.1.6 Components not containerized with proper protection shall be boxed to the greatest extent possible. Boxes shall be constructed of suitable material to withstand the transport requirements. Boxes shall be lined with waterproof paper running the full circumference of the sides, lapped as required. A waterproof membrane of sufficient size shall be under or between the lids and be carried down the sides of the box a minimum of four inches.

6.1.7 Materials inside boxes shall be securely braced to prevent movement. Large components shall be individually secured to the sleepers under the box.

6.1.8 Appropriate lifting lugs and tie down points shall be fitted by Vendor and clearly marked. All components shall be marked with destination, weights, etc. and special handling instructions. Each box shall have the contents clearly marked and numbered (box 1 of 5, etc.). All boxes must show the Purchase Agreement or Purchase Order Number, item numbers and equipment number(s). Vendor shall provide packing lists for all boxes, enclosing one list inside each box and securely fastening one list to the outside of each box.

6.1.9 The center of gravity of each crate shall be clearly marked and accessible.

6.1.10 Lifting points shall be clearly marked and easily useable. Where possible, crates should be designed for forklift handling.

7.0 CORRESPONDENCE

All correspondence, including proposals, drawings and documentation shall be directed to:

Walk, Haydel & Associates
600 Carondelet Street
New Orleans, LA 70130
Attention: Mr. Nick Malek, E&I Lead Engineer
Fax: (504) 522-0554

8.0 ATTACHMENTS

8.1 Attachment A
480V Motor Control Center One Line Diagram

8.2 Attachment B
480V Motor Control Center Data Sheet

8.3 Attachment C
Adjustable Frequency Drive Data Sheet (Typical)

8.4 Attachment D
"SDODR",
Schedule of Drawing & Other Document Requirements

ATTACHMENT A

480V Motor Control Center One Line Diagram

ATTACHMENT B

480V Motor Control Center Data Sheet

ATTACHMENT C

Adjustable Frequency Drive Data Sheet (Typical)

ATTACHMENT D

"SDODR",
Schedule of Drawing & Other Document Requirements

STRUCTURAL

Civil/Structural

1. Site Preparation

The existing site, based on information provided, consists of gravel averaging one-foot thick, underlain by riprap grouted with flowable fill. The new site will require leveling and compaction of the existing gravel and the addition of crushed stone as required for the shelter floor, tanks and other equipment. Grades will be established to direct rainfall and wash-up run-off by surface drainage to adjacent ditches and towards Impoundment B. The east-west running ditch at the north side of the site will be improved to facilitate the evacuation of the surface run-off to an existing pipe beneath the roadway along the east side of Impoundment B. Run-off from the site will flow into Impoundment B.

2. Temporary Shelter

A 32.8-foot by 80-foot temporary shelter will be provided for the process equipment. The shelter is not designed to current building codes but has been destruction tested by the vendor to ensure reliability in the field. The 32.8-foot span will carry a 9-psf live load with a 1.25 factor of safety to failure. The shelter is composed of steel tubes, which are galvanized after welding. Frames for the structure are located on 10-foot centers. Wall height is 11 feet. Clearance beneath the frame at the longitudinal centerline of the shelter is 16 feet and approximately 19 feet between frames. A PVC coated Trevira polyester cover is tensioned over the frames to the foundation. The PVC roof material is translucent white for daylight transmission and is self-extinguishing to Federal Test Std. 191 method 5903 and NFPA701. Framework for ventilation openings will be fitted to the gables. Lighting fixtures and HVAC ducting will be suspended from the frames of the shelter.

An approximate 12-foot wide by 14-foot high plastic strip door will be provided at the west end of the shelter. Two steel personnel access doors, 3' X 6'-8", will be provided. One will be located on the south side of the shelter in the second bay from the west end. The other door will be located on the east end of the shelter for emergency egress.

Foundation for the shelter will consist of 12-inch by 12-inch hardwood timber and ballast anchors. A continuous base angle around the perimeter of the shelter is supplied with the shelter. The base angle frame will connect to the top of the one-foot wide timber. A total of approximately 225 linear feet of timber will be required to support the angle around the perimeter of the shelter.

Each tube frame leg is connected to the base angle at 10-foot centers. Uplift of the shelter due to wind load will be prevented by the use of ballast anchors at the base of each frame leg section. The shelter vendor will supply the ballast weight kits excluding the ballast. Approximately 300 pounds of ballast is required at each leg section to prevent uplift of the shelter. Sandbags will be used to make up the 300 pounds required.

