OAK RIDGE National Laboratory

SECTION 00 01 01

SEWAGE TREATMENT PLANT MODERIZATION
DESIGN BUILD SPECIFICATION
February 2021

OAK RIDGE NATIONAL LABORATORY
OAK RIDGE, TENNESSEE

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SECTION 01 10 00 – SUMMARY OF WORK

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this section.

1.2 SUMMARY OF WORK

A. Constructed work is located at the Oak Ridge National Laboratory (ORNL), a government owned facility, managed by UT-Battelle, LCC, (the Company), for the Department of Energy (DOE), in Oak Ridge, TN.

B. See Section 01 81 00 for project scope.

C. Perform work in accordance with 29 Code of Federal Regulations (CFR) 1926 and applicable portions of 29 CFR 1910.

D. Work shall be completed in strict accordance with the subcontract documents.

E. Refer to Section 01 23 00 - Alternates for scopes of work to be separately priced as additive alternates.

1.3 PROJECT EXECUTION

A. The execution of the project will be as follows:
   1. Firm fixed price, Design-Build contract shall be utilized for the design and construction of the project.

B. The Company will provide project design and construction oversight.

C. The Seller shall provide an A-E to design the project and produce the Contract Documents (CFC design package), as established in this Design Criteria.

D. The Seller shall construct the project per the approved CFC contract documents.

1.4 COMPANY INTERFACE

A. Communication between the Seller and the Company shall be through the Company's Technical Project Officer (TPO). The Seller shall communicate issues affecting the contract with a Request for Information (RFI). An RFI form is posted on the Procurement website.

1.5 SECURITY

A. Badge requirements.
1. Workers must be badged to enter ORNL. Access points are located on Bethel Valley Road. Submit the badge request form, located on the Procurement website at least seven calendar days, but not more than 14 calendar days, in advance of scheduled plant entrance. Proof of the following current training is a prerequisite for obtaining a badge and for performing work at ORNL:
   a. The ORNL Site Access Training (SAT) within the past two years.
   b. The ORNL Environmental Management System Awareness Training.
2. Request badges only for employees assigned or scheduled to work at the site.
3. Submit temporary badge request forms for one-time visitors at least 48 hours in advance of scheduled visit using Construction Badge Request Form on the Procurement website.
4. Return all badges (and dosimeters, if provided) upon completion of work. Final payment will not be processed until badges and dosimeters are returned.

B. Vehicle requirements.
1. Personal vehicles may only be parked in spaces designated as open employee parking. Parking violations may result in termination of employee access to ORNL.
2. Parking and work site access for vehicles used to conduct the subcontract work shall be coordinated with the TPO.
3. Parking along roads is prohibited.

1.6 SUBMITTAL REQUIREMENTS

A. See Section 01 33 00 Submittal Procedures.

1.7 WORKING AND STORAGE AREAS

A. Limit activities and storage to the immediate project site and designated storage areas.

B. Limit travel to the main roads.

C. Store only work-related material and equipment in stockpile areas, storage trailers, and designated storage sites located on government-controlled land.

D. Perform cleanup, trash disposal, and neatly arrange material and equipment on a daily basis.

E. The ORNL has a smoking policy that limits cigarette smoking to certain designated ORNL areas. For work in existing ORNL facilities, the Seller shall only allow its employees, and employees of its lower tier providers, to smoke in the ORNL designated smoking areas. For work on other ORNL construction sites (e.g., outdoor work and/or new facilities) the Seller may request that a site-specific, outdoor smoking area be designated for the Seller's work; such designated area must be 25' away from any building entrance or building air intake.

1.8 PROJECT WORK AND PAYMENT SCHEDULE

A. The Seller shall be substantially complete with work by or before the Completion Date in the Contract Agreement. All work shall be complete 90 days after substantial completion is achieved. Substantial completion is when work is sufficiently complete in accordance with the subcontract documents so the company can occupy or utilize the facility/area for its intended use.

B. Within 30 days of award, the subcontractor shall submit a cost-loaded, baseline project schedule with activities and related costs that match the schedule of values. The baseline schedule shall consist of a precedence network diagram using the critical path method (CPM) to show each individual essential activity in sequence to meet the contract milestones.

C. The schedule shall also show durations and dependencies, including off-jobsite activities such as design, fabrication of equipment, and procurement and delivery of material, as well as total float and free float times.

D. A rolling four-week schedule showing one week actual progress and a three-week look-ahead forecast shall be reviewed and maintained weekly in the Company review meetings. The baseline schedule shall be used for critical path and total float analysis.

E. Submit for approval, within 30 calendar days after the award of contract, a schedule of values (payment schedule) allocated to various portions of the work. The schedule of values shall be in enough detail to verify applications for payment and be traceable to the activities and progress on the schedule. Activities with substantial material values shall be listed separately.

F. Update the project work schedule monthly during design, and bi-weekly during on site work.

1.9 PROJECT COORDINATION

A. Normal construction working hours are 7:00 a.m. to 5:00 p.m., Monday through Thursday. Provide sufficient personnel to complete the project within the specified time. Notify the Company at least 48 hours in advance if performing work at times other than the normal working hours.

B. The Company holidays are New Years Day, Martin Luther King's Birthday, Good Friday, Memorial Day, Independence Day, Labor Day, Thanksgiving and the day after, and Christmas (two days). Request 72 hours in advance to access the plant on holidays observed by the Company. The Company retains the right to reject requests to work on holidays.

C. A project kick-off meeting will be held within 10 business days after Notice to Proceed. Representatives from the Seller's A/E firm shall be in attendance. The kick-off meeting will be include a predesign conference in accordance with Section 01 80 00 Design Build Requirements.

D. Progress and coordination meetings will be held weekly. This meeting will be chaired by the Company's TPO, Construction Field Representative (CFR), or the Company's Project Manager (PM). During construction, the Seller's superintendent shall attend this meeting and have

authority to resolve field problems and make changes in cost and schedule. The project schedule shall be updated prior to the meeting and used as a basis for the discussion.

E. All work shall be coordinated with the Company, to allow integration with the balance of ORNL's activities, to ensure the mutual safety all work activities. The Seller shall notify the TPO, CFR or PM no later than 24 hours in advance of work activities scheduled by the Seller. No work shall take place on any day without explicit approval from the TPO, CFR or PM.
   1. For all work in or around existing ORNL facilities or infrastructure, protect the existing ORNL facilities and infrastructure from damage, and protect all personnel from injury resulting from the Seller's activities.

F. Submit requests for outages a minimum of eight calendar days in advance of need. Hold outages to a minimum in number and duration.

G. Request project specific permits such as hot-work and lockout/tag-out at least 48 hours in advance of need.

H. Provide five-day advance notice before shut down of the sprinkler system to make proper arrangements with the Company's Fire Protection Department.

I. Provide 48 hours advance notice before shut down of any portion of the Public Address System as may be required for a project.

J. Provide 48 hours advance notice before shut down of any safety systems devices.

1.10 UNUSUAL CONDITIONS

1. Company's personnel will monitor excavation and demolition activities which have a potential of containing unidentified contamination to ensure contamination is not present. Periodic surveys of the work area, equipment, and personnel will be performed.
2. The site is a brownfield site. Based on surveys performed by the Company, the construction area is not expected to contain any significant radiological contamination.
3. Radiological Protection support will be provided by the Company to assist the Seller with radiological monitoring during on-site activities. If radiological contamination is encountered, the Seller shall suspend work in that area as directed by the Company Radiological Protection personnel in concert with the Technical Project Officer (TPO). The Company will provide further direction if radiological contamination is encountered.
4. If radiological contamination is encountered, the Company will self-perform the radiological work.
5. Seller equipment brought on site will require a receipt survey by Company Radiological Control Technician (RCT) prior to use and a release survey prior to removal from the site. Seller shall provide the Company 24-hour notice in advance of the survey requirement. The Company will direct the Seller as to the location of the survey area. Items being surveyed are in a "hold point" until the survey results are returned.

B. Work within existing confined space areas will be required for this project.

1.11 SEQUENCING

A. The Seller is responsible for the sequencing of all construction elements to result in the successful completion of the work in accordance with the approved design.

PART 2 - PRODUCTS

2.1 PROPERTY FURNISHED TO THE SELLER

A. Not applicable.

PART 3 - EXECUTION

3.1 PREPARATION

A. Training.
   1. Ensure work-specific training is provided before performing work activities.
   2. Each worker shall provide proof of current SAT.

3.2 TESTING

A. The Seller shall perform subcontract specified tests in accordance with the following:
   1. Provide labor and technical support, annually calibrated (unless more frequent calibration is specified) and properly maintained equipment, and materials required to perform testing. Equipment calibration records shall be submitted upon request.
   2. Notify the Company 24 hours before performing tests and inspections, five-days for fire or sprinkler systems.
   3. Perform tests and inspections in a manner that allows observation by the Company.
   4. Submit a copy of tests performed within 48 hours after test completion.

3.3 EXCAVATION AND PENETRATION ACTIVITY

A. An excavation/penetration permit will be provided at the pre-construction meeting. A representative of the Seller is required to sign the permit. Ensure the issuance of an approved permit before starting excavation or penetration work. Work covered by the excavation/penetration permit requires an underground survey by the Company before work begins. Contact the Company TPO before digging or penetrating the surfaces.

B. The permit owner (or designee) makes sure that the entity performing work complies with the following:
   1. If at any time during the excavation or penetration work the entity performing work cannot clearly determine where the subsurface utilities or structures are located, based on existing

location markings or markings recently disturbed by the work, the work is suspended until utilities or structures in the work area can be relocated and remarked.

2. Ensures that Tennessee One Call markings in an active work area are not older than 15 days from the date on the One Call Ticket received from the Tennessee One Call Center. If they are older than 15 days from the ticket date, the work is suspended until utilities or structures in the work area can be relocated and remarked.
    a. Note: Details of the Tennessee One Call law can be found on their website.

C. The following special work requirements and precautions are to be followed for excavation activities:
1. When excavating within a distance of 15' or less from energized electrical power circuits, the following applicable requirements apply:
    a. The energized circuits must be de-energized and grounded or guarded effectively by insulation or other means. See Electrical Work and Lockout/Tagout.
    b. Until underground-energized utility structures are exposed, personnel using hand tools (jackhammers, shovels, etc.) must be provided with PPE appropriate to protect them from the hazard associated with contacting the utility structure. Selection of the PPE will be part of the Job Hazard Evaluations.
    c. Proper warning signs shall be posted and maintained where underground-energized circuits are suspected but the exact locations are unknown. Personnel shall be advised of such circuits, the hazards involved, and alternative and/or protective measures to be taken.
    d. Use of heavy excavation equipment (non-hand-held equipment) in these areas shall be approved and noted. Also, this use shall require compliance with other requirements as deemed appropriate and so noted.
2. When an excavation will cross other potential energy utilities, those utilities should be de-energized, if at all possible. If the utility cannot be de-energized, then the supervisor must establish strict controls to ensure the safety of all personnel; no less than an ORNL Level-3 Manager must approve controls utilized.
    a. Hand digging is required with 24" (any direction) to positively identify the location of any active utility. Adjustments to the depth are required based upon the location of the marked utilities (i.e., begin hand digging at 24" if the slope of the marked utility is not parallel with the ground surface or of unknown slope). Mechanized clearing (toothless bucket if using mechanized machinery such as a backhoe) of soil above the depth of hand-dug clearing is permissible.
    b. Once the utility has been exposed and cleared by hand digging below 12" of the utility, mechanized means of digging can commence if supervision determines appropriate.
3. At the discretion of supervision, heavy equipment (i.e., other means than hand excavation) may be used to expose out-of-service utilities so long as reasonable caution is exercised to preclude physical damage to the utility.
4. Flag persons (ground-level observers) shall be required for heavy excavation equipment (non-hand-held equipment) operations in areas of inexactly located energized electrical circuits and other in-service utilities, as well as when the equipment operator can no longer maintain eye contact with the surface being excavated.

D. The Seller shall obtain approval of the Utility Division of the Company before covering existing or newly installed utilities. The Company shall verify that utility locations are recorded before allowing the utilities to be covered. Reference Section 01 18 00 – Site Utility Interface.

E. Penetrations less than 2" deep:
   1. For penetrating activities (including installation of fasteners less than 2") where subsurface elements are unknown, the following requirements will be performed.
      a. Investigate and/or survey for subsurface elements.
      b. Use Ground Fault Circuit Interrupters protection for electrically-operated equipment and tools.
      c. Connect non-double insulated electrically operated equipment and tools with an insulated #8 American Wire Gage (AWG) or larger copper conductor. This applies to non-electric coring/cutting machines also.
      d. Workers shall wear appropriately rated electrically insulated gloves.

3.4 CONTROL OF MOLD DURING CONSTRUCTION

A. The Company recognizes that mold infestation represents a risk during the construction phase. To reduce the risk of mold infestation the Company requires the following actions by the Seller.
   1. Avoid trapping water in finished work.
   2. Replace or clean any material that has visible signs of mold.
   3. Protect building materials and components from flowing or standing water once the building roof is installed.
   4. Keep interior spaces and materials or components stored in those spaces, reasonable clean and protected from water damage.
   5. Maintain drywall, ceiling tiles, insulation, and other porous materials dry. Replace or properly dry any porous materials that get wet.
   6. Do not cover any fireproofing, insulation or other porous materials that are clearly wet.
   7. Maintain appropriate levels of ventilation during construction. Ventilate spaces and storage areas that are enclosed before construction is completed.

3.5 PROJECT SIGN

A. Post identification and emergency notification signs in a conspicuous location at the work site. All points of entry shall have a sign warning of the pre-requisites.

B. Identification signs shall be weatherproof and have the following information:
   1. Project title and contract number.
   2. Name, address, and phone number of the Seller's business.
   3. Name and phone number of person available 24 hours, seven days per week, to be notified in case of an emergency. Phone number may be pager or cellular phone.

3.6 NEW BURIED UTILITIES

A. Buried underground utilities shall include a tracer wire per Section 01 89 19 – Site Plumbing Utilities

3.7 AS-CONSTRUCTED DRAWINGS, MANUALS AND WARRANTY INFORMATION

A. The Seller shall maintain one set of contract documents that reflect the as constructed condition per Section 01 78 39 - Project Record Documents.

B. The Seller shall submit a Facility System Manual per Section 01 78 23 - Facility Systems Manual.

C. At substantial completion of the project, the Seller shall update and submit the design drawings to incorporate the "as-constructed" redline documents and the Operation and Maintenance Manuals to the Company per Section 01 77 00 Closeout Procedures. Final payment will not be made until both submittals are received and approved by the Company.

3.8 MANAGEMENT REPORTING OF ACCIDENTS AND INCIDENTS

A. Notification:
   1. If there is any unplanned, unusual work condition that presents an actual or potential hazard or threat to workers or facility infrastructure, it shall be reported to the Company as soon as possible after the event occurs, and in no case longer than 15 minutes after the event occurs unless acute personnel or facility hazards associated with the event prevent subcontractor personnel from contacting the TPO.

B. Preservation of the site following an accident or incident:
   1. The Seller shall make every effort to preserve the site following an accident or near-miss incident. Take pictures of the site. Have all witnesses provide a statement on what they saw or heard.
   2. Taking care of any injured personnel takes precedence over preservation of the accident site.

C. Accident/Incident report:
   1. Submit an "Individual Accident/Incident Report" (DOE Form 5484) within two working days of a recordable or lost time injury or illness (Occupational Safety and Health Administration definition). The Company will provide the report form upon request.
   2. The Seller must perform a structured accident investigation for any recordable or lost time injury and/or for any significant non-injury accident/incident that disrupts project operations. An accident investigation report (in addition to the Form 5484, if applicable, discussed in Section C.1 above) containing the following information must be submitted to the Company within three working days:
      a. A timeline of critical events before, during, and immediately after the accident/incident.
      b. A causal analysis listing the direct cause, contributing cause(s), and root cause(s) of the accident/incident; the causes shall also identify in which area of the five core

functions of the Integrated Safety Management Program (ISM), Reference Section 011100, the cause occurred.

c. A corrective action plan listing actions and completion dates that the Seller has taken or plans to take, to correct any deficient conditions or worker behaviors that led to the accident/incident. The corrective action plan should also consider the applicability of the actions to other projects that the Seller may be performing at ORNL.

END OF SECTION 01 01 00

SECTION 01 11 00 - SAFETY AND HEALTH

PART 1 - GENERAL

1.1 SAFETY AND HEALTH PROGRAM

A. Oak Ridge National Laboratory (ORNL) is committed to accomplishing construction work in a manner that ensures protection of workers, the public, and the environment. In order to meet that commitment, ORNL has implemented an Integrated Safety Management System (ISMS). The objective of ISMS is to WORK SAFELY. By systematically integrating safety into management and work practices at all levels, work is accomplished while protecting the public, the worker, and the environment. Safety management activities can be grouped into five core safety management functions:

1. Define the scope of work.
2. Analyze the hazards.
3. Develop and implement hazard controls.
4. Perform work within controls.
5. Provide feedback and continuous improvement.

These five core safety management functions provide the necessary structure for safely accomplishing any work activity and are applied as a continuous cycle with the degree of rigor appropriate to address the type of work activity and the hazard involved.

B. Submit for approval a written project specific Safety and Health (S&H) Plan 21 calendar days prior to site activities. The plan shall:

1. Address how the Seller will implement the S&H requirements described in the project subcontract documents, i.e., terms and conditions, technical specifications, and drawings.
2. Designate the individual responsible for on-site implementation of the plan and who has authority to act on behalf of the Seller, including the qualifications of the designated individual.
3. Provide a list of those project activities for which subsequent hazard analyses are to be performed.

C. Submit for approval a written hazard analysis (HA), addressing project specific hazards, to the Company 21 calendar days prior to site activities. Using ISMS as described in Section 1.1.A, the HA shall identify work tasks anticipated during the construction work, as well as any potential health, safety, and environmental hazards that could reasonably be expected during the work activities, and list specific actions or precautions that will be taken to minimize the risk of such hazards that could cause an accident, injury, illness, or environmental insult. Prior to submission to the Company for approval, the HA shall be approved by a safety manager (or equivalent) and a line manager in the Seller's work execution team.

The HA shall be revised whenever activities, hazards, or hazard controls change. Minor revisions (not significantly changing the safety risk profile of the job) shall be approved by a competent manager or supervisor of the Seller. In addition, significant revisions to the HA (changes in job scope, the Seller means and methods, etc. from the previously approved HA that

result in a significant change in the safety risk profile of the work) shall be submitted to the Company for approval. All final, approved changes to the HA shall be communicated to the affected workers.

The HA shall identify competent persons required for workplace inspections of the construction activity, where required by Occupational Safety and Health Administration (OSHA) standards.

The HA shall provide drawing and/or other documentation of protective measures for which applicable OSHA standards require preparation by a professional engineer or other qualified professional.

The HA shall notify/inform employees that if unsafe conditions have not been addressed, each employee has the right to contact either the ORNL Employee Concern Program by calling 1-888-280-0616, or the Department of Energy Oak Ridge Operations (DOE-ORO) Employee Concerns Hotline at 865-241-3267.

A copy of the HA shall be readily available at the work site in such a way as to make the information readily available to workers in the work area on a continuous basis. Anyone performing hands-on work and anyone requiring unescorted access to the site shall be required to review and sign the HA prior to entering the work area. Each worker shall be briefed on the hazards specific to their work before signing the HA, and shall be re-briefed as often as necessary to ensure their understanding of the HA hazard controls applicable to their daily work activities.

A sample of the Change Summary sheet, HA form and signature sheet are available on the ORNL Procurement web site.

D. The Seller and its lower tier subcontractors shall conduct pre-task briefings, sufficient to ensure job site safety, with affected workers to review hazards and hazard controls for tasks planned that day.

E. The Seller shall confirm that training for their employees and their lower tier subcontractor employees is adequate for the tasks being performed. Documentation of training shall be provided if requested by the Company.

F. Submit tabulation of man-hours worked on a monthly basis using the "Tabulation of Work Hours" form provided on the Procurement website. This should include all work hours for both manual and non-manual personnel on the job.

1.2 SAFETY AND HEALTH ENFORCEMENT

A. During all execution of field construction activities, the Seller shall designate the role of a safety officer responsible for the safe conduct of work on the site. The role may be assigned to the designated site superintendent under the following conditions:
   1. The site superintendent has the technical competency to identify, understand and manage all aspects of hazard analysis, hazard mitigation, and safe work control for all work going on at the site at any given time.

2. The site superintendent recognizes assignment of the safety officer role takes primacy over any other supervision duties.
3. The site superintendent demonstrates competency to meet the Company expectations as a safety officer capable to oversee the conduct of safe work by the Seller in all regards.

B. To the extent the Seller's site superintendent cannot, or does not meet these expectations for the role of the work's designated safety officer for all work going on at any given time, the Seller will be expected to appoint another person with sufficient competency and responsibility to meet the Company's requirements and expectations for the appropriate safety management of the ongoing work as the Seller's designated safety officer. This designated individual shall have sufficient knowledge and understanding of the work, the Seller's means and methods, and any applicable regulatory requirements to ensure the work can be prosecuted safely and compliantly. This person shall also have:
1. Minimum 30-hour OSHA construction safety course.
2. Experience and the authority to stop work if the S&H of a worker or the environment are in danger.
3. Sufficient time and resource to execute the designated S&H responsibilities as a first priority of work. The designated person may have concurrent additional jobsite duties only to the extent those additional duties do not interfere with the ability to perform S&H responsibilities. The S&H shall be the first priority and any other duties shall be immediately suspended if they interfere.

C. The designated S&H person shall have the following responsibilities:
1. Attend a one-hour ORNL Construction Safety Meeting every month. The location and time will be designated.
2. Perform and document **daily** safety inspections and correct deficiencies immediately. If deficiencies cannot be corrected, immediately stop related work until correction is completed. Maintain a logbook of inspections, safety meetings, and other project related activities.
3. Conduct safety meetings/briefings with workers to discuss precautions, needed improvements, and relevant safety topics for the work being performed prior to beginning new tasks, and as often as necessary thereafter to assure that workers recall the essentials HA elements of the work they are undertaking.
4. Ensure project personnel and unescorted visitors review and sign off as having reviewed a copy of the project HA before entering the construction site.
5. Revise the HA to reflect changes in the project scope of work, the Seller means and methods, or changes resulting from site conditions. Document additional work tasks, hazards associated with those tasks, and required safety actions in the HA.
6. Serve as the Seller's point of contact for site S&H concerns.
7. Ensure appropriate industrial hygiene monitoring and safety services are provided, including instrument calibration and record keeping.
8. Remain on site or ensure a competent, designated alternate remains on site at all times during work activities.
9. Ensure initial and daily inspections of equipment and certification/qualification of equipment operators are current.
10. Submit documentation for resolution of serious findings identified by the Company.

1.3 APPLICABLE CODES, REGULATIONS, AND STANDARDS

A. Work shall be performed in accordance with the following codes and regulations without limitations:
   1. The OSHA 29 Code of Federal Regulations (CFR) 1926 (with the exception of 1926.53 superseded by 10 CFR 835) and applicable sections of 1910 including all referenced codes and standards.
   2. The DOE 10 CFR 851.
   3. American National Standards Institute, Inc. (ANSI) B30 Series.
   4. The ANSI/Site Area Emergency (SAE) J67 (Oct80), Shovel Dipper, Clam Bucket, and Dragline Bucket Rating (equipment design specification only).
   5. The ANSI/Security Industry Association (SIA) A92.2 (1990), American National Standard for Vehicle-Mounted Elevating and Rotating Aerial Devices (equipment design specification only).
   6. American Society of Mechanical Engineers (ASME) B56.6 (1993), Rough Terrain Fork Lift Trucks (equipment design specification only).
   7. National Safety Council (NSC) A10.31 (1995), Construction and Demolition--Digger Derricks Safety Requirements (equipment design specification only).
   8. United States Department of Transportation, (USDOT) Hazardous Materials Regulations, 40 CFR 106 199 and 49 CFR 325-399.
   9. National Fire Protection Association (NFPA) Standards including NFPA 51B; Current Edition, “Fire Prevention in Use of Cutting and Welding Processes”.
   10. National Electrical Code Handbook.
   11. American Conference of Governmental Industrial Hygienists (ACGIH) “Threshold Limit Values and Biological Exposure Indices”.
   12. The ANSI Z49.1, “Safety in Welding and Cutting”.
   13. The ANSI Z88.6, 1984, “For Respiratory Protection - Respirator Use - Physical Qualifications for Personnel” and ANSI Z88.2, “Practices for Respiratory Protection”.
   14. The DOE Standard, Hoisting and Rigging, DOE-STD-1090-2007 (available on the ORNL Procurement web site).

B. In the event of conflicts between the cited regulations, notify the Company for resolution.

1.4 HAZARDOUS WORK REQUIREMENTS

A. Airborne contaminants.
   1. Airborne contaminants (chemicals, dust, cutting/grinding debris, etc.) shall be minimized to the extent reasonably practical, and in no case shall personnel exposures be allowed greater than the accepted standards for airborne contaminants to:
      a. Workers without personal protective equipment (PPE) or other protective measures outside the designated work area;
      b. Workers inside the work area, including those utilizing protective measure or equipment.
   2. Use appropriate dust-reducing methods such as vacuuming, wetting, enclosures, air flow control, and PPE during operations that can introduce airborne contaminants.
   3. The Company shall be notified of planned activities that produce airborne contaminants so that it can assess whether appropriate protections are in place to

avoid over-exposures outside the job boundary, and/or to avoid plant upset conditions (such as inadvertently triggering a facility smoke alarm).

B. Confined space.
1. The ORNL confined spaces are classified as permit-required or non-permit-required.
   a. Non-Permit spaces require a job hazard evaluation, work guideline, or a standard operating procedure approved by the Company.
   b. Permit-Required spaces require a confined space permit, which addresses all the elements of 29 CFR 1910.146 or CFR 1926 Subpart AA, whichever is applicable to the work to be performed.
2. Any construction operation involving a confined space entry requires an evaluation of work by the Seller and the Company's S&H representative to classify the space as permit-required or non-permit required.
3. Provide retrieval equipment to facilitate non-entry rescue for all permit-required spaces unless evaluation of the permit-required confined space determines that the use of retrieval equipment creates greater S&H hazards. In this case, rescue services shall be notified that entry into the confined space may require rescue operations.

C. Demolition.
1. An engineering survey of the structure to determine the condition of the framing, floors, and walls, and possibility of unplanned collapse of any portion of the structure shall be performed. The Seller shall provide written evidence that such survey has been performed.
2. The Company shall ensure electric, gas, water, steam, other service lines be shut off, capped, otherwise controlled outside building line before demolition work is started.
3. The Company shall determine if any type of hazardous chemicals, gases, explosives, flammable materials, or similarly dangerous substances have been used in any pipes, tanks, or other equipment on the property. When the presence of any such substances is apparent or suspected, testing and purging shall be performed and the hazard eliminated before demolition is started.

D. Electrical.
1. Electrical safety.
   a. Conduct electrical installation and maintenance operations in accordance with requirements in 29 CFR 1926 Subpart K, applicable requirements in 29 CFR 1910 Subpart S, NFPA *Standard for Electrical Safety in the Workplace* (NFPA 70E), and the National Electrical Code.
   b. Ensure electrical work is performed by qualified persons as defined in 1910.331-335.
   c. Provide a ground fault circuit interrupter for cord sets, receptacles, and electrical tools including plug and cord connections to generators and equipment for employee use.
2. The HA is utilized to ensure workers understand their role in the work to be performed, as well as what others involved in that project or task will be doing. Supervisory approval for "working on or near" or "working hot" shall be given in the Electrical Energized Work Permit (available on the ORNL Procurement web site). "Working on or near" or "working hot" requires approval by the subcontractor supervisor, UT-Battelle, LLC (UT-B), Technical Project Officer (TPO), and UT-B Level II Manager. Subcontractor shall follow the guidelines presented in the NFPA 70E tables for determining approach boundaries and PPE.

3. Safety concerns regarding shared neutrals.

The Seller shall be aware that the lockout/tag-out (LO/TO) of individual electrical circuits will not ensure that its associated electrical wiring will be completely de-energized. Disconnected neutrals of circuits which employ shared neutrals can remain energized with normal system voltage, a condition which is prevalent in industry wide 120/240 volt (V), 120/208V and 277/480V building circuitry.

For example, in 120/208V lighting circuits, a shared neutral is commonly used for up to three 120V circuits. Three phase wires fed from three circuit breakers (circuits 1, 3 and 5; etc.) and a shared neutral are sent from an electrical panel board to distant light fixtures via a common conduit and junction box system. If one of the circuit breakers is locked out and the other two remain energized, and the shared neutral conductor is disconnected, 120V will routinely be present on the disconnected neutral conductor. In such cases, 120V will be fed from an associated circuit breaker hot phase, through the electrical load (such as the filament of an incandescent bulb), to energize the disconnected neutral conductor with 120V.

When working on circuitry employing shared neutrals, measuring for the presence of voltage on disconnected neutrals is not an adequate safety measure. For example, a light switch on one of the associated circuits may be off, with its circuit breaker still closed (light switches are typically not locked out). A case can result, when zero voltage is measured on a disconnected neutral, due to a light switch being turned off. If one proceeds to work on the disconnected neutral of that circuit, and a light switch is turned on, then 120V will be injected onto the disconnected neutral. Note that a similar situation can exist in facilities where the neutrals are cross-connected between circuits (including circuits from different panels); hence isolating all the circuits in a single panel (using a main breaker or disconnect) may also not ensure that circuit wiring is de-energized and/or isolated.

Due to the above, when work is performed on neutral conductors of any building electrical system, the neutral conductors should be considered as “energized”, regardless of LO/TO actions, and “on or near” electrical safety measures shall be exercised. Appropriate safety precautions to minimize the hazards of “energized” disconnected neutral conductors shall be listed in the project specific HA.

E. Excavation/Penetration.

1. The Company will provide the Seller with an excavation/penetration permit, as applicable, prior to the excavation/penetration of surfaces in order to identify the Company utilities and other subsurface company infrastructure. Refer to Specification 01 01 00 (General Work Requirements), Section 3.3 for specifics required, including location of underground or subsurface utilities. The Seller shall utilize Tennessee One Call services in accordance with state law to manage protection of non-company utilities at ORNL. Protect underground or subsurface installations from damage or displacement. The excavation permit and requirements to utilize Tennessee One Call shall be referenced in the HA and be available at the work site.

F. Hazard communication.

1. Demonstrate compliance with a written hazard communication program as required by 29 CFR 1926.59, including employee information and training, provisions for labeling and availability of material safety data sheets (MSDS) as a section of the Seller S&H plan.

2. List all hazardous chemicals/materials brought on site on the form entitled "Contractor Hazardous Materials Inventory Report" (available via the Procurement web site) before starting on-site work. Provide to the TPO a copy of the MSDS for each chemical/material listed. Update the report monthly and provide a final inventory upon completion of work.
3. The Seller shall maintain the MSDS for hazardous chemicals brought onsite and shall supply information regarding hazardous chemicals to the Company representative prior to initiation of activities that may potentially expose the Company personnel to a hazard at the job location.
4. The Seller shall remove all unused chemicals or materials brought to the site at the completion of the job.

G. Heat/Cold stress.
1. Personnel exposed to temperature extremes should be protected in accordance with the ACGIH guidelines by implementing appropriate engineering controls, work rest regimens, and/or PPE. Activities must be evaluated for variables such as air temperature, wind speed, humidity, clothing and/or PPE being worn, and acclimatization status of workers to determine if there is a threat of heat/cold stress. Appropriate work rest regimens are selected based on environmental and/or physiological monitoring.
2. Personnel shall receive proper training on the hazards of working in temperature extremes. The instruction should include signs and symptoms associated with heat/cold stress, appropriate controls to protect against these hazards, first aid measures, and other factors which may increase a worker's susceptibility to heat/cold injury (e.g., age, weight, consumption of alcohol, taking medications such as diuretics, infection, pre existing medical conditions, etc.).
3. In hot environments, cool liquids shall be made available to workers and workers shall be encouraged to frequently drink small amounts, e.g., one cup every 15-20 minutes.
4. Since prolonged exposure to cold air or to immersion in cold water, at temperatures well above freezing can lead to dangerous hypothermia, whole body protection must be provided. Personnel should be protected by proper clothing and implementing a work/warm-up schedule per the ACGIH guidelines.

H. Hoisting and rigging.
1. General.
   a. Perform hoisting and rigging activities in accordance with the DOE Hoisting and Rigging Standard (DOE-STD-1090-2007), and the applicable parts of 29 CFR 1910 Subpart N, 29 CFR 1926 Subparts H and N, and ASME B30 and B56 Series. Provide for review by the Company upon request, documents of certification that the Seller's hoisting and rigging equipment meets the requirements in these documents. If an inspection certificate expires while the equipment is on site, re-inspect the equipment and update the inspection certificate before continuing work activities. Remove fall protection equipment (harness, lanyard, hooks, self-retracting lifelines) from service when it is found with any damage or when subject to shock loading imposed during a fall arrest.
   b. The Seller shall develop an HA content specifically for hoisting and rigging operations required for the work.
   c. Provide load-rating plates attached in a prominent location. When modifications or changes are made to lifting or hoisting equipment or when equipment is modified to permit lifting or hoisting, attach a new manufacturer's load rating plate. In lieu of a manufacturer's load rating plate, a certification that the equipment has safely

undergone a performance test of at least 125% of the maximum anticipated load may be furnished. This load rating shall then be affixed to the equipment.

d. The Seller's hoisting and rigging equipment/devices may be inspected by the Company with the right to suspend operations if found deficient or unsafe.

e. Cranes, boom trucks, and other types of hoisting equipment which do not have an anti-two-blocking device shall be equipped with a warning feature sufficient to alert the operator before the cable hook assembly is drawn into the top pulley, e.g., cable coating, cable wrapping, alarm device, etc.

f. The use of forklifts, backhoes, and track-hoes for hoisting or rigging activities is not permitted unless the manufacturer's written documentation specifies the equipment is designed for that purpose and lifting limits are properly identified.

g. Do not operate forklifts within 10' of any electrical lines without the Company approval. Contact the Company's TPO for a determination of safety requirements to conduct forklift operations that must be performed within 10' of electrical lines.

2. Operator qualifications.

a. Equipment operators and riggers, including alternates, shall be qualified to perform their assigned functions. Qualifications shall include physical, knowledge, and skills proficiency based on job function.

b. The Seller, or their lower tier subcontractor, shall maintain a program for

c. evaluating crane operators. The program shall be available for review by the Company. The program shall include written testing to evaluate operator knowledge and performance testing to evaluate operator skills. Elements of the program shall be consistent with the requirements of DOE hoisting and rigging standard, and include but not be limited to the following:

1) Pre-Use crane inspection.
2) Crane specifications, operator's manual, load charts, instrumentation, controls, operator aides, and operating characteristics.
3) Operating procedures under emergency conditions.
4) Setup, shutdown and parking of the crane.
5) Crane attachments.
6) Configurations and loading effects on the crane.
7) Standards, rules and regulations.
8) Rigging practices.
9) Personnel lifting procedures.

3. Ordinary, critical, and pre-engineered lifts.

a. Ordinary lifts less than 5000 pounds (lbs.).

1) The Seller is responsible for ensuring that all lifting meets the requirements of the regulatory documents noted in this section.

b. Ordinary lifts above 5000 lbs.

1) The Seller shall require an appropriate review and approval by the Seller's field supervisor and hoisting and rigging supervisor in a documented "lift planning" or equivalent format. An example of a lift planning document is available on the Procurement web site.

c. Critical lifts.

1) A lift shall be designated as a critical lift if the requirements applicable for ordinary lifts do not adequately eliminate or control the likelihood or severity of the following:

a) Personnel injury or significant adverse health impact (on site or off site).

b) Significant release of radioactivity or other hazardous material or other undesirable conditions.
c) Undetectable damage that would jeopardize future operations or the safety of a facility.
d) Damage that would result in delay to schedule or other significant program impact such as loss of vital data.
e) The use of two or more cranes or forklifts or special hoisting/rigging equipment.
f) If the lift exceeds 75% capacity of crane (steel erection only).

NOTE: A lift could also be designated as critical if the load requires exceptional care in handling because of size, weight, close-tolerance installation, high susceptibility to damage, or other unusual factors.

2) The Seller shall submit a critical lift plan, using the Critical Lift Plan form (available on the Procurement web site), to the Company for approval. The plan shall be submitted at least 10 days in advance of the scheduled lift. The lift shall not be made until approval in writing from the Company is received.

a) Include a layout sketch of the crane set up plan that includes the planned and maximum operating radii for the lift. Also show the item to be lifted.

NOTE: Show set up plans for other lifting machinery [e.g. forklift] if not using a crane.

b) Include proof load tests for slings, shackles, and hooks used for the hoisting and rigging activities. The same components that were tested must be used for the critical lifting activities.

3) The Seller shall conduct a pre-lift meeting prior to making the lift. The Company TPO (or designee) and all the Seller personnel involved in the lift shall attend.

I. The LO/TO.

1. Hazardous energy sources (electrical, mechanical, etc.) that are present at the work site must be de-energized and locked out before the Seller can begin work involving these hazardous energy sources. The Seller prepared HA shall include identification of hazardous energy sources, methods for performing LO/TO, and a sufficiently detailed LO/TO implementation plan addressing how the Company (if applicable to the work) and all tiers of subcontractors will perform LO/TO on the project in order to ensure a clear understanding of LO/TO coordination between all parties (e.g., will all sub-tier subcontractors use the prime subcontractor's locks and tags; or will each sub-tier use their own style of locks and tags; etc.)?
2. The Company will perform a LO/TO of applicable company-controlled systems and equipment. The Seller must provide at least five calendar days advance notice to the Company field representative of systems requiring LO/TO.
3. For work in existing ORNL facilities, the Seller's work may not proceed until the Company has conducted a coordination briefing with the Seller to facilitate integration between the

Company and the Seller LO/TO activities (including determination of the Company versus the Seller control of applicable systems and equipment).

4. Following any applicable isolation and LO/TO by the Company, a representative of the Seller shall review and approve the protection provided. In cases where the Company LO/TO permit is issued, the Seller's representative shall indicate this approval by signing the permit as the "Service Supervisor". The Seller employees shall verify isolation, and over-lock isolation points (or a lockbox) with their personal locks. These locks shall be identified with the Seller employee's name and a unique employee identification number. The Seller shall, as necessary, provide sub-tier authorized and/or affected employees with a pre-job briefing (approximately one hour). The briefing will cover the scope of work to be performed, the method(s) of energy isolation, and the method(s) for verifying isolation and safe energy conditions.
5. Upon completion of work, the Seller employees shall remove all personal locks and notify the Company's TPO. The removal of the Company's lock(s) shall not precede the removal of the Seller's lock(s) except in emergency conditions approved by the ORNL Laboratory Shift Superintendent (LSS).
    a. Unforeseen circumstances may require the Company to temporarily suspend the LO/TO and have the Seller to remove the over-lock. If the temporary suspension occurs during the Seller's off-shift hours, the Company's LSS will contact the Seller for removal of the over-lock. If the Seller cannot be contacted, the LSS will remove the Seller's LO/TO or over-lock device and inform the Seller prior to start of the Seller's next work shift.
6. Hazardous energy sources introduced by the Seller must be controlled through the use of the Seller's hazardous energy control procedure contained in the Seller's S&H Program. The Seller shall also provide sub-tier authorized and/or affected employees with a pre-job briefing (approximately one hour). The briefing will cover the scope of work to be performed, the method(s) of energy isolation, and the method(s) for verifying isolation and safe energy conditions.

J. Noise/Hearing protection.
1. When employees are exposed to sound levels exceeding those specified by the ACGIH, "Threshold Limit Values and Biological Exposure Indices," feasible administrative or engineering controls shall be utilized. If such controls fail to reduce sound levels within those specified by the ACGIH, PPE shall be provided and used to reduce the sound levels.

    NOTE: The more stringent ACGIH criteria are used instead of the OSHA criteria presented in 29 CFR 1926.52.

K. Respiratory protection requirements.
1. The Seller personnel are required to follow all OSHA (29 CFR 1926.103) requirements for respirator use.
2. The Seller personnel will determine which respirator type or class will offer adequate protection based on:
    a. Respiratory hazard(s) to which the worker may be exposed.
    b. Workplace and user factors that have the potential to affect respirator performance and reliability.
    c. His or her informed professional judgment.
    d. Scientific literature.

3. The Seller shall provide respirators in accordance with the following:
   a. The Seller employees required to wear negative or positive pressure, tight-fitting respirators shall be medically evaluated per 29 CFR 1926.103. The Seller is responsible for the medical evaluation.
   b. Ensure respirator wearers have completed the respirator quantitative or qualitative fit testing and respirator training.
   c. Provide respirators and cartridge type specified to protect worker from exposure to identified or suspected hazards as specified in the Seller prepared HA.
   d. Provide breathing air, if required. The compressed breathing air quality supplied to the air respiratory protections systems meet the ANSI/Compressed Gas Association (CGA) G7.1, Commodity Specification for Air, requirements.
   e. Provide optical corrections for appropriate respirators.
   f. All respirators shall be certified by the National Institute for Occupational Safety and Health (NIOSH).
4. Temporary storage of respirators for reuse shall be in accordance with 29 CFR 1926.103(h)(2).

L. Welding, cutting and hot-work requirements.
1. The Seller shall have a permit system addressing S&H and fire prevention for the following applications when work is conducted in a non-designated area; welding and allied processes, grinding, heat treating, thawing pipes with a torch or flame, torch-applied roofing, powder driven fasteners, hot riveting, and similar applications producing a spark or flame. Designated areas are permanent locations designed or approved for hot work operations to be performed regularly. Examples of hot work permits are contained in NFPA 51B.
2. All hot work operations shall be coordinated with the Company to ensure protection of surrounding work areas and avoid accidental trips of fire protection alarms.
3. Welders and burners shall wear protective clothing which meets requirements of ANSI Z49.1. The selected clothing shall be specified in the Seller's HA for hot-work activities. Protective clothing requirements shall be determined and noted on each hot-work permit issued during this project. Fire watchers who may be exposed to the same hot-work hazards as the welders and burners shall also wear the selected protective clothing.
4. If operations require welding/burning/hot-work where anti-contamination clothing is required, the Seller personnel shall wear flame-resistant clothing for all layers. Flame resistant clothing shall meet the requirements of NFPA 701. Fire watchers who may be exposed to the same hot-work hazards as the welders and burners shall also wear the selected protective clothing.
5. A fire watch must be designated if any of the following conditions exist:
   a. A significant amount of combustible material is closer than 35' to the point of operations.
   b. A significant amount of combustible material is more than 35' away but could be easily ignited by sparks.
   c. Hot work is conducted in areas where the employee must wear multiple layers of clothing and respiratory protection.
6. The fire watch shall be instructed to:
   a. Remain present in direct line of sight to the work area and perform no other activities other than fire watch duties.
   b. Be alert for any condition that could lead to a fire.
   c. Guard passers-by from welding hazards.

d. Interrupt the work when a hazardous condition develops and deal with the situation appropriately.
e. Ensure that appropriate fire extinguishing equipment is readily available and know how the equipment is to be used.
f. Remain on the scene for at least 30 minutes after completion of hot work to detect and report a fire resulting from stored heat.

1.5 ADDITIONAL SAFETY REQUIREMENTS

A. Explosives (other than powder-actuated tools) are prohibited unless written approval is obtained from the Company.

B. The Seller shall not obstruct fire protection equipment, including fire extinguishers and sprinkler systems.

C. Warnings or indications of impending sever weather conditions (heavy rains, strong winds, tornadoes, floods, etc.) shall be monitored and appropriate precautions taken to protect personnel and property from the effects of the severe weather.

1.6 OCCUPATIONAL HEALTH PROTECTION THRESHOLD EXPOSURE LIMITS

A. Exposure to any chemical or physical agent via inhalation, ingestion, skin absorption, or physical contact in excess of the acceptable limits specified in 29 CFR 1926, Subpart Z and/or the ACGIH "Threshold Limit Values and Biological Exposure Indices" shall be prohibited. In the event of conflicts between ACGIH and OSHA criteria, the more stringent shall prevail.

B. The Seller shall be responsible for all monitoring to ensure compliance with the exposure criteria. Approved and calibrated testing devices shall be provided for the measurement of hazardous substances, agents, or environments. Individuals performing testing and monitoring shall be trained in testing and monitoring procedures and hazards. Testing devices shall be used, inspected, and maintained in accordance with the manufacturer's instructions.

C. Determination of the concentrations of, and hazards from, hazardous substances, agents, and environments shall be made by a qualified industrial hygienist or other competent person during initial startup and as frequently as necessary to ensure the safety and health of the work environment.

1.7 EMERGENCY SERVICES AND EQUIPMENT

A. The Seller shall make provisions prior to commencement of the project for prompt medical attention in case of serious injury. If professional medical attention is not available within a reasonable time, the Seller is required to have a person trained in first aid at the work site and have the necessary first aid supplies. The OSHA regulations do not set specific response time requirements for the term "reasonable time". However, OSHA's interpretation is that in areas where accidents resulting in suffocation, severe bleeding, or other life threatening or permanently disabling injury or illness are likely, a three to four minute response time, from time of injury to

time of administering first aid, is required. In other circumstances, i.e., where a life threatening or permanently disabling injury is an unlikely outcome of an accident, a longer response time, such as 15 minutes, is acceptable.

B. Proper equipment for prompt transportation of the injured person to a physician or hospital, or a communication system for contacting necessary ambulance service shall be provided by the Seller.

C. If a serious or life-threatening injury occurs, the Company will provide emergency ambulance and firefighting services. The Seller employees must use the Company facility phone to dial 911 or pull a fire alarm box to notify the Company for emergency response. If using a privately owned cell phone, the Seller must call the LSS at 574-6606.

D. The ORNL Health Division will attend any serious life-threatening injury to the level of stabilization. After stabilization, the Seller employee should be transported to the emergency facility of their choice.

E. The Company will provide firefighting services. The Seller employees must use the Company facility phone to dial 911 or pull a fire alarm box to notify the Company for emergency response. If using a privately owned cell phone, the Seller must call the LSS at 574-6606.