The weight of the timber connected to the continuous angle also contributes to the total dead load resisting the uplift forces. Ballast weight determinations are based on results from a similar type structure subjected to an 80-mph exposure B wind. The maximum uplift at each leg is 1,000 pounds with the maximum lateral load of 600 pounds.

3. Shelter Floor and Equipment Foundations

The floor for the shelter will consist of compacted crushed stone, one-foot thick, placed in the area defined by the 12-inch square timber foundation for the shelter base angle and frame leg support. The area is approximately 32-feet by 79-feet. Timber mats one-foot thick will be used to support the process equipment and placed in the area previously defined. Total area of timber mats is approximately 1440 square feet.

An 80-mil thick polymeric membrane with solvent or heat-welded seams, approximately 3000 square feet, will be placed over the compacted crush stone floor and timber mat foundations for protection against process contaminants. A sand layer will be used under the liner for protection from irregular surfaces.

Process equipment will be connected directly to the timber mat foundations through the protective membrane and sealed at the penetrations.

4. Storage Tanks Foundation

Six 10-foot high and 20-foot diameter carbon steel storage tanks with open tops will be placed directly on a level surface of compacted crushed stone 6 inches thick. The area of crushed stone required is approximately 55-feet by 75-feet or 4125 square feet. Soil shear failure or excessive settlements are not likely due to nature of the underlying composition of compacted gravel and grouted rip-rap and low bearing pressures of less than 1000 psf.

5. Storage Tank Mixer Access Platforms

A structural steel frame platform, 12-feet high, 5-feet wide and 24-feet long, will be provided at each tank to straddle the 20-foot diameter. The frame supports a vertical mixer and motor over the center of the tank and provides support for personnel access to the mixer for maintenance. A portable access platform will be built if required for maintenance access.

Foundations for each of the platforms will either utilize timber mats or pre-cast concrete pads one-foot thick. Each concrete pad or timber mat will require an area of 3-foot by 7-foot for stability and load distribution.

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E-mail: info@rubbusa.com

April 7, 1999

Mr. Joe Ferguson
Walk Haydel Engineers
300 Two Office Park
Mobile, AL 36609

0232-99/JVP

By Telefax: 334-344-4963

Dear Mr. Ferguson:

As requested, please find below revised pricing on the Rubb THA shelter we discussed for the project in Oak Ridge, Tennessee. Pricing is as follows:

(1) 32.8' x 80' THA Rubb shelter with 11' sidewalls:

This price includes a complete galvanized steel structure manufactured and ready for erection by using sleeve joints and pinned connections. As standard, the Rubb shelter is supplied with vents in the gables. The walls are covered with colored and the roof with white translucent high strength, PVC coated polyester fabric. The material is flame retardant. Secure fastening to the ground and erection is customer's responsibility.

The THA shelter comes standard with a continuous 3.5" x 3.5" galvanized base angle foundation. This can be affixed to either prepared or natural ground surfaces with a variety of fastening methods.

Ballast Bars (Ballast weight not included):

(-1) <u>Doors</u>
(2) 12' x 14' Clear Vinyl Strip Doors:

(2) 3' x 6'8" (w x h) Steel Personnel Access Doors:
(Including panic hardware and support wood/steel framing)

(1) Ventilation fan, capacity 3000 CFM:
(with wiring and humidistat)

Total Shelter Purchase Price FOB Sanford, Maine:
(Excluding sales tax, if applicable.)

AN INTERNATIONAL COMPANY

RUBB BUILDINGS LTD.
Tel: +44 191 482 2211
Fax: +44 191 482 2516

RUBB MOTOR A/S
Tel: +47 55 315032
Fax: +47 55 317510

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Certificate No. US97/0577

40633-20-003
Rev. A

SPECIFICATION
FOR
CONTROL ROOM BUILDING

OAK RIDGE NATIONAL LABORATORY
SIOU WASTE TREATMENT FACILITY

Prepared by: _____
W. D. Wetzel

Checked by: _____
N. G. Malek, P.E.

Approval: _____

Client Approval: _____

Walk Haydel Job No. 40633-051
April 1999

SPECIFICATION
FOR
CONTROL ROOM BUILDING

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ATTACHMENTS:

A.) Control Room Drawing

1.0 GENERAL

1.1 This specification covers the modular building requirements for the control room at Oak Ridge National Laboratory's SIOU Waste Treatment Facility, Oak Ridge, Tennessee.

1.2 The central control room shall be of non-combustible modular construction. The building's dimensions, door and window locations shall be as shown on the drawing included as an attachment to this specification.

1.3 The modular building will be located within the facilities process building upon a steel mezzanine structure to be provided by others. The base channel for the modular building will be bolted directly to the 3/8-inch steel mezzanine decking.

1.4 Minimum loads used for design of the building and its components shall be in accordance with the requirements of the 1994 Uniform Building Code. The roof shall be designed to support maintenance loads of 20 pounds per square foot.

1.5 The manufacturer shall deliver to the site a fully fabricated, finished and ready to assemble modular building including all doors, windows, wall panels, roof, ceiling and trim in accordance with the requirements of this specification. Assembly instructions, special tools and all required hardware shall also be included.

2.0 WALLS AND ROOF

2.1 Wall panels shall be 3 to 3 ½ inch thick by 10 foot high and shall be faced with a minimum of 26 gage primed and painted steel over ½ inch gypsum. The wall cavity shall be filled with solid foam or fiberglass insulation.

2.2 Base channels shall be continuous steel "U" channels that when fastened to the floor will securely support the walls.

2.3 Interior and exterior primed and painted steel trim shall be provided to ensure a finished

appearance and to minimize noise and air infiltration.

2.4 Roof shall be 22-gage minimum primed and painted ribbed steel deck.

2.5 Ceiling shall be commercial quality 2ft X 4ft lay in ceiling tiles.

2.6 The roof shall be provided with a minimum 6 inches of fiberglass insulation (R-19).

3.0 DOORS AND WINDOWS

3.1 Doors shall be pre-hung primed and painted heavy duty metal half glazed with a minimum 3/16-inch tempered safety glass.

3.2 Doors shall be provided with commercial grade hardware, knob lockset, threshold and closer.

3.3 Window shall consist of a full panel width 3/16-inch (min) tempered safety glass assembly approximately 40 inches high. The windowsill shall be located approximately 41 inches above the floor.

4.0 ELECTRICAL AND LIGHTING

4.1 All building fixtures, switches, outlets, distribution panels and lighting shall be provided by others.

5.0 HEATING AND AIR CONDITIONING

5.1 Heating and air conditioning equipment including electrical outlet for the unit shall be provided by others.

6.0 WARRANTIES

The manufacturer shall provide a written warranty that the products furnished by the manufacturer will be free from defects in workmanship and materials for a period of not less than ten years.

7.0 SUBMITTALS

All correspondence, including proposals, drawings and documentation shall be directed to:

Walk, Haydel & Associates
600 Carondelet Street
New Orleans, LA 70130
Attention: Mr. Nick Malek, Manager E/I Department
Fax: (504) 522-0554

7.1 WITH BID DOCUMENTS:

7.1.1 Descriptions and catalog data for components to be supplied.

7.1.2 Itemized cost summary of components to be supplied.

7.1.3 Warranty information.

7.1.4 Total dollar amounts for the base and alternate bids described in section 8.0 of this specification

7.1.5 Written description and dollar value of any deviations from the specification or suggested alternates included within the bid total.

7.2 PRIOR TO FABRICATION:

7.2.1 Selection charts for building finishes.

7.2.2 Detailed design drawings for owner review and comment.

7.2.3 Detailed assembly instructions.

7.3 WITH DELIVERY:

7.3.1 Manufacturer's written warranty.

7.3.2 Letter of certification that the structure is in accordance with the requirements of this specification and the minimum load requirements of the 1994 Uniform Building Code.

8.0 BASE AND ALTERNATE BID DESCRIPTIONS

8.1 BASE BID:

The base bid shall include the total cost for manufacturing and delivery of the fully fabricated, finished and ready to assemble modular building described within this specification. Included in this cost shall be all doors, windows, wall panels, roof, ceiling, trim, assembly instructions, detailed design drawing, special tools and hardware.

8.2 BID ALTERNATE No. 2:

Bid alternate No. 2 shall provide the total cost in addition to the base bid for the manufacturer to provide field supervision for the erection of the building by the owner.

8.3 BID ALTERNATE No. 3:

Bid alternate No. 3 shall provide the total cost in addition to the base bid for the manufacturer to provide field supervision, labor and all consumable material for the installation of the building by the manufacturer.

ATTACHMENT A

Control Room Drawing

40633-20-002
Rev. A

SPECIFICATION
FOR
MOTOR CONTROL CENTER BUILDING

OAK RIDGE NATIONAL LABORATORY
SIOU WASTE TREATMENT FACILITY

Prepared by: _____
W. D. Wetzel

Checked by: _____
N. G. Malek, P.E.

Approval: _____

Client Approval: _____

Walk Haydel Job No. 40633-051
April 1999

SPECIFICATION
FOR
MOTOR CONTROL CENTER BUILDING

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ATTACHMENTS:

A.) Motor Control Center Building Drawing

1.0 GENERAL

1.1 This specification covers the modular building requirements for the motor control center (MCC) building at Oak Ridge National Laboratory's SIOU Waste Treatment Facility, Oak Ridge, Tennessee.