1.8 EMERGENCY PREPAREDNESS AND RESPONSE

A. Observe and participate in notices to evacuate the work area. The evacuation notices may be a drill or actual event.

B. The Seller shall appoint a person to ensure that all the Seller employees are aware of an evacuation alert.

C. Evacuate to the assembly point identified in the HA.

D. Before evacuating the work areas shut down or make safe equipment or processes that could become a safety or fire hazard if left unattended.

1.9 EQUIPMENT AND MACHINERY

A. The Seller employees shall be trained in the operation, inspection, and maintenance of the equipment; and the safety features and procedures to be utilized during operation, inspection, and maintenance of the equipment.

B. Before any machinery or mechanized equipment is placed in use, it shall be inspected and tested by a competent person and certified to be in safe operating condition. Inspections and tests shall be in accordance with manufacturer's recommendations and shall be documented. Records of tests and inspections shall be maintained by the Seller and shall be made available upon request.

C. All machinery and equipment shall be inspected daily (when in use) to ensure safe operating conditions. The Seller shall designate competent persons to conduct the daily inspections and tests.

D. Whenever any machinery or equipment is found to be unsafe, or whenever a deficiency that affects the safe operation of equipment is observed, the equipment shall be immediately taken out of service and it use prohibited until unsafe conditions have been corrected. A tag indicating that the equipment shall not be operated, and that the tag shall not be removed, shall be placed in a conspicuous location on the equipment.

E. Only designated qualified personnel shall operate machinery and mechanized equipment. Machinery and equipment shall not be operated in a manner that will endanger persons or property nor shall the safe operating speeds or loads be exceeded. Utilize equipment only for the purpose for which it was designed and in accordance with the manufacturer's instruction and recommendations. Modifications, extensions, replacement parts, or repairs of equipment shall maintain at least the same factor of safety as the original equipment. The manufacturer shall authorize modifications in writing.

PART 2 - EXECUTION

2.1 PREPARATION

A. Before starting on-site work provide the following:
1. Notify the Company in advance of all scheduled on-site activities.
2. Notify the TPO of any of the Seller employees receiving radiopharmaceutical treatment.
3. Notify the Company of employees who are "Declared Pregnant Workers".
4. Brief everyone entering the work-site boundaries on identified hazards, control measures, and proper work practices. Maintain documentation of this briefing by signature on HA Log Sheet.

2.2 PROTECTION OF WORK AREA

A. Ensure that the work areas and storage areas are conspicuously flagged and barricaded, as needed, prior to initiation of work.

B. Furnish, post, erect, and install safety devices, equipment, signs, barricades, flagging, and any other item necessary to give adequate warning and caution of hazards, and to provide instructions and directions to workers and the public. Signs identifying the Seller shall be posted for the work area and storage areas.

2.3 WORKING AND STORAGE AREAS

A. Limit activities and storage to the immediate project site and designated storage areas. Limit travel to the main roads.

B. Store only work-related material and equipment in stockpile areas, storage trailers, and designated storage sites located on government-controlled land.

C. Perform cleanup, trash disposal, and neatly arrange material/equipment on a daily basis.

END OF SECTION 01 11 00

SECTION 01 18 00 – PROJECT UTILITY INTERFACE

PART 1 - PROJECT REQUIREMENTS

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for utility construction interface with the Utility Division of Company.

B. Inspections provided by the Company do not relieve Seller of responsibility for compliance with the Contract Document requirements.

C. If conflicts exist between this section and other sections, this section takes precedence.

1.3 REFERENCES

A. Section 01 01 00 – General Work Requirements

B. Section 01 55 00 – Environmental Protection

C. Section 01 78 39 – Project Record Documents

D. ANSI/AWWA C651 – Disinfecting Water Mains

E. Division of Water Resources, TDEC, Community Public Water Systems Design Criteria

1.4 SUBMITTALS

A. Evaluation Reports: The Seller shall include notification time and hold points in their schedule submitted per Section 01 01 00 General Work Requirements.

B. Disinfection Plan: Provide detailed plan for Company approval a minimum of fourteen days prior to implementation.

C. As-Built Utility Drawings: Provide as-built utility drawings in MicroStation or AutoCAD format within 45 days of closing the excavation per Section 01 78 39 Project Record Documents.

PART 2 - TECHNICAL REQUIREMENTS

2.1 COMPANY EVALUATIONS

A. Testing
   1. The Utility Division of Company requires 48 hour notice before witnessing the following tests:
      a. Hydrostatic/Pneumatic testing of any underground utility.
      b. Other critical testing activities as defined in the specifications.

B. Potable Water Disinfection
   1. The Utility Division of Company will provide testing for free chlorine level of the heavily chlorinated water disinfection prior to the required 24 hour hold period and post hold period.
   2. After the heavily chlorinated water has been flushed from the system the Utility Division of Company will verify the free residual chlorine level is between 1-4 ppm.
   3. After the 48 hours hold period, the Utility Division of Company will collect a bacteriological sample.
   4. The State Laboratory does not accept samples Friday through Sunday or on Holidays.
   5. The Utility Division of Company will provide results of the bacteriological sample generally within 24 hours.

C. Buried Service Field Inspection
   1. All buried services shall be evaluated by the Company prior to backfilling
   2. Notify Company at least 48 hours advance notice of buried services construction completion for Company evaluation.
   3. Evaluation(s) will be performed by Utilities Division and Laboratory Modernization Division personnel and may be scheduled for more than one event.
   4. Inspection includes but is not limited to:
      a. 100% inspection for code and specification compliance by the Reviewer and/or responsible EAHJ prior to covering or backfill by the contractor.
      b. Confirmation that the design intent is being met by the contractor.
      c. Confirmation of compliance with the specifications.
      d. Witness critical testing and inspection activities as defined in the specifications.

2.2 REPAIR AND PROTECTION

A. General: On completion of testing, inspecting, sample taking, and similar services, repair damaged construction and restore substrates and finishes.

B. Protect construction exposed for field examination activities.

C. Repair and protection are Seller's responsibility, regardless of the assignment of responsibility for quality-control services.

PART 3 - EXECUTION

A. Materials
   1. Buried piping.
      a. Indicator tape shall be laid 18” above buried piping.
      b. Tracer wire shall be laid continuously along to top of all buried piping.
      c. Attach the wire at five foot intervals to the pipeline with several wraps of tape.
      d. Tracer wire shall run up and down exterior side of valve boxes, looped but not cut, into the valve box just below the cover.
      e. Splices shall be avoided. Splices and wire ends shall be waterproofed.
      f. Verify electrical continuity by applying an electrical current.
      g. Wire Spec: 14 AWG conductor, solid white, TWH solid copper with plastic coat. Splice connectors: Burndy KS-90 16-10 wrapped with insulating mastic tape.
      h. The ends of the tracer wire shall terminate inside a valve or junction box. A minimum of twelve inches of wire shall be located within the box.
   2. All materials/equipment shall bear the Underwriter’s Laboratories (UL) label or be approved by Factory Mutual (FM) where UL labels or FM approval is available for the type of products specified.

END OF SECTION 01 18 00

SECTION 01 18 13 – REFERENCE DOCUMENTS

PART 1 - PROJECT REQUIREMENTS

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this section.

1.2 SUMMARY

A. The following drawings are intended for general information only.
   1. Existing maps
      a. ORNL Atlas Drawing
      b. 2013 Survey
   2. Primary Treatment Project AS BUILT Drawings and Specifications
   3. Primary Treatment Project NOT BUILT Drawings and Specifications
   4. ORNL Related Documents
      a. 31 22 70 Erosion Control
      b. 32 92 19 Seeding
      c. ES-MECH-G-01 Mechanical Systems 851 Codes

PART 2 - NOT USED

PART 3 - NOT USED

END OF SECTION 01 18 13

SECTION 01 22 00 - UNIT PRICES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for unit prices.

B. Related Requirements:

1. Section 012100 "Allowances" for procedures for using unit prices to adjust quantity allowances.
2. Section 012600 "Contract Modification Procedures" for procedures for submitting and handling Change Orders.
3. Section 014000 "Quality Requirements" for field testing by an independent testing agency.

1.3 DEFINITIONS

A. Unit price is stated on the Bid Form, as a price per unit of measurement for materials or services, added to or deducted from the Contract Sum by appropriate modification, if the estimated quantities of Work required by the Contract Documents are increased or decreased.

1.4 PROCEDURES

A. Unit prices include all necessary material, plus cost for delivery, installation, insurance, applicable taxes, overhead, and profit.

B. Measurement and Payment: See individual Specification Sections for work that requires establishment of unit prices. Methods of measurement and payment for unit prices are specified in those Sections.

C. Owner reserves the right to reject Contractor's measurement of work-in-place that involves use of established unit prices and to have this work measured, at Owner's expense, by an independent surveyor acceptable to Contractor.

D. List of Unit Prices: A list of unit prices is included in Part 3. Specification Sections referenced in the Part 3 "Schedule of Unit Prices" Article contain requirements for materials described under each unit price.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 SCHEDULE OF UNIT PRICES

A. Unit Price No. 1: Removal of unsatisfactory soil and replacement with satisfactory soil material.

1. Description: Unsatisfactory soil excavation and disposal off-site and replacement with satisfactory fill material or engineered fill from off-site, as required, in accordance with Section 312000 "Earth Moving."
2. Unit of Measurement: cubic yard of soil excavated, based on in-place surveys of volume before and after removal.

B. Unit Price No. 2: Mass rock excavation and replacement with satisfactory soil material.

1. Description: Classified mass rock excavation and disposal off-site and replacement with satisfactory fill material or engineered fill from off-site, as required, in accordance with Section 312000 "Earth Moving."
2. Unit of Measurement: cubic yard of rock excavated, based on in-place surveys of volume before and after removal.

C. Unit Price No. 3: Trench rock excavation and replacement with satisfactory soil material.

1. Description: Classified trench rock excavation and disposal off-site and replacement with satisfactory fill material or engineered fill from off-site, as required, in accordance with Section 312000 "Earth Moving."
2. Unit of Measurement: cubic yard of rock excavated, based on survey of in-place surveys volume of before and after removal.

END OF SECTION 01 22 00

SECTION 01 23 00 - ALTERNATES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

B. Section 01 81 00 - Facility Performance Requirements for details on alternates.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for alternates.

1.3 DEFINITIONS

A. Alternate: An amount proposed by Seller and stated on the Bid Form for certain work defined in the bidding requirements that may be added to or deducted from the base bid amount if the Owner decides to accept a corresponding change either in the amount of construction to be completed or in the products, materials, equipment, systems, or installation methods described in the Contract Documents.

1. Alternates described in this Section are part of the Work only if enumerated in the Agreement.
2. The cost or credit for each alternate is the net addition to or deduction from the Contract Sum to incorporate alternates into the Work. No other adjustments are made to the Contract Sum.

1.4 PROCEDURES

A. Coordination: Revise or adjust affected adjacent work as necessary to completely integrate work of the alternate into Project.

1. Include, as part of each alternate, miscellaneous devices, accessory objects, and similar items incidental to or required for a complete installation, whether or not indicated as part of alternate.

B. Execute accepted alternates under the same conditions as other Work of the Contract.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 SCHEDULE OF ALTERNATES

A. See Section 01 81 00 - Facility Performance Requirements

END OF SECTION 012300

SECTION 01 33 00 –SUBMITTAL PROCEDURES

PART 1 - PROJECT REQUIREMENTS

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this section.

1.2 SUMMARY

A. Section includes requirements for the submittal schedule and administrative and procedural requirements for submitting shop drawings, product data, samples, design documents and other submittals.

1.3 REFERENCE SECTIONS

A. Section 01 80 00 Design Build Requirements for design submittals.

1.4 DEFINITIONS

A. Delegated-Design Services: Professional design services, Architect-Engineer (A-E), or certifications by a design professional specifically required of the Seller by the Contract Documents.

1.5 SUBMITTAL ADMINISTRATIVE REQUIREMENTS

A. Processing time for Company review”
   1. Allow time for submittal review, including time for resubmittals, as follows. Time for review shall commence on the Company’s receipt of submittal. No extension of the contract time will be authorized because of failure to transmit submittals enough in advance of the work to permit processing, including resubmittals.
   2. Initial review: allow 10 days for initial review of each submittal. Allow additional time if coordination with subsequent submittals is required. The Company will advise the Seller when a submittal being processed must be delayed for coordination.
   3. Intermediate review: if intermediate submittal is necessary, process it in same manner as initial submittal.
   4. Resubmittal review: allow 10 days for review of each resubmittal.

B. Processing Time for State of Tennessee Review:
   1. Allow 10 days for review by Company of each submittal before the Company transmits to the State of Tennessee. Allow additional time if coordination with subsequent submittals is required.

2. State of Tennessee Review: Generally, 30 days. Seller shall verify timeframe required by the State of Tennessee.
3. Submittals shall be in the format as required by the State of Tennessee.

C. Identification and Information:
1. Provide the submittal information as stated in the subcontract documents.

PART 2 - NOT USED

PART 3 - TECHNICAL REQUIREMENTS

3.1 SUBMITTAL PROCEDURES

A. General
1. Coordinate submittal information through the Company's TPO and Procurement representative.
2. Provide the submittal information as stated in the subcontract documents.
3. Identify submittal information with contract number, project title, the Seller's name, and date submitted.
4. Submittals shall be in electronic format with digital bookmarks, where possible, and will be managed using the Seller's electronic submittal program approved by the Company.
5. Items submitted or resubmitted for review will be returned within five business days with one of the following comments:
   a. Approved no comments.
   b. Approved with comments, revise and resubmit.
   c. Approved with comments, resubmittal not required.
   d. Rejected, revised and resubmit
   e. Review not required.

B. Product Data: Collect information into a single submittal for each element of construction and type of product or equipment.
1. Mark each copy of each submittal to show which products and options are applicable.
   a. Options: Identify options requiring selection by the Company.
   b. Deviations: Identify deviations from the Contract Documents on submittals.
2. Include the following information, as applicable:
   a. Manufacturer's catalog cutsheets including dimensional drawings as applicable.
   b. Manufacturer's product specifications.
   c. Standard color charts.
   d. Statement of compliance with specified referenced standards.
   e. Testing by recognized testing agency.
   f. Application of testing agency labels and seals.
   g. Notation of coordination requirements.
   h. Availability and delivery time information.
3. For equipment, include the following in addition to the above, as applicable:
   a. Wiring diagrams showing factory-installed wiring.
   b. Printed performance curves.

c. Operational range diagrams.
d. Clearances required to other construction, if not indicated on accompanying Shop Drawings.

C. Shop Drawings: Prepare Project-specific information, drawn accurately to scale.
1. Preparation: Fully illustrate requirements in the Contract Documents. Include the following information, as applicable:
a. Identification of products.
b. Schedules.
c. Compliance with specified standards.
d. Notation of coordination requirements.
e. Notation of dimensions established by field measurement.
f. Relationship and attachment to adjoining construction clearly indicated.
g. Seal and signature of professional engineer if specified.
2. Sheet Size: Except for templates, patterns, and similar full-size drawings, submit Shop Drawings on sheets at least 8-1/2 by 11 inches but no larger than 30 by 42 inches.

D. Welding Certificates: Prepare written certification that welding procedures and personnel comply with requirements in the Contract Documents. Submit record of Welding Procedure Specification and Procedure Qualification Record on American Welding Society (AWS) forms. Include names of firms and personnel certified.

E. Field Test Reports: Submit reports indicating and interpreting results of field tests performed either during installation of product or after product is installed in its final location, for compliance with requirements in the Contract Documents.

F. Maintenance Data: Comply with requirements specified in Section 01 78 23, Facility Systems Manual.

3.2 DELEGATED-DESIGN, A-E, SERVICES

A. See Section 01 80 00 Design Build Requirements for design submittals.

3.3 SELLER'S REVIEW

A. Review each submittal and check for coordination with other Work of the Contract and for compliance with the Contract Documents before submitting to Company. Note corrections and field dimensions.

B. Project Closeout and Maintenance/Material Submittals: Refer to requirements in Section 01 77 00, Closeout Procedures.

END OF SECTION 01 33 00

SECTION 01 40 00 - QUALITY REQUIREMENTS

PART 1 - PROJECT REQUIREMENTS

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for quality assurance and quality control.

B. Testing and inspecting services are required to verify compliance with requirements specified or indicated. These services do not relieve Seller of responsibility for compliance with the Contract Document requirements.

C. Related Sections:
   1. Divisions 02 through 49 Sections for specific test and inspection requirements.

1.3 DEFINITIONS

A. Field Quality-Control Testing: Tests and inspections that are performed on-site for installation of the Work and for completed Work.

B. Installer/Applicator/Erector: Seller or another entity engaged by Seller as an employee, Subcontractor, or Sub-subcontractor, to perform a particular construction operation, including installation, erection, application, and similar operations.

1.4 CONFLICTING REQUIREMENTS

A. Referenced Standards: If compliance with two or more standards is specified and the standards establish different or conflicting requirements for minimum quantities or quality levels, comply with the most stringent requirement. Refer conflicting requirements that are different, but apparently equal, to Company for a decision before proceeding.

1.5 SUBMITTALS

A. Shop Drawings: Provide plans, sections, and elevations, indicating materials.
   1. Indicate manufacturer and model number of individual components.
   2. Provide axonometric drawings for conditions difficult to illustrate in two dimensions.

B. Qualification Data: For testing agencies specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include proof of qualifications in the form of a recent report on the inspection of the testing agency by a recognized authority.

1.6 REPORTS AND DOCUMENTS

A. Test and Inspection Reports: Prepare and submit certified written reports specified in other Sections. Include the following:
1. Date of issue.
2. Project title and number.
3. Name, address, and telephone number of testing agency.
4. Dates and locations of samples and tests or inspections.
5. Names of individuals making tests and inspections.
6. Description of the Work and test and inspection method.
7. Identification of product and Specification Section.
8. Complete test or inspection data.
9. Test and inspection results and an interpretation of test results.
10. Record of temperature and weather conditions at time of sample taking and testing and inspecting.
11. Comments or professional opinion on whether tested or inspected Work complies with the Contract Document requirements.
12. Name and signature of laboratory inspector.
13. Recommendations on retesting and re-inspecting.

B. Manufacturer's Technical Representative's Field Reports: Prepare written information documenting manufacturer's technical representative's tests and inspections specified in other Sections. Include the following:
1. Name, address, and telephone number of technical representative making report.
2. Statement on condition of substrates and their acceptability for installation of product.
3. Statement that products at Project site comply with requirements.
4. Summary of installation procedures being followed, whether they comply with requirements and, if not, what corrective action was taken.
5. Results of operational and other tests and a statement of whether observed performance complies with requirements.
6. Statement whether conditions, products, and installation will affect warranty.
7. Other required items indicated in individual Specification Sections.

C. Factory-Authorized Service Representative's Reports: Prepare written information documenting manufacturer's factory-authorized service representative's tests and inspections specified in other Sections. Include the following:
1. Name, address, and telephone number of factory-authorized service representative making report.
2. Statement that equipment complies with requirements.
3. Results of operational and other tests and a statement of whether observed performance complies with requirements.
4. Statement whether conditions, products, and installation will affect warranty.
5. Other required items indicated in individual Specification Sections.

1.7 QUALITY ASSURANCE

A. General: Qualifications paragraphs in this article establish the minimum qualification levels required; individual Specification Sections specify additional requirements.

B. Manufacturer Qualifications: A firm experienced in manufacturing products or systems similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

C. Installer Qualifications: A firm or individual experienced in installing, erecting, or assembling work similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance.

D. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of the system, assembly, or product that are similar to those indicated for this Project in material, design, and extent.

E. Specialists: Certain Specification Sections require that specific construction activities shall be performed by entities who are recognized experts in those operations. Specialists shall satisfy qualification requirements indicated and shall be engaged for the activities indicated.
   1. Requirements of authorities having jurisdiction shall supersede requirements for specialists.

1.8 QUALITY CONTROL

A. Seller Responsibilities: Tests and inspections not explicitly assigned to Company are Seller's responsibility. Perform additional quality-control activities required to verify that the Work complies with requirements, whether specified or not.
   1. Notify Company at least 48 hours in advance of time when Work that requires testing or inspecting will be performed, five-days for fire or sprinkler systems.
   2. Provide labor and technical support, annually calibrated (unless more frequent calibration is specified) and properly maintained equipment, and materials required to perform testing. Equipment calibration records shall be submitted upon request.
   3. Perform tests and inspections in a manner that allows observation by the Company.
   4. Submit a copy of tests performed within 48 hours after test completion.

B. Manufacturer's Field Services: Where indicated, engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including service connections. Report results in writing as specified in Division 01 33 00 Section "Submittal Procedures."

C. Retesting/Re-inspecting: Regardless of whether original tests or inspections were Seller's responsibility, provide quality-control services, including retesting and re-inspecting, for construction that replaced Work that failed to comply with the Contract Documents.

D. Coordination: Coordinate sequence of activities to accommodate required quality-assurance and -control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspecting.
   1. Schedule times for tests, inspections, obtaining samples, and similar activities.

PART 2 - NOT USED

PART 3 - TECHNICAL REQUIREMENTS

3.1 TEST AND INSPECTION LOG

A. Prepare a record of tests and inspections. Include the following:
   1. Date test or inspection was conducted.
   2. Description of the Work tested or inspected.
   3. Date test or inspection results were transmitted to Company.
   4. Identification of testing agency or special inspector conducting test or inspection.

3.2 REPAIR AND PROTECTION

A. General: On completion of testing, inspecting, sample taking, and similar services, repair damaged construction and restore substrates and finishes.

B. Protect construction exposed by or for quality-control service activities.

C. Repair and protection are Seller's responsibility, regardless of the assignment of responsibility for quality-control services.

END OF SECTION 01 40 00

SECTION 01 41 00 – REGULATORY REQUIREMENTS - WORK SMART STANDARDS (WSS)

PART 1 - PROJECT REQUIREMENTS

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. WSS reference the latest edition unless otherwise noted.

PART 2 - CODES AND STANDARDS

2.1 WORK SMART STANDARDS

A. Work Smart Standards are listed in the following:
   1. Section 01 41 00.01 Work Smart Standard 1. WSS for Other Industrial, Radiological, and Non-Radiological Hazard Facilities
   2. Section 01 41 00.02 Work Smart Standard 9. WSS - Engineering Design of Standard Industrial, Radiological, Non-Reactor Category 2 & 3 Nuclear, and Accelerator Facilities
   3. Section 01 41 00.03 Work Smart Standard 8. WSS for Construction and Construction-like Activities

END OF SECTION 01 41 00

SECTION 01 41 00.01 –WORK SMART STANDARDS (WSS) GROUP 1

SBMS
ORNL Work Smart Standards

1. Other Industrial, Radiological, and Non-Radiological Hazard Facilities
(Approved 07-25-1996) through Rev/Change 109 (01-29-2020)

Many of the listed directives have embedded (referenced) standards which must be reviewed for applicability. Additionally, applicable SBMS subject areas must be reviewed to ensure all applicable requirements are implemented.

Notes / Implementation Assumptions / Exceptions / Deviations are listed at the end of the WSS list below.

10 CFR 1021, National Environmental Policy Act (NEPA) Implementation Procedures
10 CFR 1022, Compliance with Floodplain/Wetlands Environmental Review Requirements
10 CFR 820, Procedural Rules for DOE Nuclear Activities
10 CFR 830, Subpart A, Quality Assurance Requirements
10 CFR 835, Occupational Radiation Protection
10 CFR 850, Chronic beryllium Disease Prevention Program
10 CFR 851 (with notes), Worker Safety and Health Program
10 CFR 962, By-product Material
18 CFR 1304, Approval of Construction in the Tennessee River System
25 USC 3001 et seq, Native American Graves Protection & Repatriation Act
29 CFR 1977, Discrimination Against Employees Exercising Rights under the Williams-Steiger Occupational Safety & Health Act of 1970
33 CFR 320-323; 328-330, Corps of Engineers Waters Requirements
36 CFR 60, National Register of Historic Places
36 CFR 63, Determination of Eligibility for Inclusion in the National Historic Places
36 CFR 65, National Historic Landmarks Program
36 CFR 78, Waiver of Federal Agency Responsibilities under 110 of NHPA
36 CFR 79, Curation of Federally Owned & Administered Archaeological Collections
36 CFR 800, Protection of Historic & Cultural Properties
39 CFR 111.1, General Information on Postal Service
40 CFR 104-149, Implementing Regulations for Federal Water Pollution Control Act & Safe Drinking Water Act
40 CFR 1500-1508, Council on Environmental Quality
40 CFR 156, Labeling Requirements for Pesticides & Devices
40 CFR 162, State Registration of Pesticide Products
40 CFR 166, Exemption of Federal & State Agencies for Use of Pesticides Under Emergency Conditions
40 CFR 170, Worker Protection Standard
40 CFR 171, Certification of Pesticide Applicators
40 CFR 232, Program Definitions: Exempt Activities Not Requiring 404 Permits
40 CFR 260-280, Federal Hazardous Waste Regulations
40 CFR 302, Designation, Reportable Quantities & Notification
40 CFR 311, Worker Protection
40 CFR 355, Facility Notification & Release Reporting Requirements
40 CFR 370, Hazardous Chemical Inventory Reporting Requirements
40 CFR 372, Toxic Release Reporting Requirements
40 CFR 373, Reporting Hazardous Substance Activity when Selling or Transferring Federal Real Property
40 CFR 50-99, CAA Implementing Regulations
40 CFR 503, Standards for Use/Disposal of Sewage Sludge
40 CFR 720, Premanufacturing Notices
40 CFR 761, PCBs Manufacturing, Processing, Distribution in Commerce and Use Prohibitions
40 CFR 763, Asbestos
41 CFR 102-34, Subpart D (102-34.220 through .250; Subpart E 102.34.255 through .260), Official Use of Government Vehicles

41 CFR 109-38.5102(c), Utilization Controls and Practices
41 CFR 109-6.400-50(h), Instructions to DOE Passenger Carrier Operations
42 CFR 73, Possession, Use, and Transfer of Select Agents and Toxins
42 USC 2011 et seq., Atomic Energy Act of 1954
42 USCA 13101-13109, Pollution Prevention Act
42 USCA 300f to 300j-26, Safe Drinking Water Act
42 USCA 9601-9675, Comprehensive Environmental Response, Compensation & Liability Act
43 CFR 7, Protection of Archaeological Resources
49 CFR 106-199, U.S. Department of Transportation (DOT) Hazardous Materials Regulations
49 CFR 325-399, DOT Federal Motor Carrier Safety Regulations
49 USC 1813 et seq, Hazardous Materials Transportation Act
50 CFR 1-697, Wildlife and Fisheries, as applicable
7 CFR 301, Domestic Quarantine Notices
7 CFR 318, Hawaiian & Territorial Quarantine Notices
7 CFR 319, Foreign Quarantine Notices
7 CFR 330, Subparts A, B, C (§ 100-302), Federal Plant Pest Regulations; General; Plant Pests; Soil, Stone, and Quarry Products; Garbage
7 CFR 331, Agricultural Bioterrorism Protection Act of 2002;
7 CFR 340 , Introduction of Organisms and Products Altered or Produced Through Genetic Engineering Which are Plant Pests or Which There is Reason to Believe are Plant Pests
7 CFR 352, Plant Quarantine Safeguard Regulations
7 USCA 136-136y, Federal Insecticide, Fungicide, & Rodenticide Act
9 CFR 1-3, Animals and Animals Products
9 CFR 121, Possession, Use and Transfer of Biological Agents and Toxins
ANSI/ITSDF B56.6 (2016), Safety Standard for Rough Terrain
Army Regulation (AR 385-63), Policies & Procedures for Firing Ammunition for Training, Target Practice and Combat
ASME A17.1-2010, Safety Code for Elevators and Escalators, with implementation assumptions
ASME A17.3-2017, Safety Code for Existing Elevators and Escalators, with implementation assumptions
ASME B30.9 (2018), Slings (equipment design specification only)
ASME NQA-1-2000, Part II, Subpart 2.7, Quality Assurance Requirements for Nuclear Facility Applications, Subpart 2.7, Quality Assurance Requirements for Computer Software for Nuclear Facility Applications
ASME Standard NQA-1-2000, Part 1, Quality Assurance Requirements for Nuclear Facility Applications (Contract Work Smart Standards for HFIR and Non-reactor Nuclear Facilities only)
ASNT SNT-TC-1A, Qualification of Nondestructive Testing Personnel
AWS B2.1, Specification for Welding Procedure and Performance Qualification
AWS D1.1, Welding Code-Steel
AWS D1.2, Structural Welding Code-Aluminum
AWS D1.3, Structural Welding Code-Sheet Steel
AWS D1.6, Structural Welding Code-Stainless Steel
AWS D9.1, Sheet Metal Welding Code
AWS QC-1, Specification for Qualification and Certification of Welding Inspectors
AWWA D100, Welded Steel Tanks for Water Storage
DOE M 435.1-1, Administrative Change 2, Radioactive Waste Management Manual
DOE O 151.1D, Attachment 1; (with Implementation Assumptions), Comprehensive Emergency Management System
DOE O 153.1, Departmental Radiological Emergency Response Assets; Attachment 2 (with the exception of Sections 3, 4, 5, 7, 11, and 13 which are not applicable)
DOE O 231.1B, Administrative Change 1, Environment, Safety and Health Reporting
DOE O 232.2A, Occurrence Reporting and Processing of Operations Information
DOE O 414.1D, Administrative Change 1, Quality Assurance
DOE O 420.1C, Change 2, Facility Safety; Compliance Line, Implementation Plan submitted to DOE 12/17/2018
DOE O 420.1C, Change 2; Attachment 2, Chapter 1, Facility Safety; Nuclear Safety Design Criteria;
DOE O 420.1C, Change 2; Attachment 2, Chapter II, with Implementation Assumptions, Facility Safety; Fire Protection;
DOE O 420.1C, Change 2; Attachment 2, Chapter IV, with Implementation Assumptions, Facility Safety; Natural Phenomena

4/20/2020 WSS for Other Industrial, Radiological, and Non-Radiological Hazard Facilities

Hazards Mitigation

DOE O 420.1C, Change 2; Attachment 2, Chapter V, Facility Safety; Cognizant System Engineer Program

DOE O 440.2C, Administrative Change 1, Aviation Management and Safety

DOE O 443.1B, Administrative Change 1, Protection of Human Research Subjects

DOE O 456.1A, The Safe Handling of Unbound Engineered Nanoparticles

DOE O 458.1, Administrative Change 3, Radiation Protection of the Public and the Environment

DOE O 460.1D , Hazardous Materials Packaging and Transportation Safety

DOE O 460.2A, Departmental Materials Transportation and Packaging Management

DOE-STD-1090-2011 with exceptions, Hoisting and Rigging

DOE-TEMA Emergency Management Coordination (With Assumptions), Agreement Between the United States Department of Energy and the State of Tennessee for Emergency Management Coordination, Dated November 19, 2019

Executive Order 11988, Floodplain Management

Executive Order 11990, Protection of Wetlands

MUTCD, Manual on Uniform Traffic Control Devices

NBIC, National Board Inspection Code (for existing and new pressure vessels) (The latest edition of the NBIC is to be used (see NBIC Foreword for specific applicability).

Pelletier Letter, Table 1, Surface Activity Guidelines (and footnotes)

Public Law 102-579, WIPP Land Withdrawal Act of 1992, as amended (P.L. 102-579

Tenn Code 1200-01-20, Asbestos Accreditation Requirements

Tenn. Code Ann. 43-8-101 et seq, Tennessee Insecticide, Fungicide & Rodenticide Act

Tenn. Code Ann. 62-21-101 et seq, Tennessee Application of Pesticides Act

Tenn. Code Ann. 65-15-101 et seq, Motor Carriers

Tenn. Code Ann. 68-120-101 et seq, Statewide building construction safety standards

Tenn. Code Ann. 68-14-301 , Hotels, Food Service Establishment & Public Swimming Pool Inspection Act of 1985

Tenn. Code Ann. 68-140-307, Standards for Vehicles and Equipment

Tenn. Code Ann. 68-216-101 et seq, Tennessee Oil Spill Cleanup & Environmental Preservation Act

Tenn. Code Ann. 69-9-201 et seq, Tennessee Boating Safety Act of 1965

Tenn. R. & Reg. 0080-6-14, Pest Control Operators

Tenn. R. & Reg. 0080-6-16, Regulations Governing Use of Restricted Use Pesticides

Tenn. R. & Reg. 0400-11-01, Solid Waste Processing & Disposal

Tenn. R. & Reg. 0400-12-01, Hazardous Waste Management

Tenn. R. & Reg. 0400-18-01, Underground Storage Tank Program

Tenn. R. & Reg. 0400-40, Tennessee Water Quality Regulations

Tenn. R. & Reg. 0400-45-01, Public Water Systems

Tenn. R. & Reg. 0400-48-01, Regulation to Govern Subsurface Sewage Disposal Systems

Tenn. R. & Reg. 1200-12-01, Rules of the Tennessee Department of Health, Bureau of Health Licensure and Regulation, Division of Emergency Medical Services, General Rules

Tenn. R. & Reg. 1200-23-1, Rules Governing Food Service Establishments

Tenn. R. & Reg. 1200-3, Division of Air Pollution Control Regulations

Tenn. R. & Reg. 1340-6-1 (formerly listed as 1220-2-1), Rules and Regulations as to Supervision and Control of Motor Vehicles and Motor Buses

Tenn. R. & Reg. 1660-01-32, Wildlife Resources.

END OF SECTION 01 41 00

SECTION 01 41 00.02 –WORK SMART STANDARDS (WSS) GROUP 8

SBMS
ORNL Work Smart Standards

8. Construction and Construction-like Activities
(Approved 05-07-1997) through Rev/Change 13 (09-28-2018)

Many of the listed directives have embedded (referenced) standards which must be reviewed for applicability. Additionally, applicable SBMS subject areas must be reviewed to ensure all applicable requirements are implemented.

Notes / Implementation Assumptions / Exceptions / Deviations are listed at the end of the WSS list below.

The necessary and sufficient standards set approved for the Other Industrial, Radiological and Non-Radiological Hazard Facilities are approved for use in Construction and Construction-like Activities plus the following additional standards *(Where 1926 is inadequate or silent, appropriate general industrial standards found in 1910, an already accepted standard, will be incorporated)*:

ANSI/SIA A92.2 (1990), American National Standard for Vehicle-Mounted Elevating and Rotating Aerial Devices (equipment design specification only)

DOE O 420.1C, Change 2; Attachment 2, Chapter 1, Facility Safety; Nuclear Safety Design Criteria;

DOE O 425.1D, Administrative Change 1, Verification of Readiness to Start Up or Restart Nuclear Facilities

END OF SECTION 01 41 00.02

SECTION 01 41 00.03 –WORK SMART STANDARDS (WSS) GROUP 9

SBMS
ORNL Work Smart Standards

9. Engineering Design of Standard Industrial, Radiological, Non-Reactor Category 2 and 3 Nuclear, and Accelerator Facilities
(Approved 04-14-1998) through Rev/Change 16 (09-28-2018)

Many of the listed directives have embedded (referenced) standards which must be reviewed for applicability. Additionally, applicable SBMS subject areas must be reviewed to ensure all applicable requirements are implemented.

Notes / Implementation Assumptions / Exceptions / Deviations are listed at the end of the WSS list below.

Engineering design activities for a given ORNL facility will utilize the WSS set for Other Industrial, Radiological, and Non-Radiological Hazard Facilities; the WSS set for Construction and Construction-like Activities; and the WSS for the given facility plus the following additional standards:

Note: This WSS Set applies to new designs, facility modifications, and equipment installations that pertain to facility modifications.

Standard Industrial Facility:

1 CFR 436, Federal Energy Management and Planning Programs. (The hazards that this law addresses are not directly related to ES&H issues but applicable to engineering design.)

23 CFR 625, Design Standard for Highways

23 CFR 655, Traffic Operations

4 CFR 4 3, General Pretreatment Regulations for Existing and New Sources of Pollution. (ORNL at Y-12 only)

ASME N5 9, Nuclear Power Plant Air Cleaning Units and Components, 1989

AWS QC-1, Specification for Qualification and Certification of Welding Inspectors

DOE O 42 1C, Change 2; Attachment 2, Chapter IV, with Implementation Assumptions, Facility Safety: Natural Phenomena Hazards Mitigation

FED-STD-795, Uniform Federal Accessibility Standards

Instrument Society of America (ISA) 5.1, Instrument Society of America (ISA) 5.1, Instrumentation Symbols and Identification, 2 9

Instrument Society of America (ISA) 5.4, Instrument Society of America (ISA) 5.4, Instrument Loop Diagrams, 1991

International Building Code (IBC), 2 12, International Building Code (IBC), 2 12: Exceptions: All Appendices and replace all references to the ICC Electrical Code with the NFPA 7 National Electrical Code, latest edition. (See WSS Set #9, Implementation Assumption #6 for coordination of requirements from DOE Standard 1 2 -2 16.)

International Fire Code (IFC) 2 12 , International Fire Code, 2 12: Exception: Appendix A – Board of Appeals. Include Appendix B through I as reference only.

International Fuel Gas (IFG) Code, 2 12 , International Fuel Gas (IFG) Code, 2 12 – Exception: Appendix A. Include Appendix B through I as reference only.

International Mechanical Code (IMC), 2 12 , International Mechanical Code (IMC), 2 12 Exceptions: All Appendices

International Plumbing Code (IPC), 2 12, International Plumbing Code, 2 12 – Exception: Appendix A. Include Appendix B through G as reference only.

National Association of Corrosion Engineers (NACE) RPO 169-92, Control of External Corrosion on Underground or Submerged Piping Systems

Public Law 1 1-336, Americans with Disabilities Act (ADA)

Note: International Building Codes (I-Codes) 2012 WSS Report, Attachments C and D, includes additional information to describe applicability of the I-Codes and how the Chapter 1 (Administration) sections of the specific codes are applied at ORNL: WSS Building Codes Report. The implementing matrices in Attachment D will also be made available in the Standards Based Management System (SBMS) Engineering Management System Subject Area for Design.

END OF SECTION 01 41 00.03

SECTION 01 42 16 – DEFINITIONS

PART 1 - PROJECT REQUIREMENTS

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

PART 2 - CODES AND STANDARDS

2.1 DEFINITIONS

A. Architect-Engineer (A-E): An Architect-Engineering firm(s) that is currently licensed in the state of Tennessee and normally engages in architectural and engineering design work.

B. Contract Documents, Certified for Construction (CFC): Contract documents issued, signed and professionally stamped by the A-E.

C. Atlas Sheets –Drawings depicting utilities and subsurface interferences exterior to ORNL Buildings. The contents and accuracy of these drawings must be verified in the field.

D. Company: UT Battelle, LLC.
   1. The Company is the Code Authority and the Authority Having Jurisdiction.

E. Seller: Construction contractor responsible for building the project in accordance with the contract documents.

F. Work Smart Standards (WSS): Codes/Standards required as part of the UT Battelle contract with DOE.

PART 3 - NOT USED

END OF SECTION 01 42 16

SECTION 01 50 00 - TEMPORARY FACILITIES AND SITE CONTROLS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this section.

1.2 SUMMARY

A. This section provides the requirements for temporary utilities, control of the project area, change facilities, and dust control.

1.3 REFERENCES

A. American National Standards Institute (ANSI) A225.1, 1987, Manufactured Home Installation.

B. The ANSI/National Fire Protection Association (NFPA) 70 Current Edition, National Electrical Code (NEC).

C. The NFPA 501A, Current Edition, Manufactured Home Installation, Sites, and Communities.

D. The ANSI D 6.1, “Manual on Uniform Traffic Control Devices for Streets and Highways.”

PART 2 - PRODUCTS

2.1 MATERIALS

A. Barrier Fence: 48” high, orange plastic barrier fence, Vallen Safety Catalog No. FNC-450.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Temporary utilities.
   1. Provide temporary lines to use existing plant utilities. Tie-Ins and disconnects to existing systems will be performed by the Company. Provide material and equipment, in place and ready for tie-in. Remove temporary utilities after final disconnect.

2. Electric power is available at the work site.
   a. The Company will provide utility pole and transformer from nearest available service location.
   b. It is the responsibility of the Seller to provide all labor, equipment and material for service from transformer to project site and temporary facilities.
   c. Provide Ground Fault Circuit Interrupters (GFCIs) for temporary electrical lines.
   d. Perform temporary electrical work in accordance with ANSI/NFPA 70 NEC requirements.
   e. Provide Company the following temporary power requirements
      1) The circuit types, voltage, phase, circuit size, etc. that are required by the subcontractor to perform the work.
      2) The power requirements for any subcontractor provided prefabricated power distribution assembly/skid requiring service from F&O.
      3) Information that the subcontractor prefabricated power distribution assemblies and skids are UL 1640 listed.
   f. Provide appropriate access upon request to Company representatives for the purposes of inspection, testing and maintenance of temporary power system installations.
   g. Provide access to testing records for the contractor's assured grounding conductor program.
3. Water is available at the work site. Install reduced-pressure backflow preventers for all temporary water lines. Sanitization of all water lines shall be performed by the subcontractor and verified by the Company prior to placing into service. If temporary water service is used for potable water, subcontractor shall test/verify water quality at all service points prior to use.
4. Telephone service is available through Tyto Athene. The Seller is responsible for providing their telephone service.
5. Provide chemical toilet facilities at the site location. Maintain the toilets in a clean, safe, and sanitary condition for duration of the project.

B. Protection of the work area.
1. Provide and maintain an orange plastic barrier fence around the perimeter of the work site and storage areas with delineated entrances and exits, appropriate signage identifying the hazards of the work area, and the appropriate PPE required to enter the work area.
2. Provide additional flagging, signage and barricades inside the job site to delineate storage areas and hazardous work areas.
3. Post project signs providing the Seller's name, 24-hour telephone number(s), project title and contract number at the project site and for storage areas not located within the work site.
4. Comply with Company generated documentation that establishes the responsibility for the maintenance and protection of the work area and related utility systems and equipment during construction and/or demolition activities.
5. Participate in routine work area protection reviews.

C. Traffic and pedestrian control.
1. At the construction kick-off meeting, provide a schedule of plant roads needed to be closed to perform work.

2. A traffic control plan shall be developed to identify required road closures and potential impediments to emergency vehicle traffic. The plan shall be approved by the Company before implementation.
3. Provide and maintain sufficient traffic control signs and barriers, and when closing lanes on all affected streets.
4. Provide structurally sound temporary crossing walkways for pedestrian traffic over open excavations.
5. Provide and maintain pedestrian walkways and building access during the project.
6. Provide an adequate number of concrete barricades in front of open trenches adjacent to vehicle traffic.

D. Trailer facility.
1. Locate the trailer a minimum of 40’ clear of existing buildings. Coordinate location with the Company construction field representative (CFR).
2. Provide a platform, stairs, and handrails at each exterior door. Platforms shall be level with the trailer floor. Platforms and steps shall have a non-skid surface.
3. Anchor and support the trailer to prevent sliding and overturning according to ANSI A225.1 and NFPA 501A.
4. Outside the trailer, provide a sign containing the Company’s name, and the name and phone number of supervisor. Provide a listing of phone numbers to reach a responsible individual at all times including off-shift and weekend hours.

E. Borrow Materials: If required, are the responsibility of the Seller.

F. Dust control
1. Control dust emissions during work. Prevent dust from migrating to areas adjacent to the work site. Limit use of water to prevent erosion. Provide hoods, enclosures, and other methods of containment during sandblasting or similar operations.

END OF SECTION 01 50 00

SECTION 01 55 00 – ENVIRONMENTAL PROTECTION

PART 1 - GENERAL

1.1 ADDITIVE ALTERNATE 1

A. If this additive alternate is awarded, additional requirements are provided in yellow highlighted text within the Section.

1.2 RELATED DOCUMENTS

A. Specification Section 010100, General Work Requirements.

B. Specification Section 011100, Safety and Health.

C. Specification Section 011500, Radiological Protection.

D. Specification Section 015000, Temporary Facilities and Site Controls.

E. Specifications Section 017419, Demolition Waste Management and Disposal.

1.3 ATTACHMENTS

A. Attachment 1, Oak Ridge National Laboratory (ORNL) Environmental Management System (EMS) Awareness Training for Construction and Service Contractors.

B. Attachment 2, ORNL Project-Specific Site Wide Prevention Pollution Plan (SWPPP) Template. Provided at Pre-Construction Meeting (EPA SWPPP Template was the basis for this SWPPP).

C. Attachment 3, Managing Construction Waste Waters.

1.4 REFERENCES

A. Environmental Protection Agency (EPA) 40 Code of Federal Regulations (CFR) 260 – 280 and Tennessee (TN) Rule 0400-12-01.

B. The EPA, Designation, Reportable Quantities and Notification, 40 CFR 302.

C. The EPA, National Emission Standards, Hazardous Air Pollutants, 40 CFR 61 & 40 CFR 63; and TN Rules 1200-3-8, Fugitive Dust, and 1200-3-11, Asbestos.

D. Solid Waste Processing and Disposal, TN Rule 0400-11-01.

E. EPA Protection of Stratospheric Ozone, 40 CFR 82.

1.5 DEFINITIONS

A. Environmental protection: the prevention/control of pollution and habitat disruption that may occur to the environment during construction. The control of environmental pollution and damage requires consideration of land, water, and air; biological and cultural resources; and includes management of visual aesthetics; noise, solid, chemical, gaseous, and liquid waste; radiant energy and radioactive material as well as other pollutants.

B. Resource Conservation and Recovery Act (RCRA) hazardous waste: any discarded material that is not excluded by 40 CFR Part 261.4(a) and that is listed in 40 CFR Subpart D or exhibits any of the characteristics identified in 40 CFR 261 Subpart C.

C. Respiratory hazard wastes: fiberglass with loose fibers, mineral wools, slag wools, rock wools, and other manmade mineral fiber material.

D. Sanitary waste: waste generated by offices, cafeteria, medical facilities and laboratories, and includes textile products (personal protective equipment [PPE], coveralls, cotton items, carpet, etc.).

E. Special waste: wastes that are either difficult or dangerous to manage such as friable or non-friable asbestos, empty aerosol or paint containers, petroleum contaminated soil, etc.

1.6 TRAINING

A. All on-site personnel performing work activities with potential to negatively impact the environment shall be provided with environmental awareness training in accordance with requirements of the ORNL EMS. The attached electronic file (Attachment 1) represents the minimum level of EMS Awareness Training to be provided to construction and subcontract workers. The training shall be provided by the Seller as part of the initial employee site orientation and Environment, Safety and Health (ES&H) briefing.

B. The Sellers, their subcontractors and all employees who use hazardous materials and may generate or handle a hazardous waste, must provide evidence of having received RCRA Hazardous Waste Awareness Training and annual refresher training as required by 40 CFR 265.16 and 262.34 prior to starting any work involving these items.

1.7 SUBMITTALS

A. Submit the name of the individual that will be the Tennessee Department of Environment and Conservation (TDEC) Level 1 Erosion Prevention & Sediment Control (EP&SC) inspector. Must be submitted and Company approved prior to the start of work.

B. Submit three copies of the Seller signed SWPPP for this project. Include Tennessee Department of Environment and Conservation (TDEC) Level 1 Erosion Prevention &

Sediment Control (EP&SC) inspector certification documentation. Must have original seller signatures in blue ink. Must be submitted prior to the start of work.

C. Submit the original signed SWPPP, complete with any revisions, addendums, TDEC inspection forms, and supplemental information at project completion.

D. Submit for approval, a list of non-storm water/waste water streams that are anticipated to be generated and the treatment and disposal methods for each stream. This must be approved by the Company prior to the start of work.

E. Submit the following information for Ozone Depleting Substances removed for each unit/appliance that contains these substances in 5 lbs or greater within 1 week of removal activities:

1. Location of the unit
2. Equipment ID
3. Date of recovery of refrigerant (i.e., removed from appliance)
4. Type of refrigerant removed
5. Quantity of refrigerant removed
6. Quantity and type of refrigerant reused or sent for recycle/reclamation
7. Person to whom recovered refrigerant transferred to and the date of transfer
8. Vacuum achieved when refrigerant removed
9. Certification by contractor that refrigerant was removed before disposal of unit/appliance

1.8 REQUIREMENTS TO COMPLY WITH APPLICABLE LAWS AND REGULATIONS

A. The Seller shall provide written proof of registration, licensing, insurance, or other requirements upon request. It is the Seller's responsibility to ascertain and comply with all applicable federal, state, local and multi-jurisdictional laws, ordinances, and regulations pertaining to the registration, licensing, handling, transportation, packaging, management, processing, resale and disposal of these materials under this contract. These federal, state, and local laws include but are not limited to the Clean Air Act; the Toxic Substances Control Act; the Atomic Energy Act; the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA); the Hazardous Materials Transportation Regulations; the Federal Motor Carrier Safety Regulations; the Tennessee Motor Vehicle Laws Annotated; the Emergency Planning and Community Right-to-Know Act, 40 CFR 279; and TDEC Rule Chapter 0400-12-01-.11.

PART 2 - ENVIRONMENTAL PROTECTION

2.1 PERMITS

A. Conduct all work so as to comply with applicable permits and regulatory requirements. The Company will identify the applicable permits and other regulatory requirements.

B. The installation of the new discharge outfall to the tributary to White Oak Creek will be required to follow all requirements of the Tennessee General Aquatic Resource Alteration Permit (ARAP) titled, General Permit for Construction of Intake and Outfall Structures. This ARAP can be found at this link: https://www.tn.gov/environment/permit-permits/water-permits1/aquatic-resource-alteration-permit--arap-/permit-water-aquatic-resource-alteration-list-of-general-permits.html .

C. Conduct all work in accordance with the Tennessee General Permit No. TNR10-0000, "Storm water Discharges from Construction Activities" (hereafter referred to as the General Permit). A copy of the Notice of Coverage will be provided by the Company.

2.2 GENERAL REQUIREMENTS

A. Placement of fuel or oil storage tanks on-site is not allowed. Fluids needed for construction equipment shall be provided by off-site delivery trucks, as needed.

B. The Seller shall minimize environmental pollution and damage that may occur as the result of demolition, renovation and/or any other construction operations.

C. The Seller shall address environmental issues, potential negative impacts, and appropriate control measures in the Hazards Analysis (per Specification 011100) and discuss these topics during site orientation and pre-job briefings.

D. Conduct all work that generates waste requiring disposal so as to comply with waste acceptance criteria of the disposal facility, in a manner that avoids negative impacts to operational or compliance status of the disposal facility.

E. The Seller's personnel shall be cognizant of all aspects of environmental protection applicable to the Seller's work activities, including, but not limited to storm water pollution prevention and control, spill prevention and control, erosion and sediment control, fugitive dust and air emission control, and waste management requirements.

F. Pollution prevention and waste minimization principles shall be incorporated in abatement and demolition activities to ensure the greatest environmental benefits and minimize future liability for the waste that is generated.

G. Comply with all requirements of Section 017419, Demolition Waste Management and Disposal, including but not limited to the implementation of work planning and work practices to facilitate, where feasible, the recycle and/or salvage of at least 50% of non-hazardous construction and demolition debris.

2.3 SPILL PREVENTION

A. Petroleum products stored in quantities greater than or equal to 55 gallons shall be appropriately labeled and have secondary containment capable of preventing any release to a drainage system or the environment. Secondary containment shall be configured so as to capture leaks and spills from both dispensing equipment and/or container(s).

Containers 55 gallons or greater that store oil or Hazardous Substances (40 CFR 116 and 40 CFR 302) must comply with the requirements in the ORNL Spill Prevention Control and Countermeasures (SPCC) Plan.

B. Prior to mobilization to the site, perform an inspection of equipment containing liquid systems including, but not limited to, bulldozers, backhoes, bobcats, drill rigs, trucks, hoists, and cranes, to ensure no leaks exist. Verify hoses, tubing, and hydraulic lines are in good operating condition. Make all necessary repairs before delivery of equipment or vehicles to the construction site.

C. Perform daily inspections to ensure continued good operating condition of equipment and promptly repair all deficiencies. The Seller shall maintain documentation of inspections and provide to the Company upon request.

D. Use due caution when operating oil-bearing equipment near aquatic resources. Where necessary, implement appropriate control measures, including but not limited to the use of physical barriers (plastic or tarps, berms, etc.) and/or absorbent materials to prevent leaks or spills from entering waterways.

E. Use due caution when refueling vehicles or equipment, transferring fuels or other liquids to or from containers; have spill kit on hand for immediate cleanup as necessary. Avoid performing such transfer of fuels near streams or storm water inlets.

2.4 SPILL CONTROL AND CLEAN-UP

A. When on-site, all personnel shall report spills of any hazardous substance and chemical/radiological releases. The Laboratory Shift Superintendent's (LSS) Office should be called for any spill or other emergency at 574-6606. Specially trained spill response teams clean up all types of spills at ORNL, including oil, hazardous substances, and hazardous waste and are available on shift 24 hours per day, 365 days per year. All spill response personnel have had, at a minimum the initial 24-hour Hazardous Waste Operations (HAZWOPER) Training. The Company will provide initial response; the Seller shall be responsible for all cleanup costs after initial response for activities caused by the Seller.

B. The person discovering a spill should give the following information to the LSS:
1. Type of spill if known (oil, gasoline, acid, base, etc.).
2. Estimated volume of the spilled material.
3. Location of the spill.
4. Extent of the spill.
5. Observer's location and telephone number.

C. For outside work, provide a spill kit, inspect equipment for leaks, and repair leaking equipment in a timely manner.

D. For inside work, provide a spill kit, prevent spills to floor drains and do not discharge waste into any ORNL systems without the Company approval.

2.5 STORM WATER POLLUTION PREVENTION AND CONTROL

A. Conduct all work activities and maintain site conditions in accordance with the approved "Project-Specific SWPPP" (Attachment 2).

B. Do not allow liquids, including but not limited to, gasoline, diesel fuel, lubricating oil, or antifreeze to enter the storm sewer systems, waterways, drainage ditches, or the ground.

C. Be aware of storm drain inlets and utilize appropriate control methods and or devices, and cover or contain debris stored outside. Seal interior drains, roof drains, and nearby area drains prior to demolition activities.

D. Tanks, drums, other containers, pumps and other dispensing units, and any secondary containment structures shall be located indoors, or under a canopy, or otherwise sheltered from contact with storm water in an appropriate and effective manner.

E. Store all materials indoors or otherwise protected from weather.

F. For outdoor painting operations, minimize overspray, and use tarps/vacuums/enclosures to contain sandblasting waste and paint chips from paint removal operations.

G. Flushing empty concrete trucks or dumping excess concrete is prohibited. Transport excess concrete back to the batch plant. The truck chute may be washed onsite at a location to be designated by the Company or collected and disposed as approved by the Company. Solidified cement waste from truck chute cleaning is solid waste and shall be cleaned up, and transported to Oak Ridge Reservation (ORR) landfill.

H. Prevent contamination of storm water by appropriate and effective control methods, such as daily removal of debris to the extent practicable, covering spoil material and debris piles from demolition or other activities, and otherwise diverting storm water from contact with same. Implement other effective controls to detain and filter or collect and treat waste waters generated by storm water contact with radiological or chemical contaminants. Controls shall be sized to handle the 25 year, 24 hour storm event.

I. Minimize the use of deicing compounds and other chemical surface treatments; application should be performed at the minimum effective rates.

J. Maintain a 60' minimum buffer zone from streams, be aware of storm drain inlets, and cover or contain debris stored outside.

K. The 90-day accumulation areas shall strictly adhere to requirements provided in Section 017419, "Demolition Waste Management and Disposal".

2.6 MANAGING WASTE WATER

A. Manage all waste waters in compliance with Attachment 3, "Managing Construction Waste Waters".

B. Water used to suppress dust during concrete cutting, demolition, or other activities shall not be discharged directly to storm drains, sanitary sewer, etc. Positive controls shall be used to protect drains from unfiltered discharges of this type. Water generated by demolition activities and decontamination that include Class 1 asbestos containing material (ACM) will require filtration to 10 microns or less for asbestos fibers. This also applies to water from showers provided for asbestos workers. A variance is required for disposal of this wastewater (refer to Attachment 3).

C. Unless otherwise directed by the Company, all chlorinated or treated water shall be discharged through a treatment/detention basin and monitored for chlorine levels, other contaminants when applicable, and standard water quality indicators. The treatment/detention basin may consist of a field-constructed structure or portable tank per the Seller's approved water management plan.

D. The Seller shall establish a hold point for the Company inspection of the Seller installed water diversion and collection system prior to initiation of demolition activities with the potential for release.

E. Storm water accumulated in demolition areas, chlorinated rinse water, and chlorinated water used to sterilize/flush pipelines shall not be directly discharged, or otherwise allowed to enter the storm systems, waterways, or drainage ditches without written approval from the Company.

F. Notify the Company at least one week prior to any activities that will generate waste water. The Seller's water management plan identifying the source and composition of the waste water, and describing the control methods to be used for management and disposal shall be approved prior to generating the water. Notify the Company prior to any discharge of water, waste water or other liquid material at least 24 hours in advance, then again immediately prior to initiating discharge.

2.7 EROSION AND SEDIMENT CONTROL

A. Appropriate temporary sediment controls will be in place prior to initiation of site clearing activities. Observe site conditions and inspect sediment controls at least twice weekly, and document the inspections using the "Construction Storm Water Inspection Certification (Twice-weekly Inspections)" Form at http://tnepsc.org/ (CGP drop down menu at this home page). A Level I E&SC inspector is required to complete these inspections, as noted in the instructions on the inspection form.

B. Appropriate effort will be made to avoid and/or mitigate damage to trees and shrubs adjacent to work activities. When it is deemed necessary to prune or remove branches from a tree or shrub (or when other damage occurs), the limb shall be cut off clean with chainsaw or other suitable device, and the wound dressed with an appropriate coating to mitigate future damage from insects or fungi.

C. Manage excavated soil and spoil material in a manner protective of the environment. Cover stockpiled material to prevent erosion and/or install appropriate sediment controls.

Use due caution during excavation or any other soil management in the vicinity of sanitary or storm systems, waterways, or drainage ditches.

D. All erosion prevention measures and sediment controls shall comply with the Tennessee Erosion and Sediment Control Handbook (latest edition).

2.8 FUGITIVE DUST AND AIR EMISSION CONTROL

A. Equipment operation, activities, or processes performed by the Seller shall be in accordance with all federal, state, and local air pollution standards.

B. Asbestos debris shall be kept adequately wet in accordance with 40 CFR 61.

C. Use water mist, temporary enclosures, and other suitable methods to limit spread of dust and dirt.

D. Burning will not be allowed on the project.

E. Manage all equipment containing ozone-depleting substances (e.g. refrigerants) in accordance with the requirements of 40 CFR 82.

PART 3 - WASTE MANAGEMENT

3.1 WASTE MANAGEMENT REQUIREMENTS

A. The Seller shall comply with all waste management instructions provided by the Company, including but not limited to written specifications, drawing notes, waste management plans, policy or procedures, verbal instructions and waste accumulation area postings.

B. Substantive requirements for waste management planning and execution, landfill requirements, salvage and recycling goals and methods are provided within Section 017419, “Demolition Waste Management and Disposal”.

END OF SECTION

SECTION 01 55 00.01 ATTACHMENT 1

ORNL ENVIRONMENTAL MANAGEMENT SYSTEM AWARENESS TRAINING FOR CONSTRUCTION AND SERVICE SUBCONTRACTORS

I. POLLUTION

Water Pollution:
Release of pollutants directly into surface waters, or indirectly via storm water runoff, fuels, oil, chlorine, & other chemical products, uncured cement, erosion & sedimentation, etc.

Fish kills, impairment of water quality and aquatic habitat

Land Pollution:
Windblown litter from job sites and/or moving open bed trucks, improper management of chemical products and hazardous wastes

Air Pollution:
Fugitive dust from site grading, sandblasting, demolition, etc.

Many construction activities have potential to pollute the environment:

Refueling operations	Site clearing, grading and excavation
Spills & leaking equipment	Demolition & other dust-producing activities
Material handling & storage	Concrete finishing, cutting, concrete pumper and/or delivery chute flush out
Paint & coatings applications	Water line disinfection and flushing

II. CONSEQUENCES

Fines and penalties	Suspension of permits
Cost and schedule impacts	Work stoppage
Abatement measures	Corrective actions
Loss of eligibility to participate in future projects	Potential negative impacts to funding for future projects

III. PREVENTION

The ORNL Environmental Management System:

Applies to everyone whose work has the potential to impact the environment.

Requires that all workers be made aware of potential environmental consequences associated with their work activities, and use appropriate control measures.

Requires notification of Construction Field Representative (CFR) and LSS in response to spills and other environmental incidents or unusual conditions.

Environmental Requirements are communicated to Subcontractors:
To managers and supervisors through technical specifications, plans & drawings, electronic postings, correspondence, etc.

To individual workers, during site orientations and Hazard Analysis (HA) review, at ES&H briefings, and whenever assigning specific tasks that could result in a negative environmental impact.

Environmental Expectations:

Construction and Service Subcontractors are expected to:

- Plan, bid, and conduct work in accordance with specifications
- Communicate & enforce requirements with employees and with lower tier subcontractors.

Workers are expected to:

- Understand and comply with environmental requirements,
- Report unusual conditions and/or environmental incidents, and
  Consult supervision with any environmental concerns, questions, or observations

END OF SECTION 01 55 00.01

Storm Water Pollution Prevention Plan (SWPPP)

For Construction Activities At:

Project Name
Oak Ridge, Tennessee 37830

SWPPP Prepared For:

U. S. Department of Energy
Oak Ridge National Laboratory
Oak Ridge, TN 37830

SWPPP Prepared By:

Company Name, Preparer, Title, Company Address and Phone

SWPPP Preparation Date:

_____

Estimated Project Dates:

Project Start Date: _____
Project Completion Date: _____

Instructions for using this template: Blue font, blanks, or check boxes indicate sample text or information that is project-specific and should be provided by the preparer. Black font indicates standard text that must be included in the SWPPP. For questions, please contact T. North at 574-8918.

Contents

SECTION 1: CONTACT INFORMATION/RESPONSIBLE PARTIES

1.1 Primary Contractor(s) & Primary Construction Contractor(s)

Primary Contractor (referred to as "Company"):

UT-Battelle, LLC
Name, Project Manager
P. O. Box 2008
Oak Ridge, TN 37831
(865) 999-9999
emailname@ornl.gov

Primary Construction Contractor (referred to as "Seller"):

Seller Company Name
Contact Name
Address
(865) 999-9999

Emergency 24-Hour Contact:

Oak Ridge National Laboratory
Laboratory Shift Superintendent's Office
(865) 576-4LSS (4577)

Seller Company Name
Contact
(865) 999-9999

1.2 Storm Water Team

SWPPP Preparer:
Name, P.E. - *Title*
Company
Phone: (865) 999-9999
E-mail:

Primary Contractor Representative:
Todd North, P.E. – Clean Water Act Compliance Specialist
UT-Battelle, LLC
P. O. Box 2008
Oak Ridge, TN 37831

(865) 574-8918
E-mail: northta@ornl.gov

Primary Construction Contractor Representative:
Name of Company Contact and phone number

SECTION 2: SITE EVALUATION, ASSESSMENT, AND PLANNING

There is an existing Construction General Permit Tracking number for this project, since the project will be permitted under the existing NPDES permit coverage for the Spallation Neutron Source (SNS) Facility. The tracking number is TNR139975. Current versions of this SWPPP, NOI, and the NOC will be kept on-site for the duration of the project. These items will be available for the use of operators and site personnel involved with erosion and sediment controls, and will be available to TDEC personnel visiting the site. A notice will be posted near the construction entrance containing a copy of the NOC with the tracking number assigned by the EFO, the name, company name, telephone number, and address of the project site owner or a local contact person for the development, and a brief description of the project. *(This paragraph is applicable to work at SNS and should be retained for those applicable projects)*.

It is the intent and goal of the TN CGP (copy provided in Appendix A) and this SWPPP that storm water discharge from the property described in this document causes no objectionable color contrast to the water body that receives it. The construction activity will be carried out in such a manner as to prevent discharge that would cause a condition in which visible solids, bottom deposits, or turbidity impairs the usefulness of the waters on the property or downstream of the property for fish and aquatic life, livestock watering and wildlife, recreation, irrigation, navigation, or industrial or domestic water supply. Should any discoloration occur prior to effluent leaving the site the contractor is advised to use a polyacrylamide in the influent waters just upstream of the sediment basin/pond.

This plan may be amended for reasons described herein, or for other reasons. As per 3.5.8.2(f) of the TN CGP, the SWPPP must be updated within 7 days and revisions implemented within 14 days after the need for modification is identified. *The construction erosion & sediment controls drawings will be maintained to reflect current erosion & sediment controls installed in the field. Assessment of the accuracy of the erosion & sediment controls drawings to field conditions will be completed every 2 weeks.* A log to documents the amendments will be maintained and provided in Appendix B.

This site-specific SWPPP and the "Construction Site Storm Water Control and Pollution Prevention Plan - Comprehensive Plan for All Site, Land Improvements and Utilities Construction Activities" (referred to as the General SWPPP for the SNS area). are used to comply with the TN CGP. This site specific SWPPP has been prepared to satisfy the requirements of the General SWPPP for the SNS area.

The installation of erosion prevention and sediment controls (EP&SC) will be supervised by a TDEC Level 1 EP&SC certified person. A copy of this certification is provided in Appendix C.

2.1 Project/Site Information

Project Name and Address

Oak Ridge, Tennessee 37830
Roane County

This project site is located within an area that does not have published survey data. The Roane County Soils Maps produced by the United States Department of Agriculture Natural Resources Conservation Service has this area labeled as "AREA NOT SURVEYED – U.S. DEPARTMENT OF ENERGY (OAK RIDGE AREA)". The soil groups of the nearest surveyed soil to the project site (approximately 3 miles to the south-west) indicate Hydrologic Soil Groups (HSG) of B and C in this region. We estimate an HSG of B for pre-developed conditions and an HSG of C for post-construction conditions. The Runoff Curve Number (CN) for the pre-

developed conditions is estimated to be 69 for open space (lawns, parks, etc.) – Fair condition; grass cover 50% to 75%. The Runoff CN for the post-construction conditions is estimated to be 98 for impervious areas – paved parking lots, roofs, driveways, streets and roads.

Project Latitude/Longitude

Latitude: (degrees, minutes, seconds)

Longitude: (degrees, minutes, seconds)

Method for determining latitude/longitude:

☐ USGS topographic map (specify scale): ☐ EPA Web site ☐ GPS

Horizontal Reference Datum:

☐ NAD 27 ☐ NAD 83 or WGS 84 ☐ Unknown ☐ ORNL Grid

If you used a U.S.G.S topographic map, what was the scale? _____

Permit Information

Are there any additional permits applicable to this project which may impose additional requirements during construction? ☐ Yes ☐ No

If yes, check the applicable permits:

U.S. Army Corps of Engineers (USACE) Nationwide Permit (wetlands, streams, etc.)
☐ Yes ☐ No

TN Aquatic Resource Alteration Permit ☐ Yes ☐ No

TN Underground Injection Control (septic tanks, improvements to sink holes, etc.)
☐ Yes ☐ No

Additional Project Information

2.2 Discharge Information

Are there any surface waters that are located within 60 feet of your construction disturbances?

☐ Yes ☐ No

Table 1 – Names of Receiving Waters *(The following Tables have been filled out for projects that are located within the WOC drainage area, which is anticipated to be applicable for the majority of future construction projects at ORNL. For other receiving waters, please check with T. North at 574-8918)*

Name(s) of the first surface water that receives storm water directly from your site and/or from the MS4 (note: multiple rows provided where your site has more than one point of discharge that flows to different surface waters)
1. Whiteoak Creek
2.
3.
4.
5.
6.

Table 2 – Impaired Waters / TMDLs (Answer the following for each surface water listed in Table 1 above)

	Is this surface water listed as "impaired"?	If you answered yes, then answer the following:			
		What pollutant(s) are causing the impairment?	Has a TMDL been completed?	Title of the TMDL document	Pollutant(s) for which there is a TMDL
1.	☒ YES ☐ NO	**Cesium, Strontium**	☐ YES ☒ NO		
2.	☒ YES ☐ NO	**Biointegrity loss due to undetermined cause**	☐ YES ☒ NO	**EPA to develop TMDL in future**	
3.	☐ YES ☐ NO		☐ YES ☐ NO		
4.	☐ YES ☐ NO		☐ YES ☐ NO		
5.	☐ YES ☐ NO		☐ YES ☐ NO		
6.	☐ YES ☐ NO		☐ YES ☐ NO		

Describe the method(s) you used to determine whether or not your project/site discharges to an impaired water:

Research through the Tennessee Department of Environment and Conservation resources and documentation. The receiving water for the storm water runoff from this site is Whiteoak Creek. The construction site is about XX stream miles from the Clinch River. The Lower Clinch River watershed has two approved TMDLs, one for pathogens and one for siltation and habitat alteration. Whiteoak Creek is a tributary to the Lower Clinch River. Neither Whiteoak Creek nor the reach of the Clinch River to which Whiteoak Creek discharges are identified in either of the TMDL's as a sub watershed that is impaired by those pollutants, and are therefore not targeted in the TMDLs for pollutant reductions. There is also an approved TMDL for PCBs and Chlordane for the Watts Bar Reservoir, including the Roane County portion of the reservoir which includes the Lower Clinch River. The TMDL surmises that the primary source of PCBs and chlordane in the Watts Bar Reservoir is existing sediments in the river channel. Construction activities are not identified as sources of PCBs or chlordane and are not targeted in the TMDL for pollutant reductions. Therefore, this project is

eligible for coverage under the general permit. Controls outlined in this SWPPP were selected to ensure that neither Whiteoak Creek, nor the Clinch River will be adversely impacted by this proposed development.

Table 3 – Tier 2, 2.5, or 3 Waters (Answer the following for each surface water listed in Table 1 above)

	Is this surface water designated as a Tier 2, Tier 2.5, or Tier 3 water?	If you answered yes, specify which Tier (2, 2.5, or 3) the surface water is designated as?
1.	☐ YES ☒ NO	
2.	☐ YES ☐ NO	
3.	☐ YES ☐ NO	
4.	☐ YES ☐ NO	
5.	☐ YES ☐ NO	
6.	☐ YES ☐ NO	

2.3 Nature of the Construction Activity

General Description of Project

The project at the Chestnut Ridge Maintenance Shop will include the removal of the existing gravel parking, the removal of a portion of the existing paved parking lot, the construction of a new maintenance shop, and the installation of associated sidewalks and pavement.

Size of Construction Project

SIZE OF PROPERTY: X.X acres
TOTAL AREA OF CONSTRUCTION DISTURBANCES: X.X acres
MAXIMUM AREA TO BE DISTURBED AT ANY ONE TIME: X.X acres

Construction Support Activities *(only provide if applicable)*

Construction support activities for this project (e.g., equipment staging yards, material storage areas, excavated material disposal areas, borrow areas) will be maintained and operated off-site. The current locations designated for staging and laydown areas are currently gravel pads and no new disturbance of these areas is expected during construction. If ground disturbance does take place in these areas during construction, the contractor shall follow the same guidelines as those for the site activities.

2.4 Sequence and Estimated Dates of Construction Activities

Phase I
Initial BMP's
- Provide month/yr (if applicable)and list activity

Phase II
Site Grading
- Provide month/yr (if applicable) and list activity

Phase III
Storm Utility Installation
- Same as above

Phase IV
Stabilize Pervious and Paved Areas
- Same as above

Phase V
Complete Construction
- Start Phase V Date and end Phase V Date
- Date: Remove all erosion control measures listed in Phases I-IV.

2.5 Allowable Non-Storm Water Discharges

List of Allowable Non-Storm Water Discharges Present at the Site

Type of Allowable Non-Storm Water Discharge	**Likely to be Present at Your Site?**
Waters used to wash vehicles and equipment	☐ YES ☐ NO
Water used to control dust	☐ YES ☐ NO
Potable water including uncontaminated water line flushings	☐ YES ☐ NO
Routine external building wash down	☐ YES ☐ NO
Uncontaminated, non-turbid discharges of ground water or spring water	☐ YES ☐ NO
Foundation or footing drains	☐ YES ☐ NO
Construction dewatering water	☐ YES ☐ NO

If "yes", refer to requirements provided in Appendix D.

2.6 Site Map

See Appendix E

SECTION 3: DOCUMENTATION OF COMPLIANCE WITH OTHER FEDERAL REQUIREMENTS

3.1 Endangered Species Protection, Wetlands, Flood Plains, Etc.

Are any of the following applicable to this project:

Any endangered species (flora, animals, etc.) ☐ Yes ☐ No

Indiana Bat Roosting Trees ☐ Yes ☐ No

Project within the 100-yr or 500-yr flood plain boundaries ☐ Yes ☐ No

Wetlands present on-site or adjacent to the project boundaries ☐ Yes ☐ No

3.2 Safe Drinking Water Act Underground Injection Control Requirements

Do you plan to install any of the following controls? Check all that apply below.

☐ Infiltration trenches (if storm water is directed to any bored, drilled, driven shaft or dug hole that is deeper than its widest surface dimension, or has a subsurface fluid distribution system)

☐ Commercially manufactured pre-cast or pre-built proprietary subsurface detention vaults, chambers, or other devices designed to capture and infiltrate storm water flow

☐ Drywells, seepage pits, or improved sinkholes (if storm water is directed to any bored, drilled, driven shaft or dug hole that is deeper than its widest surface dimension, or has a subsurface fluid distribution system)

If yes, explain:

SECTION 4: EROSION AND SEDIMENT CONTROLS

The erosion and sediment control best management practices identified in this SWPPP and as shown on the construction plans will be installed in accordance with the Tennessee Erosion and Sediment Control Handbook, latest revision.

Prior to tree removal, clearing, and grubbing, forestry BMP's should be employed to prevent water quality impacts, and in addition, the contractor is responsible for promptly adding additional controls if forestry BMPs prove inadequate.

4.1 Natural Buffers or Equivalent Sediment Controls *(The sections that follow should be considered for each project, but this section should be modified as applicable)*

Buffer Compliance Alternatives

Are there any surface waters within 60 feet of your project's earth disturbances? ☐ YES ☐ NO

Check the compliance alternative that you have chosen:

- ☐ I will provide and maintain a 60-foot undisturbed natural buffer.
- ☐ I will provide and maintain an undisturbed natural buffer that is less than 60 feet (but not less than an average of 30 ft with no disturbance within 15 ft) and is supplemented by additional erosion and sediment controls, which in combination achieves the sediment load reduction equivalent to a 60-foot undisturbed natural buffer.
- ☐ It is infeasible to provide and maintain an undisturbed natural buffer of any size, therefore I will implement erosion and sediment controls that achieve the sediment load reduction equivalent to a 60-foot undisturbed natural buffer.
- ☐ I qualify for a buffer zone exemption based on existing uses of the property, as described in Paragraph 4.1.2.1 of the TN CGP.

Buffer Exceptions

Which of the following exceptions to the buffer requirements applies to your site?

- ☐ There is no discharge of storm water to the surface water that is located 59 feet from my construction disturbances.
- ☐ No natural buffer exists due to preexisting development disturbances that occurred prior to the initiation of planning for this project.
- ☐ For a "linear project" (defined in Appendix A), site constraints (e.g., limited right-of-way) make it infeasible for me to meet any of the CGP Part 2.1.2.1.a compliance alternatives.
- ☐ Buffer disturbances are authorized under a CWA Section 404 permit or a Tennessee Department of Environment and Conservation (TDEC) Aquatic Resources Alteration Permit (ARAP).

4.2 Perimeter Controls

General

- Appropriate erosion and sediment control structures will be installed in accordance with the Erosion and Sediment Control Plan prior to any land disturbance beginning. Silt fencing shall be installed and properly maintained during all grading activities until final stabilization is established on the site.

Specific Perimeter Controls

Perimeter Control # 1

Perimeter Control Description

- A silt fence will be installed at downgradient locations around the perimeter of the construction site according to the engineering plans.
- Reference the construction drawings for locations and details of perimeter controls.

Installation

- The silt fence will be installed in *Date* in Phase I of construction.

Maintenance Requirements

- Accumulated sediment will be removed from silt fence when it has reached one-third the height of the fence.
- Silt fences will be inspected for depth of sediment, tears, security of attachment to the fence posts, and to see that the fence post are firmly in the ground and upright.
- Reference TDEC standard BMP's requirements for installed erosion prevention and sediment control devices.

4.3 Sediment Track-Out

General

- Before any construction begins, a construction entrance will be installed as shown on the engineering plans for ingress and egress.

Specific Track-Out Controls

Track-Out Control # 1

Track-Out Control Description

- A construction entrance for ingress and egress will be installed in accordance with the engineering plans.
- Reference design drawings for locations and details of construction entrance.

Installation

- The construction entrance will be installed in *Date* in Phase I of construction.

Maintenance Requirements

- A construction entrance shall be used to remove mud and other debris from the wheels of

construction vehicles. If necessary, a separate vehicle wash down station may be necessary in order to minimize the amount of mud and debris carried into the main roadway system (ensure compliance with applicable procedures in Appendix D). Regular removal of material tracked onto streets is required.

- Where sediment has been tracked-out from your site onto the surface of off-site streets, other paved areas, and sidewalks, you must remove the deposited sediment by the end of the same work day in which the track-out occurs or by the end of the next work day if track-out occurs on a non-work day. You must remove the track-out by sweeping, shoveling, or vacuuming these surfaces, or by using other similarly effective means of sediment removal. You are prohibited from hosing or sweeping tracked-out sediment into any storm water conveyance (unless it is connected to a sediment basin, sediment trap, or similarly effective control), storm drain inlet, or surface water.

4.4 Stockpiled Sediment or Soil

General

- Diversion ditches and berms will be constructed as necessary to divert runoff from the active construction area, and to prevent off-site run-off from draining into the construction area.

Specific Stockpile Controls

Stockpile Control # 1

Stockpiled Sediment/Soil Control Description

- Diversion ditches shall be directed to grassy areas whenever possible.
- Stockpiles should be covered with plastic (anchored appropriately) to prevent mobilization of sediment during rain events. If this approach is not practical and as approved by the Company, sediment controls, such as silt fence and erosion waddles/eels, may be used around the stockpile.
- Disturbed portions of the site where construction activity temporarily ceases will be stabilized with temporary seed and mulch no later than 15 days from the last construction activity in that area.
    - Follow specification Section 32 92 19 – Seeding for temporary seeding information.

Installation

- Diversion ditches and berms shall be installed in *Date* as part of Phase ? construction.

Maintenance Requirements

- Do not hose down or sweep soil or sediment accumulated on pavement or other impervious surfaces into any storm water conveyance (unless connected to a sediment basin, sediment trap, or similarly effective control), storm drain inlet, or surface water.

4.5 Minimize Dust

General

Specific Dust Controls

Dust Control # 1
Dust Control Description

- Contractor shall provide required water to the site to keep airborne dust to a minimum. This can be achieved by spraying the site with a tanker truck or utilizing a washed gravel pad over disturbed areas.

- Follow specification Section 32 92 19 – Seeding for permanent & temporary seeding information.

Installation
- Reference design drawings and specifications for installation requirements.

Maintenance Requirements
- Disturbed portions of the site where construction activities permanently cease will be stabilized with permanent seed no later than 15 days after the last construction activity.

4.6 Minimize the Disturbance of Steep Slopes

General
- Steep slopes are defined as slopes of 3H:1V or greater slope.
- Disturbance of areas with steep slopes will be kept to a minimum. Additional controls will be installed as required to ensure stabilization of these areas.

Specific Steep Slope Controls

Steep Slope Control # 1
Steep Slope Control Description
- Erosion control matting will be used on steep slopes as necessary to ensure sufficient stabilization.
- Areas of the site which are to be paved will be temporary stabilized by applying stone sub-base until bituminous pavement can be applied.
- Reference design drawings and specifications for construction on or adjacent steep slopes.

Installation
- Steep slope stabilization will occur in Phase ?.

Maintenance Requirements
- Once the steep slope areas have reached final grade, matting, topsoil and final seeding shall be applied as stated in the construction documents. Temporary matting shall be placed on all unfinished slopes and monitored and maintained in working order until final stabilization is applied.

4.7 Topsoil

General
- Topsoil shall be stripped and stockpiled in accordance with TDEC's requirements and the construction drawings.

Specific Topsoil Controls

Topsoil Control # 1
Topsoil Control Description
- Topsoil will be removed from the work areas and stockpiled on-site. Stockpile requirements within Section 4.4 will be followed.
- Clearing and grubbing will be kept to a minimum necessary to accomplish the grade work within the particular work area.
- The contractor is encouraged to clear the site in phases to minimize exposed areas.
- The contractor shall leave the existing vegetation in place until a maximum of 10 days prior to grading activities.
- For areas of the site that are to receive permanent vegetation, a minimum of 4-inches of topsoil will be placed prior to applying seed and mulch.

Installation
- Reference construction drawings and specifications for the installation requirements.

Maintenance Requirements
- Reference the stockpile maintenance requirements for the temporary treatment of topsoil while construction activities are ongoing.

4.8 Soil Compaction

General
- All areas of the site are to be compacted properly to allow for the construction of the proposed building and parking areas.

Specific Soil Compaction Controls

Soil Compaction Control # 1
Soil Compaction Control Description
- Soils shall be properly compacted in accordance with the construction drawings and the specifications.

Installation
- Site compaction will take place during Phase?of the project.

Maintenance Requirements
- Once final grade has been achieved, the final ground treatment (building, parking, landscaping, etc.) shall be installed to ensure proper compaction is maintained.

4.9 Storm Drain Inlets

General
- The contractor will use a combination of temporary storm drain inlets, structural drainage covers, and filter fabric inserts with stone filtration to minimize the volume of sediment reaching the ORNL storm water drainage system.

Specific Storm Drain Inlet Controls

Storm Drain Inlet Control # 1

Storm Drain Inlet Control Description
- Pre-manufactured storm drainage structure inserts such as Flexstorm or equivalent.
- Reference construction documents and specifications for details.

Installation
- Drainage structure inlets will be installed as follows:
  - Phase I for existing inlets, and
  - Phase III for newly installed inlets.

Maintenance Requirements
- Clean, or remove and replace, the protection measures as sediment accumulates, the filter becomes clogged, and/or performance is compromised. Where there is evidence of sediment accumulation adjacent the inlet protection measure, you must remove the deposited sediment

by the end of the same work day in which it is found or by the end of the following work day if removal by the same work day is not feasible.
- Structures will be maintained per the manufacturer's requirements.

Storm Drain Inlet Control # 2

Storm Drain Inlet Control Description
- Pre-manufactured storm drainage structure covers such as Silt Saver or equivalent.
- Reference construction documents and specifications for details.

Installation
- Drainage structure inlets will be installed in Phase ? of construction.

Maintenance Requirements
- Clean, or remove and replace, the protection measures as sediment accumulates, the filter becomes clogged, and/or performance is compromised. Where there is evidence of sediment accumulation adjacent the inlet protection measure, you must remove the deposited sediment by the end of the same work day in which it is found or by the end of the following work day if removal by the same work day is not feasible.
- Structures will be maintained per the manufacturer's requirements.

Storm Drain Inlet Control # 3

Storm Drain Inlet Control Description
- At-grade inlet protection will consist of filter fabric installed into existing structures with a layer of stone placed over the structure.
- Reference construction documents and specifications for details.

Installation
- Drainage structure inlets will be installed in Phase ? of construction.

Maintenance Requirements
- Clean, or remove and replace, the protection measures as sediment accumulates, the filter becomes clogged, and/or performance is compromised. Where there is evidence of sediment accumulation adjacent the inlet protection measure, you must remove the deposited sediment by the end of the same work day in which it is found or by the end of the following work day if removal by the same work day is not feasible.
- Structures will be maintained per the manufacturer's requirements.

4.10 Constructed Storm Water Conveyance Channels

General
- Swales and drainage channels will be installed on the site to transport storm water into the proposed storm structures and into the existing storm water system.

Specific Conveyance Channel Controls

Storm Water Conveyance Channel Control # 1
Storm Water Conveyance Channel Control Description

- Drainage swales are to be installed on the site to convey the storm water runoff. The swales will have a permanent erosion control matting liner. Temporary rock check dams will also be installed to assist in preventing the transport of sediment to the downstream system.
- Reference construction documents and details for specifications of drainage swales.

Installation

- The temporary rock check dams will be installed while grading activities are ongoing. Once site grading is stabilized, the permanent matting for the drainage swale will be installed.

Maintenance Requirements

- Drainage swales and temporary rock check dams will be maintained as siltation accumulates. These will be reviewed by the on-site representative.

4.11 Sediment Basins

Not applicable.

4.12 Chemical Treatment

Not applicable.

4.13 Dewatering Practices

Requirements in Appendix D will be followed.

4.14 Other Storm Water Control

General

- Not applicable for this project.

Specific Storm Water Control Practices

- Not applicable for this project.

4.15 Site Stabilization

Site Stabilization Practice (only use this if you are <u>not</u> located in an arid, semi-arid, or drought-stricken area)
☐ *Vegetative* ☐ *Non-Vegetative*
☐ *Temporary* ☐ *Permanent*

Description of Practice

- All areas of the site not receiving a permanent hard surface [e.g., building, washed-gravel (without fines present), concrete] shall be permanently covered with grass, shrubs, or other landscaping.
- Permanent landscaping shall be of such good quality to prevent erosion of the topsoil and other soil capable of downstream sedimentation.
- Grass areas shall be as directed within the construction documents (see drawings, details and specifications).

Installation

- Site stabilization will occur in *Phase IV* of construction. These activities are to begin approximately *Date*.
- Final stabilization will occur as the final construction of the building and site are complete in *Date*.

Maintenance Requirements

- Maintenance of site stabilization will consist of general maintenance for lawn care to ensure the health of the landscaping.

Final Stabilization

- Final stabilization shall meet the more stringent of the following:
    1. As defined in the TN Construction General Permit (CGP), Section 10 – Definitions, or
    2. An "acceptable stand of grass" as in specification Section 32 92 19 – Seeding, Paragraph 3.2(E)(4).

SECTION 5: POLLUTION PREVENTION BMPs

5.1 Potential Sources of Pollution

Construction Site Pollutants

Describe pollutants anticipated for this project. Make sure to include any unique conditions/materials that may result in pollutants that are not described in Sections 5.2 through 5.6.

Pollutant-Generating Activity	**Pollutants or Pollutant Constituents** (that could be discharged if exposed to storm water)	**Location on Site** (or reference SWPPP site map where this is shown)
Grading activities	Sediment	All areas
Concrete pouring	Concrete wash water	All areas
Fuel contamination	Hydrocarbons	All areas

5.2 Spill Prevention and Response

Materials and equipment necessary for spill cleanup will be kept in the material storage area on-site. Equipment and materials may include, but will not be limited to brooms, dust pans, mops, rages, gloves, goggles, kitty litter, sand, sawdust, and plastic and metal trash containers specifically for this purpose.

If a release containing a hazardous substance or petroleum/oil product occurs, the contractor will immediately notify the ORNL Laboratory Shift Superintendent's Office at 576-4LSS (4577) and the appropriate Company Representative. In the event that a release occurs, the contractor will prepare a revision of this document to identify measures to prevent the reoccurrence of such releases and how to clean-up the spill if there is another one. A description of the spill, what caused it, and the clean-up measures will also be included.

5.3 Fueling and Maintenance of Equipment or Vehicles

General

- Petroleum products stored in quantities greater than or equal to 55 gallons shall be appropriately labeled and have secondary containment capable of preventing any release to a drainage system or the environment. Secondary containment shall be configured so as to capture leaks and spills from both dispensing equipment and/or container(s). Containers 55-gallons or greater that store oil or CERCLA Hazardous Substances (40 CFR 302) must comply with the requirements in the ORNL Spill Prevention Control and Countermeasures (SPCC) plan.
- Placement of fuel or oil storage tanks on-site is not allowed. Fluids needed for construction equipment shall be provided by off-site delivery trucks, as needed.
- Fueling of equipment and vehicles on-site will be conducted near the construction entrance/staging area, but a sufficient distance away from the existing storm drain in this area. A spill cover/mat shall be placed over this storm drain inlet whenever equipment is fueled.
- A spill kit shall be readily available during equipment fueling operations.
- Spills will be removed immediately. Contaminated soils will be placed on heavy plastic and covered or placed into approved containers to prevent contact with storm water. Fuel tanks will be located within a designated area. Oils, other vehicle fluids, paints, and solvents will be stored in the construction trailer or other covered structure. Any spills will be reported to a Company Representative.

5.4 Washing of Equipment and Vehicles

General

- Construction runoff related to equipment washing, rinsing or other maintenance shall not be done on the site unless proper control measures are taken. Approval of the Company of the proposed control measures and location will be obtained.

Specific Pollution Prevention Practices

Pollution Prevention Practice # 1
Description

- Concrete trucks will not be allowed to wash out or discharge surplus concrete or drum wash water on the site unless appropriate provisions are provided. Requirements are listed in Appendix D.

Installation

- Contractor to verify the location of all temporary controls as required by construction activities.

Maintenance Requirements

- Maintenance of standard controls will be required is used for maintenance activities other than those intended for the device. Contractor to ensure that these controls are always in working order.

5.5 Storage, Handling, and Disposal of Construction Products, Materials, and Wastes *(The sections that follow should be considered for each project, but this section should be modified as applicable)*

5.5.1 Building Products

General

- Building product will be covered or enclosed to prevent rainfall or runoff from contacting these materials.

Specific Pollution Prevention Practices

Pollution Prevention Practice

Description

- Storm water control devices, described in Sections 4.9 and 4.10 of this SWPPP, will provide protection of downstream storm water systems for solid-phase building products.

Installation

- Reference Sections 4.9 and 4.10 for information.

Maintenance Requirements

- Reference Sections 4.9 and 4.10 for information.

5.5.2 Pesticides, Herbicides, Insecticides and Fertilizers

General

- Storage of these chemicals will be in enclosed containers to prevent rainfall or runoff from contacting these materials.
- Contractor to prevent contact of chemicals for landscaping and pest control from entering the storm system.

Specific Pollution Prevention Practices

Pollution Prevention Practice

Description

- Chemicals applied to the site for landscaping and pest control will be applied only in the minimum amounts recommended by the manufacturer or as otherwise specified. Once applied, fertilizer will be worked into the soil to limit exposure to storm water. Store fertilizer and other chemicals in covered shed or other protective enclosure. The contents of used bags of fertilizer and other chemicals will be transferred to a sealable plastic bin to avoid spills.

Installation

- Chemical controls will be installed during Phase II of construction. Chemicals will be applied according to manufacturer's recommendations, taking into consideration the required drying time.

5.5.3 Diesel Fuel, Oil, Hydraulic Fluids, Other Petroleum Products, and Other Chemicals

General

- Storage of these chemicals will be in enclosed containers to prevent rainfall or runoff from contacting these materials.
- Petroleum products will be stored in tightly sealed containers, which are clearly labeled.
- Asphalt substances used on-site will be applied according to the manufacturer's recommendations.
- Waste materials will be properly disposed of according to the manufacturer's instructions and in conformance with applicable local, state, and federal regulations.

5.5.4 Hazardous or Toxic Waste

General

- Hazardous and toxic products will be stored in tightly sealed containers, which are clearly labeled.
- Hazardous and toxic products used on-site will be applied according to the manufacturer's recommendations.
- Hazardous and toxic waste materials will be properly disposed of according to the manufacturer's instructions and in conformance with applicable local, state, and federal regulations.

5.5.5 Construction and Domestic Waste

General

- Each contractor is responsible to provide litter control for trash generated by their crew.

Specific Pollution Prevention Practices

Pollution Prevention Practice # 1

Description

- A dumpster or other appropriate securely lidded container for garbage will be located near the construction trailer and is limited to garbage and paper trash only.

Installation

- Container and receptacles are to be installed as part of Phase I by the contractor.

Maintenance Requirements

- Contractor to maintain a clean work site with available containers for site waste.

5.5.6 Sanitary Waste

General

- Contractor to make on site provisions for workers to have on-site potable bathroom facilities.

Specific Pollution Prevention Practices

Pollution Prevention Practice # 1

Description

- Contractor to locate portable bathrooms on the site as required by the project's general conditions. Location of these bathrooms will not be near storm drain inlets.