1.2 The MCC building shall be of non-combustible modular construction. The building's dimensions and door locations shall be as shown on the drawing included as an attachment to this specification.

1.3 The modular building will be located outdoors upon a wooden structure of railroad ties to be provided by others. The base channel for the modular building will be bolted directly to the wooden structure.

1.4 Minimum loads used for design of the building and its components shall be in accordance with the requirements of the 1994 Uniform Building Code. The roof shall be designed to support maintenance loads of 20 pounds per square foot. The floor shall be designed to support the MCC loads of 250 pounds per square foot.

1.5 The manufacturer shall deliver to the site a fully fabricated, finished and ready to assemble modular building including all doors, wall panels, roof, ceiling and trim in accordance with the requirements of this specification. Assembly instructions, special tools and all required hardware shall also be included.

2.0 WALLS AND ROOF

2.1 Wall panels shall be 3 to 3 ½ inch thick by 10 foot high and shall be faced with a minimum of 26 gage primed and painted steel over ½ inch gypsum. The wall cavity shall be filled with solid foam or fiberglass insulation.

2.2 Base channels shall be continuous steel "U" channels that when fastened to the floor will securely support the walls.

2.3 Interior and exterior primed and painted steel

trim shall be provided to ensure a finished appearance and to minimize noise and air infiltration.

2.4 Roof shall be 22-gage minimum primed and painted ribbed steel deck.

2.5 Ceiling shall be commercial quality 2ft X 4ft lay in ceiling tiles.

2.6 The roof shall be provided with a minimum 6 inches of fiberglass insulation (R-19).

3.0 DOORS

3.1 Doors shall be pre-hung primed and painted heavy duty metal half glazed with a minimum 3/16-inch tempered safety glass.

3.2 Doors shall be provided with commercial grade hardware, knob lockset, threshold and closer and louvers for exhaust.

4.0 ELECTRICAL AND LIGHTING

4.1 All building fixtures, switches, outlets, distribution panels and lighting shall be provided by others.

5.0 HEATING AND AIR CONDITIONING

5.1 Heating and air conditioning equipment including electrical outlet for the unit shall be provided by others.

6.0 WARRANTIES

The manufacturer shall provide a written warranty that the products furnished by the manufacturer will be free from defects in workmanship and materials for a period of not less than ten years.

7.0 SUBMITTALS

All correspondence, including proposals, drawings and documentation shall be directed to:

Walk, Haydel & Associates
600 Carondelet Street
New Orleans, LA 70130
Attention: Mr. Nick Malek, Manager E/I Department
Fax: (504) 522-0554

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APPENDIX C

EROSION CONTROL CHECKLIST FOR SIOU STAGE 2 REMEDIAL ACTION

EROSION CONTROL CHECKLIST FOR SIOU STAGE 2 REMEDIAL ACTION

Inspection Date: _____ Inspection Performed By: _____

STRAW BALE DAM

No	Yes*	Checklist Item
		Are all adjacent catch basins and drainage channels properly protected from off site sediment transport (i.e., have any new work areas developed since last report)?
		Have dams been breached or otherwise damaged from recent flows?
		If check dam in channel, is center spillway elevation lower than ends of dam?
		Has sediment accumulated to half of the dam's lowest height? Clean out if yes!
		Are dams fully functional for next run-off event?

SILT FENCES

No	Yes*	Checklist Item
		Has silt fence been breached or otherwise damaged from recent flows?
		Are ends of silt fence barrier higher than center span?
		Has sediment accumulated to half of the silt fence's lowest height? Clean out if yes!
		Are silt fences fully functional for next run-off event?

EROSION CONTROL MAT OR MULCH

No	Yes*	Checklist Item
		Has mat/mulch been damaged or washed-out?
		Has movement of topsoil occurred (under matting) or eroded?
		Uneven seed germination (i.e., undesirable bare patches)?
		Is topsoil dry? If yes, moisten immediately!
		Is the mat/mulch fully functional to control erosion for next run-off event?

STORM WATER FLOW

No*	Yes	Checklist Item
		Is all potentially contaminated surface areas designed to drain into impoundment?
		Is clean run-on being properly diverted around potentially contaminated areas?
		Has accumulated sediment been properly disposed of or properly stored/used? Stockpiled sediment should not be stored in floodplain area!
		Are current erosion control structures sufficiently handling run-off events?

*If marked, explain correction method:

_____

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