Installation

- Portable facilities to be located on site during Phase I of construction.

Maintenance Requirements

- Contractor to coordinate with supplier for on-site maintenance of facilities and disposal of wastes.

5.6 Washing of Applicators and Containers used for Paint or Other Materials

General

- Paint wash waters shall be contained and properly disposed off-site.
- Construction runoff related to equipment washing, rinsing or other maintenance shall not be done on the site unless proper control measures are taken.

Pollution Prevention Practice # 1

Description

- Concrete trucks will not be allowed to wash out or discharge surplus concrete or drum wash water on the site unless appropriate provisions are provided.
- Reference Appendix D for requirements.

Installation

- Contractor to verify the location of all temporary controls as required by construction activities.

Maintenance Requirements

- Maintenance of standard controls will be required is used for maintenance activities other than those intended for the device. Contractor to ensure that these controls are always in working order.

SECTION 6: INSPECTIONS

6.1 Inspection Personnel and Procedures

Personnel Responsible for Inspections

- Seller to submit names of on-site inspectors to the Company prior to construction.
- All personnel conducting inspections must have the TDEC Level 1 Erosion Prevention & Sediment Control Certification. This certification is also required for the person that will supervise installation of erosion and sediment controls.

Inspections

- Disturbed areas that have not been finally stabilized, areas used for storage of materials exposed to precipitation, structural control measures, locations where vehicles enter and exit the site, and all points of outfall will be inspected in anticipation of a storm event, at least twice per week (at least 72 hours apart).
- A construction entrance shall be used to remove mud and other debris from the wheels of construction vehicles. If necessary, a separate vehicle wash down station may be necessary in order to minimize the amount of mud and debris carried into the main roadway system. Regular removal of material tracked onto streets is required.
- Control structures will be maintained in good working order; if a repair is necessary, it will be initiated within 7 days of discovery and/or prior to the next rain event if possible.
- Built up sediment will be removed from silt fence when it has reached one-third the height of the fence.
- Silt fences will be inspected for depth of sediment, tears, security of attachment to the fence posts, and to see that the fence posts are firmly in the ground and upright.
- Temporary and permanent seeding will be checked for bare spots, washouts, and healthy growth and reseeding shall occur as necessary.

Inspection Report Forms

- Reference Appendix F for Inspection Reports.

6.2 Delegation of Authority

Company Duly Authorized Representative(s) or Position(s):

UT-Battelle, LLC
Todd North
Clean Water Act Compliance Specialist
P. O. Box 2008
Oak Ridge, TN 37831
(865) 574-8918

Delegation of authority letter is provided in Appendix G.

Seller Duly Authorized Representative(s) or Position(s):

Company Name
Contact Name and Title
Address and Phone No.

Delegation of authority letter is provided in Appendix G.

SECTION 7: CERTIFICATION

Primary Contractor: **UT-Battelle, LLC**

I certify under penalty of law that I have reviewed this document, any attachments, and the SWPPP referenced above. Based on my inquiry of the construction site owner/developer identified above, and/or my inquiry of the person directly responsible for assembling this NOI and SWPPP, I believe the information submitted is accurate. I am aware that this NOI, if approved, makes the above-described construction activity subject to NPDES permit number TNR100000, and that certain of my activities on-site are thereby regulated. I am aware that there are significant penalties, including the possibility of fine and imprisonment for knowing violations and for failure to comply with these permit requirements.

Signed: _____ Date: _____
J. E. Powell, Director ES&H

Primary Construction Contractor:
_____

I certify under penalty of law that I have reviewed this document, any attachments, and the SWPPP referenced above. Based on my inquiry of the construction site owner/developer identified above, and/or my inquiry of the person directly responsible for assembling this NOI and SWPPP, I believe the information submitted is accurate. I am aware that this NOI, if approved, makes the above-described construction activity subject to NPDES permit number TNR100000, and that certain of my activities on-site are thereby regulated. I am aware that there are significant penalties, including the possibility of fine and imprisonment for knowing violations and for failure to comply with these permit requirements.

Signed: _____ Date: _____

Name and Title: _____

SWPPP APPENDICES

Attach the following documentation to the SWPPP:

Appendix A – Copy of TN Construction General Permit (CGP)

Appendix B – SWPPP Amendment Log

Appendix C – TDEC Level 1 Certifications

Appendix D – Managing Construction Waste Waters

Appendix E – Site Maps

Appendix F – Inspection Forms

Appendix G – Delegation of Authority

Appendix A – TN CGP

Refer to: http://tennessee.gov/environment/wpc/stormh2o/TNR100000.pdf

Appendix B – SWPPP Amendment Log

No.	Description of the Amendment	Date of Amendment	Amendment Prepared by [Name(s) and Title]

Appendix C – TDEC Level 1 Certifications

Appendix D – *Managing Construction Waste Waters*

Managing Construction Waste Waters

For the purposes of these guidelines, when a construction process utilizes water from any source, water that is not used up in the process (or lost by evaporation) should be considered to be waste water.

Typical construction waste waters include those listed below, although particular circumstances and/or site specific conditions may alter the nature of these waste waters, or result in the generation of non-typical waste waters not addressed under these guidelines. When project planners determine that non-typical wastewaters may be generated or discover that they have been, consultation with an Environmental Compliance Representative should take place as soon as practicable.

Mechanical construction activities:

Pipeline draining, flushing, disinfection, hydrostatic testing

Civil construction activities:

Removing accumulated storm water from trenches & other excavations or structures

Flushing concrete truck chute and/or cleaning associated tools and equipment

Water from high pressure washing and/or hosing down surfaces

Demolition activities:

Asbestos worker shower facilities & tool decontamination

Concrete cutting systems (blade coolant/dust suppression water)

General dust suppression water

Work Activity	**Waste water description - potential contaminants**	**Method(s) of disposal**	**Applicable procedure or permit(s)**
Mechanical Construction			
Draining non-waste water piping systems	Rust preventative, algaecide, Chlorine (2 ppm or less), other chemical products, and:	Accumulate, characterize, and dispose of as liquid hazardous waste when appropriate	SBMS, EM Subject Area: Hazardous and Mixed Waste Management
		Sewage Treatment Plant (STP) or Process Waste Treatment Complex (PWTC)	Variance required SBMS, EM Subject Area: Wastewater, Managing
	(waters exhibiting high temperature shall not be allowed to enter storm drains or surface water)	or discharge to upland area in a manner that prevents erosion (when deemed acceptable)	General Permit for Storm Water Discharges from Construction Activities (TNR10-0000), Project Storm Water Pollution Prevention Plan
	(waters exhibiting high temperature shall not be allowed to enter storm drains or surface water)	or, if chlorine is known to be the only contaminant, discharge to storm drain system	Field verification of successful de-chlorination is required, ORNL Site Wide NPDES Permit (TN0002941)

Notes: Rust preventative & algaecide are considered non-hazardous at typical concentrations utilized in cooling water and other closed loop systems. Negative impacts to aquatic resources are possible, however, and care shall be taken to prevent release to surface waters. Chlorine is typically absent from existing systems other than potable or process water (i.e. chilled water, etc)

Work Activity	**Waste water description - potential contaminants**	**Method(s) of disposal**	**Applicable procedure or permit(s)**
Mechanical Construction			
Flush non-waste water piping systems	Chlorine (2 ppm or less), nominal sediment, scale, etc.	STP or PWTC	Variance required SBMS, EM Subject Area: Wastewater, Managing
		Or discharge to upland areas in a manner that prevents erosion – chemical treatment of discharge to remove chlorine – filtration as necessary to remove sediment/scale	General Permit for Storm Water Discharges from Construction Activities (TNR10-0000), Project Storm Water Pollution Prevention Plan
		or, if chlorine is known to be the only contaminant, discharge to storm drain system	Field verification of successful de-chlorination is required, ORNL Site Wide NPDES Permit (TN0002941)

Notes:

Work Activity	**Waste water description - potential contaminants**	**Method(s) of disposal**	**Applicable procedure or permit(s)**
Mechanical Construction			
Hydrostatic testing	Chlorine (2 ppm or less)	STP or PWTC	Variance required SBMS, EM Subject Area: Wastewater, Managing
		or discharge to upland areas in a manner that prevents erosion – chemical treatment of discharge to remove chlorine	
		or, if chlorine is known to be the only contaminant, discharge to storm drain system	Field verification of successful de-chlorination is required, ORNL Site Wide NPDES Permit (TN0002941)

Notes:

Work Activity	**Waste water description - potential contaminants**	**Method(s) of disposal**	**Applicable procedure or permit(s)**
Mechanical Construction			
Disinfect piping systems	Chlorine (50 – 200+ ppm)	Discharge to STP, PWTC (Collection and pre-treatment may be required)	Variance required SBMS, EM Subject Area: Wastewater, Managing
		or to treatment basin via suitable and effective de-chlorination system – monitor discharge and basin overflow for chlorine, pH, temperature, turbidity, etc. and halt or modify operations as needed	Field verification of successful de-chlorination is required, ORNL Site Wide NPDES Permit (TN0002941)

Notes: Heavily chlorinated water is extremely toxic to aquatic systems; exceptional care shall be taken to prevent release of untreated or insufficiently treated water to the environment. Overflow from treatment basin shall be released onto a suitable upland area (or storm drain system, if necessary) only after verification of acceptable de-chlorination and other water quality parameters

Work Activity	**Waste water description - potential contaminants**	**Method(s) of disposal**	**Applicable procedure or permit(s)**
Civil Construction			
De-watering excavations	Sediment, suspended solids, chemical or radiological contaminants (previously existing or due to construction activities)	Filtration, discharge to STP or PWTC	Variance required SBMS, EM Subject Areas: Wastewater, Managing; Hazardous & Mixed Waste Management; Managing PCB Waste
		Or, Filtration and discharge to vegetated upland areas taking care to ensure that pump intake does not agitate water within the excavation, discharging to upland areas through filtration and in a manner that prevents erosion	By approval of Construction Field Representative and/or Environmental Protection General Permit for Storm Water Discharges from Construction Activities (TNR10-0000), Project Storm Water Pollution Prevention Plan

Notes: Excavations associated with construction or maintenance of potable water lines or other liquid-carrying pipelines may present with chlorine or other potential contaminants which must be addressed on a case by case basis. The presence of regulated contaminants in excavation water or adjacent soils requires investigation by EP Staff prior to disposition.

Work Activity	**Waste water description - potential contaminants**	**Method(s) of disposal**	**Applicable procedure or permit(s)**
Civil Construction			
Flushing concrete truck chute/cleaning tools	Moderate alkalinity, Chlorine (2 ppm or less), suspended solids	Discharge to STP, PWTC,	Variance required SBMS, EM Subject Area: Wastewater, Managing.
		or upland areas, followed up by removal of cured concrete residues cement-contaminated water shall not be released into storm drains or surface water, or runoff otherwise allowed beyond the construction site boundaries	By approval of Construction Field Representative and/or Environmental Protection
Pressure washing surfaces	Chlorine (2 ppm or less), suspended solids	Discharge to STP	Variance required SBMS, EM Subject Area: Wastewater, Managing.
		or upland areas, collect/filter prior to entering aquatic features	(TNR10-0000), Project SWPPP
Notes: No detergent or other cleaning agent allowed where runoff may reach aquatic features! Chlorine typically absent from tank-stored water and/or lost during use due to agitation, exposure to sunlight and wind. Prevent contamination of storm water runoff or other surface water sources due to contact with uncured cement and/or other suspended solids			

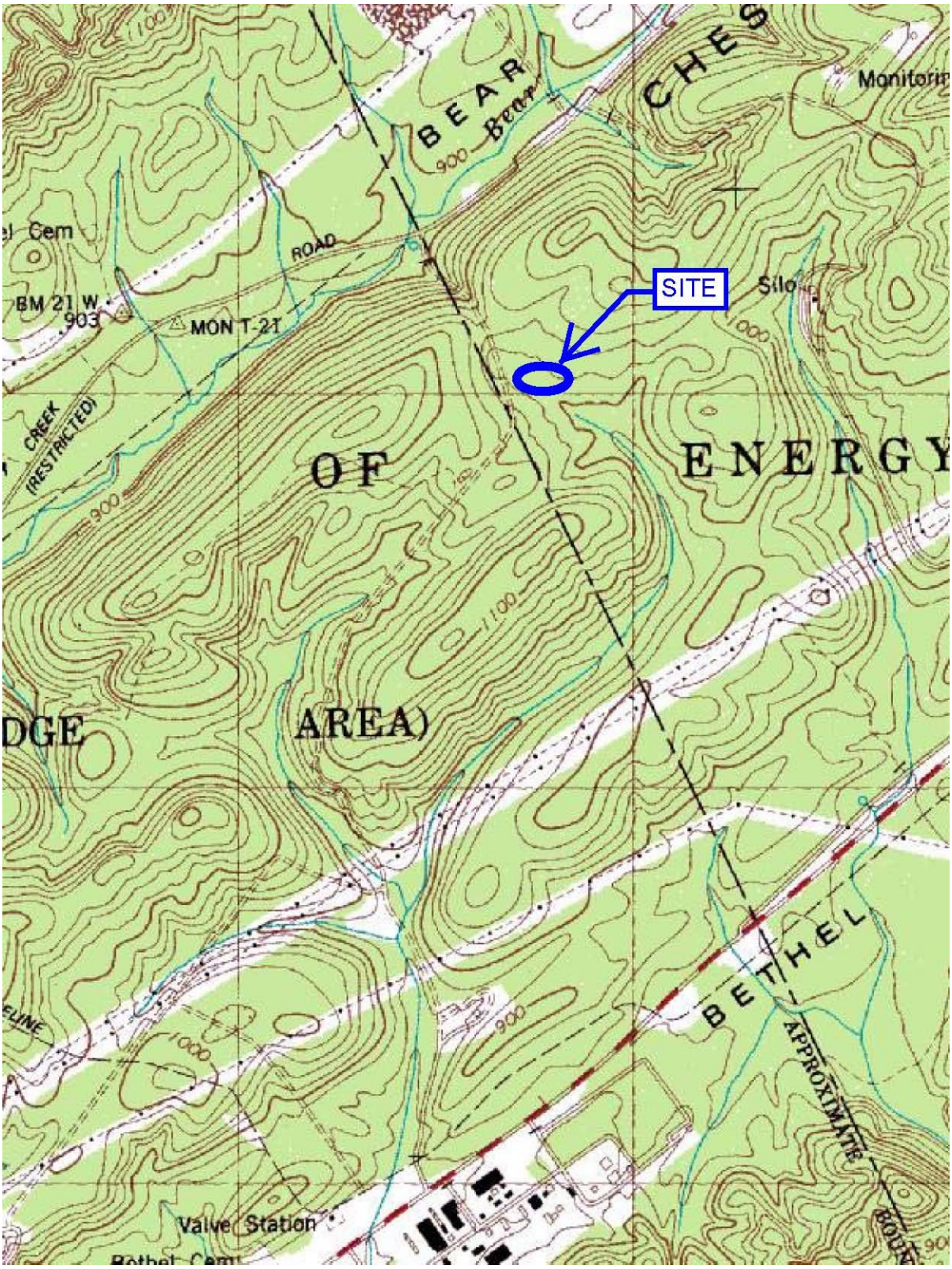
Work Activity	**Waste water description - potential contaminants**	**Method(s) of disposal**	**Applicable procedure or permit(s)**
Demolition			
Asbestos worker showers & tool decontamination	Asbestos, Chlorine (2 ppm or less)	HEPA filtered (10 micron or better) & discharged to STP.	Variance required SBMS, EM Subject Area: Wastewater, Managing.

Notes: Discharge permitted under NESHAP when HEPA filtered and disposed of to Sewage Treatment Plant

Concrete cutting blade coolant/dust suppression	Moderate alkalinity, Chlorine (2 ppm or less), suspended solids	Discharge to STP or PWTC	Variance required SBMS, EM Subject Area: Wastewater, Managing.
		or to upland areas, collect/filter prior to entering aquatic features	(TNR10-0000), Project SWPPP
General dust suppression	Chlorine (2 ppm or less)	Discharge to upland areas, collect/filter prior to entering aquatic features	

Notes: Chlorine typically lost during water use due to agitation, exposure to sunlight and wind, depending upon volumes and flow rates. Monitor runoff and treat discharge as necessary to remove chlorine and/or suspended solids. Prevent runoff to storm drains or surface water if pH is determined to be above 8.5

Appendix E – Site Maps


SITE
BEAR
ROAD
MON T-21
BM 21 W
903
Silo
ENERGY
AREA)
BETHEL
APPROXIMATE
Valve Station

Appendix F –Inspection Forms

Refer to: http://tennessee.gov/environment/wpc/forms/cn1173_cgp_inspection.pdf

Appendix G – Delegation of Authority Form

Delegation of Authority

I, _____ (name), hereby designate the person or specifically described position below to be a duly authorized representative for the purpose of overseeing compliance with environmental requirements, including the Construction General Permit, at the _____ construction site. The designee is authorized to sign any reports, storm water pollution prevention plans and all other documents required by the permit.

_____ (name of person or position)
_____ (company)
_____ (address)
_____ (city, state, zip)
_____ (phone)

By signing this authorization, I confirm that I meet the requirements to make such a designation as set forth in Appendix I of EPA's Construction General Permit (CGP), and that the designee above meets the definition of a "duly authorized representative" as set forth in Appendix I.

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Name: _____

Company: _____

Title: _____

Signature: _____

Date: _____

SECTION 01 55 00.03- MANAGING CONSTRUCTION WASTEWATERS

For the purposes of these guidelines, when a construction process utilizes water from any source, water that is not used up in the process (or lost by evaporation) should be considered to be wastewater.

Typical construction wastewaters include those listed below, although particular circumstances and/or site specific conditions may alter the nature of these wastewaters, or result in the generation of non-typical wastewaters not addressed under these guidelines. When project planners determine that non-typical wastewaters may be generated or discover that they have been, consultation with an Environmental Compliance Representative should take place as soon as practicable.

Mechanical construction activities:

M1. Pipeline draining
M2. Pipeline flushing
M3. Pipeline hydrostatic testing
M4. Pipeline disinfection

Civil construction activities:

C1. Removing accumulated storm water from trenches & other excavations or structures
C2. Flushing concrete truck chute and/or cleaning associated tools and equipment
C3. Water from high pressure washing and/or hosing down surfaces

Demolition activities:

D1. Asbestos worker shower facilities & tool decontamination
D2. Concrete cutting systems (blade coolant/dust suppression water)
D3. General dust suppression water

Work Activity	Wastewater description - potential contaminants	Method(s) of disposal	Applicable procedure or permit(s)
Table M Mechanical Construction Activities			
M1 - Draining non-wastewater piping systems	Rust preventative, algaecide, Chlorine (2 ppm or less), other chemical products, etc.	Accumulate, characterize, and dispose of as liquid hazardous waste when appropriate	SBMS, EM Subject Area: Environmental Management of Research and Operations – Procedure – "Managing Waste and Excess Materials"
		Sewage Treatment Plant (STP) or Process Waste Treatment Complex (PWTC)	Variance required SBMS, EM Subject Area: Environmental Management of Research and Operations – Procedure – "Clean Water Act"
	(waters exhibiting high temperature shall not be allowed to enter storm drains or surface water)	or discharge to upland area in a manner that prevents erosion (when approved by the Company)	General Permit for Storm Water Discharges from Construction Activities (TNR10-0000), Project Storm Water Pollution Prevention Plan
	(waters exhibiting high temperature shall not be allowed to enter storm drains or surface water)	or, if chlorine is known to be the only contaminant, discharge to storm drain system	Field verification of successful de-chlorination is required, ORNL Site Wide NPDES Permit (TN0002941)
Notes: Rust preventative & algaecide are considered non-hazardous at typical concentrations utilized in cooling water and other closed loop systems. Negative impacts to aquatic resources are possible, however, and care shall be taken to prevent release to surface waters. Chlorine is typically absent from existing systems other than potable or process water (i.e. chilled water, etc)			

Work Activity	Wastewater description - potential contaminants	Method(s) of disposal	Applicable procedure or permit(s)
Table M Mechanical Construction Activities			
M2 - Flush non-wastewater piping systems	Chlorine (2 ppm or less), nominal sediment, scale, etc.	STP or PWTC	Variance required SBMS, EM Subject Area: Environmental Management of Research and Operations – Procedure – "Clean Water Act"
		Or discharge to upland areas in a manner that prevents erosion – chemical treatment of discharge to remove chlorine – filtration as necessary to remove sediment/scale	General Permit for Storm Water Discharges from Construction Activities (TNR10-0000), Project Storm Water Pollution Prevention Plan
		or, if chlorine is known to be the only contaminant, discharge to storm drain system	Field verification of successful de-chlorination is required, ORNL Site Wide NPDES Permit (TN0002941)
Notes:			

Work Activity	Wastewater description - potential contaminants	Method(s) of disposal	Applicable procedure or permit(s)
Table M Mechanical Construction Activities			
M3 - Hydrostatic testing	Chlorine (2 ppm or less)	STP or PWTC	Variance required SBMS, EM Subject Area: Environmental Management of Research and Operations – Procedure – "Clean Water Act"
		or discharge to upland areas in a manner that prevents erosion – chemical treatment of discharge to remove chlorine	
		or, if chlorine is known to be the only contaminant, discharge to storm drain system	Field verification of successful de-chlorination is required, ORNL Site Wide NPDES Permit (TN0002941)
Notes:			

Work Activity	Wastewater description - potential contaminants	Method(s) of disposal	Applicable procedure or permit(s)
Table M Mechanical Construction Activities			
M4 - Disinfect piping systems	Chlorine (50 – 200+ ppm)	Discharge to STP, PWTC (Collection and pre-treatment may be required)	Variance required SBMS, EM Subject Area: Environmental Management of Research and Operations – Procedure – "Clean Water Act"
		or to treatment basin via suitable and effective de-chlorination system – monitor discharge and basin overflow for chlorine, pH, temperature, turbidity, etc. and halt or modify operations as needed	Field verification of successful de-chlorination is required, ORNL Site Wide NPDES Permit (TN0002941)
Notes: Heavily chlorinated water is extremely toxic to aquatic systems; exceptional care shall be taken to prevent release of untreated or insufficiently treated water to the environment. Overflow from treatment basin shall be released onto a suitable upland area (or storm drain system, if necessary) only after verification of acceptable de-chlorination and other water quality parameters			

Work Activity	Wastewater description - potential contaminants	Method(s) of disposal	Applicable procedure or permit(s)
Table C Civil Construction Activities			
C1 - Dewatering excavations	Sediment, suspended solids, chemical or radiological contaminants (previously existing or due to construction activities)	Filtration, discharge to STP or PWTC	Variance required SBMS, EM Subject Areas: Environmental Management of Research and Operations – Procedure – "Clean Water Act" & "Managing Waste and Excess Materials"
		Or, Filtration and discharge to vegetated upland areas taking care to ensure that pump intake does not agitate water within the excavation, discharging to upland areas through filtration and in a manner that prevents erosion	By approval of Construction Field Representative (CFR) and FDD Environmental Representative (ER) General Permit for Storm Water Discharges from Construction Activities (TNR10-0000), Project Storm Water Pollution Prevention Plan
Notes: Excavations associated with construction or maintenance of potable water lines or other liquid-carrying pipelines may present with chlorine or other potential contaminants which must be addressed on a case by case basis. The presence of regulated contaminants in excavation water or adjacent soils requires investigation by EP Staff prior to disposition.			

Work Activity	Wastewater description - potential contaminants	Method(s) of disposal	Applicable procedure or permit(s)
Table C Civil Construction Activities			
C2 - Flushing concrete truck chute/cleaning tools	Moderate alkalinity, Chlorine (2 ppm or less), suspended solids	Discharge to STP, PWTC,	Variance required SBMS, EM Subject Area: Environmental Management of Research and Operations – Procedure – "Clean Water Act"
		or upland areas, followed up by removal of cured concrete residues cement-contaminated water shall not be released into storm drains or surface water, or runoff otherwise allowed beyond the construction site boundaries	By approval of Construction Field Representative (CFR) and FDD Environmental Representative (ER)
C3 - Pressure washing surfaces	Chlorine (2 ppm or less), suspended solids	Discharge to STP	Variance required SBMS, EM Subject Area: Environmental Management of Research and Operations – Procedure – "Clean Water Act"
		or upland areas, collect/filter prior to entering aquatic features	(TNR10-0000), Project SWPPP
Notes: **No detergent or other cleaning agent allowed where runoff may reach aquatic features!** Chlorine typically absent from tank-stored water and/or lost during use due to agitation, exposure to sunlight and wind. Prevent contamination of storm water runoff or other surface water sources due to contact with uncured cement and/or other suspended solids			

Work Activity	Wastewater description - potential contaminants	Method(s) of disposal	Applicable procedure or permit(s)
Table D Demolition Activities			
D1 - Asbestos worker showers & tool decontamination	Asbestos, Chlorine (2 ppm or less)	HEPA filtered (5 micron or better) & discharged to STP.	Variance required SBMS, EM Subject Area: Environmental Management of Research and Operations – Procedure – "Clean Water Act"
Notes: Discharge permitted under NESHAP when HEPA filtered and disposed to Sewage Treatment Plant			
D2 - Concrete cutting blade coolant/dust suppression	Moderate alkalinity, Chlorine (2 ppm or less), suspended solids	Discharge to STP or PWTC	Variance required SBMS, EM Subject Area: Environmental Management of Research and Operations – Procedure – "Clean Water Act"
		or to upland areas, collect/filter prior to entering aquatic features	(TNR10-0000), Project SWPPP
D3 - General dust suppression	Chlorine (2 ppm or less)	Discharge to upland areas, collect/filter prior to entering aquatic features	
Notes: Chlorine typically lost during water use due to agitation, exposure to sunlight and wind, depending upon volumes and flow rates. Monitor runoff and treat discharge as necessary to remove chlorine and/or suspended solids. Prevent runoff to storm drains or surface water if pH is determined to be above 8.5			

END OF SECTION 01 55 00.03

SECTION 01 74 19 – DEMOLITION WASTE MANAGEMENT AND DISPOSAL

PART 1 - GENERAL

1.1 ATTACHMENTS

A. Attachment 1, Oak Ridge Reservation Master Profile S-010, Rev 3, Construction/ Demolition Waste, Effective 10/01/2012.

B. Attachment 2, Oak Ridge Reservation Master Profile S-050, Rev 3, Spoil Materials, Effective 10/01/2012.

C. Attachment 3, Oak Ridge Reservation Master Profile S-040, UCOR-5112, Special Waste, Effective May 2018.

D. Attachment 4, Landfill Prohibited Waste Items.

E. Attachment 5, Prohibited Items for Metal Recycle

1.2 DEFINITIONS

A. Resource Conservation and Recovery Act (RCRA) hazardous waste: any discarded material that is not excluded by 40 CFR Part 261.4(a) and that is listed in 40 CFR Subpart D or exhibits any of the characteristics identified in 40 CFR 261 Subpart C.

B. Sanitary waste: waste generated by offices, cafeteria, medical facilities and laboratories, and includes textile products (personal protective equipment [PPE], coveralls, cotton items, carpet, etc.).

C. Special waste: wastes that are either difficult or dangerous to manage such as friable or non-friable asbestos, empty aerosol or paint containers, petroleum contaminated soil, bulk product polychlorinated biphenyl (PCB) waste, PCB remediation wastes, etc.

D. Construction waste: building and site improvement materials and other solid waste resulting from construction, remodeling, renovation, or repair operations. Construction waste includes packaging.

E. Demolition waste: building and site improvement materials resulting from demolition or selective demolition operations.

F. Disposal: removal off-site of demolition and construction waste and subsequent recycling, reuse, or deposit in landfill or incinerator acceptable to authorities having jurisdiction.

G. Recycle: recovery of demolition waste (i.e., metals, electronics) for subsequent processing in preparation for reuse.

H. The PCB waste: waste subject to PCB disposal requirements defined in Toxic Substances Control Act (TSCA) of 1976 as defined in 40 CFR 761.

1.3 TRAINING

A. The Sellers, their subcontractors and all employees who use hazardous materials and may generate or handle a hazardous waste, must provide evidence of having received RCRA Hazardous Waste Awareness Training and annual refresher training as required by 40 CFR 265.16 and 262.34 prior to starting any work involving these items.

B. Prior to the transport of friable asbestos, truck drivers shall provide evidence of a valid medical card and Class-A Commercial Driver's License (CDL) with HazMat endorsement.

1.4 REQUIREMENTS TO COMPLY WITH APPLICABLE LAWS AND REGULATIONS

A. The Seller shall provide written proof of registration, licensing, insurance, or other requirements upon request. It is the Seller's responsibility to ascertain and comply with all applicable federal, state, local and multi-jurisdictional laws, ordinances, and regulations pertaining to the registration, licensing, handling, transportation, packaging, management, processing, resale and disposal of these materials under this contract. These federal, state, and local laws include but are not limited to the Clean Air Act; the TSCA; the Atomic Energy Act; the Comprehensive Environmental Response, Compensation and Liability Act; the Hazardous Materials Transportation Regulations; the Federal Motor Carrier Safety Regulations; the TN Motor Vehicle Laws Annotated; the Emergency Planning and Community Right-to-Know Act, 40 CFR 279; and TDEC (Tennessee Department of Environment and Conservation) Rule Chapter 1200-1-11-.11.

PART 2 - WASTE MANAGEMENT

2.1 WASTE MANAGEMENT REQUIREMENTS

A. The Seller removal of Oak Ridge Reservation (ORR) landfill prohibited wastes must precede all excavation/demolition work.

B. Items prohibited from disposal at the ORR landfill must be removed from the buildings and affected areas prior to excavation/demolition. Instructions for managing the ORR landfill prohibited wastes are provided in Part 2.2 of this section.

C. The Seller is responsible for gross segregation of all waste items into the following potential categories as listed:

1. **Special (asbestos and respiratory hazard) waste** – special wastes are wastes that are either difficult or dangerous to manage such as friable or non-friable asbestos, respiratory hazards (includes fiberglass with loose fibers), empty aerosol or paint containers, petroleum contaminated soil, etc. Care must be taken to avoid mixing waste type, as some disposal requirements vary from one waste type to another.

Coordinate the removal of these materials with the Waste Management (WM) project lead. Attachment 3 provides the ORR landfill waste acceptance criteria for special waste.

2. **Universal wastes, Hazardous Wastes** – mercury thermostats, batteries, and lamps/bulbs and ballasts, oils and refrigerants will be recycled by the Company's approved vendor. The Company will provide containers and instructions for the Seller accumulation of these items. Other waste items such as fuses, capacitors (liquid-filled), smoke detectors (with circuit boards and radiological sources), and door closures (with oil reservoirs) should be segregated into Company-provided containers. No liquids, refrigerants or oils can go to the landfill, metals or electronics recycle vendors.
3. **Metal Recycle** – all scrap metal must be collected for the Company's approved metal recycle vendor. Work through the Company WM project lead will coordinate delivery and pickup of recycle metal containers. Both ferrous and nonferrous metals can be collected in the same secure container. Brass, bronze, and lead should be collected separately. See Attachment 5 for a list of prohibited items.
4. **Electronics Recycle** - Printed circuit boards and small electronics should be collected in fiber drums. Copper wire should be collected separately. The Company will provide the accumulation containers. Larger electronics such as monitors, computers, printers, and instrumentation should be palletized, shrink-wrapped and delivered to the ORNL Property Sales facility once the Company WM lead has entered the items into the ORNL database and Rad surveys has been performed.
5. **Salvageable materials** – all excess property and salvaged materials must be processed by the Company's Excess Property Group before leaving the site (this includes palletized electronics for recycle), and the Company will provide assistance with this process. It is the Seller's responsibility to protect the property from pilferage and damage until it has been transported to the excess property/salvage area.
6. **Radiological-contaminated wastes streams** – all radiological-contaminated materials excluding Naturally Occurring Radioactive Materials (NORM). ***All packaging of radiological wastes will be done in the Company-provided containers. Waste packaging will be performed by the Seller under the supervision of the Company.***
7. **Sanitary waste** – sanitary wastes are wastes generated by offices, cafeteria, medical facilities and laboratories, and include textile products (PPE, coveralls, cotton items, carpet, etc.). Generally, these wastes are covered under the Sanitary Waste profile for the landfill and are typically disposed of by the Company. The Seller shall bag garbage and deposit daily in the Company's dumpster.

NOTE: Where feasible, collect ALUMINUM CANS, PAPER, and CARDBOARD for RECYCLE. The Company will provide collection containers.

8. **Construction/Demolition debris –** these are wastes that result from construction, remodeling, repair and demolition of structures, and from road building or repair. These wastes include lumber, plastic, siding, paneling, flooring, windows, doors, and miscellaneous building demolition materials, brick, concrete, masonry materials, polyvinyl chloride (PVC) material, sheetrock/gypsum board, roofing

materials, siding, paneling, flooring, and miscellaneous metals associated with demolition, windows, door, and miscellaneous building demolition materials. Attachment 1 provides the ORR landfill waste acceptance criteria for construction debris. Construction waste, as described in Section 1.2.C, consists of excess new materials (i.e. packaging) brought into the project by the Seller. It is the responsibility of the Seller to remove these materials because they are not eligible for disposition in the ORR landfill.

9. **Spoil materials** – uncontaminated excavated earthen-like materials such as soil, rock, gravel, concrete (without rebar), asphalt and clay material. Spoil materials will be sent to either the ORR landfill off Clear Spring Road or the on-site spoil facility, Copper Ridge. The Company will provide Seller with options for disposition of spoils at the project pre-bid kickoff meeting. Attachment 2 provides the ORR landfill waste acceptance criteria for spoil materials. Waste acceptance criteria for the Copper Ridge facility will be consistent with the ORR landfill requirements. The general requirements for loading and transportation of spoil materials at the Oak Ridge National Laboratory (ORNL) project site are outlined in Part 2.3.B of this section.
10. **Prohibited items –** special handling requirements for managing prohibited items is provided in Part 2.2 of this section and a complete list of these items for the ORR landfill is provided in Attachment 4 of this section. The Company will ensure the proper management and disposal of these wastes and should be notified whenever items on the list are generated.

D. The Seller is responsible for ensuring that waste is sized so that it does not get stuck in transportation vehicles. Bulky items, i.e. pipe, concrete foundations, large storage tanks, structural steel, etc., must be less than 8’ in length in order to permit safe handling with ORR landfill equipment.

E. If unexpected radiological materials are encountered during demolition, the Company will be responsible for the overall management and direction of the Seller’s packaging operations on radioactive waste. The Company will manifest radioactive wastes, RCRA Hazardous, and/or PCB waste. Waste from cleanup of spills may require being managed as a special or a hazardous waste. The Company will make this determination.

F. Instructions for managing ORR landfill eligible waste and the special handling requirements associated with each category of eligible wastes are provided in Part 2.3 of this section.

G. The Company will perform the duties of the generator on behalf of the Seller. The Company’s EPA identification (ID) number will be listed on all manifests and records for any hazardous waste being sent off-site for disposal.

H. Any materials (solvents, paint, chemicals, etc.) brought on-site by the Seller will be removed by the Seller at the completion of the project INCLUDING EMPTY CONTAINERS, AND PARTIALLY FULL CONTAINERS.

I. The Company will assign and manage areas for interim storage of RCRA/TSCA waste-containing drums, universal waste, and recyclable materials.

J. When a RCRA 90-day area has been established within the project boundary, the Company will be responsible for providing any necessary secondary containment (if applicable), and will provide covers/tarps for all drums within the 90-day area if necessary. If roll off or other open top containers are used for RCRA waste, the Company will provide the necessary tarps.

K. When a RCRA 90-day area has been established within the project boundary, the Seller shall ensure that all covers/tarps (with no holes, tears, or rips present) are in place over drums/small containers staged in the area. For roll off or larger open top containers, the Seller shall ensure the tarps are installed properly and any holes/rips in the tarps are repaired in-place. These actions shall be accomplished at the end of each work day and prior to any rain event. The Seller shall also ensure that secondary containment does not contain any liquids. The Seller shall promptly notify the Company of any observations of liquids in secondary containment.

L. The Seller shall provide containers and/or transport vehicles for ORR landfill eligible waste.

M. The Seller shall ensure the provision of respirators and PPE for personnel transporting Special Wastes (friable and airborne hazards) to the ORR landfill.

N. The Seller shall provide all of the materials (including bulk and non-bulk containers) required for the packaging, labeling, marking, and transportation of non-rad/non-hazardous wastes (including special wastes) to the ORR landfill in conformance with Department of Transportation (DOT) standards.

2.2 MANAGING ORR LANDFILL PROHIBITED WASTES

A. Landfill prohibited wastes are identified in Attachment 4 of this section.

B. The Seller shall request a radiological survey prior to attaching labels and green tags on all containers.

C. Free liquids.

1. Pumps, motors and HVAC units shall have plugs removed and water, oil and refrigerants drained prior to disposal. Hoses shall be cut and drained. All piping (e.g. fire protection and chilled water systems) shall be drained of free liquids.
2. Collect in containers provided by the Company. Always have 3” to 5” of empty space above volume of material when using drums for packing.
3. Provide identification of material added to containers (using log sheets) to permit safe opening, storage and handling by the Company.
4. Identify the type of waste and the date the container was filled and request survey of the container before removing it from the building.
5. Deliver green tagged containers to the Company WM lead for proper labeling and interim storage.

2.3 CONTROL AND DISPOSAL OF ORR LANDFILL ELIGIBLE WASTE

A. Construction/Demolition (C/D) waste.
   1. Remove C/D waste from the buildings and segregate from other wastes whenever possible.
   2. The C/D wastes are wastes, typically other than special wastes, resulting from construction, remodeling, repair and demolition of structures, and from road construction and repair including, but not limited to:
      a. Bricks.
      b. Concrete and other masonry materials.
      c. Soil.
      d. Rock.
      e. Lumber.
      f. Road spoils.
      g. Rebar.
      h. Paving materials.
      i. Vitrified clay materials (tile, pipe, block, etc.).
      j. The PVC pipe.
      k. Polyethylene sheeting.
      l. Sheetrock/Gypsum board.
      m. Roofing materials.
      n. Styrofoam and neoprene insulation materials.
      o. Building siding materials.
      p. Paneling.
      q. Flooring.
      r. Miscellaneous metals associated with building demolition.
      s. Window and door glass associated with building demolition.
   3. Bulk handling and transport of C/D wastes:
      a. Size and load the waste into the waste delivery vehicles in such a manner to prevent the waste from becoming lodged in waste delivery vehicles and containers (i.e., dump truck beds, dump trailers, roll-off containers) during the dumping operations. The Seller shall be responsible for safely removing and clearing lodged materials from the waste delivery vehicles/containers and all associated costs.
      b. Waste delivery vehicles shall not be leaking fluids.
      c. It is recommended that wastes be delivered in vehicles that are self-dumping/unloading. If it is absolutely necessary to deliver bulky and containerized wastes on flatbed trucks or trailers, the waste generator shall minimize the generation of such containerized and bulky wastes and shall perform advance coordination with the Landfill Operations Manager for the unloading.
      d. All containers intended for disposal must be greater than 90% full (less than 10% void) except for 55 gallon or smaller containers, which can be safely compacted with landfill equipment.
   4. Refer to Master Waste Profiles S-010 for C/D Waste, Attachment 1.

B. Spoil material waste.
   1. Remove spoil material and segregate from other wastes whenever possible.

2. Spoil materials are earthen clean/non-contaminated materials, typically other than special wastes, resulting from construction, and demolition of structures, and from road construction and repair including, but not limited to:
   a. Gravel.
   b. Soil.
   c. Rock.
   d. Concrete (no rebar)
   e. Brick.
   f. Cinder/Concrete blocks.
   g. Clay products (tile, pipe, etc.).
   h. Asphalt pavement.
3. Bulk handling and transport of spoil material wastes:
   a. Size and load the waste into the waste delivery vehicles in such a manner to prevent the waste from becoming lodged in waste delivery vehicles and containers (i.e., dump truck beds, dump trailers, roll-off containers) during the dumping operations. The Seller shall be responsible for safely removing and clearing lodged materials from the waste delivery vehicles/containers and all associated costs.
   b. Waste delivery vehicles shall not be leaking fluids.
   c. It is recommended that wastes be delivered in vehicles that are self-dumping/unloading. If it is absolutely necessary to deliver bulky and containerized wastes on flatbed trucks or trailers, the waste generator shall minimize the generation of such containerized and bulky wastes and shall perform advance coordination with the Landfill Operations Manager for the unloading.
   d. All containers intended for disposal must be greater than 90% full (less than 10% void) except for 55 gallon or smaller containers, which can be safely compacted with landfill equipment.
   e. Refer to Master Waste Profiles S-050 (Attachment 2) for disposition of spoil material waste at the ORR landfill.
   f. Specific instructions dealing with waste identification, transportation and logistics will be provided to subcontractor's field supervisor and truck drivers in a field briefing prior to start of work.

C. Category I non-friable asbestos (refer to Attachment 3; Master Waste Profile S-040):
1. The prohibited items for C/D waste, with the exception of Category I non-friable asbestos, still apply for this category (see Attachment 4 of this section for a comprehensive listing of landfill prohibited items).
2. Bulk handling and transport of Category I non-friable material (refer to Attachment 3; Master Waste Profile S-040, Attachment 3-3 for specific packaging instructions) is permissible as follows:
   a. Non-Dedicated use dump trucks, inter-modals, roll-off containers, and similar transport containers requires entire load be wrapped with a single layer (minimum) of 6-mil thick plastic sheeting no later than the end of each work shift.
   b. Dedicated use dump trucks, inter-modals, roll-off containers, and similar transport containers do not require plastic sheeting if the containers are dust tight and leak tight via closed gasket doors and closed tarps or metal covers/lids.

c. Bundled/Stacked transite panels require each bundle to be wrapped, closed, and sealed in a single (minimum) layer of 6-mil thick plastic sheeting no later than the end of each work shift.

d. The label or tag describing the contents of each container must include the following words to meet landfill acceptance requirements, and must meet the current OSHA requirements for labeling:

Non-friable Asbestos
DANGER
CONTAINS ASBESTOS FIBERS
AVOID CREATING DUST
CANCER AND LUNG DISEASE HAZARD

e. The packaged wastes shall be transported to the landfill in such a manner to prevent airborne releases or the loss of the waste.

f. Unloading shall be done carefully to keep the materials in the wrapping as much as possible and to maintain the non-friability of the asbestos containing material (ACM).

3. Respiratory protection is required when personnel are within 100' of disposal activities of these wastes.

4. Provide verbal notification and coordination/concurrence with the WM project lead at least one working day prior to the delivery of these wastes.

5. Return copies of date-stamped Universal Control Number (UCN)-2109 and original Asbestos Work Authorization (AWA) form to the Asbestos Program Manager (APM).

D. Regulated ACM (RACM) includes friable asbestos: Category I non-friable ACM that has become friable or has become subjected to sanding, grinding, etc.; and Category II non-friable that has a high probability of becoming or has become crumbled, pulverized, or reduced to powder by the forces expected to act on the material in the course of the demolition or renovation operations (refer to Attachment 3; Master Waste Profile S-040, Attachment 3-1 for definitions).

1. Bulk handling and transport of RACM (refer to Attachment 3; Master Waste Profile S-040, Attachment 3-2 for specific packaging instructions) as follows:

a. Dump trucks, flatbed trucks, roll-bins, or similar vehicles shall be double-lined with 6-mil thick plastic sheets.

b. Place waste in the lined vehicle/container and the loose edges of the plastic sheets shall be lapped over the top of the waste and sealed.

c. Label the containers or wrapped friable ACM with the following warning labels in accordance with 29 CFR 1926.1101:

US DOE, ORNL, Bldg. No.___
DANGER
CONTAINS ASBESTOS FIBERS
AVOID CREATING DUST
CANCER AND LUNG DISEASE HAZARD

d. The packaged wastes shall be transported to the landfill in fully enclosed space or fully covered by a secure tarpaulin to prevent airborne releases or the loss of the waste.

e. Unloading shall be done carefully to keep the materials in the wrapping.

2. Respiratory protection is required when personnel are within 100' of asbestos containing waste material (ACWM) disposal activities.
3. Return copies of Bill of Lading, Waste Shipment Record (WSR), date-stamped UCN-2109 forms along with original AWA form to the APM.

E. Beryllium-Contaminated waste: Beryllium Oxide (BeO) waste, including wood, paper, clothing, piping, metal, equipment, and demolition material that is contaminated with BeO.

1. Package waste in tightly sealed, double-bagged, 6-mil thick plastic bags, double-bagged 6-mil thick plastic sheeting, fiber drums, metal drums or plywood boxes.
2. Each package shall be labeled (or equivalent) as shown below to meet landfill acceptance requirements, and must meet the current OSHA requirements for labeling ["Danger" is in white on a red oval, which is imposed on a larger white oval on a place rectangle. The text is black on a white background. The border is black.]:

DANGER
CONTAMINATED WITH BERYLLIUM, DO NOT REMOVE DUST BY BLOWING OR SHAKING
CANCER AND LUNG DISEASE HAZARD

3. Waste shipment shall be accompanied by a UCN-2109 form and a *Generator's/Shipper's Log for Beryllium Oxide Removal and Disposal*, to be completed by the Company for each waste load.
4. If the waste is bagged, it shall be transported in a fully enclosed space or fully covered by a secured tarpaulin.
5. Respiratory protection is required when personnel are within 100' of disposal activities of these wastes.

F. Respiratory Hazard (RH) waste includes fiberglass with loose fibers, refractory ceramic fibers, mineral wools, slag wools, rock wools, and other manmade fiber materials and silica. (Refer to Attachment 14 of the Master Waste Profile S-040 Rev. 6.)

1. These materials may be wet down prior to removal activities to reduce concentration of airborne fibers and materials for the protection of employees. Wastes containing these materials that do not create potential respiratory hazards (for example: solid fiberglass items, wool fibers that are bound in asphalt roofing shingles) will not be subject to the following requirements.
2. These wastes will be packaged and tightly sealed in single bagged 6-mil thick plastic bags, single wrapped in 6-mil thick plastic sheets (piping, equipment, etc.), fiber drums, metal drums, plywood boxes or metal boxes.
3. No specific labeling requirements for RH waste.
4. The packaged wastes will be transported to the landfill in such a manner to prevent airborne release or loss of the waste.
5. All handling and unloading shall be performed carefully to avoid rupturing of the packaging and shall be the responsibility of the waste generator/transporter. If assistance is needed, such as with the all-terrain fork truck, the generator must verbally coordinate this with the Landfill Operations Manager (865-574-6905) at

least one working day in advance of the delivery. The landfill can assist, but must have prior notification from the Company.

2.4 FRIABLE ASBESTOS TRANSPORTATION REQUIREMENTS

A. Notify the WM project lead one working day prior to scheduled shipping date to arrange deliveries of RACM to the ORR landfill.

B. Provide the following information:
1. Intended date of delivery.
2. Number of bulk loads to be delivered.
3. Quantities of each load in cubic feet or cubic meter.
4. Name, address, and phone number of carrier.
5. Names of truck drivers who will deliver the waste.

C. The WM lead and Asbestos Program Manager (APM) will begin preparation of the WSR which is required for transport on public highway.

D. Notify the WM lead, APM, and Company shipper of record to complete an inspection of the load while the containers are still at the job-site.

E. The truck driver shall perform the following:
1. Before leaving the job-site, the driver shall have respirator in vehicle.
2. Pick up the containerized load from the job-site. Company Radiation Control Technician (RCT) or CFR will issue green-tag for each load of waste. After survey, proceed to ORNL Building 7014.
3. Proceed through radiation monitor, if available, following posted instructions.
4. Present green tag to the Company Waste Handler on duty.
5. Sign paperwork provided by Company Waste Technician and obtain a date stamped copy of the UCN-2109 and original green tag.
6. Sign and copy the WSR as directed by the APM or designee to accept responsibility for the load.
7. Take load and documents (UCN-2109 form, original green tag, signed WSR, and any other paperwork provided by the Company Waste Technician or APM) to ORNL Building 7120 (Shipping and Receiving Facility) to initiate DOT inspection. Truck drivers shall provide evidence of a valid medical card and Class-A CDL with hazardous material endorsement.
8. Present paperwork to shipping personnel in the office area of the shipping area.
9. Sign Bill of Lading and obtain driver's copy.
10. Proceed to Building 9616-11 at the ORR landfill with all documentation obtained from the Company and follow directions provided by the ORR landfill staff.
11. Return copies of Bill of Lading, WSR, date-stamped UCN-2109 form, along with original AWA form to the APM.

2.5 ORR LANDFILL INFORMATION

A. Disposal at the ORR landfill (formerly known as the Y-12 landfill) will be free of charge to the Seller according to the following schedule for non-hazardous, non-radiological demolition waste and construction debris generated at ORNL facilities.

B. Typical hours of operation are Monday through Thursday; however, the landfill schedule is subject to change weekly. An updated schedule will be made available at the Company project kickoff meeting.

C. Provide verbal notification and coordination/concurrence with the Company WM project lead at least one working day prior to the delivery of a newly approved special waste or a special waste that is not routinely delivered to the ORR landfill.

D. Provide verbal notification and coordination/concurrence with the Company WM project lead at least one working day prior to the delivery of friable asbestos waste, non-friable asbestos waste or respiratory hazard waste.

E. Respiratory protection is required when personnel are within 100’ of disposal activities of asbestos, beryllium, and respiratory hazard wastes (including fiberglass and loose fibers).

F. This includes activities such as opening and closing the doors on asbestos roll-offs before and after dumping, and all manual handling of potentially respirable waste materials.

G. Personnel stationed within a closed-cab vehicle with all doors, windows, and openings closed are not required to wear respirators. Respirators must be present in the cab and available for use by trained personnel should the need arise to exit the vehicle.

H. All personnel on the ground of any active ORR landfill must wear: high visibility apparel (i.e. highly reflective vests); safety glasses; safety shoes; and hard hats. Also, cell phone use is prohibited on the ORR landfill property.

I. The UCN-2109 forms approved by the ORR landfill Operations Office are the primary “ticket” to gain access to the ORR landfill. The Company will complete the required UCN-2109 form set for each waste stream intended for ORR landfill disposal and initiate the review cycle required by the ORR Landfill Acceptance Manager.

J. The approved UCN-2109 forms will be available at ORNL Building 7014 Vehicle Portal Monitor (the inspection/monitoring station), and each load of waste intended for ORR landfill disposal must stop at Building 7014 for inspection, monitoring, and collection of forms before leaving ORNL.

K. Each load of waste delivered to the ORR landfill must be accompanied by a RADCON green tag. The Seller field supervision will be responsible for writing the correct UCN-2109 number on each green tag prior to the load leaving the project site. Copies of the approved UCN-2109’s will be proved to the Seller at the field briefing prior to the start of work.

L. All waste material must pass through the Vehicle Portal Monitor and will be subject to random inspection and RADCON survey.

M. Any waste delivered to the ORR landfill that does not meet the waste acceptance criteria, is not packaged properly, is not labeled properly, or where required notification has not been given, is subject to rejection by the ORR landfill operator. If the delivery is rejected, the Seller shall immediately notify the Company and remain at the ORR landfill for further instructions.

END OF SECTION 01 74 19

ORR WASTE CERTIFICATION PROGRAM
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Profile Number: **S-010, Construction/Demolition Waste**

Revision Number: **3**

Date Printed: _____

Person Checking Revision Number: _____

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Key words: Non-Radioactive, Non-RCRA, Non-TSCA, Construction/Demolition

PROFILE NAME: Construction/Demolition Waste

Profile No.: S-010
Rev. No. : 3, 10/01/12
Effective Date: 10/15/12

UCOR waste generators shall manage and dispose of Construction/Demolition waste intended for disposal in the ORR Landfills, in accordance with the requirements presented in this profile and following documents:

- ***UCOR Waste Management Program Plan, PPD-WM-2400***
- ***URS │CH2M Oak Ridge LLC Waste Certification Program Plan, Oak Ridge, Tennessee, UCOR-4187***

Proper characterization of waste is the responsibility of the generator. Signature of the UCN-2109 form (or equivalent, hereinafter referred to as UCN-2109 or 2109) is certification by the Waste Generator that sufficient controls are in place to mitigate the potential for non-conformances against this profile. This certification includes future generated waste where a blanket UCN-2109 is utilized.

A. Material Description

Construction/demolition wastes are wastes, other than special wastes, resulting from construction, remodeling, repair and demolition of structures, and from road building or repair. Such wastes include, but are not limited to bricks, concrete and other masonry materials, soil, rock, lumber, road spoils, rebar, and paving materials.

Construction/demolition wastes are **not** radioactive and not regulated under RCRA or TSCA.

Acceptable routine wastes include:

- Brick
- Masonry materials
- Rock
- Lumber and pallets
- Rebar (embedded in concrete)
- Vitrified clay materials (tile, pipe, block, etc.)
- Polyethylene sheeting
- Roofing materials
- Building siding materials
- Flooring
- Window and door glass associated with building demolition
- Concrete
- Soil
- Gravel
- Road spoils
- Paving materials
- PVC pipe
- Sheetrock/gypsum board
- Insulation materials (fiberglass[1], rockwool, styrofoam)
- Paneling
- Miscellaneous metals associated with building demolition
- Miscellaneous building demolition materials

Construction/Demolition waste from the demolition of an industrial process or treatment process, or resulting from a CERCLA action may require special waste evaluation and approval by TDEC. Refer to Waste Profile S-040, "Special Waste" for guidance regarding acceptance and disposal of special wastes.

[1] Fiberglass with loose fibers that is a respiratory hazard shall be disposed as a special waste (see waste profile S-040).

B. Chemical Constituent Limitations

Wastes shall **not** exhibit characteristics of, or be listed as, hazardous waste as identified in the RCRA regulations, and cannot be subject to any RCRA Land Disposal Restrictions.

Wastes shall **not** be a PCB-detectable waste. PCB concentrations shall be less than 2 ppm. Wastes containing PCBs in concentrations exceeding 2 ppm may be acceptable as a special waste under the provisions of Waste Profile S-040.

C. Radiological Constituent Limitations

The wastes shall meet the following criteria established with TDEC:

1) Specific activity < 35 picocuries of total uranium per gram of waste, or

2) Material that meets the off-site guidelines established in Figure IV-1 of DOE Order 5400.5, "Radiation Protection of the Public and the Environment," or

3) Wastes that are known to be nonradioactive by process knowledge (refer to Appendix A for guidance concerning the use of process knowledge).

Wastes exceeding radiological surface release criteria are prohibited from acceptance under this profile. Reference DOE Order 5400.5, "Radiation Protection of the Public and the Environment," Figure IV-1, Surface Contamination Guidelines.

Radioactive wastes are not acceptable for disposal. Wastes containing residual levels of radionuclides other than uranium may be candidates for landfill disposal under the guidelines of waste profile S-040.

D. Physical Parameter Limitations

1) No free liquids[2]

2) The waste form shall have the consistency to be managed and compacted by landfill heavy equipment.

3) Bulky items, i.e., pipe, concrete foundations, structural steel, etc., should be sized to be less than 8 feet in length to permit safe handling with landfill equipment. For guidance on bulky wastes, the generator should consult with the Landfill Waste Acceptance Manager or the Landfill FacilityManager.

4) Minimize the mixing of waste across the various waste types, i.e., mixing gravel with lumber and pallets.

E. Characterization Parameters and Methodology

Process knowledge and/or sampling and analysis may be used for categorizing and characterizing solid waste. Process knowledge may include knowledge and historical information of the areas and buildings from which the waste stream was generated, operations/processes that were performed in the areas/buildings from which the waste stream was generated, materials/contaminants that were used/processed/stored in the areas/buildings from which the waste stream was generated, and whether the waste was stored in radiologically contaminated and/or uncontaminated buildings/areas.

Sampling and analysis, if used, must identify and quantify the contaminants that are present in the waste. Analyses may be conducted for TCLP constituents, ignitability, corrosivity, reactivity, PCBs, radiological contaminants, and free liquids. If there are other suspected contaminants in the waste stream, the generator must analyze for these as

[2] Any waste material that is determined to contain "free liquids" as defined by Method 9095 (Paint and Filter Liquids Test), as described in "Test Methods for Evaluating Solids Wastes, Physical/Chemical Methods" (Environmental Protection Agency [EPA] pub. No. SW-846).

well. -Sampling and analysis of the waste shall conform to the requirements of EPA document SW-846, "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods", or other nationally recognized standards.

In reference to volumetric contamination, uranium is the only radionuclide with volumetric criteria established with TDEC for on-site landfill disposal using this profile. Radionuclide data must be reported in picocuries per gram of waste. (dry weight basis) Quantification of uranium isotopes may be accomplished at a TDEC reviewed NDA facility.

In regard to the disposal of waste in the on-site landfills, use of TDEC reviewed NDA facilities for surveying waste is only intended for providing verification that waste believed to meet radiological constituent limitations (see Section C) is suitable for disposal in the on-site landfills. Wastes that are known to be low level radioactive waste or radioactive material through process knowledge, radiological survey, or analytical data must not be sent directly or indirectly (i.e. through a TDEC reviewed NDA facility) to the landfill for disposal.

F. Prohibited Items

If prohibited materials are observed/detected in wastes delivered to the landfill, the waste generator will be notified so that they can retrieve the materials. Prohibited materials will not be accepted. Items prohibited under this profile include:

- Classified wastes
- RCRA Hazardous wastes
- PCB wastes
- Radioactive wastes
- Friable asbestos
- Liquid wastes
- Garbage and other putrescible materials
- Waste containing free liquids
- Waste contaminated with mercury, beryllium, PCBs, or petroleum products, or other chemicals
- Tires
- Lead acid batteries
- Untreated/treated medical wastes
- Refrigeration equipment not complying with 40 CFR 82.156
- Bulk metals
- Bulk paper
- Municipal wastes (All solid waste of or relating to being generated by city or local government, or private ownership be it business or personal.)
- Industrial wastes (Solid waste produced in, or generated by, industrial or manufacturing processes. This term does not include commercial, domestic, mining, or hazardous waste regulated under Subtitle C of RCRA, or oil and gas waste.)
- Institutional wastes (All solid waste which are not special waste, emanating from institutions such as, but not limited to, hospitals, health care facilities, nursing homes, laboratories, orphanages, correctional institutions, schools, and universities.)
- Unapproved special wastes
- Wastes that are not generated by DOE activities in the Oak Ridge area
- Drums
- Paint and adhesive containers
- Laboratory chemicals
- Commercial products manufactured with radioactive materials, i.e., smoke detectors, thoriated welding rods, etc.
- Landscaping or land clearing wastes

G. Packaging Requirements

Packaging and labeling shall comply with the applicable Department of Transportation (49 CFR) requirements. Every waste delivery to the ORR Landfills must be accompanied by a UCN-2109 form, which has been reviewed

and approved by the Landfill Facility Manager or the Waste Acceptance Manager. If waste generators have questions regarding delivery of waste to the landfill, contact the Landfill Waste Acceptance Manager or Landfill Facility Manager.

Any dumpsters used to deliver waste to the landfill shall have identification numbers or bar codes, and those identification numbers/bar codes shall be clearly reflected on the corresponding UCN-2109 forms.

The waste generator shall contact the Landfill Facility Manager if there are questions regarding personal protective equipment and training requirements for delivery personnel.

The waste generator shall size and load the waste into the waste delivery vehicles in such a manner to prevent the waste from becoming lodged in waste delivery vehicles and containers (i.e., dump truck beds, roll-off containers) during the dumping operations. The waste generator/transporter shall be responsible for safely removing and clearing lodged materials from the waste delivery vehicles/containers and all associated costs.

Waste delivery vehicles shall not leak fluids.

It is highly recommended that waste generators deliver wastes in vehicles that are self-dumping/unloading. If it is necessary to deliver wastes on flatbed trucks or flatbed trailers, the waste will be palletized if possible and the generator shall perform advance coordination with the Landfill Facility Manager to confirm that forklift support will be available.

Dump trailers (framed and frameless) are prohibited.

H. Additional Requirements

Notification is required at least one working day prior to delivery of new waste streams with new UCN-2109 forms from large construction/demolition projects and prior to non-routine deliveries. Notification must include a UCN-2109 form, associated documentation, and delivery schedules prior to shipping to the landfills. The delivery schedule must be agreed to by the Landfill Operations personnel.

All wastes delivered to the landfill must pass through the Vehicle Portal Monitor and will be subject to random inspection and radiological survey. The waste generator should contact the Waste Acceptance Manager or Landfill Facility Manager prior to delivery if the waste has elevated levels of naturally occurring radioactivity.

Any waste delivered to the landfill is subject to rejection by the landfill operator. If waste is rejected, the reason for rejection will be furnished to the waste generator. In addition, if advance notification of waste delivery is required for the waste and the notification is not provided to the ORR Landfill staff, the waste will be subject to rejection. If waste is rejected, the reason for rejection will be furnished to the waste generator. The waste generator will be responsible for the cost of retrieval, management, and proper disposition of all prohibited wastes delivered to the landfill.

If non-conforming/prohibited waste is dumped into the landfill, the waste generator shall be responsible for removal, packaging, transportation, and disposition of non-conforming/prohibited wastes, and all associated costs. The waste generator shall remove all non-conforming/prohibited waste from the ORR Landfills on the same day the non-conforming/prohibited waste is delivered to the ORR Landfills.

I. Required Documentation (as applies)

Specific requirements are stated for form UCN-2109, *Waste Item Description*, and UCOR Form 398, *Process Knowledge Documentation*. These requirements also apply to the corresponding forms UCN-21941, *Request for Landfill Disposal*, and UCN-21395, *Process Knowledge Documentation*, which are used by the Y-12 National Nuclear Security Complex, and the *ORR Landfill Shipping Form*, which is used by UCOR.

1. Completed and signed form UCN-2109, "Waste Item Description." Every waste delivery to the ORR Landfills must be accompanied by a UCN-2109 form, which has been reviewed and approved by the Landfill Facility Manager or the Landfill Waste Acceptance Manager. The UCN-2109 form shall comply with the following requirements:

    1.1. Information on UCN-2109 forms must accurately represent the waste and must be current, complete, and correct.

    1.2. If there is a change in the generating company, the UCN-2109 form must be modified to identify the correct company and correct generator information and be re-signed by the waste generator, unless otherwise approved by the Waste Acceptance Manager.

    1.3. If a radiological "green tag" is used to support the disposition of waste, the waste generator must provide the green tag number on the UCN-2109 form when the green tag number becomes available or attach the green tag to the 2109.

    1.4. Any Special Handling Instructions must be clearly noted on the UCN-2109 form.

2. Completed Form 398 (or equivalent), "Process Knowledge Documentation".

3. Radiological "green tag", or Process Knowledge Documentation Form 398 (or equivalent), or analytical data to clearly show the waste is not a radiological waste.

4. Sampling plans, laboratory data, statistical evaluation of the data, and/or other information that characterizes the waste.

APPENDIX A

USE OF PROCESS KNOWLEDGE FOR RADIOLOGICAL RELEASE OF MATERIAL TO U. S. DEPARTMENT OF ENERGY (DOE) LANDFILLS

Process knowledge (PK) is a tool used to aid the characterization of waste generated by DOE activities in the Oak Ridge area. PK is not used as a stand alone process. PK is one input into the evaluation of a material. Only a trained member of the radiological organization with input from trained waste generator can determine if an item is releasable from a radiological perspective. The radiological representative will use the signed PK form as an input to the evaluation for release of the material. The following points emphasize how PK is used in the evaluation for the release of materials to the DOE landfills:

- PK is not used for the release of materials to DOE landfills if those materials have been generated, used, or stored within radiologically contaminated areas. All materials released from contaminated areas are surveyed prior to release. Inaccessible internal surfaces that are physically prevented from coming into contact with radiological contamination—such as the internal surfaces of compressed cylinders or aerosol cans—are not required to be surveyed provided all accessible surfaces are found to meet the release criteria.

- Materials released to landfills from within radiologically controlled areas must be appropriately characterized to demonstrate compliance with applicable release criteria prior to release to the landfills. Radiological surveys and/or sampling are the primary means of characterization even for those materials for which the potential for contamination is known to be very low. However, for those materials not originating from radiological contamination areas and for which the potential for contamination is known to be insignificantly small, PK may be used as the basis for releasing these materials to the DOE landfills.

- PK requires an equipment or material owner to certify by signature that equipment or material could not possibly be contaminated based on personal and specific knowledge about the history of the item including its origin, use, and locations of use.

- PK may be used to help the Health Physicist or Radiological Engineer determine if equipment and material may be potentially contaminated. PK does not relieve the Health Physicist or Radiological Engineer from accountability for assuring the material or equipment meets the release limits.

ORR WASTE CERTIFICATION PROGRAM
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Profile Number: **S-050, Spoil Materials**

Revision Number: **3**

Date Printed: _____

Person Checking Revision Number: _____

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Keywords: **Concrete, Soil, Rock, Gravel, Brick**

PROFILE NAME: **Spoil Materials**

Profile No.: **S-050**
Rev. No.: **3, 10/01/12**
Effective Date: **10/15/12**

UCOR generators shall manage and dispose of Spoil Materials intended for disposal in the ORR Landfills, in accordance with the requirements presented in this profile and following documents:

- ***UCOR Waste Management Program Plan, PPD-WM-2400***
- ***URS │CH2M Oak Ridge LLC Waste Certification Program Plan, Oak Ridge, Tennessee, UCOR-4187***

Proper characterization of waste and materials is the responsibility of the generator. Signature of the UCN-2109 form (or equivalent, hereinafter referred to as UCN-2109 or 2109) is certification by the generator that sufficient controls are in place to mitigate the potential for non-conformances against this profile. This certification includes future generated waste/materials where a blanket UCN-2109 is utilized.

A. Material Description

The intention of this profile is to identify certain earthen clean/non-contaminated materials that do not have to be deposited in a landfill. Placing this type of material in a "spoil area" will save valuable landfill space.

Acceptable Spoil Materials are listed below:

- Gravel
- Soil
- Rock
- Concrete
- Brick
- Cinder/concrete blocks
- Clay products (tile, pipe,etc.)
- Asphalt pavement

B. Chemical Constituent Limitations:

Spoil materials shall be clean, non-contaminated materials. If any chemical contamination is suspected, refer to profiles S-010, S-020, S-030, and/or S-040.

C. Radiological Constituent Limitations:

Spoil materials shall be clean, non-contaminated materials. If any radioactive contamination is suspected, refer to profiles S-010, S-020, S-030, and/or S-040.

D. Physical Parameter Limitations:

1) No free liquids[1]

2) Spoil materials should be sized to be less than 8 feet in length to permit safe handling with landfill equipment. For guidance on bulky materials, consult with the Waste Acceptance Manager or Landfill Facility Manager.

E. Characterization Parameters and Methodology:

Process knowledge and/or sampling and analysis may be used for categorizing and characterizing spoil material. Process knowledge may include knowledge and historical information of the areas and buildings from which the material was generated, operations/processes that were performed in the areas/buildings from which the material was generated, materials/contaminants that were used/processed/stored in the areas/buildings from which the material was generated, and whether the material was stored in radiologically contaminated and/or uncontaminated buildings/areas. Refer to Appendix A for guidance concerning the use of process knowledge.

Sampling and analysis, if used, must identify and quantify the contaminants that may be present in the spoil material. Analyses may be conducted for TCLP constituents, ignitability, corrosivity, reactivity, PCB's, radiological contaminants, and free liquids. If there are other suspected contaminants in the spoil material, the generator must analyze for these as well. Sampling and analysis of spoil materials shall conform to the requirements of EPA document SW-846, "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods" or other nationally recognized standards. Sampling, analysis and subsequent data review should appropriately characterize/represent the spoil materials.

In reference to volumetric contamination, total uranium and other radionuclides must be reported in picocuries per gram of material. Radioactivity must not be greater than background and enrichment must not substantially deviate from natural (0.711 weight percent). Verification that radioactive isotopes are not greater than background must be performed by process knowledge, analysis of representative samples, or scan at a TDEC-reviewed NDA facility.

In regard to the disposal of material in the on-site spoil area, use of TDEC reviewed NDA facilities for surveying spoil material is only intended for providing verification that spoil material believed to be non-contaminated is suitable for disposal in the on-site spoil area. Materials that are known to be low level radioactive waste or radioactive material through process knowledge, radiological survey, or analytical data must not be sent directly or indirectly (i.e. through a TDEC reviewed NDA facility) to the spoil area for disposal.

F. Prohibited Items

If prohibited materials are observed/detected in materials delivered to the spoils area, the generator will be notified so that they can retrieve the materials. Prohibited materials will not be accepted. Items prohibited under this profile include:

- Classified wastes
- RCRA Hazardous wastes
- PCB wastes
- Radioactive wastes
- Friable asbestos

[1] Any spoil material that is determined to contain "free liquids" as defined by Method 9095 (Paint and Filter Liquids Test), as described in "Test Methods for Evaluating Solids Wastes, Physical/Chemical Methods" (Environmental Protection Agency [EPA] pub. No. SW-846).

- Liquid wastes
- Garbage and other putrescible materials
- Waste containing free liquids
- Waste contaminated with mercury, beryllium, PCBs, or petroleum products, or other chemicals
- Tires
- Lead acid batteries
- Untreated/treated medical wastes
- Refrigeration equipment not complying with 40 CFR 82.156
- Bulk metals
- Bulk paper
- Municipal wastes (All solid waste of or relating to being generated by city or local government, or private ownership be it business or personal.)
- Industrial wastes (Solid waste produced in, or generated by, industrial or manufacturing processes. This term does not include commercial, domestic, mining, or hazardous waste regulated under Subtitle C of RCRA, or oil and gas waste.)
- Institutional wastes (All solid waste which are not special waste, emanating from institutions such as, but not limited to, hospitals, health care facilities, nursing homes, laboratories, orphanages, correctional institutions, schools, and universities.)
- Wastes that are not generated by DOE activities in the Oak Ridge area
- Drums
- Paint and adhesive containers
- Laboratory chemicals
- Commercial products manufactured with radioactive materials, i.e., smoke detectors, thoriated welding rods, etc.
- Landscaping or land clearing wastes

G. Requirements Packaging

Packaging shall comply with the applicable Department of Transportation (49 CFR) requirements. Every spoil material delivery to the ORR Landfills must be accompanied by a UCN-2109 form, which has been reviewed and approved by the Landfill Facility Manager or the Waste Acceptance Manager. If generators have questions regarding delivery of materials to the landfill, contact the Landfill Waste Acceptance Manager or Landfill Facility Manager.

The generator shall size and load the material into delivery vehicles in such a manner to prevent the material from becoming lodged in delivery vehicles and containers (i.e., dump truck beds, roll-off containers) during the dumping operations. The generator/transporter shall be responsible for safely removing and clearing lodged materials from the delivery vehicles/containers and all associated costs.

Delivery vehicles shall not leak fluids.

Dump trailers (framed and frameless) are prohibited.

The generator shall contact the Landfill Facility Manager if there are questions regarding personal protective equipment and training requirements for delivery personnel.

H. Additional Requirements

Notification is required at least one working day prior to delivery of new spoil materials with new UCN-2109 forms from large construction/demolition projects and prior to non-routine deliveries. Notification must include a UCN-2109 form, associated documentation, and delivery schedules prior to shipping to the landfills. The delivery schedule must be agreed to by Landfill Operations personnel.

All spoil materials delivered to the landfill must pass through the Vehicle Portal Monitor and will be subject to random inspection and radiological survey. The generator should contact the Waste Acceptance Manager or Landfill Facility Manager prior to delivery if the spoils have elevated levels of naturally occurring radioactivity.

Any material delivered to the landfill is subject to rejection by the landfill operator. If material is rejected, the reason for rejection will be furnished to the generator. In addition, if advance notification of delivery is required and the notification is not provided to the ORR Landfill staff, the load will be subject to rejection. If loads are rejected, the reason for rejection will be furnished to the generator. The generator will be responsible for the cost of retrieval, management, and proper disposition of all prohibited materials delivered to the landfill.

If non-conforming/prohibited items are disposed in the spoils area, the generator shall be responsible for removal, packaging, transportation, and disposition of non-conforming/prohibited items, and all associated costs. The generator shall remove all non-conforming/prohibited items from the ORR Landfills on the same day the non-conforming/prohibited item is delivered to the ORR Landfills.

I. Required Documentation (as applies)

Specific requirements are stated for form UCN-2109, *Waste Item Description*, and UCOR Form 398, *Process Knowledge Documentation*. These requirements also apply to the corresponding forms UCN-21941, *Request for Landfill Disposal*, and UCN-21395, *Process Knowledge Documentation*, which are used by the Y-12 National Nuclear Security Complex, and the *ORR Landfill Shipping Form*, which is used by UCOR.

1. Completed and signed form UCN-2109, "Waste Item Description." Every delivery to the ORR Landfills must be accompanied by a UCN-2109 form, which has been reviewed and approved by the Landfill Facility Manager or the Landfill Waste Acceptance Manager. The UCN-2109 form shall comply with the following requirements:

    1.1. Information on UCN-2109 forms must accurately represent the spoil material and must be current, complete, and correct.

    1.2. If there is a change in the generating company, the UCN-2109 form must be modified to identify the correct company and correct generator information and be re-signed by the generator, unless otherwise approved by the Waste Acceptance Manager.

    1.3. If a radiological "green tag" is used to support the disposition of material, the generator must provide the green tag number on the UCN-2109 form when the green tag number becomes available or attach the green tag to the 2109.

2. Completed Form 398 (or equivalent), "Process Knowledge Documentation".

3. Radiological "green tag", or Process Knowledge Documentation Form 398 (or equivalent), or analytical data to clearly show the material is not a radiological waste.

4. Sampling plans, laboratory data, statistical evaluation of the data, and/or other information that characterizes the material.

APPENDIX A

USE OF PROCESS KNOWLEDGE FOR RADIOLOGICAL RELEASE OF MATERIAL TO U. S. DEPARTMENT OF ENERGY (DOE) LANDFILLS

Process knowledge (PK) is a tool used to aid the characterization of waste generated by DOE activities in the Oak Ridge area. PK is not used as a stand alone process. PK is one input into the evaluation of a material. Only a trained member of the radiological organization with input from trained waste generator can determine if an item is releasable from a radiological perspective. The radiological representative will use the signed PK form as an input to the evaluation for release of the material. The following points emphasize how PK is used in the evaluation for the release of materials to the DOE landfills:

- PK is not used for the release of materials to DOE landfills if those materials have been generated, used, or stored within radiologically contaminated areas. All materials released from contaminated areas are surveyed prior to release. Inaccessible internal surfaces that are physically prevented from coming into contact with radiological contamination—such as the internal surfaces of compressed cylinders or aerosol cans—are not required to be surveyed provided all accessible surfaces are found to meet the release criteria.

- Materials released to landfills from within radiologically controlled areas must be appropriately characterized to demonstrate compliance with applicable release criteria prior to release to the landfills. Radiological surveys and/or sampling are the primary means of characterization even for those materials for which the potential for contamination is known to be very low. However, for those materials not originating from radiological contamination areas and for which the potential for contamination is known to be insignificantly small, PK may be used as the basis for releasing these materials to the DOE landfills.

- PK requires an equipment or material owner to certify by signature that equipment or material could not possibly be contaminated based on personal and specific knowledge about the history of the item including its origin, use, and locations of use.

- PK may be used to help the Health Physicist or Radiological Engineer determine if equipment and material may be potentially contaminated. PK does not relieve the Health Physicist or Radiological Engineer from accountability for assuring the material or equipment meets the release limits.

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SAFELY DELIVERING THE DEPARTMENT OF ENERGY'S VISION
FOR THE EAST TENNESSEE TECHNOLOGY PARK MISSION

UCOR-5112

Oak Ridge Reservation Landfills, Profile S-040: Special Waste, Oak Ridge, Tennessee

This document is approved for public release per review by:

D. C. Lannom — 4/17/18

UCOR Classification & Information Control Office — Date

UCOR-5112

Oak Ridge Reservation Landfills, Profile S-040: Special Waste, Oak Ridge, Tennessee

Date Issued—May 2018

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

URS | CH2M Oak Ridge LLC
Safely Delivering the Department of Energy's Vision
for the East Tennessee Technology Park Mission
under contract DE-SC-0004645

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APPROVALS

Oak Ridge Reservation Landfills, Profile S-040: Special Waste, Oak Ridge, Tennessee	UCOR-5112
	May 2018

USQD Review Determination	☐ USQD ☒ UCD ☐ CAT X ☐ Exempt (Select Criteria 1–3 below.) USQD/UCD/CAT X No.: UCD-YT-0RRL-0694
Exemption Criteria	☐ (1) Non-Intent Change ☐ (2) DOE-Approved Safety Basis Document ☐ (3) Chief Accounting Officer, Internal Audit, Labor Relations, General Counsel, Outreach & Public Affairs, or Project Controls Services OR ☐ (4) Document identified in USQD-MS-CX-REPORTS-1074
USQD Preparer:	Name: [signature] Date: 5/1/2018
Exhibit L Mandatory Contractor Document	☒ No (No PCCB Reviewer Signature Required) ☐ Yes (Requires review by the Proforma Change Control Board.)
PCCB Reviewer:	Name: Date:

Prepared by: [signature] Courtney Julius, WM Quality Engineer, UCOR/Strata-G — Date: 4/26/18

Concurred by: [signature] Brandy Belicek, ORR Landfill Operations Manager, UCOR — Date: 4/30/18

Approved by: [signature] Douglas Hanahan, UCOR Waste Acceptance and Tracking Manager, RSI EnTech — Date: 4/26/18

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REVISION LOG

Revision Number	Description of Changes	Pages Affected
0	Initial issue of document. Replaces Profile S-040, Rev. 6, *Oak Ridge Reservation Landfills Profiles S-040: Special Waste*. Please note that conversion of Profile S-040 to a UCOR-numbered document followed guidelines of UCOR-4000 (*Document Preparation Guide for URS | CH2M Oak Ridge LLC, Oak Ridge, Tennessee*) as best as practicable. However, due to previous cross-referencing between the profile, its associated forms, and the landfills, certain formatting falls outside the UCOR-4000 instructions. Formatting variations are explained/indicated where necessary.	All

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CONTENTS

ACRONYMS

ACM	asbestos-contaminated material
AWSR	Asbestos Waste Shipment Record
CDL	Construction/Demolition Landfill
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	*Code of Federal Regulations*
DOE	U.S. Department of Energy
DR	Disposal Request
EPA	U.S. Environmental Protection Agency
ILF	Industrial Landfill
NDA	non-destructive assay
ORR	Oak Ridge Reservation
OSHA	Occupational Safety and Health Administration
PK	process knowledge
PLM	polarized light microscopy
RACM	regulated asbestos-contaminated material
RCRA	Resource Conservation and Recovery Act
RESRAD	residual radioactive
TCLP	toxicity characteristic leaching procedure
TDEC	Tennessee Department of Environment and Conservation
UCOR	URS | CH2M Oak Ridge LLC
VPM	Vehicle Portal Monitor
WAT	Waste Acceptance Team
WTMS	Waste Transportation Management System

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1. INTRODUCTION

The Department of Energy (DOE)-Oak Ridge Office of Environmental Management manages three solid waste landfills permitted by the Tennessee Department of Environment and Conservation (TDEC) for the disposal of solid wastes generated by DOE activities in the Oak Ridge area. Through TDEC-approved permits and other documents, these landfills are approved to accept specific industrial wastes, institutional wastes, construction/demolition wastes, and special wastes. The landfills are:

- Industrial Landfill (ILF)-IV (Permit Number IDL 01-103-0075)
- ILF-V (Permit Number IDL 01-103-0083)
- Construction/Demolition Landfill (CDL)-VII (Permit Number DML 01-103-0045)

Special wastes are wastes that are either difficult or dangerous to manage and may include sludges, bulky wastes, pesticide wastes, medical wastes, industrial wastes, hazardous wastes that are not subject to regulation under TDEC Rules 0400-12-01-.03 through 0400-12-01-.07 (*Rules of the Tennessee Department of Environment and Conservation Division of Hazardous Waste Management*), liquid wastes, friable and non-friable asbestos wastes, and combustion wastes. Special Waste is accepted at the Oak Ridge Reservation (ORR) Landfills as described in this waste profile.

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2. WASTE DESCRIPTION

2.1 SPECIAL WASTES EXEMPT FROM APPLICATION PROCESS

The approvals to accept certain special wastes have been incorporated into the landfill permits and are therefore approved by TDEC on a "blanket" approval basis for disposal in the ORR Landfills. The approval and disposal requirements for these particular special wastes are presented in Chap. 6 in the corresponding Attachments, as summarized below. Special wastes with blanket approval are exempt from the application process described in Attachment 1.

- Attachment 3—Asbestos (friable and non-friable)
- Attachment 4—Beryllium oxide
- Attachment 5—Dead animals
- Attachment 6—Empty hazardous material containers
- Attachment 7—Empty aerosol cans/empty (non)pressurized gas
- Attachment 8—Empty pesticide containers
- Attachment 10—Petroleum product contaminated soil
- Attachment 11—Glass
- Attachment 12—Empty paint cans
- Attachment 14—Treated medical/biological waste
- Attachment 15—Bird droppings

2.2 POTENTIAL SPECIAL WASTES REQUIRING TDEC EVALUATION AND APPROVAL

Special wastes or potential special wastes require review and approval by TDEC prior to disposal in the ORR Landfills. Only TDEC has the authority to determine whether a potential special waste is a special waste and is approved for disposition. The Waste Generator must make application to the landfill operator and to TDEC for review and approval of a special waste application, as described in Attachment 1. Potential special wastes requiring evaluation and approval include, but are not limited to:

- Sand/grit blast wastes
- Mercury-contaminated soils and materials
- Soils and materials contaminated with industrial chemicals
- Wastes generated by environmental restoration of contaminated sites
- Wastes generated from the demolition of industrial processes
- Wastes generated from the demolition of treatment processes
- Wastes generated from Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) projects (additional guidance is available from TDEC regarding CERCLA building debris)
- Wastes requiring special handling during disposal operations as defined by Industrial Hygiene
- Wastes that are bulky or difficult to manage
- Industrial process wastes:
  - Wastes emitted from industrial processes

— Raw material for industrial processes that become wastes

- Sludges from treatment or industrial processes
- Filters from industrial or treatment processes
- Activated carbon from industrial or treatment processes
- Treatment media from industrial or treatment processes
- Raw materials from treatment processes that become wastes
- Wastes from air emission control devices
- Polychlorinated biphenyl (PCB) detectable wastes
- PCB bulk product waste
- Lead-based paint debris (additional guidance available from TDEC regarding lead paint in building debris)
- Wastes that present potential respiratory hazards
- Solid laboratory chemicals
- Metal turnings, shavings, and dust from industrial processes and machining operations
- Bulk quantities of non-PCB light ballasts
- Incinerator ashes
- Paint chips
- Untreated medical/biological wastes

3. LIMITATIONS

3.1 CHEMICAL CONSTITUENT LIMITATIONS

Waste shall not exhibit characteristics of, or be listed as, hazardous waste (as identified in the Resource Conservation and Recovery Act [RCRA] regulations) and cannot be subject to any RCRA Land Disposal Restrictions.

Certain PCB wastes that are approved under the Toxic Substances Control Act regulations for disposal in a state-approved non-hazardous waste landfill (e.g., PCB bulk product wastes) may be acceptable for disposal. **All wastes containing quantifiable levels of PCBs require TDEC review and approval as a special waste**. All other PCB wastes will not be acceptable for landfill disposal.

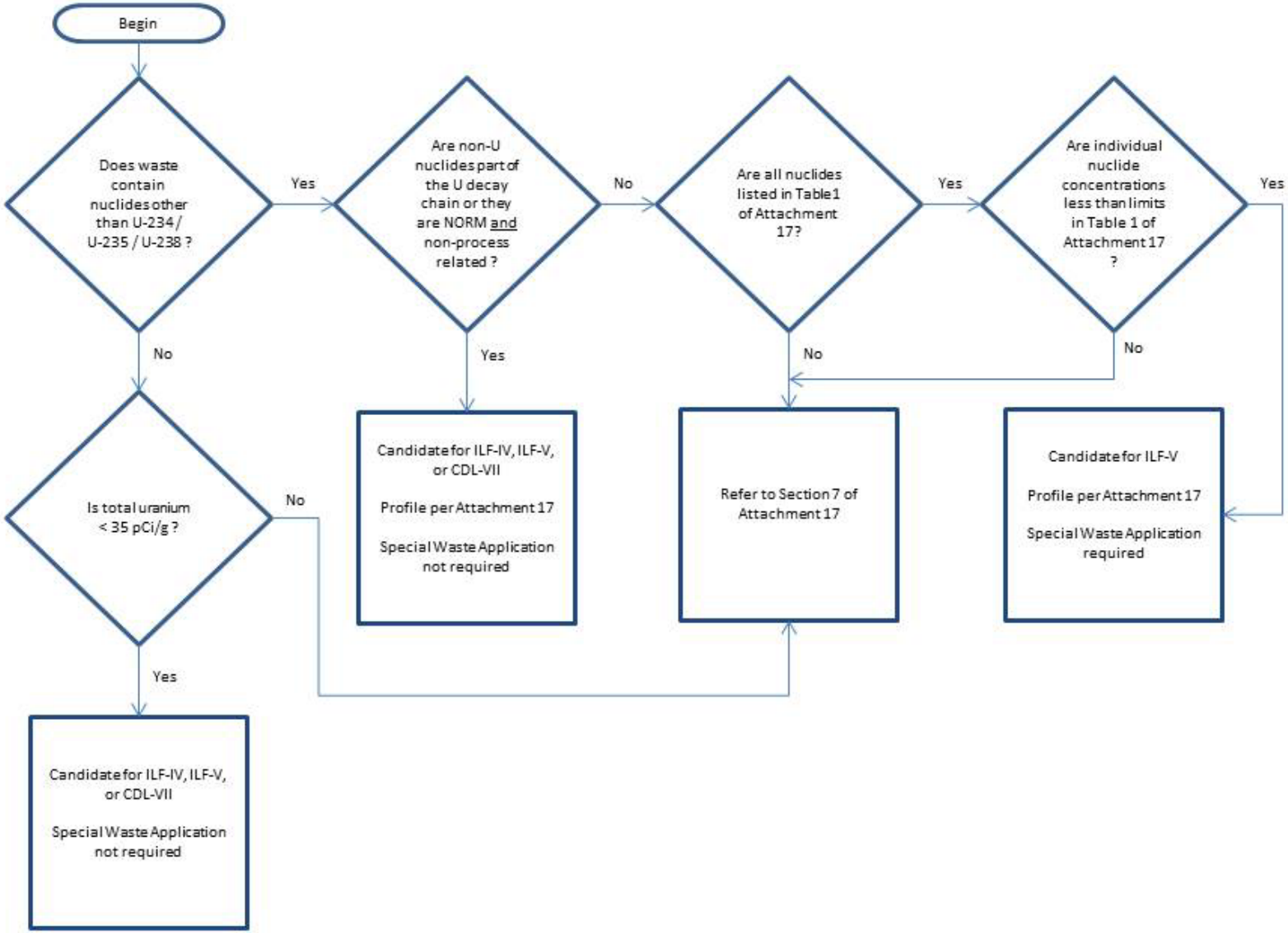
3.2 RADIOLOGICAL CONSTITUENT LIMITATIONS

Wastes proposed for disposal in the ORR Landfills shall be either non-radioactive or, if residual radioactivity is present, shall meet the surface/volumetric radiological criteria established with DOE and TDEC. It is strongly recommended that generators consult with the Waste Acceptance Team (WAT) and cognizant Radiological Engineer or Health Physicist to determine when to use surface or volumetric criteria for waste characterization, or both, as applicable.

- If non-radioactive waste, then the waste must be documented as such by process knowledge (PK), by radiological surface survey results, and/or by volumetric analytical data, as applicable for each waste stream. Some waste streams may require surface and volumetric screening. Refer to Attachment 2 for guidance concerning the use of PK.
- If the waste is surface contaminated with radioactive isotopes, then the waste must meet the offsite surface release guidelines established in Figure IV-1 of DOE Order 5400.5[1], *Radiation Protection of the Public and the Environment*.
- If the waste is volumetrically contaminated with radioactive isotopes, the waste must comply with the following:
  - — If the waste has a total uranium activity of less than 35 picocuries per gram and no other non-naturally occurring radionuclides are present, the waste is a candidate for disposal in ILF-IV, ILF-V, or CDL-VII.
  - — If the waste contains non-naturally occurring radionuclides other than uranium, the waste must meet the volumetric screening criteria specified in Table 1 of Attachment 17 (see Chap. 6). The process for obtaining approval to dispose of these wastes is described in Attachment 17. These limits only apply to ILF-V and CDL-VII. ILF-IV is not authorized to receive volumetric waste other than uranium isotopes, as previously stated.
  - — If the waste is volumetrically contaminated with radionuclides that exceed or are not specifically included in Table 1 of Attachment 17, the waste may be a candidate for disposal. It will be necessary for the Waste Generator to obtain approval to dispose of the waste following the process described in Sect. 7 of Attachment 17.

Profiling guidance for volumetrically contaminated materials is illustrated in Fig. 1 (Note: Attachment 17 cited in the figure can be found in Chap.6).

[1] DOE Order 458.1 authorizes continued use of the former DOE Order 5400.5 surface-contamination criteria as a pre-approved authorized limit.



NORM = naturally occurring radioactive material
U = uranium

Fig. 1. Profiling guidance for volumetrically contaminated materials.

3.3 PROHIBITED ITEMS

If prohibited materials are detected in wastes delivered to the landfill, the Waste Generator will be notified so the materials can be retrieved. Prohibited materials will not be accepted. Items prohibited under this profile include:

- RCRA-hazardous wastes
- PCB wastes, except those PCB wastes allowable under 40 *CFR* 761 (*Polychlorinated Biphenyls [PCBs] Manufacturing, Processing, distribution in Commerce, and Use Prohibitions*) and approved by TDEC as special waste
- Radioactive wastes, in excess of limits in Sect. 3.2.
- Liquid wastes or waste containing free liquids
- Tires, unless quartered or shredded
- Lead acid batteries
- Refrigeration equipment not complying with 40 *CFR* 82.156 (“Proper evacuation of refrigerant from appliances”)
- Unapproved special wastes

Any waste delivered to the landfill that does not meet the requirements of this profile, is not packaged properly, or is not labeled properly is subject to rejection by the landfill operator. In addition, if advance notification of waste delivery is required for the waste and the notification is not provided to the ORR Landfill staff, the waste will be subject to rejection. If waste is rejected, the reason for rejection will be furnished to the Waste Generator. The Waste Generator will be responsible for the cost of retrieval, management, and proper disposition of all prohibited wastes delivered to the landfill.

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4. PARAMETERS

4.1 PHYSICAL PARAMETERS

- No free liquids[2]. The waste form shall have the consistency to be managed and compacted by landfill heavy equipment.
- Bulky items (e.g., pipe, concrete foundations, large storage tanks, structural steel) must be less than 8 ft in length in order to permit safe handling with landfill equipment. The Waste Generator is responsible for ensuring that waste is sized so that it does not get stuck in transportation vehicles. For guidance on oversized items, the Waste Generator should contact the Landfill WAT or Landfill Facility Manager.
- Except as authorized in this profile or authorized by the Landfill WAT, the Waste Generator shall segregate wastes (special wastes shall be segregated from construction/demolition and sanitary/industrial wastes and shall be segregated by special waste type [e.g., friable asbestos shall be segregated from non-friable asbestos, PCB bulk product paint waste shall be segregated from friable asbestos]) at the point of generation for segregated delivery of the wastes to the ORR Landfills.

4.2 CHARACTERIZATION PARAMETERS AND METHODOLOGY

- URS | CH2M Oak Ridge LLC (UCOR) Waste Generators shall manage and dispose of waste intended for disposal in the ORR Landfills, in accordance with the requirements presented in this profile and following documents:
  - — *UCOR Waste Management Program Plan*, PPD-WM-2400
  - — *URS | CH2M Oak Ridge LLC Waste Certification Program Plan, Oak Ridge, Tennessee*, UCOR-4187

  Non-UCOR Waste Generators shall manage and certify wastes in accordance with their DOE prime contractor-approved documents. Proper characterization of waste is the responsibility of the generator.
- PK and/or sampling and analysis must be used for categorizing and characterizing solid waste. PK may include knowledge and historical information of the areas and buildings from which the waste stream was generated, operations/processes that were performed in the areas/buildings from which the waste stream was generated, materials/contaminants that were used/processed/stored in the areas/buildings from which the waste stream was generated, and whether the waste was stored in radiologically contaminated and/or uncontaminated buildings/areas.
- Sampling and analysis, if utilized, must identify and quantify the contaminants that are present in the waste. Depending on the nature of the waste, analyses may be required for toxicity characteristic leaching procedure (TCLP) constituents, ignitability, corrosivity, reactivity, PCBs, beryllium, radiological contaminants, and/or free liquids. Sampling and analysis of the waste shall conform to the requirements of U.S. Environmental Protection Agency (EPA) document SW-846, *Test Methods for Evaluating Solid Waste: Physical/Chemical Methods*, or other nationally recognized standards. If a non-standard method is used to characterize the waste, a detailed explanation must be provided in the TDEC Waste Evaluation Application.

[2]Any waste material that is determined to contain "free liquids" as defined by Method 9095 (Paint and Filter Liquids Test), as described in *Test Methods for Evaluating Solids Waste: Physical/Chemical Methods* (Environmental Protection Agency [EPA] Pub. No. SW-846).

- Radiological characterization must conform to the sampling and analytical requirements in Attachment 17, Sect. 3. Radionuclide characterization data must be reported in picocuries per gram of waste (dry weight basis).
- If a Waste Generator proposes to use non-destructive assay (NDA) to characterize volumetrically contaminated waste, the Waste Generator shall follow the guidance presented in Attachment 17, Sect. 3.

5. REQUIREMENTS

5.1 PACKAGING/TRANSPORTATION REQUIREMENTS

- Packaging and labeling shall comply with applicable Department of Transportation (49 *CFR*) requirements, the requirements specified in this profile, and any additional conditions specified in TDEC special waste approval letters.
- Labels, markings, identification, etc. on drums and containers that are not applicable to the drum, container, or waste in the drum or container must be rendered unidentifiable and the action identified in the accompanying Disposal Request (DR) (see Sect. 5.3). Any dumpsters used to deliver waste to the landfill shall have identification numbers or bar codes, and those identification numbers/bar codes shall be clearly reflected on the corresponding DR.
- The Waste Generator shall size and load the waste into the waste-delivery vehicles in such a manner to prevent the waste from becoming lodged in waste-delivery vehicles and containers (i.e., dump truck beds, roll-off containers) during the dumping operations. The Waste Generator/Transporter shall be responsible for safely removing and clearing lodged materials from the waste-delivery vehicles/containers.
- The ORR Landfills can provide assistance with off-loading via forklift; however, it is highly recommended that Waste Generators deliver wastes in vehicles that are self-dumping/unloading. If it is necessary to deliver wastes on flatbed trucks or flatbed trailers, the waste shall be palletized or cribbed and the generator shall perform advance coordination with the WAT or Landfill Facility Manager to confirm that forklift support will be available. Additionally, the weight must be clearly marked on the item upon arrival at the Truck Receiving Station. Some material may also require that the center of gravity be marked before the material can be handled.
- For deliveries of large, bulky items that exceed the handling capacity of standard equipment at the landfill, the Waste Generator shall make all necessary unloading preparations (i.e., equipment [cranes and large fork trucks], trained personnel, hoisting and rigging plans, work plans, activity hazard assessments). The Waste Generator shall be responsible for all costs associated with such unloading activities.
- Waste-delivery vehicles **shall not** leak fluids (e.g., compactor trucks, dump trucks, dumpsters, roll-offs)
- Dump trailers (framed and frameless) are prohibited.
- The Waste Generator shall contact the WAT or Landfill Facility Manager if there are questions regarding personal protective equipment requirements for delivery personnel.

5.2 ADDITIONAL REQUIREMENTS

- During preparation of proposals and preparation of waste management plans for projects, the Waste Generator shall communicate with the Landfill WAT to discuss the project schedule, projected waste generation/delivery schedule(s), projected waste streams, estimated waste volumes, waste characterization, potential special waste requests, waste segregation, and waste documentation. Waste-delivery quantities per day may be limited based on available landfill resources.

- Disposal plans for special wastes that require TDEC approval prior to disposal must be coordinated with the WAT during initial planning activities to allow sufficient time for obtaining TDEC special waste approval.
- The Waste Generator shall provide notification to and coordinate with the WAT or Landfill Facility Manager at least one working day prior to delivery of a newly approved special waste or a special waste that is not routinely delivered to the landfill.
- All wastes delivered to the landfill, including NDA-surveyed wastes, must pass through the Vehicle Portal Monitor (VPM), and will be subject to random inspection and random radiological survey.
- If the waste to be delivered to the landfill contains naturally occurring radioactive material or has been approved by TDEC with volumetric contamination, the generator may request a VPM bypass. VPM bypass requests must be made to the WAT and include justification for the request (e.g., PK statements, analytical data) and a completed DR. VPM bypass requests shall be evaluated by the Radiological Engineer supporting the ORR Landfills and must be approved by the Landfill Facility Manager.

5.3 DOCUMENTATION REQUIREMENTS

Documentation required for acceptance and disposal of special waste is discussed below. The terms "Disposal Request or DR," as used in this document, refers to Form-3206, *ORR Landfill Waste Profile Data Package* (publication in process); Form UCN-2109, Waste Item Description; Form UCN-21941, Request for Landfill V and VII Disposal; the ORR Landfill Shipping Form in UCOR's Waste Transportation Management System (WTMS) or eMWaste; or equivalent.

Information on DRs and PK Documentation Forms must accurately represent the waste and must be current, complete, and correct. Signature of the DR constitutes certification by the Waste Generator that sufficient controls are in place to mitigate the potential for non-conformances against this profile. This certification includes future-generated waste when a blanket DR is utilized.

5.3.1 Documentation Required for Special Waste Evaluation Applications

The documents required for special waste evaluation applications to be submitted to TDEC are described in Attachment 1 (see Chap. 6).

5.3.2 Documentation Required for Disposal Requests

The following documents shall be submitted to the WAT for review and approval prior to waste delivery.

- Completed and signed DR form (if using an electronic system such as WTMS, submittal for approval shall constitute signature of the DR).
  - — Special Waste that is routinely generated can be represented on a "blanket" DR, which must be renewed annually.
  - — If there is a change in the generating company or generator contact, the DR must be modified to identify the correct company and correct generator information and be re-signed by the Waste Generator, unless otherwise approved by the WAT.
  - — If a radiological "green tag" is used to support the disposition of waste, the Waste Generator must provide the green tag number on the DR when the green tag number becomes available or attach the green tag to the DR.

— The TDEC special waste approval letter number must be clearly noted on the DR.

— Any special handling instructions must be clearly noted on the DR.

- PK Documentation Form

  — A PK form, or equivalent, shall be submitted for all wastes using this profile.

- Radiological certification clearly showing the waste meets the radiological acceptance criteria:

  — "Green tag"
  — Custodial justification
  — Radiological surveys
  — Analytical data
  — PK documentation

- Sampling plans, laboratory data, statistical evaluation of the data, and/or other information that characterizes the waste, if not previously included in a special waste evaluation application.
- TDEC special waste approval letter, if applicable.
- Draft copy of Asbestos Waste Shipment Record, per Attachment 3.
- Draft copy of Generator's/Shipper's Log for Beryllium/Beryllium Oxide Removal and Disposal, per Attachment 4.
- Any other documentation required by the TDEC special waste approval letter (e.g., radiological certification letters)

5.3.3 Documentation Required for Waste Deliveries

- A completed and signed DR that has been approved by the WAT or Landfill Facility Manager. Signed forms are not required for compactors and numbered dumpsters with blanket approvals.
- If not previously provided, radiological certification (see previous section for acceptable means of certification).
- Any other documents required by the Attachments to this profile or the TDEC special waste approval letter.

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6. SPECIAL WASTE ATTACHMENTS

This chapter presents attachments that represent ORR Landfill special wastes that have been incorporated into the original landfill permits; therefore, these certain wastes have been previously approved for disposal by TDEC on a "blanket" approval basis and do not have to go through the application process. In addition, the special waste evaluation application process (though not necessary for these special wastes) and use of PK in determining radiological release of material is discussed. Below is a list of the attachments, which further describe the special wastes on the following pages. Attachment 17 also includes two appendices (A and B) that discuss supplemental material related to that attachment. Note that some attachments are reserved, meaning they are no longer in use.

Attachment 1—Special Waste Application Process
Attachment 2—Use of Process Knowledge for Radiological Release of Material to DOE Landfills
Attachment 3—Special Waste: Asbestos (Friable and Non-friable)
Attachment 4—Special Waste: Beryllium Oxide
Attachment 5—Special Waste: Dead Animals
Attachment 6—Special Waste: Empty Hazardous Material Containers
Attachment 7—Special Waste: Empty Aerosol Cans/Empty (Non)Pressurized Gas
Attachment 8—Special Waste: Empty Pesticide Containers
Attachment 9—Reserved
Attachment 10—Special Waste: Petroleum Product Contaminated Soil
Attachment 11—Special Waste: Glass
Attachment 12—Special Waste: Empty Paint Cans
Attachment 13—Reserved
Attachment 14—Special Waste: Treated Medical/Biological Waste
Attachment 15—Special Waste: Bird Droppings
Attachment 16—Reserved
Attachment 17—Special Waste: Wastes Volumetrically Contaminated with Residual Radioactive Materials

Appendix A—Background Concentration and Other Radionuclides
Appendix B—Sampling and Analytical Summary Form

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ATTACHMENT 1
SPECIAL WASTE EVALUATION APPLICATION PROCESS

1. REGULATORY REQUIREMENTS AND OTHER INFORMATION

The special waste evaluation application process is discussed below. The forms referenced in this section, and other information, can be found on the TDEC website.

TDEC Rule 0400-11-01-.07(2)(b)4 requires a $300 fee for special waste evaluations. The fee is required for all special waste evaluations.

Generators should allow sufficient time in their project schedules to obtain special waste approval. Per the information provided on TDEC's web site, special waste evaluation applications will be processed within **30 days** of receipt of the application.

2. SPECIAL WASTE EVALUATION APPLICATION SUBMITTAL AND APPROVAL PROCESS

Based upon the regulatory requirements and guidance from DOE, the process for handling "potential" special wastes and special wastes generated as a result of DOE activities in the Oak Ridge area is described below. Special wastes with blanket approval (Sect. 2.1) are exempt from this process.

2.1 The Waste Generator shall review the Sanitary/Industrial Waste Profiles, and properly characterize and categorize the waste, including special wastes and "potential" special wastes. If a Waste Generator has questions regarding categorization of special wastes or "potential" special wastes, the Waste Generator should consult with the Landfill WAT.

2.2 If the Waste Generator has a special waste or "potential" special waste, the Waste Generator shall prepare a draft special waste evaluation application package including:

- Transmittal letter containing the appropriate radiological assurance statement, as described in Sect. 3 of this attachment
- Waste Evaluation Application (see Sect. 4 of this attachment)
- Relevant associated documentation (e.g., safety data sheets, laboratory data, waste sampling descriptions)
- $300.00 check

2.3 If the waste is volumetrically contaminated with radionuclides, the Waste Generator shall comply with the requirements presented in Attachment 17 and include the following additional documents in the special waste evaluation application package:

- Sampling and Analytical Summary (Appendix B of Attachment 17), with supporting analytical data
- Volumetric Screening and Compliance Calculation Spreadsheet (see Sect. 5 of Attachment 17)
- Information and documentation, as described in Sect. 7 of Attachment 17, for waste containing radionuclides that exceed or are not listed in Table 1 of Attachment 17

2.4 The Waste Generator shall transmit the entire draft special waste application package to the Landfill WAT for review[3].

2.5 Upon receipt of review comments from the Landfill WAT, the Waste Generator shall revise the special waste request package to appropriately address the review comments and sign the transmittal letter and Waste Evaluation Application.

2.6 The Waste Generator shall deliver the final special waste application package, including the signed transmittal letter, signed Waste Evaluation Application, all support documentation, and a $300 check to the Landfill WAT, who will transmit the information to TDEC. Alternately, the package may be transmitted to TDEC by the Waste Generator, provided that a copy of the final package is provided to the WAT.

2.7 Any interim correspondence between TDEC and the generator should be forwarded to the WAT.

2.8 Upon receipt of the TDEC special waste approval letter, the Waste Generator shall submit the documents specified in Sect. 5.3.2 to the WAT for review and approval.

3. TRANSMITTAL LETTER ASSURANCE STATEMENTS

3.1 Wastes Only Subject to Volumetric Contamination

"This waste complies with applicable authorized limits as provided for in DOE Order 458.1 (previously DOE Order 5400.5) and delineated in the Memorandum of Understanding between the Tennessee Division of Radiological Health and the Tennessee Division of Solid Waste Management for release from radiological control and is appropriate for disposal at the ILF-V and/or CDL-VII. The waste has been, or will be, fully characterized and has been shown, or will be shown, to meet the agreed upon screening criteria for volumetric contamination as demonstrated in the Sampling and Analytical Summary and the Screening Calculations Worksheet included in this waste request."

3.2 Wastes Only Subject to Surface Contamination

"This waste complies with applicable authorized limits as provided for in DOE Order 458.1 (previously DOE Order 5400.5) for release from radiological control and is appropriate for disposal at the ILF-V and/or CDL-VII. The waste has been fully characterized, or will be, and has been shown, or will be shown, to meet the applicable surface contamination criteria from Table IV-1 of DOE Order 5400.5 (as amended in November 1995 guidance), and the potential for volumetric contamination within the waste has been evaluated and found to be insignificant."

3.3 Wastes Subject to Volumetric and Surface Contamination

"This waste complies with applicable authorized limits as provided for in DOE Order 458.1 (previously DOE Order 5400.5) for release from radiological control and is appropriate for disposal at the ILF-V and/or CDL-VII. The waste has been fully characterized, or will be, and has been shown, or will be shown, to meet the applicable surface contamination criteria from Table IV-1 of DOE Order 5400.5 (as amended in November 1995 guidance), and has been shown, or will be shown, to meet the agreed

[3]All draft special waste request packages will be reviewed by the Landfill WAT, DOE, and other UCOR staff, as needed. The WAT will provide consolidated review comments to the Waste Generator five (5) working days after the draft special waste request package is provided to the WAT by the Waste Generator.

upon screening criteria for volumetric contamination as demonstrated in the Sampling and Analytical Summary and the Screening Calculations Worksheet included in this waste request."

3.4 Wastes Evaluated by PK

"The potential for surface and volumetric contamination of the waste was evaluated and determined to be insignificant based on process knowledge. Process knowledge of the waste was used to determine that the waste is not radiologically contaminated as a result of U. S. Department of Energy operations and that the waste is appropriate for disposal in the Oak Ridge Reservation Landfills. The process knowledge determination is applied only to materials that have not been within radiological contamination areas and is based on the known origin, use, and usage location of the materials. The process knowledge determination is not applied to legacy wastes or other materials for which the origin, use, or usage locations are not well known."

4. SPECIAL WASTE EVALUATION APPLICATION FORM

The Special Waste Evaluation Application (Form # CN-1051) is illustrated below. Current versions of the form may be obtained from TDEC's website (see Sect. 1.1).

Reset Form

TENNESSEE DEPARTMENT OF ENVIRONMENT AND CONSERVATION
DIVISION OF SOLID WASTE MANAGEMENT
312 Rosa L. Parks Avenue, 14th Floor
Nashville, TN 37243

SPECIAL WASTE EVALUATION APPLICATION

PLEASE COMPLETE ALL QUESTIONS

Official Use Only
SPC ID #

1. GENERATOR INFORMATION.

(A) Facility Name:
Mailing Address:
Zip Code: Phone:
(B) Physical Location:
County: Phone:
(C) Nature of Business:
Technical Contact:
Title: Phone:

2. UNDER TENNESSEE RULES GOVERNING HAZARDOUS WASTE MANAGEMENT, IS THE WASTE:

		YES	NO
(A)	IGNITABLE?	☐	☐
(B)	CORROSIVE?	☐	☐
(C)	REACTIVE?	☐	☐
(D)	TCLP HAZARDOUS?	☐	☐
(E)	IS IT A LISTED HAZARDOUS WASTE?	☐	☐

Hazardous Waste Code(s):

RULE 0400-12-01-.03(1)(b) - A person who generates a waste must determine if that waste is a hazardous waste.

3. NAME AND/OR DESCRIPTION OF WASTE:

4. WASTE CHARACTERIZATION. Attach laboratory reports and/or material safety data sheets to adequately characterize the waste or explain why this is not necessary.

Describe any Special Handling Procedures:

Attachment Included (Y/N)

pH (if applicable)
Radioactive (Y/N)
Flash Point (if applicable)
Infectious (Y/N)
Physical State: Solid ☐ Liquid ☐ Sludge ☐ Slurry ☐
Color: Percent Solid:

5. DESCRIBE HOW WASTE IS GENERATED (Be Specific).

(A)

Rate of Waste "Generation": Quantity
Type Units: Tons ☐ cy ☐ lbs ☐ Other ☐ (specify)
Frequency of Generation: One Time ☐ Daily ☐
Weekly ☐ Monthly ☐ Annually ☐ Other ☐ (specify)

(B)

Rate of Waste "Disposal": Quantity
Type Units: Tons ☐ cy ☐ lbs ☐ Other ☐ (specify)
Frequency of Disposal: One Time ☐ Daily ☐ Weekly ☐
Monthly ☐ Annually ☐ Other ☐ (specify)

5. (continued)

(C) Include a narrative and a flow diagram of the process that generates the waste. Your explanation must describe the **POTENTIAL** contaminants in the waste which should justify your scope of constituents in Item 3. Include attachments as necessary.

Attachment Included (Y/N) ☐

6. HOW IS WASTE PRESENTLY MANAGED?

7. DESCRIBE THE TYPE OF CONTAINER USED FOR TRANSPORT OF WASTE.

Drums ☐ Roll-Off ☐ Container (dumpster, collector box) ☐ Plastic Bags ☐ Truck ☐ Other ☐

8. PROPOSED DISPOSAL / PROCESSING FACILITY. List only a facility that you have contacted and which has agreed to accept your waste if approved by the Department.

(A) Facility Name:

(B) Facility Permit Number:

(C) Facility Operator / Contact Name:

Phone:

9. PROPOSED TRANSPORTER.

Name:

Address:

Phone:

10. I certify under penalty of law that this document and all attachments were prepared by me, or under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, and accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment. As specified in Tennessee Code Annotated Section 39-16-702(a)(4), this declaration is made under penalty of perjury.

Waste Generator's Authorized Signature:	Preparer's Signature (If Different):
Date	Date

Official Use Only

Reviewer's Signature	Date Reviewed

Send originals with attachments to the Solid Waste Environmental Field Office for the region in which the facility listed in Item 8 above is located.

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ATTACHMENT 2
USE OF PROCESS KNOWLEDGE FOR RADIOLOGICAL RELEASE OF MATERIAL TO U. S. DEPARTMENT OF ENERGY LANDFILLS

PK is a tool used to aid the characterization of waste generated by DOE activities in the Oak Ridge area. PK is not used as a stand-alone process. PK is one input into the evaluation of a material. Only a trained member of the radiological organization with input from a trained Waste Generator can determine if an item is releasable from a radiological perspective. The radiological representative will use the signed PK form as an input to the evaluation for release of the material. The following points emphasize how PK is used in the evaluation for the release of materials to the DOE landfills:

- PK is not used for the release of materials to DOE landfills if those materials have been generated, used, or stored within radiologically contaminated areas. All materials released from contaminated areas are surveyed prior to release. Inaccessible internal surfaces that are physically prevented from coming into contact with radiological contamination—such as the internal surfaces of compressed cylinders or aerosol cans—are not required to be surveyed, provided all accessible surfaces are found to meet the release criteria.
- Materials released to landfills from within radiologically controlled areas must be appropriately characterized to demonstrate compliance with applicable release criteria prior to release to the landfills. Radiological surveys and/or sampling are the primary means of characterization even for those materials for which the potential for contamination is known to be very low. However, for those materials not originating from radiological contamination areas and for which the potential for contamination is known to be insignificantly small, PK may be used as the basis for releasing these materials to the DOE landfills.
- PK requires an equipment or material owner to certify by signature that equipment or material could not possibly be contaminated based on personal and specific knowledge about the history of the item, including its origin, use, and locations of use.
- PK may be used to help the Health Physicist or Radiological Engineer determine if equipment and material may be potentially contaminated. PK does not relieve the Project Health Physicist from accountability for assuring the material or equipment meets the release limits.

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ATTACHMENT 3
SPECIAL WASTE: FRIABLE AND NON-FRIABLE ASBESTOS-CONTAINING MATERIAL

1. DEFINITIONS

The following definitions are based on TDEC Rule 1200-03-11-.02. Waste generators are responsible for referring to TDEC Rule 1200-03-11-.02 for other regulatory definitions.

"Asbestos-containing material" (ACM) means asbestos or any ACM that contains more than 1 percent asbestos as determined using polarized light microscopy (PLM), according to the method specified in Appendix A, Subpart F, 40 *CFR*, Part 763, Section 1, "Polarized Light Microscopy," as contained in the 7-1-91 Edition of the *CFR*.

"Category I non-friable ACM" means asbestos-containing packings, gaskets, resilient floor covering, and asphalt roofing products containing more than 1 percent asbestos as determined using PLM, according to the methods specified in Appendix A, Subpart F, 40 *CFR* Part 763, Section 1, "Polarized Light Microscopy," as contained in the 7-1-91 Edition of the *CFR*.

"Category II non-friable ACM" means any material, excluding Category I non-friable ACM, containing more than 1 percent asbestos as determined using polarized light microscopy according to the methods specified in Appendix A, Subpart F, 40 *CFR* Part 763, Section 1, "Polarized Light Microscopy," as contained in the 7-1-91 Edition of the *CFR*, that, when dry, cannot be crumbled, pulverized, or reduced to powder by hand pressure.

"Friable asbestos material" means any material containing more than 1 percent asbestos as determined using PLM, according to the methods specified in Appendix A, Subpart F, 40 *CFR* Part 763, Section 1, Polarized Light Microscopy, as contained in the 7-1-91 Edition of the *CFR*, that, when dry, can be crumbled, pulverized, or reduced to powder during hand pressure. If the asbestos content is less than 10 percent as determined by a method other than point counting by PLM, verify the asbestos content by point counting using PLM.

"In poor condition" means the binding of the material is losing its integrity, as indicated by peeling, cracking, or crumbling of the material.

"Leak-tight" means that solids or liquids cannot escape or spill out. It also means dust-tight.

"Regulated asbestos-containing material (RACM)" means friable asbestos material; Category I non-friable ACM that has become friable; Category I non-friable ACM that will be or has become subjected to sanding, grinding, cutting, or abrading; or Category II non-friable ACM that has a high probably of becoming or has become crumbled, pulverized, or reduced to powder by the forces expected to act on the material in the course of the demolition or renovation operations regulated by Rule 1200-03-11-.02

"Visible emissions" means any emissions that are visually detectable without the aid of instruments, coming from RACM or ACM, or from any asbestos milling, manufacturing, or fabricating operation. This does not include condensed, uncombined water vapor.

2. FRIABLE ACM

Friable ACM waste, including insulation, piping, metal, equipment, and clothing that contains or is contaminated with friable asbestos, shall be managed as follows:

1. **Shall be packaged and sealed tightly in double-bagged, 6-mil-thick plastic bags, double-wrapped 6-mil-thick plastic sheeting, fiber drums, metal drums, or plywood boxes**.

2. Shall be labeled (or equivalent) as shown below: An updated label may be obtained on the Occupational Safety and Health Administration (OSHA) website

DANGER **CONTAINS ASBESTOS FIBERS** **AVOID CREATING DUST** **CANCER AND LUNG DISEASE HAZARD**

3. **Shall be transported in a fully enclosed space or fully covered by a secured tarpaulin**.

4. Shall be accompanied by a signed Asbestos Waste Shipment Record (AWSR) or equivalent, in addition to the documents specified in Chap. 5 of this profile. The AWSR form can be downloaded from TDEC's website.

5. Personnel within 100 ft of unloading operations shall, as a minimum, wear a respirator with cartridges for asbestos protection, unless personnel are inside a totally enclosed cab with all windows, vents, openings, etc. closed. All non-essential personnel shall stay out of the unloading area. Waste Generators/Transporters shall provide any personal protective equipment they need for the unloading operations.

6. The Waste Generator shall exercise extreme care in off-loading the waste to avoid rupturing the package. Unloading is the responsibility of the Waste Generator/Waste Generator.

    a. Lightweight, plastic-wrapped, or bagged waste containing friable asbestos must be unloaded manually by hand or via fork-lift (i.e., not direct dumping from dump trucks, roll-off containers, or dumpsters will be permitted).

    b. Friable asbestos packaged in durable containers, such as drums or boxes, may be dumped directly from the conveyance.

    c. In order to direct dump friable asbestos packaged in supersacks, the package must be closed properly per the manufacturer's instructions or by generator procedure and must not contain material that may puncture or rupture the package during dumping.

7. Waste approved for disposal via an individual special waste letter may differ from the guidance in this attachment.

8. **The generator shall coordinate delivery with ORR Landfill personnel at least one working day in advance**.

9. Friable asbestos is accepted at ILF-V. Waste shipments must be at the Truck Receiving Station at least 30 minutes prior to the close of waste receipts.

3. NON-FRIABLE ACM

Non-friable ACM is classified as either Category I ACM or Category II ACM. Asphalt roofing products, which may contain asbestos, include built-up roofing; asphalt-containing single-ply membrane system; asphalt shingles; asphalt containing underlayment felts; asphalt containing roofing coatings and mastics; and asphalt-containing base flashings. ACM roofing products that use other bituminous or resinous binders (such as coal tars or pitches) are also considered to be Category I ACM. Category II ACM includes all other non-friable ACM, for example, asbestos-cement tiles, and transite boards or panels containing more than 1 percent asbestos.

For projects that involve handling of non-friable ACM, appropriate regulatory and industrial hygiene guidance requires that the work be performed in a manner to maintain the non-friability of the ACM. For non-friable Category I and II ACM to be classified as non-friable waste and be eligible for handling under the designation of "non-friable" ACM, the removal operations must conform to the requirements specified in the federal regulations (40 *CFR* Part 61, Appendix A to Subpart M, " Interpretive Rule Governing Roof Removal Operations").

All friable ACM, RACM, and Category I non-friable ACM in poor condition shall be handled separately under the friable ACM handling requirements. **Non-friable Category I and II ACMs that become friable during the removal, loading, and transporting operations shall be managed under the friable ACM handling and disposal requirements described in Sect. 3.2 of this attachment**.

Bulk disposal of Category I non-friable ACM mixed with demolition debris is acceptable, as described below:

- Prior to demolition of structures and facilities, the Waste Generators will perform all necessary actions to identify and remove all ACM, except for Category I non-friable ACM that is not in poor condition and is not friable prior to demolition. The determination of the category and condition of the ACM shall be made by Asbestos Hazard Emergency Response Act Accredited Asbestos Inspectors using proceduralized processes (e.g., UCOR Procedure PROC-IH-5177, *Asbestos and Other Fibrous Materials*, or equivalent) incorporating EPA criteria of visual and tactile methods as found in EPA guidance documentation. If it is determined that the Category I non-friable ACM is in poor condition and either friable or will become friable during demolition, it will be considered RACM, and it shall be removed from the facility prior to demolition of the facility. The remaining Category I non-friable ACM that is not in poor condition and is not friable prior to demolition may be left in the structures/facilities for demolition.
- In addition, the Waste Generators shall follow appropriate demolition methods as described in EPA document *A Guide to Normal Demolition Practices Under the Asbestos NESHAP* (EPA-340/1-92-013) to minimize the potential for converting the Category I non-friable ACM to RACM during demolition of structures and facilities, handling of the waste at the demolition site, loading of the waste into waste transport vehicles, and transporting the waste to the ORR Landfills.
- The resulting Category I non-friable ACM mixed with demolition debris shall be managed as bulk non-friable ACM, as described below.
  - The label or tag describing the contents of each container must include the following words and must be visible on each waste package:

    Non-friable Asbestos

  - The *Asbestos Waste Shipment Record* is NOT required.

1. Personnel within 1 ft of unloading operations shall, as a minimum, wear a respirator with cartridges for asbestos protection, unless personnel are inside a totally enclosed cab with all windows, vents, openings, etc. closed. All non-essential personnel shall stay out of the unloading area. Waste Generators/Waste Generators shall provide any personal protective equipment they need for the unloading operations.

2. Packaging for bulk handling of <u>non-friable</u> ACM (Category I and II) shall be performed as follows:

    a. <u>Bulk Shipment of Non-Friable ACM in Non-Dedicated Use Dump Trucks, Intermodals, Roll-off Containers, and Similar Transport Containers</u>:

        - The non-friable ACM shall be kept adequately wet during demolition and loading (without creating free liquids problems).
        - A single layer (minimum) of 6-mil (minimum) plastic sheeting shall wrap the entire load. Sealed bladder bags or sealed supersacks, which are specifically designed for asbestos containment, may be used in lieu of the plastic sheeting. If plastic sheeting is used, it shall comply with the following:
            — Use oversize plastic sheeting to line the empty transport conveyance
            — After the non-friable ACM is placed in the lined conveyance, the loose edges of the plastic sheets shall be lapped over the top of the ACM and sealed.
        - A tarp or metal lid shall cover the entire load and the tailgate/door shall be closed.
        - Asbestos label(s) shall be applied to comply with 29 *CFR* 1926.1101(k)(8) and shall include the words "Non-Friable Asbestos."

    b. <u>Bulk Shipment of Non-Friable ACM in Dedicated Use Dump Trucks, Intermodals, Roll-off Containers, and Similar Transport Containers:</u>

        - The non-friable ACM shall be kept adequately wet during demolition and loading (without creating free liquids problems).
        - The containers shall be dust-tight and leak-tight via closed, gasketed doors and closed tarps or metal covers/lids.
        - No liner or plastic sheeting shall be required.
        - Asbestos label(s) shall be applied to comply with 29 *CFR* 1926.1101(k)(8) and shall include the words "Non-Friable Asbestos."
        - The containers shall be dedicated to ACM use until the units are decontaminated, in accordance with OSHA regulation 29 *CFR* 1926.1101.

    c. <u>Bundled/Stacked Transite Panels</u>:

        - The non-friable ACM shall be kept adequately wet during demolition and loading (without creating free liquids problems).
        - Each bundle of transite shall be wrapped, closed, and sealed in a single (minimum) layer of 6-mil (minimum)-thick plastic sheeting. Sealed bladder bags or sealed supersacks, which are specifically designed for asbestos containment, may be used in lieu of the plastic sheeting.

- Asbestos labels shall applied to each bundle to comply with 29 *CFR* 1926.1101(k)(8) and shall include the words "Non-Friable Asbestos."

5. Unloading shall be done carefully to keep the materials in the wrapping as much as possible and to maintain the non-friability of the ACM. Unloading is the responsibility of the Waste Generator and Waste Generator.

6. **The generator shall coordinate delivery with ORR Landfill personnel at least one working day in advance**.

7. Non-friable ACM waste is normally disposed in CDL-VII instead of ILF-V (waste in drums must be disposed in ILF-V). Waste shipments must be at the Truck Receiving Station at least 15 minutes prior to the close of waste receipts.

TDEC's Form CN-1054—Asbestos Waste Shipment Record—may be used. An example of an equivalent form (and instructions) is provided on the following two pages.

State of Tennessee
Department of Environment and Conservation
Division of Air Pollution Control
William R. Snodgrass Tennessee Tower
312 Rosa L. Parks Avenue, 15th Floor
Nashville, TN 37243-1531
615-532-0554

Asbestos Waste Shipment Record

(See Completion Instructions on Reverse)

GENERATOR

1. Work site name and mailing address	Owner's name	Owner's telephone no.
2. Operator's name and address **Authorized agent**:_____		Operator's telephone no.
3. Waste disposal site (WDS) name, mailing address, physical site location:	WDS phone no. Permit No.	

4. Name and address of responsible agency:
Tennessee Department of Environment & Conservation
Division of Air Pollution Control
William R. Snodgrass Tennessee Tower
312 Rosa L. Parks Avenue, 15th Floor
Nashville, TN 37243-1531

5. Description of waste:	**6.** Containers No._____Type_____ (See instructions for type code)	**7.** Total quantity _____yd^3 _____gal

8. Special handling instructions and additional information:

9. OPERATOR'S CERTIFICATION: I hereby declare that the contents of this consignment are fully and accurately described above by proper shipping name and are classified, packed, marked, and labeled, and are in all respects in proper condition for transport by highway according to applicable international and government regulations. As specified in Tennessee Code Annotated Section 39-16-702(a)(4), this declaration is made under penalty of perjury.

Printed/typed name_____Title_____Date_____

TRANSPORTER

10. Transporter # 1 (Acknowledgement of receipt of waste)
Printed/typed name_____Title_____Date_____

Signature_____Phone (_____)_____

Address_____

11. Transporter # 2 (Acknowledgement of receipt of waste)
Printed/typed name_____Title_____Date_____

Signature_____Phone (_____)_____

Address_____

DISPOSAL SITE

12. Discrepancy indication space:

13. Waste disposal site owner or operator:
Certification of receipt of asbestos materials covered by this manifest except as noted in item 12.

Printed/typed name_____Title_____Date_____

Signature_____Phone (_____)_____

CN-1054 (Rev. 07-13) Continued RDA 1298

Instructions for Completing Tennessee Asbestos Waste Shipment Record (Form CN-1054)

Waste Generator Section (Items 1-9) **NOTE: The waste generator must retain a copy of this form.**

1. Enter the name and address of the facility at which asbestos waste is generated. In the appropriate spaces, also enter the name of the owner of the facility and the owner's phone number.

2. If a demolition or renovation, enter the name and address of the company and the **authorized agent** responsible for performing the asbestos removal. In the appropriate space, also enter the phone number of the operator.

3. Enter the name, address, and physical site location of the waste disposal site (WDS) that will be receiving the materials. In the appropriate spaces, also enter the phone number and permit number of the WDS. Enter "on-site" if the waste will be disposed of on the generator's property.

4. Provide the name and address of the local, state, or EPA regional office responsible for administering the asbestos NESHAP program.

5. Indicate the types of asbestos waste materials generated. If from a demolition or renovation, indicate the amount of asbestos that is
- Friable asbestos material
- Non-friable asbestos material

6. Enter the number of containers used to transport the asbestos materials listed in item 5. Also enter one of the following container codes used in transporting each type of asbestos material (specify any other type of container used if not listed below):

DM - Metal drums, barrels
DP - Plastic drums, barrels
BA - Plastic bags or wrapping

7. Enter the quantity of each type of asbestos material removed in units of cubic yards (or gallons if drums or barrels are used).

8. Use this space to indicate special transportation, treatment, storage or disposal or Bill of Lading information. If an alternate waste disposal site is designated, note it here. Emergency response telephone numbers or similar information may be included here.

9. The **authorized agent** of the waste generator must read and then sign and date this certification. The date is the date of receipt by transporter.

Transporter Section (Items 10 & 11) **NOTE: The transporter must retain a copy of this form.**

10. Enter the name, address, and telephone number of transporter used. Print or type the full name and title of person accepting responsibility and acknowledging receipt of materials as listed on this waste shipment record for transport. Enter date of receipt and signature.

11. Enter same information as item 10 requires if more than one transporter is used.

Disposal Site Section (Items 12 & 13)

12. The authorized representative of the WDS must note in this space any discrepancy between waste described on this manifest and waste actually received as well as any improperly enclosed or contained waste. Any rejected materials should be listed and destination of those materials provided. A site that converts asbestos-containing waste material to non-asbestos material is considered a WDS.

13. The signature (by hand) of the authorized WDS agent indicates acceptance and agreement with statements on this manifest except as noted in item 12. The date is the date of signature and receipt of shipment.

NOTE: The WDS must retain a completed copy of this form for at least 2 years. The WDS must also send a completed copy to the operator listed in item 2.

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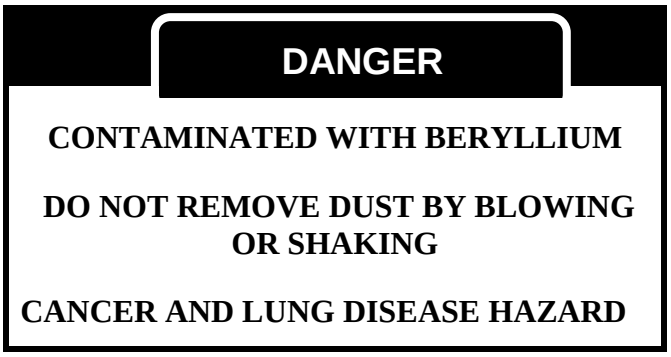
ATTACHMENT 4
SPECIAL WASTE: BERYLLIUM OXIDE WASTE

1. **Beryllium oxide (BeO) waste**, including wood, paper, clothing, piping, metal, equipment, and demolition material that is contaminated with BeO shall be managed as follows:

   a. **Shall be packaged and sealed tightly in double-bagged 6-mil-thick plastic bags, double-wrapped 6-mil-thick plastic sheeting, fiber drums, metal drums, or plywood boxes.**

   b. Shall be labeled (or equivalent) as shown below:



   "Danger" is in white letter on a red oval, which is imposed on a larger white oval on a place rectangle. The text is black on a white background. The border is black.

   c. Shall be accompanied by a completed and signed *Generator's/Shipper's Log for Beryllium Oxide Removal and Disposal* (Form-335), for each load of waste, in addition to the documents specified in Chap. 5 of this profile.

   d. **If the waste is bagged, it shall be transported in a fully enclosed space or fully covered by a secured tarpaulin. Wastes in drums and boxes shall be transported using standard transport vehicles only**.

   e. Personnel within 100 ft of unloading operations shall, as a minimum, wear respiratory protection, unless personnel are inside a totally enclosed cab with all windows, vents, openings, etc. closed. All non-essential personnel shall stay out of the unloading area. Waste Generators/Waste Generators shall provide any personal protective equipment they need for the unloading operations

   f. The Waste Generator shall exercise extreme care in off-loading the waste to avoid rupturing the package. Unloading is the responsibility of the Waste Generator/Transporter.

      - Lightweight, plastic-wrapped, or bagged waste containing BeO must be unloaded manually by hand or via fork-lift (i.e., not direct dumping from dump trucks, roll-off containers, or dumpsters will be permitted).
      - BeO packaged in durable containers, such as drums or boxes, may be dumped directly from the conveyance.

   g. Waste approved for disposal via an individual special waste letter may differ from the guidance in this attachment.

h. **The generator shall coordinate delivery with ORR Landfill personnel at least one working day in advance**.

i. Beryllium oxide wastes are accepted at ILF-V. Waste shipments must be at the Truck Receiving Station at least 30 minutes prior to the close of waste receipts.

UCOR Form-335—Generators/Shippers Log for Beryllium Oxide Disposal—shall be used. An example is provided on the following page.

UCOR
URS | CH2M
Oak Ridge LLC

Generator's/Shipper's Log for Beryllium Oxide Removal and Disposal

SECTION I – DESCRIPTION OF BeO-CONTAINING WASTES

DATE LOADED	NUMBER OF CONTAINERS	TYPE OF CONTAINERS	TOTAL WEIGHT (POUNDS)	TOTAL VOLUME (CUBIC YARDS)

DESCRIPTION and SPECIAL HANDLING

SECTION II – NAME/ADDRESS OF SITE FROM WHICH REMOVED

PLANT SITE , OAK RIDGE, TN.

BUILDING(S) AND AREA(S)

SECTION III – NAME/ADDRESS OF FACILITY TO WHICH CONTAINER SENT FOR STORAGE OR DISPOSAL (check one)

☐ Y-12 INDUSTRIAL LANDFILL V, OAK RIDGE, TN ☐ OTHER (specify)

SECTION IV– TRANSPORTER INFORMATION (Company Name / Address)

RFD (2109) NUMBER	JOB OR CHARGE NUMBER

SECTION V– WASTE DELIVERY (to be completed by Transporter)

DELIVERY NUMBER	DATE DELIVERED	TRUCK TAG NUMBER

SECTION V – CERTIFICATION BY PERSON RESPONSIBLE FOR REMOVAL OPERATIONS

I hereby certify that the above record of waste shipped is complete and accurate, and that the waste was Packaged and transported as specified in the approval letter.

GENERATOR	TRANSPORTER #1	TRANSPORTER #2
NAME	NAME	NAME
AFFILIATION	AFFILIATION	AFFILIATION

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ATTACHMENT 5
SPECIAL WASTE: DEAD ANIMALS

Occasionally, there is a need to dispose of dead animals from the ORR. These animals may result from incidents such as highway accidents, discovery of dead animals on a plant site, or extermination projects. Consequently, the following guidance is provided for disposal of nonhazardous, nonradioactive dead animals. Dead animals will be disposed of in ILF-V.

1. Dead animals shall be wrapped in plastic and packaged in a sealed container.

2. At least one working day advance notice shall be provided to the WAT or Landfill Facility Manager prior to shipment of such waste to the landfill.

3. The following animals are prohibited from disposal:

   - Animals containing and/or contaminated with hazardous materials, as defined in 40 *CFR* Part 261 (*Identification and Listing of Hazardous Waste*) or Tennessee Hazardous Waste Management Regulations.
   - Animals containing and/or contaminated with radioactive materials, as defined by the Atomic Energy Act of 1954, amended.
   - Animals containing and/or contaminated with carcinogens or suspected carcinogens.
   - Animals containing and/or contaminated with PCBs.

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ATTACHMENT 6
SPECIAL WASTE: EMPTY HAZARDOUS MATERIAL CONTAINERS

Containers that have contained hazardous materials and that meet the requirements for empty[4] containers in Rule 0400-12-01-.02(1)(g) of *Rules of the Tennessee Department of Environment and Conservation Division of Hazardous Waste Management* may be disposed of in ILF-V. Glass and plastic laboratory chemical containers meeting the definition of *empty* in the regulations referenced above may be crushed prior to disposal in ILF-V.

1. Empty hazardous material containers must have the following information documented on the DR:
    a. No free liquids must be stated on the request
    b. Type of absorbent added and approximate quantity if added to the container
    c. Contact information of responsible person that performed free-liquid verification

[4]The referenced hazardous waste regulations indicate that residual quantities of materials can be left in containers; however, wastes containing "free liquids" are prohibited from disposal in the ORR Landfills. Therefore, Waste Generators shall take appropriate measures (e.g., completely draining the containers, adding absorbent materials) to ensure that empty containers delivered to the ORR Landfills do not contain residual free liquids.

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ATTACHMENT 7
SPECIAL WASTE: EMPTY AEROSOL CANS AND NON-PRESSURIZED GAS CYLINDERS

Empty aerosol cans and empty gas cylinders (reference Bureau of Explosives Specification Number 39) shall be considered empty when the pressure in the container is at atmospheric pressure. Cans/cylinders shall be packaged in sealed fiber drums, metal drums, or 6-mil-thick plastic bags. Cylinders may be secured to clean pallets. Empty aerosol cans and empty non-pressurized gas cylinders shall **not** be placed in bulk solid waste receptacles (dumpsters). The generator must coordinate delivery with the Landfill WAT or Facility Manager at least one working day in advance of delivery.

Empty aerosol cans and gas cylinders shall be disposed of in ILF-V.

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ATTACHMENT 8
SPECIAL WASTE: EMPTY PESTICIDE CONTAINERS

The following guidance will be used for the disposal of empty pesticide containers. This guidance generally follows the guidelines found in 40 *CFR* 165.9, *Recommended Procedures for the Disposal of Pesticide Containers and Residues*. Empty pesticide containers shall be disposed of in ILF-V.

If the container is made of paper, cardboard, or other materials that would deteriorate upon rinsing with water, the container shall be shaken vigorously to remove all residue. The residue will be collected and used along with the bulk of the pesticide. All cardboard boxes will be crushed. The containers will be sealed in plastic bags.

If the container is metal, fiber, or other wettable material, it will be rinsed three times. The rinse liquid will be added to the spray mixture. Each rinsing will be done with a volume of water (or other normal dilatant) equal to approximately one-fourth of the container volume. After the final rinse, the container will be punctured and drained prior to disposal.

In the event that the contents of the container included a listed acute hazardous waste (40 *CFR* 261.33) and if the container is made of paper, cardboard, or other material that would be deteriorated by rinsing with water, this container shall be disposed of as a hazardous waste. If the container can be triple-rinsed without deteriorating, the procedure given above for wettable material containers may be used.

The following is a list of substances that are used in pesticides and that are classified as acute hazardous wastes upon disposal:

SUBSTANCE	**CHEMICAL ABSTRACTS NO.**
Acetic acid, fluoro-, sodium salt	62-74-8
Acrolein	107-02-8
Aldicarb	116-06-3
Aldrin	309-00-2
Allyl alcohol	107-18-6
Aluminum phosphide (R,T)	20859-73-8
4-Aminopyridine	504-24-5
Arsenic acid H_3AsO_4	7778-39-4
Arsenic oxide As_20_3	1327-53-3
Arsenic trioxide	1327-53-3
Calcium cyanide	592-01-8
Calcium cyanide $Ca(CN)_2$	592-01-8
Carbon disulfide	75-15-0
Copper cyanide	544-92-3
Copper cyanide Cu(CN)	544-92-3
Cyanogen chloride	506-77-4
Cyanogen chloride (CN)CI	506-77-4
2-Cyclohexyl-4,6-dinitrophenol	131-89-5
Dieldrin	60-57-1
O,O-Diethyl O-pyrazinyl phosphorothioate	297-97-2
Dimethoate	60-51-5
4,6-Dinitro-o-cresol, & salts	[1]534-52-1
Dinoseb	88-85-7
Disulfoton	298-04-4
Endosulfan	115-29-7

SUBSTANCE	CHEMICAL ABSTRACTS NO.
Endothall	145-73-3
Endrin	72-20-8
Endrin, & metabolites	72-20-8
Famphur	52-85-7
Fluoroacetamide	640-19-7
Heptachlor	76-44-8
Hydrocyanic acid	74-90-8
Hydrogen cyanide	74-90-8
Hydrogen phosphide	7803-51-2
Isodrin	465-73-6
Methomyl	16752-77-5
Methyl parathion	298-00-0
alpha-Naphtylthiourea	86-88-4
Nicotine, & salts	[1]54-11-5
Parathion	56-38-2
Phenylmercury acetate	62-38-4
Phorate	298-02-2
Phosphine	7803-51-2
2-Propenal	107-02-8
Sodium azide	26628-22-8
Sodium cyanide	143-33-9
Sodium cyanide Na(CN)	143-33-9
Strychnidin-10-one, & salts	[1]57-24-9
Tetraethyl pyrophosphate	107-49-3
Thallium (I) sulfate	7446-18-6
Thiofanox	39196-18-4
Thiourea, 1-naphthalenyl-	86-88-4
Toxaphene	8001-35-2
Warfarin & salts, when present at concentrations greater than 0.3%	[1]81-81-2
Zinc phosphide Zn_3P_2, when present at concentrations greater than 10% (R,T)	1314-84-7

[1]Chemical Abstracts Service Number given for parent compound only.

These compounds have other names commonly used and included as such in the EPA's Title III List of Lists. They are listed below, along with their chemical abstracts number.

SUBSTANCE	CHEMICAL ABSTRACTS NO.
Camphechlor	8001-35-2
PMA	62-38-4
TEPP	107-49-3
Thionazin	297-97-2

ATTACHMENT 9
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ATTACHMENT 10
SPECIAL WASTE: PETROLEUM PRODUCT CONTAMINATED SOIL

Occasionally, soil contaminated with petroleum product or spill cleanup residues may be disposed of in ILF-V. In order to safely dispose of the waste, the following procedures will be followed.

1. All free liquid gasoline or other petroleum products must be removed from the soil or spill cleanup residues before they are taken to the landfill. As much of the petroleum product will be removed from the material as can practically be removed and will be recycled or disposed of in an appropriate manner.

2. The contaminated soil or spill cleanup residues will be tested and must be found to contain less than the RCRA-hazardous waste limits for benzene and lead before they are taken to the landfill. Soil with other chemical or radiological contamination is not included under this blanket special waste approval, and the soil/waste will be subject to a separate evaluation as a special waste.

3. The landfill technician and the equipment operator shall be notified in advance that the contaminated soils and residues could present a fire hazard (flammable materials should not be sent to the landfill) and will act accordingly. There will be no smoking around the waste and minimum contact with sources of heat or sparks from the equipment. Clean soil or cool fly ash will be pushed over the contaminated soil or cleanup residues before it is graded and compacted. Fire extinguishers will be readily available during the disposal operation.

4. Only soil from petroleum product spill cleanups in locations that are not known or believed to be contaminated with hazardous or radioactive constituents will be accepted.

5. Prior to shipment of the waste to the landfill, the Waste Generator shall provide the following information to the Landfill WAT. A report will be made to TDEC following each petroleum product spill cleanup incident in which the soil or residues are placed in ILF-V, in accordance with this approval. This report will contain the following information:

    - The location and nature of the spill
    - A laboratory analysis of the contaminated soils and residues showing TCLP hazardous waste limits for benzene and lead are not exceeded
    - The date of each disposal, with the estimated quantity of waste disposed.

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ATTACHMENT 11
OTHER WASTE: GLASS

In general, glass will be crushed by in-plant facilities prior to delivery and disposal in ILF-V. As circumstances arise, disposal of uncrushed glass at the landfill may be allowed at the discretion of the Landfill WAT. All glass chemical containers to be disposed of in the landfill shall be empty as defined in Rule 0400-12-01-.02(1)(g) of *Rules of the Tennessee Department of Environment and Conservation Division of Hazardous Waste Management*. In all cases, the condition of the glass and method of handling the glass will be selected on the basis of ensuring the safety of the equipment operators and other site operating personnel. The glass will be placed on the working face of the refuse cell and compacted, along with other daily refuse. If operating experience at the facility dictates, the glass may be spread and covered with 6 in. of compacted soil immediately following each such disposal to promote safe operating conditions for personnel and to minimize damage to delivery vehicles.

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ATTACHMENT 12
SPECIAL WASTE: EMPTY PAINT CANS

As a result of ongoing construction and maintenance programs, empty paint cans are generated by DOE contractors in Oak Ridge Operations. Most waste paint cans have a capacity of 5 gal or less. Empty paint cans containing small amounts of dry paint residue will be disposed of in ILF-V.

Waste paint cans containing large amounts of dry paint residue will be disposed of as hazardous waste per *Rules Governing Hazardous Waste Management in Tennessee* and/or screened by TCLP and ignitability tests in the subject hazardous waste management rules. If these tests are conducted, the test results will be considered representative for later disposal of paint residue of the same brand and generic type. Liquid paint will not be allowed in the landfill.

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ATTACHMENT 13
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ATTACHMENT 14
SPECIAL WASTE: TREATED BIOLOGICAL/MEDICAL WASTES

1. Untreated medical/biological wastes are prohibited from landfill disposal using this blanket approval and require individual review and approval by TDEC prior to disposal.

2. Liquid biological/medical waste shall not be discarded in the industrial waste receptacles, since liquid wastes are prohibited from landfill disposal.

3. Small quantities of non-radiologically contaminated, non-liquid medical, and noninfectious institutional (biological) waste (except for sharps, such as needles, glass, knives or razor blades, or broken glass) may be placed in the regular industrial waste dumpsters and considered profiled under Master Profile S-020, if the following conditions are met:

   a. The waste shall meet the landfill acceptance criteria and shall be consistent with the landfill operating permit requirements.

   b. A written description of the treated waste must be provided to the landfill.

   c. The wastes shall be packaged and rendered non-infectious prior to disposal (e.g., by autoclaving or other sterilization process) and the waste package shall be prominently labeled as TREATED MEDICAL WASTE or TREATED BIOLOGICIAL WASTE. The waste package shall be sealed and shall also be prominently labeled with the generator's name, building number, and phone number.

   d. A written and signed verification must be provided to the landfill that the waste has been rendered non-infectious.

   e. The generator must provide advance notice to the landfill operator prior to delivering medical/biological wastes.

4. Bulk quantities of non-infectious and uncontaminated institutional waste and biological waste (e.g., a sample freezer cleanout of non-contaminated fish or animal carcasses) are acceptable for disposal. To arrange for disposal, the generator shall contact the WAT or Landfill Facility Manager and request guidance on waste delivery.

5. Sharps, used and unused, that have been treated and destroyed (i.e., that have been put through a shredder-grinder, hammer mill, or other equivalent destructive treatment technology) that are solidified and packaged may be placed in sealed, labeled containers.

6. Medical/biological sharps, used and unused, that have been treated, but not destroyed (i.e., not put through a shredder-grinder, hammer mill, or other equivalent destructive treatment technology) shall be placed in puncture-proof containers, appropriately labeled, and sent directly to the landfill for disposal. These may, if necessary, be accumulated in a designated locked dumpster prior to separate shipment to the landfill.

7. Treated medical/biological wastes shall be disposed in ILF-V.

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ATTACHMENT 15
OTHER WASTE: BIRD DROPPINGS

1. Cleanup of bird droppings occurs at the facilities on the DOE ORR. Bird droppings may contain fungi that cause lung diseases. In accordance with communications with TDEC, disposal of bird dropping waste can be accepted for disposal in ILF-V without a special waste application, if the following precautions are taken:

   - The waste shall be managed to prevent airborne releases
   - The waste shall be properly and thoroughly treated with bleach and lime to eliminate the biological hazard (the Waste Generator shall obtain detailed disinfection instructions from the generator's Industrial Hygiene or Environmental Health and Safety representative)
   - The treated waste shall be packaged in sealed containers (i.e., sealed bucket or drum)
   - The containerized waste should be carefully transported and unloaded to avoid rupturing the container
   - The waste shall be covered with soil prior to waste compaction

2. No free liquids will be allowed for landfill disposal. Extra lime may be used to prevent free liquids.

3. Due to the potential for generation of gas from the decomposition of the bird droppings, the containers should be promptly disposed of after container sealing is performed.

4. At least one working day advance notice shall be provided to the WAT or Landfill Facility Manager prior to shipment of such waste to the landfill.

5. The Waste Generator shall indicate in the waste description on the DR "bird droppings that have been treated to eliminate biological hazards."

6. Bird dropping waste contaminated with chemical contaminants or residual levels of radioactive materials will be subject to the special waste application process described in Attachment 1.

7. Management of bird dropping waste that does not comply with the above requirements will require TDEC special waste approval prior to acceptance of the waste at the landfill.

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ATTACHMENT 16
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ATTACHMENT 17
SPECIAL WASTE: WASTES VOLUMETRICALLY CONTAMINATED WITH RESIDUAL RADIOACTIVE MATERIALS

(Attachment 17 contains Appendices A and B.)

1. INTRODUCTION

TDEC has developed and established for DOE the *Memorandum of Understanding between the Tennessee Division of Radiological Health and the Tennessee Division of Solid Waste Management* (Reference 1) for the disposal of solid wastes volumetrically contaminated with residual radioactive materials in ILF-V and CDL-VII on the ORR. This Memorandum of Understanding requires that solid wastes be appropriately characterized in accordance with the *Sampling and Analytical Summary for Special Waste Permit Requests for Industrial Landfill V & Construction/Demolition Landfill VII Involving Volumetrically Contaminated Materials* (Appendix B and Reference 2) and evaluated in accordance with *Volumetric Screening Criteria and Compliance Calculations for Industrial Landfill V & Construction/Demolition Landfill VII* (Reference 3).

2. APPLICABILITY

These requirements are applicable to solid wastes that meet the requirements for disposal in ILF-V and CDL-VII and are volumetrically contaminated with radionuclides listed in Table 1. These requirements and the associated screening criteria do not apply to wastes proposed for disposal in any other facility, to surface-contaminated waste that would be considered a Surface-Contaminated Object, or to wastes volumetrically contaminated with radionuclides other than those listed in Table 1 of this attachment.

Table 1. Volumetric screening criteria

Radionuclide[1, 2]	Authorized limit[3] (pCi/g)	Hot-spot limit[4] (pCi/g)	Detection limit[5] (pCi/g)	Dose-based screening criteria
H-3	150	1500	15.0	150
C-14	30	300	3.0	62
Co-60	2	20	0.2	2
Sr-90	30	300	3.0	4800
Tc-99	40	400	4.0	150
Cs-137	10	100	1.0	10
Eu-152	5	50	0.5	5
Eu-154	5	50	0.5	5
Ra-226	3	30	0.3	3
Th-230	3	30	0.3	5
Th-232	3	30	0.3	5
U-234	35	175	3.5	120
U-235	35	175	3.5	37
U-238	35	175	3.5	95
Total U	35	175	3.5	100
Np-237	3	30	0.3	5
Pu-238	3	30	0.3	40
Pu-239	3	30	0.3	37
Am-241	3	30	0.3	35

[1]See Appendix A for additional information regarding background concentrations and other radionuclides.

[2]It is not necessary to analyze for all the listed radionuclides, unless they are expected contaminants.

[3]The authorized limit is the smaller of the dose-based screening criteria or the administrative limit, as described in Reference 5.

[4]The hot-spot limit is the highest single concentration allowed for each radionuclide listed in a set of data.

[5]The detection limit listed is ten percent of the authorized limit. Detection limits **must** be less than the authorized limit.

3. SAMPLING AND ANALYTICAL REQUIREMENTS

The waste shall be characterized by sampling and analysis, and characterization shall be performed in accordance with nationally recognized standards. It is recommended that characterization be performed in accordance with the requirements of EPA Document SW-846, *Test Methods for Evaluating Solid Waste: Physical/Chemical Methods* (Reference 6). A sampling plan shall be developed and implemented for characterizing the waste, and it is recommended that the sampling plan be developed in accordance with Chap. 9 of SW-846, "Sampling Plan."

NDA measurement technologies (e.g., gamma spectrometry systems such as the In-Situ Object Counting System) may be used for characterization of waste for disposal at ILF-V, either independently or in combination with physical sampling and laboratory analysis (Reference 7). NDA measurement technologies and providers must be qualified through the DOE Consolidated Audit Program or licensed by the TDEC Division of Radiological Health. Use of NDA techniques may be appropriate for waste streams that have appropriate physical characteristics consistent with the approved NDA program plans and procedures, and where the radiological constituents of concern are amenable to NDA measurements and the relative isotopic composition of the waste is known.

The sampling plan shall address the following:

A. Provide administrative information including, but not limited to, the following: name of contractor/subcontractor, name of contractor/subcontractor representative, and name of waste stream.

B. Provide a physical description of the waste, including the approximate volume.

C. Explain how the waste was generated and describe the history of the material/waste.

D. State whether the waste will be sampled in accordance with SW-846. If not, provide an explanation of why SW-846 is not appropriate and describe the sampling protocol that will be followed, including how the minimum number of samples was determined.

E. Explain how the samples will be taken, including the sample size and the number of samples to be obtained.

F. Discuss the extent to which samples will be composited and provide the basis upon which the compositing will be performed (i.e., over what volumes of waste will samples be composited).

G. Identify the radionuclides that will be analyzed for and explain the basis upon which these radionuclides were selected for analysis (e.g., existing data, historical PK).

H. If the waste characterization is based on NDA:

- Describe the non-destructive testing methodology to be used and the justification for selection of this methodology.

- Discuss the PK or analytical documentation used to determine the waste stream physical characteristics are amenable to the use of the selected NDA techniques and to determine the relative isotopic composition of the waste.
- Describe the qualifications of the provider.

4. DATA REVIEW

The Waste Generator should review the laboratory data resulting from the sampling and analysis of the waste to ensure the data are complete, properly identified, reasonable, and meet the requirements of the sampling and analysis plan. The laboratory data used in the calculations described below should be final approved data that has successfully passed through the laboratory's quality control/quality assurance program, and any analytical difficulties (e.g., matrix interferences) should be appropriately resolved. Any deviations from the sampling plan should be explained/justified and documented.

5. VOLUMETRIC SCREENING AND COMPLIANCE CALCULATIONS

5.1 Volumetric Screening and Compliance Calculation Spreadsheet

DOE and TDEC have developed the *Volumetric Screening Criteria and Compliance Calculations for Industrial Landfill V & Construction/Demolition Landfill VII* spreadsheet for use in determining whether solid waste volumetrically contaminated with residual radioactive materials are suitable for disposal in ILF-V and/or CDL-VII. The spreadsheet includes the dose-based screening criteria, administrative limits, and hot-spot limits; determines if the sample mean exceeds the individual criteria/limit; calculates the ratio of the mean concentration in the waste to the screening criteria for the individual radionuclides; performs the "sum of fraction" calculation and compares the sum of fraction result with unity; and determines if the maximum sample concentration exceeds the hot-spot criteria.

In addition, the spreadsheet determines whether or not the sample data passes or fails the individual radionuclide (isotopic) screen, the hot-spot screen, and the sum of fraction screen. The spreadsheet can also perform adjustment calculations for background concentrations of radium (Ra)-226, thorium (Th)-230, and Th-232 in soil and other wastes, if appropriate supporting information is provided (see Appendix A). The spreadsheet also presents one of the following conclusions "This data set passes screening criteria" or "This data set fails screening criteria." The spreadsheet does not perform the statistical calculations to calculate the mean and standard deviation for each radionuclide.

A copy of the spreadsheet may be obtained by contacting the WAT.

5.2 Data Input

If the data are complete and justifiable for use, the Waste Generator should input the data for each radionuclide of concern into the *Volumetric Screening Criteria and Compliance Calculations for Industrial Landfill V & Construction/Demolition Landfill VII* spreadsheet, as described below.

A. Input the number of samples/detects.

B. Input the minimum concentration in pCi/g.

C. Input the maximum concentration in pCi/g.

D. Calculate (see Note 4) and input the mean concentration in pCi/g.

E. Calculate (see Note 4) and input the standard deviation of the mean in pCi/g.

F. If the waste is not soil, ensure that the default background concentrations for Ra-226, Th-230, and Th-232 are set to the number zero (0.0). Use of background concentrations for Ra-226, Th-230, and Th-232 for wastes other than soil is subject to the justification requirements presented in Appendix A.

Notes:

1. Concentrations should be in pCi/g on a dry weight basis.

2. When data are reported as "less than values" or "not detected," a concentration equivalent to one half of the detection limit should be used in the calculation of the mean.

3. When individual sample results are reported as negative numbers, these negative numbers can be included in the calculation of the mean. However, if a negative result is obtained for the calculation of the mean, this value should be entered as a zero in the *Volumetric Screening Criteria and Compliance Calculations for Industrial Landfill V & Construction/Demolition Landfill VII* spreadsheet.

4. The *Volumetric Screening Criteria and Compliance Calculations for Industrial Landfill V & Construction/Demolition Landfill VII* spreadsheet will **not** calculate the sample mean or standard deviation. Therefore, the Waste Generator will have to calculate the sample mean and standard deviation using the appropriate statistical formulas based on the statistical basis of the sampling plan. Table 9-1 in Chap. 9 of SW-846 presents statistical formulas for the sample mean and standard deviation, which are dependent on the statistical basis for the sampling (i.e., simple random sampling, systematic random sampling, or stratified random sampling). It is recommended that the Waste Generator develop a spreadsheet to calculate the sample mean and the standard deviation for the radionuclides of concern.

   At a minimum, the spreadsheet should present the following information for each radionuclide: sample identification, number of samples, number of detects, analytical results for each sample, one half of the detection limit for each result that is reported as "less than value" or "not detected," the formulas for calculating the mean and the standard deviation, the calculated mean for each radionuclide, and the calculated standard deviation for each radionuclide.

   (Note: The *Mean and Standard Deviation Calculation* spreadsheet, available from the WAT, can be used for performing these calculations if the statistical basis of the sampling was based on simple random sampling or systematic random sampling in accordance with SW-846. This spreadsheet is a tool. If the data do not fit the parameters established for this spreadsheet, then another method should be used to determine the mean concentration and standard deviation of the mean.)

5. The Waste Generator should only input data into the *Volumetric Screening Criteria and Compliance Calculations for Industrial Landfill V & Construction/Demolition Landfill VII* spreadsheet for the number of samples/detects, minimum concentration, maximum concentration, mean concentration, and standard deviation. The Waste Generator must **not** change or tamper with the calculations and evaluation criteria built into the spreadsheet.

5.3 Results of Volumetric Screening

The *Volumetric Screening Criteria and Compliance Calculations for Industrial Landfill V & Construction/Demolition Landfill VII* spreadsheet will perform the necessary calculations to determine whether or not the residual radioactivity in the waste is acceptable for disposal in ILF-V. The results of the calculations will be presented adjacent to the "Conclusion," which is under the table. The conclusion statement "This data set passes screening criteria" indicates the residual radioactivity in the waste is acceptable for disposal in ILF-V and/or CDL-VII. The conclusion statement "This data set fails screening criteria" indicates the waste is **not** acceptable for disposal in ILF-V and/or CDL-VII under the screening criteria.

Wastes that fail the volumetric screening criteria are not necessarily precluded from disposal in ILF-V or CDL-VII. Those wastes may be candidates for disposal, as detailed in Sect. 7 of this attachment.

6. DOCUMENTATION

If the waste successfully passes the volumetric screening process outlined in Sect. 5 and receives the conclusion statement "This data set passes screening criteria," the Waste Generator shall prepare and submit the following documentation to the Landfill WAT. The documentation shall be high quality, well organized and labeled, checked by the Waste Generator, and suitable for transmission to DOE and TDEC by the Landfill WAT.

6.1 Sampling and Analytical Summary

The form in Appendix B shall be used for the compilation and presentation of the information described in Sect. 3 of this Attachment. In addition, the following information shall be provided on the summary or an attachment to the summary:

A. Provide the detection limits (minimum detectable activities in pCi/g dry weight) for the analyses. The detection limits shall be less than or equal to the detection limits presented in Table 1, unless the result exceeds the detection limit, and must be less than the authorized limits provided in Table 1.

B. Provide copies of the laboratory data, including the definitions of all abbreviations and data qualifiers.

C. Provide justification and supporting documentation for background concentrations of radium and thorium, if the Waste Generator decides to use background concentrations of these radionuclides in wastes other than soil. Justification and supporting documentation is not required if the generator's waste is soil and the background concentrations presented in Appendix A are used for these radionuclides.

6.2 Volumetric Screening Criteria and Compliance Calculations

A. Provide the results of the calculations for the sample mean and standard deviation for the radionuclides of concern using the appropriate statistical formulas based on the statistical basis of the sampling plan. The information should include the following: sample identification, number of samples, number of detects, analytical results for each sample, the statistical basis for the sampling, the formulas for calculating the mean and the standard deviation, the calculated mean for each radionuclide, and the calculated standard deviation for each radionuclide. (Note: The

results from the *Mean and Standard Deviation Calculation* spreadsheet can be used to provide the necessary information.)

B. Provide the results from the *Volumetric Screening Criteria and Compliance Calculations for Industrial Landfill V & Construction/Demolition Landfill VII* spreadsheet.

7. RADIONUCLIDES THAT EXCEED OR ARE NOT LISTED IN TABLE 1

If a waste is volumetrically contaminated with radionuclides that exceed or are not specifically included in Table 1, the Waste Generator may pursue disposal of those wastes in the ORR Landfills. The Waste Generator will be required to perform, or fund the performance of, residual radiation (RESRAD) modeling to determine the total effective dose equivalent for the proposed disposal of the waste in the applicable landfill; compare the calculated total effective dose equivalent to allowable effective dose equivalents, in accordance with DOE Order 458.1 and DOE EH-412 Memorandum, Subject: "Application of DOE 5400.5 requirements for release and control of property containing residual radioactive material," dated November 17, 1995 (Reference 8); and prepare "authorized limits" justification packages for the proposed disposal of the waste in the appropriate DOE landfill(s).

Prior to performance of such activities, the proposed activities and specific requirements of the RESRAD modeling shall be discussed with the Landfill WAT and other subject matter experts. The RESRAD modeling results, dose comparisons, and authorized limits justification packages will be submitted to DOE for review and approval. In addition, similar information plus waste characterization data will be submitted via a special waste evaluation application to the TDEC Division of Solid Waste Management and Division of Radiological Health for review and concurrence. It should be noted that considerable time and effort will be needed for completing this process.

8. REFERENCES (Note: References listed below are specific to this attachment and do not constitute the entire list of references cited in the complete profile.)

1 Tennessee Department of Environment and Conservation, *Memorandum of Understanding between the Tennessee Division of Radiological Health and the Tennessee Division of Solid Waste Management*, October 18, 2005

2 *Sampling and Analytical Summary for Special Waste Permit Requests For Industrial Landfill V & Construction/Demolition Landfill VII Involving Volumetrically Contaminated Materials*, June 14, 2012

3 *Volumetric Screening Criteria and Compliance Calculations for Industrial Landfill V & Construction/Demolition Landfill VII*, June 2007

4 U. S. Department of Energy, 2011, *Radiation Protection of the Public and the Environment*, DOE Order 458.1, February 11, 2011

5 *Authorized Limits for Disposal of Waste at Construction/Demolition Landfill VII at the Y-12 National Security Complex, Oak Ridge, Tennessee,* DOE-07-0429

6 U. S. Environmental Protection Agency, 1986, *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods*, Document SW-846, September 1986

7 Tennessee Department of Environment and Conservation, "*RE: Request for Approval to Utilized Non-Destructive Assay Technologies for Wastes Exhibiting Extremely Low Levels of Radiological*

Contamination for Disposal in Resource Recovery and Conservation Act Subtitle D Landfills Located at the Y-12 Complex" October 20, 2012

8 Memorandum from Raymond F. Pelletier to Distribution, *Application of DOE 5400.5 Requirements for Release and Control of Property Containing Residual Radioactive Material*, November 17, 1995

APPENDIX A
(to Attachment 17)

A.1 BACKGROUND CONENTRATIONS

A.1.1 SOILS OR EARTHEN-BASED WASTES

With the exception of radium and thorium in soil or earthen-based wastes, background values will not be subtracted from the concentrations of potentially process-related radionuclides measured in the waste for the purpose of demonstrating compliance with the screening criteria. The default background concentrations for radium and thorium in soils and earthen-based wastes incorporated in the spreadsheet *Volumetric Screening Criteria and Compliance Calculations for Industrial Landfill V & Construction/Demolition Landfill VII* are as follows:

- Ra-226 1.1 pCi/g
- Th-230 1.0 pCi/g
- Th-232 0.95 pCi/g

These values are based on data collected on the Oak Ridge Reservation and are taken from Myrick, T. E., et. al, "Determination of Concentrations of Selected Radionuclides in Surface Soil in the U.S."

A.1.2 OTHER WASTES

If background subtraction is to be performed for radium or thorium in waste materials other than soils or earthen-based materials, or if values other than the defaults are to be used for soil or earthen-based waste, appropriate background values must be provided with an explanation as to how these values were determined and why they are considered representative of the background levels in the waste material. The user must enter these user-supplied background values directly into the appropriate data entry fields in the spreadsheet *Volumetric Screening Criteria and Compliance Calculations for Industrial Landfill V & Construction/Demolition Landfill VII* and must include appropriate justification for the site-specific values.

A.2 OTHER RADIONUCLIDES

There are three groups of radionuclides for which data may be reported by the laboratory, but for which data are not entered in the *Volumetric Screening Criteria and Compliance Calculations for Industrial Landfill V & Construction/Demolition Landfill VII* spreadsheet.

A.2.1 SHORT-LIVED DECAY PRODUCTS OF URANIUM, RADIUM, AND THORIUM DECAY SERIES

The potential doses from the short-lived decay products that would be associated with process-related uranium, radium, or thorium are addressed within the modeling that was used to calculate screening criteria for the longer-lived members of these decay series. (Similarly, short-lived radioactive decay

products of strontium (Sr)-90, cesium (Cs)-137, and neptunium (Np)-237 are not considered individually, but their in-growth is considered in the evaluation of the parent radionuclide in each case.)

A.2.2 POTASSIUM-40

Potassium (K)-40 is a naturally occurring radioactive nuclide of potassium. It has a half-life of 1.26 billion years. All potassium includes K-40 at an isotopic abundance of 0.0118% (i.e., anything that contains potassium will contain K-40). Because potassium is found throughout the environment and because K-40 is readily detected by gamma spectroscopy, this radionuclide is commonly reported in radioanalytical data sets. However, because it is not a process-related radionuclide (i.e., there have been no processes utilized at the DOE facilities that would have altered the natural abundance of K-40 relative to stable potassium), screening criteria are not needed for this radionuclide.

A.2.3 BERYLLIUM-7

Beryllium (Be)-7 is a cosmogenic radionuclide with a half-life of 53.3 days, produced mostly in the stratosphere by cosmic ray spallation of nitrogen and oxygen and entering the lower troposphere by atmospheric circulation processes. Because Be-7 is found throughout the environment and because it is readily detected by gamma spectroscopy, this radionuclide is commonly reported in radioanalytical data sets. However, because it is not a process-related radionuclide, screening criteria are not needed for this radionuclide.

APPENDIX B

(to Attachment 17)

Sampling and Analytical Summary for Special Waste Evaluation Applications Involving Volumetrically Contaminated Materials	
General Information	
1.	Date:
2.	Name of Contractor/subcontractor:
3.	Name of Contractor/Subcontractor Representative:
4.	Name of Waste Stream:
Sampling Summary	
5.	Provide a physical description of the waste, including the approximate volume.
6.	Explain how the waste was generated. What is the history of the material involved?
7.	If the characterization is based on collection of physical samples of the waste stream for on-site or off-site laboratory analysis:
	Was the waste sampled in accordance with SW-846? If not, explain why the use of SW-846 was not appropriate and describe the sampling protocol that was followed, including how the minimum number of required samples was determined.
	Explain how the samples were collected, including the sample size and the number of samples taken.
	Discuss the extent to which samples were composited and provide the basis upon which the compositing was done (e.g. over what volumes of waste were samples composited)
8.	If the waste characterization is based on non-destructive analysis:
	Describe the non-destructive testing methodology used and the justification for selection of this methodology.
	Discuss the process knowledge or analytical documentation used to determine the waste stream physical characteristics are amenable to the use of the selected NDA techniques and to determine the relative isotopic composition of the waste.
	Describe the qualifications of the provider.
Analytical (Laboratory and/or NDA) Results	
9.	Was the waste sampled in accordance with EPA Document SW-846?
10.	If the waste was not sampled in accordance with SW-846, provide an explanation of why SW-846 was not appropriate and describe the sampling protocol that was followed including how the minimum number of samples was determined:
11.	How many samples were taken?

Sampling and Analytical Summary for Special Waste Evaluation Applications Involving Volumetrically Contaminated Materials

12.	Explain how the samples were taken including the sample size:
13.	Discuss the extent to which samples were composited and provide the basis upon which the compositing was performed (i.e., over what volumes of waste were samples composited):
14.	Identify the radionuclides that were analyzed for, provide the detection limit for the analysis, and explain the basis upon which these radionuclides were selected or excluded from analysis (e.g., existing data, historical process knowledge)

Radionuclide	Analyzed For?	Detection Limit pCi/g dry weight	Explain the basis upon which these were selected or excluded from analysis (e.g., existing data, historical process knowledge)
H-3			
C-14			
Co-60			
Sr-90			
Tc-99			
Cs-137			
Eu-152			
Eu-154			
Ra-226			
Th-230			
Th-232			
U-234			
U-235			
U-238			
Total U			
Np-237			
Pu-238			
Pu-239			
Am-241			

15.	Attach copies of the laboratory data including definitions of abbreviations and data qualifiers.
16.	If background concentrations have been used for radium and thorium for wastes other than soil, provide the justification and supporting references/documentation for the background concentrations:

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7. REFERENCES

CN-1054. Asbestos Waste Shipment Record, latest revision, Tennessee Department of Environment and Conservation, Nashville, TN.

DOE Order 458.1. *Radiation Protection of the Public and the Environments,* February 2011, U.S. Department of Energy, Office of Health, Safety and Security, Washington, D.C. (replaced DOE Order 5400.5).

———DOE Order 5400.5. *Radiation Protection of the Public and the Environments,* January 1993, (replaced by DOE Order 458.1).

EPA-340/1-92-013. *A Guide to Normal Demolition Practices Under the Asbestos NESHAP,* September 1992, U.S. Environmental Protection Agency, Washington, D.C.

Form-335. *Generator's/Shipper's Log for Beryllium Oxide Removal and Disposal,* latest revision, URS | CH2M Oak Ridge LLC, Oak Ridge, TN.

Myrick, T. E., et.al. "Determination of Concentrations of Selected Radionuclides in Surface Soil in the U.S.," *Health Physics,* 1983, Vol. 45, pp.631–642, Health Physics Society, Cincinnati, OH.

ORR Landfill Shipping form, latest revision, URS | CH2M Oak Ridge LLC, Oak Ridge, TN.

PPD-WM-2400. *UCOR Waste Management Program Plan,* latest revision, URS | CH2M Oak Ridge LLC, Oak Ridge, TN.

PROC-IH-5177. *Asbestos and Other Fibrous Materials,* latest revision, URS | CH2M Oak Ridge LLC, Oak Ridge, TN.

Rule 0400-12-01-.02–.07. *Rules of the Tennessee Department of Environment and Conservation Division of Hazardous Waste Management,* latest revision, Tennessee Department of Environment and Conservation, Nashville, TN.

SW-846. *Test Methods for Evaluating Solid Waste: Physical/Chemical Methods,* latest revision, U. S. Environmental Protection Agency, Washington, D.C.

UCN-2109. Waste Item Description, latest revision, UT-Battelle LLC.

UCN-21941. Request for landfill V and VII Disposal, latest revision, Consolidated Nuclear Security, Y-12 National Security Complex, Oak Ridge, TN.

UCOR-4187. *URS | CH2M Oak Ridge LLC Waste Certification Program Plan, Oak Ridge, Tennessee,* 2014, URS | CH2M Oak Ridge LLC Oak Ridge, TN.

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Attachment 4 - Landfill Prohibited Waste Items

Landfill Prohibited Items

Prohibited Items (DO NOT SEND TO ORR LANDFILL)

- Commercial products manufactured with radioactive materials, i.e., smoke detectors, thoriated welding rods, etc.
- Containerized liquids
- Electronic equipment with capacitors, mercury switches, ballasts, etc.
- Fluid filled mechanical equipment (heating, ventilation, and a/c systems, refrigerators, pumps, motors, appliances, etc.
- Landscaping or land clearing wastes (straw bales, trees, brush, etc.)
- Liquid wastes or wastes containing free liquids
- Metal that can be recycled
- PCB wastes, except those PCB wastes allowable under 40 CFR 761 and approved by TDEC as special waste
- Petroleum product contaminated soil
- Pressurized gas cylinders
- Radioactive wastes (wastes known or expected to exceed radiological surface release criteria)
- RCRA Hazardous Wastes
- Refrigeration equipment not complying with 40 CFR 82.156
- Unapproved special wastes (**listed below**)
- Universal waste (bulbs, batteries, thermostats)
- Tires
- Wastes not generated by DOE activities in the Oak Ridge area

Construction/Demolition Debris Prohibited Items

- Bulk quantities of clean fill (gravel, soil, rock, concrete, cinder/concrete blocks, clay pipe/tile, asphalt pavement)
- General garbage (food waste, packing material)
- Loose trash or office waste
- Metals from Radiological Materials Management Areas (RMMAs)

Special Wastes (These Waste Are Subject to Review Prior to Disposal)

- Aerosol cans
- Asbestos debris (friable and non-friable)
- Beryllium Oxide
- Bulk quantities of non-PCB light ballasts
- C/D Debris with PCB Conc. in paint less than 50 ppm
- Dead animals
- Empty hazardous materials containers and drums
- Fiberglass with loose fibers
- Filters from industrial or treatment processes
- Industrial process waste
- Mercury contaminated soils and materials

Landfill Prohibited Items

- Metal turnings, shavings, and dust from industrial processes and machining operations
- PCB bulk product waste (PCB concentration greater than 50 ppm)
- PCB items (ballasts, capacitors, or items with detectable PCBs)
- Paint chips (when not firmly adhered to surfaces)
- Paint wastes (buckets, cans, brushes, rollers, etc.)
- Potential respiratory hazards (refractory ceramic fibers, mineral wools, etc.)
- Sand/grit blast waste
- Soils and materials contaminated with industrial chemicals
- Solid laboratory chemicals
- Treatment media from industrial or treatment processes
- Wastes that are bulky or difficult to manage (greater than 8' long)

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Attachment 5: Prohibited Items for Metal Recycle

- Acetylene cylinders
- Asbestos-containing material (i.e., insulated pipe and transite concrete fiber board)
- Leaking ballasts and PCB-containing equipment
- Fluorescent bulbs
- Fluid filled capacitors
- Closed compressed gas cylinders
- Closed containers of any kind
- Containers with free-flowing liquids inside or outside (e.g., tar, oil, gasoline)
- Flammable or combustible material/liquids or liquids of any type
- Rags/wipes containing solder paste and/or solvents
- Material or equipment containing refrigerants
- Munitions, bullets, military target range scrap, explosives
- Microwave ovens
- Paint cans
- Pressure regulated valves
- Radioactive material (including smoke detectors)
- Thermometers
- Thermostats
- Aerosol cans
- Barrels, drums, pails and buckets
- Gas tanks
- Propane cylinders
- Transformers (fluid filled or that have PCB's)
- Bio hazardous materials/fluids
- Batteries: NiCad, NiMH, Lithium ION, Alkaline
- Medical equipment that is not properly decontaminated (TCG can request a certificate of decontamination if unit appears to be soiled)
- Anything else that meets the definition of a characteristic (toxic, flammable, corrosive or reactive) or listed hazardous waste per Federal, State, or Local regulations. The only exceptions shall be materials that TCG is permitted to accept as detailed on our accepted materials list)

SECTION 01 77 00 - CLOSEOUT PROCEDURES

PART 1 - PROJECT REQUIREMENTS

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for contract closeout, including, but not limited to, the following:
   1. Substantial Completion procedures.
   2. Final completion procedures.
   3. Warranties.
   4. Final cleaning.

1.3 SUBSTANTIAL COMPLETION

A. Preliminary Procedures: Before requesting inspection for determining date of Substantial Completion, complete the following. List items below that are incomplete with request.
   1. Prepare a list of items to be completed and corrected (punch list), the value of items on the list, and reasons why the Work is not complete.
   2. Submit specific warranties, workmanship bonds, maintenance service agreements, final certifications, Operation and Maintenance manual and similar documents.
   3. Complete startup testing of systems.
   4. Submit test records.
   5. As constructed copies of the Contract Drawings and Shop Drawings.
   6. Terminate and remove temporary facilities from Project site, along with construction tools, and similar elements.
   7. Complete final cleaning requirements, including touchup painting.
   8. Touch up and otherwise repair and restore marred exposed finishes to eliminate visual defects.
   9. Complete submittal log documenting closeout of submittals and resubmittals.

1.4 FINAL COMPLETION

A. Preliminary Procedures: Before requesting final inspection for determining final completion, complete the following:
   1. Instruct Company's personnel in operation, adjustment, and maintenance of products, equipment, and systems, per Section 01 79 00 Demonstration and Training.

1.5 LIST OF INCOMPLETE ITEMS (PUNCH LIST)

A. Organization of List: Include name and identification of each space and area affected by construction operations for incomplete items and items needing correction including, if necessary, areas disturbed by Seller that are outside the limits of construction.
   1. Include the following information at the top of each page:
      a. Project name.
      b. Date.
      c. Name of Seller.
      d. Page number.
   2. Submit list of incomplete items in the following format:
      a. PDF electronic file.

1.6 WARRANTIES

A. Submittal Time: Submit written warranties on request of Company for designated portions of the Work where commencement of warranties other than date of Substantial Completion is indicated.

B. Organize warranty documents into an orderly sequence based on the table of contents of the Facility Manual.

C. Provide additional copies of each warranty to include in Operation and Maintenance Manuals, per section 01 78 23 Operation and Maintenance Manuals.

PART 2 - NOT USED

PART 3 - TECHNICAL REQUIREMENTS

3.1 FINAL CLEANING

A. General: Perform final cleaning. Conduct cleaning and waste-removal operations to comply with local laws and ordinances and Federal and local environmental and antipollution regulations.
   1. Complete the following cleaning operations before requesting inspection for certification of Substantial Completion for entire Project or for a portion of Project:
      a. Clean Project site, yard, and grounds, in areas disturbed by construction activities, including landscape development areas, of rubbish, waste material, litter, and other foreign substances.
      b. Remove tools, construction equipment, machinery, and surplus material from Project site.
      c. Leave Project clean and ready for occupancy.

B. Construction Waste Disposal: Comply with waste disposal requirements in Section 01 74 19, Demolition Waste Management and Disposal.

END OF SECTION 01 77 00

SECTION 01 78 23 - OPERATION AND MAINTENANCE MANUALS

PART 1 - PROJECT REQUIREMENTS

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for preparing Operation and Maintenance Manuals, including the following:
   1. Operation manuals for systems, subsystems, and equipment.
   2. Highlighted equipment specification cutsheets indicating component supplied.
   3. Maintenance manuals for the care and maintenance of products, systems and equipment.
   4. Warranty Information

B. Related Sections:
   1. Section 01 33 00 Submittals for submitting copies of submittals for operation and maintenance manuals.
   2. Sections 01 91 33 Commissioning for verification and compilation of data into operation and maintenance manuals.
   3. Divisions 02 through 49 Sections for specific operation and maintenance manual requirements for the Work in those Sections.

1.3 GENERAL

A. Organization: Each manual shall contain the following materials:
   1. Title page.
   2. Table of contents.
   3. Manual contents.

B. Title Page: Include the following information:
   1. Subject matter included in manual.
   2. Name and address of Project.
   3. Date of submittal.
   4. Name and contact information for Seller.
   5. Name and contact information for Company/Engineer.

C. Table of Contents: List each product included in manual identified by product name and cross-referenced to Specification Section number in Project Manual.

1. If operation or maintenance documentation requires more than one volume to accommodate data, include comprehensive table of contents for all volumes in each volume of the set.

D. Manual Contents: Organize into sets of manageable size. Arrange contents alphabetically by system, subsystem, and equipment. If possible, assemble instructions for subsystems, equipment, and components of one system into a single binder.

E. Manuals, Paper Copy: Submit manuals in the form of hard copy, bound and labeled volumes.
1. Binders: Heavy-duty, three-ring, vinyl-covered, loose-leaf binders, in thickness necessary to accommodate contents, sized to hold 8-1/2-by-11-inch paper; with clear plastic sleeve on spine to hold label describing contents and with pockets inside covers to hold folded oversize sheets.
   a. If two or more binders are necessary to accommodate data of a system, organize data in each binder into groupings by subsystem and related components. Cross-reference other binders if necessary, to provide essential information for proper operation or maintenance of equipment or system.
   b. Identify each binder on front and spine, with printed title "FACILITY SYSTEMS MANUAL", Project title or name, and subject matter of contents. Indicate volume number for multiple-volume sets.
2. Dividers: Heavy-paper dividers with plastic-covered tabs for each section of the manual. Mark each tab to indicate contents. Include typed list of products and major components of equipment included in the section on each divider, cross-referenced to Specification Section number and title of Project Manual.
3. Drawings: Attach reinforced, punched binder tabs on drawings and bind with text.
   a. If oversize drawings are necessary, fold drawings to same size as text pages and use as foldouts.
   b. If drawings are too large to be used as foldouts, fold and place drawings in labeled envelopes.

F. Manuals, Electronic Copy: Submit manuals in searchable pdf format.

1.4 FACILITY SYSTEMS MANUAL

A. Content: In addition to requirements in this Section, include operation data required in individual Specification Sections and the following information:
1. Product name and model number. Use designations for products indicated on Contract Documents.
2. Manufacturer's name.
3. Vendor contact information including website if available.
4. Nameplate data
5. Equipment identification with serial number of each component.
6. Performance curves.
7. Engineering data and tests. Including test and balance (TAB) reports as required by subcontract documents.
8. Operating procedures.
9. Operating logs.
10. Wiring diagrams.

11. Control diagrams.
12. Piped system diagrams.
13. Precautions against improper use.
14. License requirements including inspection and renewal dates.

B. For each system, subsystem, and piece of equipment not part of a system, include source information, manufacturers' maintenance documentation, maintenance procedures, maintenance and service schedules, spare parts list and source information, maintenance service contracts, and warranty and bond information.
1. List of contacts for service and warranty issues for all equipment.
2. List and summary of warranties (including at minimum the scope of the warranty, term of warranty, and required preventive maintenance to maintain valid warranty).
3. Copies of specific written vendor warranties if required by contract (e.g., roof warranties).

C. Systems and Equipment Controls: Describe the sequence of operation, and diagram controls as installed.

1.5 SUBMITTALS

A. Maintenance Material Submittals
1. Preventative Maintenance
2. Spare Parts List
3. Operational Manuals

B. Closeout Submittal
1. Manual Submittal: Submit each manual in final form prior to Substantial Completion.
2. Correct or modify each manual to comply with Company’s comments. Submit copies of each corrected manual within 15 days of receipt of Company's comments.

PART 2 - NOT USED

PART 3 - TECHNICAL REQUIREMENTS

3.1 MANUAL PREPARATION

A. Operation Manuals: Assemble a complete set of operation data indicating operation and maintenance of each system, subsystem, and piece of equipment not part of a system.

B. Manufacturers' Data: Where manuals contain manufacturers' standard printed data, include only sheets pertinent to product or component installed. Mark each sheet to identify each product or component incorporated into the Work. If data include more than one item in a tabular format, identify each item using appropriate references from the Contract Documents. Identify data applicable to the Work and delete/mark out references to information not applicable.

C. Comply with Section 01 77 00, Closeout Procedures for schedule for submitting operation and maintenance documentation.

END OF SECTION 01 78 23

SECTION 01 78 39 - PROJECT RECORD DOCUMENTS

PART 1 - PROJECT REQUIREMENTS

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for project record documents, including the following:
   1. Record Drawings.
   2. Revised Calculations.
   3. Record Product Data.
   4. Miscellaneous record submittals.

B. Related Sections:
   1. Section 01 18 00 Site Utility Interface for Utility As-Built drawings
   2. Section 01 77 00, Closeout Procedures for general closeout procedures.
   3. Section 01 78 23, Facility System Manual for operation and maintenance manual requirements.
   4. Divisions 02 through 49 Sections for specific requirements for project record documents of the Work in those Sections.

1.3 RECORD DRAWINGS

A. Record Drawings: Maintain one full-sized set of marked-up copies of the Contract Drawings and Shop Drawings. The as constructed conditions shall be noted in red using Bluebeam software or Company approved alternative method.
   1. Preparation: Mark prints to show the actual installation where installation varies from that shown originally.
      a. Give particular attention to information on concealed elements that would be difficult to identify or measure and record later.
      b. Accurately record information.
      c. Record data as soon as possible after obtaining it.
   2. Content: Types of items requiring marking include, but are not limited to, the following:
      a. Dimensional changes to Drawings.
      b. Revisions to details shown on Drawings.
      c. Locations and depths of underground utilities.
      d. Revisions to routing of piping and conduits.
      e. Revisions to electrical circuitry.
      f. Actual equipment locations.

g. Changes made by Change Order and/or Requests for Information.
h. Changes made following Company's written orders.
i. Details not on the original Contract Drawings.

3. Mark the Contract Drawings and Shop Drawings completely and accurately.
4. Mark prints with erasable, red-colored pencil.
5. Mark important additional information that was either shown preliminarily or omitted from original drawings.
6. Note Change Order and Request for Information numbers, and similar identification, where applicable.
7. Consolidate all mark-ups and incorporate information into Native (CAD) files, as applicable.
8. Identify and date each revised Record Drawing; include the designation "RECORD DRAWING" in the revision block of revised Drawings.

B. Format:
1. Record Native (CAD) Files: Organize digital data information into separate electronic files that correspond to each revised sheet of the Contract Drawings.
2. Record Drawing Files: Generate electronic (PDF) drawing files from the Native (CAD) Files.

1.4 MISCELLANEOUS RECORD SUBMITTALS

A. Assemble miscellaneous records required by other Specification Sections for miscellaneous record keeping and submittal in connection with actual performance of the Work. Bind or file miscellaneous records and identify each, ready for continued use and reference.

B. Format: Submit miscellaneous record submittals as paper copy or scanned searchable PDF electronic file(s) of marked up miscellaneous record submittals.
1. Include miscellaneous record submittals directory organized by specification section number and title, electronically linked to each item of miscellaneous record submittals.

1.5 CLOSEOUT SUBMITTALS

A. Record Drawings: Comply with the following:
1. Number of Copies: Submit copies of record Drawings as follows:
a. Initial Submittal: Submit one paper copy or electronically scanned (PDF) set of marked-up prints and one set of Record Digital Data Files created from corrected Record Native (CAD) files within 30 days of Company acceptance. Company will indicate whether general scope of changes, additional information recorded, and quality of drafting are acceptable.
b. Final Submittal: Submit Record Drawing Files (PDF) and Record Native (CAD) Files within 30 days of Company acceptance of initial submittal.

PART 2 - NOT USED

PART 3 - NOT USED

END OF SECTION 01 78 39

SECTION 01 79 00 - DEMONSTRATION AND TRAINING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for instructing Company's personnel, including the following:

1. Demonstration of operation of systems, subsystems, and equipment.
2. Training in operation and maintenance of systems, subsystems, and equipment.
3. Demonstration and training video recordings.

B. Company operates five rotating shifts on 24/7 schedule. Provide minimum of five training sessions for 10-15 personnel each.

1.3 SUBMITTALS

A. Action Submittal
1. Training schedule minimum 14 days prior to proposed training start.

B. Informational Submittal
1. Instruction Program: Submit outline of instructional program for demonstration and training, including a list of training modules and a schedule of proposed dates, times, length of instruction time, and instructors' names for each training module. Include learning objective and outline for each training module.
    a. Indicate proposed training modules using manufacturer-produced demonstration and training video recordings for systems, equipment, and products in lieu of video recording of live instructional module.
2. Qualification Data: For instructor and videographer.
3. Attendance Record: For each training module, submit list of participants and length of instruction time.

C. Closeout Submittals
1. Demonstration and Training Video Recordings: Submit two copies within seven days of end of each training module.
    a. Identification: On each copy, provide an applied label with the following information:
        1) Name of Project.

2) Name and address of videographer.
3) Name of Company.
4) Name of Construction Manager.
5) Name of Seller.
6) Date of video recording.

b. Transcript: Prepared and bound in format matching operation and maintenance manuals. Mark appropriate identification on front and spine of each binder. Include a cover sheet with same label information as the corresponding video recording. Include name of Project and date of video recording on each page.

c. Transcript: Prepared in searchable PDF electronic format. Include a cover sheet with same label information as the corresponding video recording and a table of contents with links to corresponding training components. Include name of Project and date of video recording on each page.

d. At completion of training, submit complete training manual(s) for Company's use in searchable PDF electronic file format on compact disc.

1.4 QUALITY ASSURANCE

A. Facilitator Qualifications: A firm or individual experienced in training or educating maintenance personnel in a training program similar in content and extent to that indicated for this Project, and whose work has resulted in training or education with a record of successful learning performance.

B. Instructor Qualifications: A factory-authorized service representative, complying with requirements in Section 01 40 00 "Quality Requirements," experienced in operation and maintenance procedures and training.

C. Videographer Qualifications: A professional videographer who is experienced photographing demonstration and training events similar to those required.

D. Preinstruction Conference: Conduct conference at Project site to comply with requirements in Section 01 10 00 "General Work Requirements." Review methods and procedures related to demonstration and training including, but not limited to, the following:

1. Inspect and discuss locations and other facilities required for instruction.
2. Review and finalize instruction schedule and verify availability of educational materials, instructors' personnel, audiovisual equipment, and facilities needed to avoid delays.
3. Review required content of instruction.
4. For instruction that must occur outside, review weather and forecasted weather conditions and procedures to follow if conditions are unfavorable.

1.5 COORDINATION

A. Coordinate instruction schedule with Company's operations. Adjust schedule as required to minimize disrupting Company's operations and to ensure availability of Company's personnel.

B. Coordinate instructors, including providing notification of dates, times, length of instruction time, and course content.

C. Coordinate content of training modules with content of emergency, operation, and maintenance manuals. Do not submit instruction program until operation and maintenance data has been reviewed by Company.

PART 2 - PRODUCTS

2.1 INSTRUCTION PROGRAM

A. Program Structure: Develop an instruction program that includes individual training modules for each system and for equipment not part of a system, as required by individual Specification Sections.

B. Training Modules: Develop a learning objective and teaching outline for each module. Include a description of specific skills and knowledge that participant is expected to master. For each module, include instruction for the following as applicable to the system, equipment, or component:

1. Basis of System Design, Operational Requirements, and Criteria: Include the following:

    a. System, subsystem, and equipment descriptions.
    b. Performance and design criteria if Seller is delegated design responsibility.
    c. Operating standards.
    d. Regulatory requirements.
    e. Equipment function.
    f. Operating characteristics.
    g. Limiting conditions.
    h. Performance curves.

2. Documentation: Review the following items in detail:

    a. Emergency manuals.
    b. Operations manuals.
    c. Maintenance manuals.
    d. Project record documents.
    e. Identification systems.
    f. Warranties and bonds.
    g. Maintenance service agreements and similar continuing commitments.

3. Emergencies: Include the following, as applicable:

    a. Instructions on meaning of warnings, trouble indications, and error messages.
    b. Instructions on stopping.
    c. Shutdown instructions for each type of emergency.
    d. Operating instructions for conditions outside of normal operating limits.

e. Sequences for electric or electronic systems.
f. Special operating instructions and procedures.

4. Operations: Include the following, as applicable:

a. Startup procedures.
b. Equipment or system break-in procedures.
c. Routine and normal operating instructions.
d. Regulation and control procedures.
e. Control sequences.
f. Safety procedures.
g. Instructions on stopping.
h. Normal shutdown instructions.
i. Operating procedures for emergencies.
j. Operating procedures for system, subsystem, or equipment failure.
k. Seasonal and weekend operating instructions.
l. Required sequences for electric or electronic systems.
m. Special operating instructions and procedures.

5. Adjustments: Include the following:

a. Alignments.
b. Checking adjustments.
c. Noise and vibration adjustments.
d. Economy and efficiency adjustments.

6. Troubleshooting: Include the following:

a. Diagnostic instructions.
b. Test and inspection procedures.

7. Maintenance: Include the following:

a. Inspection procedures.
b. Types of cleaning agents to be used and methods of cleaning.
c. List of cleaning agents and methods of cleaning detrimental to product.
d. Procedures for routine cleaning
e. Procedures for preventive maintenance.
f. Procedures for routine maintenance.
g. Instruction on use of special tools.

8. Repairs: Include the following:

a. Diagnosis instructions.
b. Repair instructions.
c. Disassembly; component removal, repair, and replacement; and reassembly instructions.
d. Instructions for identifying parts and components.
e. Review of spare parts needed for operation and maintenance.

PART 3 - EXECUTION

3.1 PREPARATION

A. Assemble educational materials necessary for instruction, including documentation and training module. Assemble training modules into a training manual organized in coordination with requirements in Section 01 78 23 "Facility Systems Manual."

B. Set up instructional equipment at instruction location.

3.2 INSTRUCTION

A. Facilitator: Engage a qualified facilitator to prepare instruction program and training modules, to coordinate instructors, and to coordinate between Seller and Company for number of participants, instruction times, and location.

B. Engage qualified instructors to instruct Company's personnel to adjust, operate, and maintain systems, subsystems, and equipment not part of a system.
   1. Company will furnish Seller with names and positions of participants.

C. Scheduling: Provide instruction at mutually agreed on times. For equipment that requires seasonal operation, provide similar instruction at start of each season.

   1. Schedule training with CFR with at least twenty-one days' advance notice.

D. Training Location and Reference Material: Conduct training on-site in the completed and fully operational facility using the actual equipment in-place. Conduct training using final operation and maintenance data submittals.

E. Cleanup: Collect used and leftover educational materials and give to Company. Remove instructional equipment. Restore systems and equipment to condition existing before initial training use.

3.3 DEMONSTRATION AND TRAINING VIDEO RECORDINGS

A. General: Engage a qualified commercial videographer to record demonstration and training video recordings. Record each training module separately. Include classroom instructions and demonstrations, board diagrams, and other visual aids, but not student practice.

   1. At beginning of each training module, record each chart containing learning objective and lesson outline.

B. Video: Provide minimum 640 x 480 video resolution converted to format file type acceptable to Company, on electronic media.

1. Electronic Media: Read-only format compact disc acceptable to Company, with commercial-grade graphic label.
2. File Hierarchy: Organize folder structure and file locations according to project manual table of contents. Provide complete screen-based menu.
3. File Names: Utilize file names based upon name of equipment generally described in video segment, as identified in Project specifications.
4. Seller and Installer Contact File: Using appropriate software, create a file for inclusion on the Equipment Demonstration and Training DVD that describes the following for each Seller involved on the Project, arranged according to Project table of contents:

a. Name of Seller/Installer.
b. Business address.
c. Business phone number.
d. Point of contact.
e. E-mail address.

C. Recording: Mount camera on tripod before starting recording, unless otherwise necessary to adequately cover area of demonstration and training. Display continuous running time.

1. Film training session(s) in segments not to exceed 15 minutes.

a. Produce segments to present a single significant piece of equipment per segment.
b. Organize segments with multiple pieces of equipment to follow order of Project Manual table of contents.
c. Where a training session on a particular piece of equipment exceeds 15 minutes, stop filming and pause training session. Begin training session again upon commencement of new filming segment.

D. Light Levels: Verify light levels are adequate to properly light equipment. Verify equipment markings are clearly visible prior to recording.

1. Furnish additional portable lighting as required.

E. Narration: Describe scenes on video recording by audio narration by microphone while video recording is recorded. Include description of items being viewed.

F. Transcript: Provide a transcript of the narration. Display images and running time captured from videotape opposite the corresponding narration segment.

G. Preproduced Video Recordings: Provide video recordings used as a component of training modules in same format as recordings of live training.

END OF SECTION 01 79 00

SECTION 01 80 00 - DESIGN BUILD REQUIREMENTS

PART 1 - PROJECT REQUIREMENTS

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 DEFINITIONS

A. Delegated Design Services, A-E: An Architect-Engineering firm(s) that is currently licensed in the state of Tennessee and normally engages in engineering design work.

1.3 REFERENCE SECTIONS

A. Section 01 33 00 Submittal Procedures

1.4 SUBMITTALS

A. Design Reviews
   1. Reference Table 01 80 00-A, Design Document Review Submittal Schedule for limited summary of submittal information at each design phase.
   2. Submit as agreed upon during Predesign Conference.
   3. Schematic Design (30% design)
   4. Design Development (60% design)
   5. Construction Documents, pre CFC, (100% design)
   6. Certified for Construction, CFC, documents (Final)
      a. Design drawings:
         1) (1) Full size copy of design drawings
         2) Electronic file of Design drawings: In native format and bookmarked pdf.
      b. Construction specifications:
         1) (1) 8 ½ x 11 unbound hard copy of complete construction specifications.
         2) Electronic file of construction specification: In native format and searchable pdf with bookmarks.
      c. Electronic file of calculations: : In native format and searchable pdf.
   7. Comment resolution from Design Development and Draft Contract Document reviews, within 10 days of receipt of Company comments.

B. Listing of drawing titles for assignment of drawing numbers.

PART 2 - CODES AND STANDARDS

2.1 GENERAL

A. Work Smart Standards: Design and construction of the facility shall be in accordance with the 01 41 00 Work Smart Standards as applicable including deviations and other standards as listed in the body of this document.

B. The design and construction of this project at the Oak Ridge National Laboratory (ORNL) shall adhere to the following codes.
   1. 29 CFR 1910 – Occupational Safety and Health Standards
   2. 29 CFR 1926 – Safety and Health Regulations for Construction (with the exception of 1926.53 superseded by 10 CFR 835)

PART 3 - PERFORMANCE REQUIREMENTS

3.1 PROJECT EXECUTION

A. Company: The Company will provide project, design and construction oversight.

B. AE: The A-E shall provide the contract documents as established in this specification.

C. Seller: A Design-Build Seller will be utilized for the design and construction of the project.

D. Delegated Design: Engage a qualified professional engineer, A-E, as defined in Division 01 40 00 Section "Quality Requirements," to design all portions of this scope.
   1. Performance and Design Criteria: Provide products and systems complying with specific performance and project description, including this design criteria.

E. General
   1. Predesign Conference: Schedule and conduct a predesign conference in conjunction with the project kick-off meeting. The Predesign Conference shall be held before starting design, at a time convenient to Company, but no later than 10 business days after Notice to Proceed.
      a. Discussion shall include:
         1) Dates for design review submittals, including any partial submittal dates or early design packages.
         2) Dates for CFC document sign off(s) and a pre-construction conference.
         3) Prepare a discipline list of documents, similar to Table 01 80 00.1, with proposed levels of completion at each design review stage. The list will be reviewed and finalized at the meeting. List shall specify which submittal package the document will be issued under, if applicable.
         4) Representatives of the Seller, A-E firm and Company shall attend the meeting.
         5) This meeting does not replace the pre-construction conference.

2. All construction documents, including drawings, specifications, and calculations shall be signed, dated and sealed by the responsible professional Engineer, Architect, Company or other licensed professional registered in the State of Tennessee. This applies to lead A-E firm and any A-E firms that are sub-tier to the lead firm.
3. Design Drawings
    a. The Cover sheet shall list all project design drawings, reference drawings, and general notes. Include the drawing numbers, title, and revision number.
    b. Design drawings shall utilize the ORNL grid system. A minimum of two survey control points with their coordinate values and elevations shall be shown on the design drawings.
    c. Drawings shall include all demolition plans, dimensional plans, elevations, sections, details, notes, and identification of materials and equipment necessary to complete construction of project.
    d. Design coordinates and elevations shall be determined for utilities, roads, and parking areas at their principal points of definition. This information shall be provided on the design drawings.
        1) The principal points of definition for utility systems shall include utility poles, obstructions, manholes, valves boxes, and crossings with other systems.
        2) Principal points of definition for potable water and natural gas distribution systems shall be valve boxes, main line intersects, and fire hydrants.
    e. A-E shall design the tie-ins to the existing utility systems for installation by the Company. Seller shall furnish the excavation, materials and restoration.
    f. Engineering standards will be provided by the Company.
4. Construction Specification
    a. Each Division's index sheet shall be sealed by the responsible Professional Engineer or Architect registered in the State of Tennessee.
    b. Divisions 02 through Division 46 shall be provided utilizing the Construction Specification Institute current version format.
    c. Division 01 shall be used as provided by the Company.
    d. Schematic Design (30%) submittal shall only include the index of proposed Construction Specification Sections.
    e. Design Development (60%) submittal shall be an edited version of the Construction Specification with all edits highlighted using MS Work Track Changes or similar.
    f. Construction Documents 100% submittal shall have all 60% comments incorporated and 60% highlights removed. The 100% submittal shall have all of the edits made from 30% to 60% identified. The 100% submittal shall be considered a complete set of Contract Documents ready for final signatures to be submitted as CFCs. It is intended that the only remaining item to complete is final signatures to allow issue of CFCs.
5. Calculations
    a. Design calculations shall clearly document the design decisions, assumptions, and basis for design (codes, standards, design loads, design factors).
    b. A qualified reviewer (i.e., checker) capable of generating the calculation himself/herself shall check and sign the CFC calculations for accuracy and concurrence with design assumptions and philosophy.
    c. An independent peer review of the seismic design will also be required.

d. Calculations shall be sealed by the responsible Professional Engineer or Architect registered in the State of Tennessee.
e. Calculations shall be provided in hard copy and electronically in PDF format.

6. Cost Estimate.
7. Commissioning Plan

3.2 DESIGN REVIEW

A. Formal design reviews with the Company shall be held at the following or as approved by the Company:
1. Schematic Design (30% design)
2. Design Development (60% design).
3. Construction Documents, pre-CFC (100% design)

B. Company will return comments to A-E within 15 days of receipt of submittal packages.

C. The A-E shall provide formal written responses to the Company's design review comments within 10 days after receipt of Company comments. Comment log should include comment, date and response at a minimum.

D. All design reviews shall be held at ORNL unless otherwise agreed by the Company. All disciplines shall attend the design reviews.

E. ORNL's acceptance of the CFC's (Contract Documents) in no way relieves the Seller of compliance with the Design Criteria.

F. A-E Activities during Construction Phase
1. A-E to perform sufficient field surveillance to verify construction work is in accordance with final design documents.
2. After each job site visit during construction, provide a brief surveillance report documenting what was inspected and any deficiencies identified.
3. Review and approve submittals such as vendor and manufacturer data, concrete design mixes, and shop drawings. Indicate the A-E review was performed by signing the submittal cover sheet
4. Perform off-site inspection and witnessing of tests at location of production, manufacture, or shipment to ensure a quality product as directed by the Seller.

Table 01 80 00-A Design Document Submittal Schedule				
DISCIPLINE	REVIEW			
	30%	60%	100%	CFC
1. MULTI-DISCIPLINE:				
Demolition Plans	X		X	X
Demolition Specifications		X	X	X
Excavation/Penetration Permit		X	X	X
Written responses to design review comments	X	X	X	X
Construction Specification – Provide index only at 30%	X	X	X	X
Cost Estimate	X	X	X	X
2. CIVIL:				
Site Access Plan - Index drawing & notes		X	X	X
Geotechnical Report (if required)	X			X
Access Road Improvements & Additions Plans and Details	X	X	X	X
Site Survey (if required)	X			X
Site Utilities Plan, Profile and Details	X	X	X	X
Site Layout Plan	X	X	X	X
Site Grading Plan	X	X	X	X
Storm Drain – Plans, Profile and Details	X	X	X	X
Calculations (including 500 yr hydrologic evaluation)	X	X	X	X
Project Specific SWPPP		X	X	X
3. STRUCTURAL:				
Framing - Plans & Elevations	X	X	X	X
Framing - Sections and details		X	X	X
Foundations – Plans	X	X	X	X
Foundations - Sections and Details		X	X	X
Miscellaneous - Plans, Sections and Details		X	X	X
Calculations	X	X	X	X
4. ARCHITECTURAL:				
Plans and Details for enclosures		X	X	X
Calculations		X	X	X
5. MECHANICAL – HVAC:				
Plans	X	X	X	X
Elevations, Sections and Details		X	X	X
Equipment Schedules	X	X	X	X
6. MECHANICAL - PIPING:				
Site Utility Systems Plans & Details	X	X	X	X
Control diagrams/P&IDs/Sequence of Operations	X	X	X	X
Calculations		100%	X	X
Equipment Specifications		X	X	X

7. FIRE PROTECTION:				
none				
8. ELECTRICAL:				
Electrical Site Plan, Legend, and Notes	X	X	X	X
One Line Diagram	X	X	X	X
Panel Schedules		X	X	X
Building Power and Receptacle Plan		X	X	X
Grounding Plan		X	X	X
Duct Bank Details		X	X	X
Conduit and Cable Schedules		X	X	X
Schematics, Interconnection, and Wiring Diagrams		X	X	X
Miscellaneous Details, Sections, and Elevations		X	X	X
PLC Interconnection Wiring Diagram		X	X	X
Instrument Loop Diagrams		X	X	X
Process & Instrument Diagram		X	X	X
9. COMMUNICATION				
Communication Plan		X	X	X
10. SECURITY				
Security Plan		X	X	X
11. COMMISSIONING				
Commissioning Plan	X	X	X	X

END OF SECTION 01 80 00

SECTION 01 81 00 - FACILITY PERFORMANCE REQUIREMENTS

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 OVERVIEW

A. Oak Ridge National Laboratory (ORNL) has developed a conceptual program to establish project criteria and to describe ORNL's program requirements and objectives for the project, including use, space, site, and expandability requirements, as well as requirements governing design-builder's performance of the work.

B. Section 01 81 00, Facility Performance Requirements includes project scope of work, project summary, design criteria, and conceptual specifications. Existing site and conceptual drawings are located in Sections 01 81 00.01, Process Flow Diagram, Section 01 81 00.02, Site Plan – Existing Conditions, Section 01 81 00.03, Site Plan – Proposed Sewage Treatment Plant Site, Section 01 81 00.04, Site Plan – Optional Proposed Layout, and Section 01 81 00.05, Site Plan – Limits of Construction.

1.3 PROJECT SCOPE OF WORK

1. The design-builder shall design and construct the project in accordance with the requirements of ORNL's conceptual program, facilty performance requirements, and any addenda issued thereto, including all documents, conceptual drawings, conceptual specifications, Division 01 requirements, and other information referenced.
2. The specific areas of work for this project include, but are not limited to, the following:
   a. Maintaining health and safety guidelines and requirements in accordance with Division 01 requirements and ensuring subcontractors' adherence to provide a safe work site for all project participants.
   b. Planning, scheduling and managing the design and construction of the Oak Ridge National Laboratory Sewage Treatment Plant Modernization with the design-builder's key personnel (construction manager, engineering design manager, quality assurance / quality control (QA/QC) manager, and site superintendent) both on-site and at design-builder's offices.
   c. Finalization of detailed project design in accordance with the project criteria.
   d. Pre-construction engineering, planning, coordination and preparation of information for all applicable permit applications.
   e. Site inspection and engineering.
   f. Site preparation and existing utility relocation.
   g. Procurement of all design, engineering, and construction work and materials.
   h. Design management.
   i. Project management.
   j. Subcontractor staging, management, and coordination.
   k. Management and staging of materials.

l. Site access management and scheduling.
m. Procurement and management of all subcontractors, vendors, and suppliers.
n. Coordinating sequencing of construction activities/planning with ORNL.
o. Complying with all federal, state, and local construction permitting requirements, including assisting with the procurement of permits as indicated in Table 1.1.
p. Managing construction work to assure compliance with all equipment warranties.
q. Cost estimation, submittal review and management, scheduling, and controls.
r. Construction and commissioning of the facilities.
s. QA/ QC, including inspection, testing and commissioning.
t. Turnover of facilities and systems, including warranties, operation instruction, and training. See Division 01 for additional warranty information. Spare parts will not be provided as a part of this project although a list of recommended spare parts and preventive maintenance procedures shall be prepared and submitted by the design-builder.
u. Preparing and furnishing complete and accurate record drawings for all features of the project, including coordinating with system integrator to accurately reflect final system.
v. Conducting and participating in all required meetings. The design-builder shall provide agendas, and compile and distribute meeting minutes.

3. The specific design submittals related to this project shall include:
   a. See Section 01 80 00 - Design Build Requirements.
   b. It is understood by ORNL that there may be concurrent design and construction activities, and that the scope of these design submittals may vary based on such.
   c. Permits will be required for the project which could include, but not be limited to those shown in the table below. The design-build contractor shall provide required information as noted in the table to ORNL for the application so that the permit can be received in sufficient time as to not affect the construction schedule.

Table 1.1: Project Permits

Permit	Party to Prepare	Party to Pay Fee	Party to Submit	ORNL Submittal Duration	Regulatory ReviewDuration
Modification to ORNL National Pollutant Discharge Elimination System (NPDES) for STP Upgrade	ORNL	ORNL	ORNL	60 days	180 days
TDEC Division of Water Resources Approval to Construct	Design-Builder/ORNL[1]	ORNL	ORNL	14 days	60 days
TN Construction Storm Water General Permit Coverage, if req'd	Design-Builder/ORNL[2]	ORNL	ORNL	30 days	30 days
Nationwide Permit for Outfall Structures and Associated Intake Structures	ORNL	ORNL	ORNL	30 days	45 days

Permit	Party to Prepare	Party to Pay Fee	Party to Submit	ORNL Submittal Duration	Regulatory ReviewDuration
TDEC Aquatic Resource Alteration Permit/Federal Section 401 Water Quality Certification	ORNL	ORNL	ORNL	60 days	30-60 days
TDEC Division of Air Pollution Control for standby generator	ORNL	ORNL	ORNL	45 days	30 days
Notes:					
1. Design-Builder to prepare Tennessee PE stamped design drawings, calculations and specifications for submittal to TDEC. ORNL to prepare submittal, pay fee and submit design to TDEC for review and approval.					
2. Design-Builder to prepare Tennessee PE stamped design drawings (erosion and sediment control drawings required by the TN General Permit and storm water pollution prevention plan (SWPPP)) for submittal to TDEC. ORNL to prepare submittal, pay fee and submit to TDEC.					

1.4 PROJECT SUMMARY

A. The following are general criteria that are intended to provide the design-builder an understanding of the overall scope of work involved in the project. The design-builder is responsible for determining the size, ratings, and quantities of all equipment to be provided except as specifically stated and for providing a complete design and construction project in accordance with all applicable codes and standards and to comply with the requirements of the TDEC NPDES permit for wastewater discharge by this facility.

B. The project includes, but is not limited to, the following items to be provided and installed at the sewage treatment plant:
   1. A minimum of two sequencing batch reactor (SBR) tanks with flow measurement, valve actuation, mixing, decanting, sludge wasting and aeration equipment. Designer shall reserve area in the site plan and provide grading (backfill, compaction, etc.) and connections necessary for the future expansion (an additional 50% of design capacity) of the system.
   2. A post equalization basin (Post EQ) and an aerobic digester.
   3. A tertiary disk filter system.
   4. Plant wastewater transfer pumps as necessary.
   5. Solids transfer pump(s) to convey flow to existing dewatering facility.
   6. Installation of new effluent flow monitoring with Parshall flume and outfall line to tributary of White Oak Creek. The outfall line may require supporting information to be submitted to ORNL in acquiring a TDEC Aquatic Resource Alteration Permit (ARAP) General Permit for Construction of Intake and Outfall Structures and 401 State Water Certification.
   7. Construction of new peracetic acid (PAA) contact basins and the replacement of the existing PAA Facility 2663 and its equipment. A potable water line and eyewash shall be extended to the replaced PAA facility.
   8. Replacement of Environmental Compliance Facility 2656.

9. A standby power system for the sewage treatment plant capable of providing full standby power to the sewage treatment plant including, but not limited to, SBRs, Post EQ, aerobic digester, tertiary filter, PAA facility, pumps, environmental compliance facility, instrumentation, controls, and site lighting.
10. Electrical equipment, including switchgear.
11. Instrumentation and controls to allow monitoring of treatment plant equipment and generator.
12. Installation of electrical building for switchgear and controls. Reference electrical design criteria in this section and Section 01 82 00, Structural.
13. Site and basin lighting.
14. Duct banks to and from treatment equipment, generator, and electrical equipment to tie into existing equipment (including power and controls) for a fully functional system, with a minimum of one spare conduit per duct bank and four spare wires per conduit for future treatment equipment.
15. Driveway and entrance roads to allow access for trucks shall be asphalt or concrete and provide smooth transition from road to site.
16. Site modifications and all applicable land disturbance and stormwater permits as required.
17. Provide information for preparation of TDEC and NPDES permit applications. TDEC rule 0400-40-02 requires the "four-step" process requirements to be fulfilled for the TDEC to approve a wastewater treatment plant construction project. The Preliminary Project Discussion has occured. The preliminary design step which produces the engineering report and preliminary plans are the responsibility of the design-builder. Checklists for the engineering report and preliminary plans submission are contained in Appendices 1-D-2 and 1-D-3 in TDEC's *Design Criteria for Seage Works*.
18. Miscellaneous access stairs, platforms, and site lighting modifications to accommodate new equipment.
19. Integration of selected monitored parameters of the new treatment system into the existing plant Supervisory Control and Data Acquisition (SCADA) system.
20. Perform short circuit, coordination, and arc flash studies.
21. Demolition of existing buildings and structures will be completed by ORNL.
22. Final connections to existing utilities will be completed by ORNL. See Section 01 80 00, Design Build Requirements.

1.5 ADDITIVE ALTERNATE OPTIONS SHALL BE PRICED FOR THE FOLLOWING:

A. Additive alternate option pricing shall include all labor, equipment and materials for site, structural, electrical, process, mechanical, architectural and instrumentation and control upgrades from the base bid for a functioning system.

B. Additive Alternate Option 1 – Influent Equalization Tank
1. Installation of a 750,000-gallon influent equalization tank which includes erosion control, grading, tank, foundation, wet weather pump station, recirculation pumps with building, modulation/isolation valves, piping, piping from diversion structure, overflow piping to west lagoon, grading, erosion and sedimentation control, site features such as sidewalks, access stairs and platforms (except walkway noted as Additive Alternate 2 below), electrical, instrumentation and control, and lighting as previously designed in 2015 Sewage Treatment Plant Headworks (with Equalization Basin option) project drawings

and specifications.

2. This Additive Alternate Option will increase the disturbed acreage to greater than one acre. Follow additional requirements described in Section 01 55 00 Environmental Protection and schedule for time frames shown in Table 1.1 of this Section.

C. Additive Alternate Option 2- Influent Equalization Tank Walkway
1. The walkway shown over the 750,000-gallon influent equalization tank shown in 2015 Sewage Treatment Plant Headworks project drawings and specifications is shown as Bid Option C on drawing C3E020017A108 and P3E021641A003.

D. Additive Alternate Option 3 – Intermediate Lift Station Upgrade
1. Upgrade of the existing intermediate lift station to SBR peak future flow capacity. Upgrades may include, but are not limited to, pumps, piping, valves, electrical gear and controls. Reference existing facility on 2015 Sewage Treatment Plant Headworks project drawings and specifications. Any modifications required to the existing intermediate pump station to meet the proposed base flow hydraulic grade of the proposed SBR shall be included in the base bid.

E. Additive Alternate Option 4 – 150% Post EQ basin
1. Installation of a Post EQ basin sized for 150% of the design flow rate.

F. Additive Alternate Option 5 – 150 % Aerobic Digester
1. Installation of an aerobic digester sized for 150% of the design flow rate.

G. Additive Alternate Option 6 – Secondary Access Stairway and Platforms on SBR Basin
1. Installation of a second access stairway and associated platforms to the operating level of the SBR basin. Description of access stairway is found in the SBR Basins section of Section 01 81 00, Facility Performance Requirements.

H. Additive Alternate Option 7 – Full Perimeter Walkways on SBR basins
1. Installation of full perimeter walkways around the top of every basin in the SBR-post EQ-aerobic digester treatment tank system. Description of perimeter walkway is found in the SBR Basins paragraph 1.10 of Section 01 81 00, Facility Performance Requirements.

1.6 CIVIL DESIGN CRITERIA

A. The civil/site scope at the sewage treatment plant includes the following:
1. Site modifications, grading, and utility relocation to accommodate sewage treatment plant equipment, and electrical equipment including generators.
2. Sidewalks, paving or gravel areas surrounding electrical equipment, generator pads, and at stairs and platforms for access to the basins and equipment.
3. Relocation of effluent outfall.

B. Permits Applications Required
1. General NPDES Permit for Stormwater Discharge from Construction Activities, if additive alternate options are added to the project
2. ARAP and 401 Water Quality Certification drawings
3. NPDES permit for modification to the sewage treatment plant

C. Site Improvements
   1. See Specification 01 89 00 – Site Improvements and Specification 01 89 19 – Site Plumbing and Utilities.
   2. The proposed treatment plant site shown on the drawings shall be restricted by area shown in Section 01 81 05 - Construction Limits to the south, regulatory setbacks from the 13.8 kVA power line to the west, the paved road to the north and the tributary riparian zone to the east.
   3. The site improvements shall avoid disturbing the abandoned 2-inch low level liquid waste line and 6-inch process sewer line adjacent to the southeast project limits.
   4. ORNL will coordinate use of the gravel area on the west side of First Street from Building 2644 for a laydown area.
   5. The 100-year flood elevation at the site is 778.5 and the 500-year flood elevation is 781.4. No above grade structures or embankment that would restrict flowage are allowed in the 100-year flood elevation zone, with the exception of the outfall headwall which should cause no-rise and be oriented 90 degrees to the direction of flow. All generators, electrical gear, and building construction is to be constructed a minimum of 1 foot above the 500-year flood elevation or 18 inches above grade, whichever is higher. Treatment plant basins may be constructed within the 500-year flood elevation provided the tops of the basins are a minimum of 1 foot above the 500-year flood elevation.

D. Drawings and Calculations
   1. Drawings and calculations shall be prepared by or under the direct supervision of a professional engineer licensed in the State of Tennessee. Drawings shall be sealed, signed and dated by a licensed engineer in responsible charge in the State of Tennessee. Calculations shall be submitted as part of the project.

1.7 STRUCTURAL DESIGN CRITERIA

A. The structural scope at the sewage treatment plant includes the following:
   1. Foundations for basins, electrical facility and equipment, generator and structures (new PAA facility and new environmental compliance facility).
   2. Aluminum stairs and platforms for access to the basin operating levels are to be provided. Ladders and ship stairs are prohibited unless approved by the Company for extenuating circumstances.

B. Governing Codes and Standards
   1. The project shall comply with all Federal codes and standards including, but not limited to, those listed in Section 01 82 00, Structural.

C. Calculations
   1. Calculations shall be prepared by or under the direct supervision of a professional engineer licensed in the State of Tennessee. Calculations shall be sealed and signed by said engineer and shall be submitted.

D. Drawings
1. Drawings shall be prepared by or under the direct supervision of a professional engineer licensed in the State of Tennessee. Drawings shall be sealed, signed and dated by a licensed engineer in responsible charge in the State of Tennessee.

1.8 WASTEWATER GENERAL DESIGN CRITERIA

A. Primary Guidance: TDEC *Design Criteria for Sewage Works*

B. Consult the following as supplemental references as needed:
1. Recommended Standards for Wastewater Facilities. Great Lakes - Upper Mississippi River Board (GLUMRB), Health Research, Inc., Albany, NY (10 States Standards), 2014.
2. Wastewater Engineering: Treatment and Resource Recovery (5th ed.) Metcalf and Eddy / AECOM, McGraw Hill, New York, NY. (Metcalf and Eddy), 2014.
3. Design of Water Resource Recovery Facilities (6th ed.) Water Environment Federation (WEF) / American Association of Civil Engineers (ASCE) McGraw Hill: New York, NY. (MOP 8) 2018.
4. Guidance Manual for Determination of Disinfectant Contact Time and CT Requirements for Public Water Systems. Tennessee Department of Environment and Conservation, Division of Water Supply, July 1991.
5. Standard for Fire Protection in Wastewater Treatment and Collection Facilities. Standard 820, National Fire Protection Association, Quincy, MA, 2019.
6. Design Criteria for Mechanical, Electric, and Fluid System and Component Reliability. EPA-430-99-74-001, US Environmental Protection Agency, Office of Water Program Operations, 1974.
7. American National Standards Institute (ANSI)/Hydraulic Institute (HI) Pump Standards. Hydraulic Institute, Parsippany, NJ, 2019.
8. American Society of Civil Engineers (ASCE) A Standard for the Measurement of Oxygen Transfer in Clean Water ASCE/EWRI Standard 2-06, American Society of Civil Engineers, Reston, VA, 2007.

C. Calculations
1. Calculations shall be prepared by or under the direct supervision of a professional engineer licensed in the State of Tennessee. Calculations shall be submitted. A copy of a process model input and output file executed in the commercial software Biowin (Envirosim, Hamilton, Ontario, Canada) shall be submitted that justifies process sizing.

D. Drawings
1. Drawings shall be prepared by or under the direct supervision of a professional engineer licensed in the State of Tennessee. Drawings shall be sealed, signed and dated by a licensed engineer in responsible charge in the State of Tennessee.

E. All hardware and fasteners subject to corrosion in a classified area in the wastewater treatment plant shall be Type 304 stainless steel, minimum. Aluminum brackets may be used where appropriate.

1.9 EXISTING AND FUTURE FLOWS AND LOADS

A. Influent wastewater quality from the period 2018 – 2019 is summarized in the Wastewater Quality Table. This data is subject to be updated in the Request for Proposals as additional data becomes available.

Table 1.2: Wastewater Quality

Constituent	min	avg	max month*	max
BOD	30	118	210	316
TSS	4	99	214	556
TKN**		23	35	
NH4-N**		14	20	
Phosphorous**		3.7	5.6	

*Calculated from COD measurements (Assumed 2.1 lbs. COD/lb. BOD5)

** Assumed. Taken from Table 3-8, Wastewater Engineering: Treatment and Resource Recovery, 2014

B. Due to the dilution that takes place in the current system, the maximum month constituent concentrations will be used in place of average day concentrations.

C. Flows to the plant are summarized below:

Table 1.3: Current Wastewater Flows

Flow Regime	Current (MGD)
Average Daily Flow (ADF)	0.22
Maximum Month Average Flow (MMF)	0.33
MMF:ADF	1.5
Peak Day Flow (PDF)	0.50
PDF:ADF	2.27

D. Based on discussions with TDEC, ORNL design shall incorporate the following future effluent limits (at the point of compliance):

Table 1.4: Effluent Limits

Constituent	Current	Future	Units
BOD	10	10	mg/L
TSS	30	30	mg/L
TN	report	8	mg-N/L
Ammonia	2.5	2.5	mg-N/L
Phosphorous	report	report	mg-P/L

1.10 VALVES, ACTUATORS, AND FLOW METERS

A. Plug Valves
1. Plug valves with electric actuators are required on influent lines for the SBR system and on the Post EQ effluent line. Manual plug valves are required on the digested solids transfer pump.
2. In jet systems, manual plug valves with handwheels are required on pump suction and pump discharge.
3. Plug valves shall be permanently lubricated, tight closing, suitable for wastewater service, and shall be leak tested before delivery.

Table 1.4: Plug Valve Design Criteria

Characteristic	Value
Throttling	Influent, decant – isolation Post EQ – modulating Jet pump suction, discharge, digested solids pumping – isolation
Rating	150 lbs. (cold working pressure)
Seat	Welded in nickel
Body	Cast or ductile iron
Plug	Cast or ductile iron, EPDM coated
Seals	Provide on all shafts to prevent dirt and water from entering actuator
Passage	80% of full port, 4-in & greater shall pass a 3-in. spherical solid
Bearing	SS or bronze, permanently lubricated (upper and lower)
Packing	O-ring, U-cup, V-type self-adjusting or externally adjustable by means of an external packing gland Packing shall be replaceable without removing the valve actuator or bonnet
Packing gland	Shall be visible through a standoff between the valve bonnet and actuator base
Gearing	Enclosed in a semi steel housing suitable for running in a lubricant for valves greater than 4-in.
Approved Manufacturers	DeZurik PEC or PEF, Val-matic Camcentric, Pratt Ballcentric

B. Butterfly Valves for Air Service
1. Air service valves are required to toggle air supply between basins. Air service valves shall be butterfly valves and shall be specifically designed for air service.

Table 1.5: Air Butterfly Valve Design Criteria

Characteristic	Value
Throttling	shut off and throttling (multistage centrifugal blowers)
Pressure Rating	50 psi
Temperature rating	250°F
Design	Wafer or lug
Body	Cast iron
Disc	Ductile iron; 360° seating surface, stainless steel edging
Seat	Fully lined EPDM
Shaft	316 stainless steel
Bearing	Self-lubricating, corrosion resistant
Packing	Adjustable or self-adjustable, suitable for temperature and service
Gearboxes	Self-locking
Approved Manufacturers	Bray, Keystone, Mueller

C. Actuators
1. Actuated valves installed below grade shall be in vaults that include safety hatches. For below grade installations, controls shall installed above grade on a pedestal extensions to avoid confined space conditions.
2. Actuators shall have the characteristics summarized in the following table. Include overload protection and integral motor starters if required on electric actuators.

Table 1.6: Actuator Design Criteria

Characteristic	Value
Power	460 V / 3 ph / 60 Hz
Rating	50 PSI working pressure
Local controls	Open / Stop / Close pushbuttons Local / Off / Remote selector switch Open / Close / Fault indicating lights Open / Close switch for hand operation of valves at the SBR control panel Manual override, limit switch feedback in both opened and closed positions
Motor	High torque, 15 min duty rating
Insulation	Class F or better
Classification	NFPA 820
Housing	NEMA 4X; IP 68 in the installation is subject to submergence
Gearing	Grease or oil lubricated, antifriction bearings
	Compartment heater
Performance	Operate from open to full close in 60 sec.
Handwheel	Clockwise to close. Failure of the motor shall not hinder manual operation. Actuator shall switch between manual and electrical operation seamlessly without risk to the equipment.

Characteristic	Value
Manual actuators - Plug	Worm gear actuators with hand wheels, sized for 50 psi reverse shut off pressure against the face of the plug
Manual - BFV < 4-in	Lever actuators, latch in open, closed and several intermediate positions
Manual - BFV >6 in	Geared actuators with handwheels
Approved manufacturers	Rotork, Auma, Limitorque

D. Flow Meters
1. All flow meters installed below grade shall be in vaults that include safety hatches. For below grade installations, readouts shall installed above grade to avoid confined space conditions.
2. All flow meters shall include isolation valves upstream and downstream. An equally-sized spool piece, with the same bolt pattern and dimensions as the flow meter, shall be provided to allow meter to be taken out of service for maintenance.
3. Flow meters shall have the appropriate run of straight, constant-diameter pipe upstream and downstream of the meter to ensure accurate measurement.
4. If the selected flow meter requires full flow conditions for accurate measurement, flow meter should be installed to ensure such full pipe conditions.

Table 1.7: Flow Meter Design Criteria

Characteristic	Value
Construction	Unobstructed, in-line magnetic flow meter
Connections	Flanged, bolt pattern to comply with ANSI/ASME B16.5
Pressure rating	Compatible with adjoining pipe
Housing	Splash proof, drip proof
Classification	Consistent with NFPA 820
Electrodes	Self-cleaning
Calibration	Wet flow calibrated at factory to full flow capacity. Meter certified at a facility traceable to NIST
Signal converter	Separately mounted (continuous signal cables included) of the same brand as the meter +/-0.5% accuracy between 3 and 30 fps Bi-directional flow capability Micro-processor based with output dampening, self-testing, built in calibration and an “empty pipe zero” contact input
Housing	NEMA 4X
Temperature	-30°F – 140°F
Relative Humidity	10% - 100%
Output	Analog (4 – 20 mA); communications protocol shall interface seamlessly with existing ORNL system
Diagnosis / Recalibration	Hand-held device
Approved manufacturers	Endress & Hauser, Inc., Promag W400/5W4C; Rosemount 8700; Toshiba LF654

1.11 SBR BASINS

A. SBR shall be a true batch design. Flow-through SBRs are not permitted.

B. The SBR treatment cycles shall consist of anoxic fill, aerated fill, react, settle, decant and waste. Cycle structure shall be flexible to allow cycling aeration patterns using a single air delivery system.

C. Size basin so that peak day flows are treated without a change in the cycle length of the basin.

D. Efficient use of available space is required. Design of tanks should be compact. Deep basins with shared wall construction are preferred.

E. System shall include a minimum of two batch tanks with mixing, decanting and aeration equipment. Designer shall identify and reserve an area in the site plan and provide connections for the future expansion (by 50% of design capacity) of the system.

F. New tankage shall be incorporated into the existing hydraulic profile. Some modification of existing pumps or the hydraulic grade may be necessary.

G. Include electrically actuated, influent plug valves suitable for wastewater service to control the flow of wastewater to each batch tank.

H. Each tank (SBR, Post EQ, aerobic digester) shall include a drain to allow the tank to be dewatered in 24 hours or less. Drainage shall be returned to the influent pump station.

I. Each SBR tank shall include an emergency overflow that allows a tank to spill into the companion tank to avoid overtopping. A high – high level passive overflow pipe will also be installed in each basin with an opening six inches below top of wall to divert flows not managed by the emergency overflow to the Post EQ basin.

J. All tanks (tank bottom and walls) for the SBR, Post EQ and aerobic digester shall be constructed from reinforced, cast-in-place concrete. See specification section 01 82 00, Structural.

K. The operating level of the SBR system (top of the tanks) shall be accessible to operators. For above grade structures, provide stairwell access consistent with codes. Ships stairs and ladders are not acceptable. Surfaces shall minimize risk of slipping, shall include handrail rated for tie off point for maintenance personnel to match existing handrail at the site and shall be constructed from aluminum or cast-in-place concrete. A second stairwell shall be priced as Additive Alternate 6.

L. Each tank shall be accessible to operators. Provide walkways atop common walls that extend the full length of the basins consistent with codes and with TDEC-required safety equipment. All in-basin equipment and instrumentation shall be accessible from a walkway. Each walkway shall be accessible from the top of the stairwell. Walkway surfaces shall minimize risk of slipping, shall include handrail to match existing handrail on site, shall include kickplate, and shall be constructed from aluminum, fiber reinforced polyesther (FRP), or cast-in-place concrete. Full perimeter walkways shall be priced as Additive Alternate 7.

M. Hose bibbs (3/4-in.) shall be installed on the operating level of the SBR basins. Individual hose bibbs shall be separated by no more than 50 feet (ft.) and shall be installed on both ends of the basin so that equipment in the basin can be cleaned from the operating level. Hose bibbs shall be constructed from stainless steel components when installed in locations subject to hydrogen sulfide gas exposure.

N. With the exception of pumps and blowers, a single SBR equipment manufacturer is responsible for furnishing and coordinating all SBR equipment and instrumentation. Surface mixers shall be supplied by the SBR manufacturer and not out-sourced to a third party.

O. Influent wastewater to each SBR batch tank shall be discharged in such a way that flow is directed to the bottom of the tank to reduce the risk of short-circuiting.

P. Approved system suppliers are Parkson, Evoqua, Fluidyne, and Aqua Aerobics.

Q. SBR design criteria is summarized in the following table:

Table 1.8: SBR Design Criteria

Parameter	Value	Units
Annual Average Daily Flow	0.4	MGD
Maximum Month Average Flow	0.50	MGD
Peak Day Flow	0.9	MGD
Wastewater temperature, max	86	°F
Wastewater temperature, min	50	°F
MLSS at low water level, design	<4,500	mg/L
MLSS at high water level, design	>3,000	mg/L
Number of batch cycles per day per basin	4	cycles
Maximum daily aeration time per basin	12	hrs.
Minimum settle time per cycle	45	min
F:M	0.04	/days
SRT	15 - 30	days
Volumetric loading	5 – 15	lb. BOD/10^3 ft^3
Hydraulic residence time	15 - 40	hours

1.12 POST EQ BASIN

A. Post EQ basin shall be sized to equalize 100% of the design average day flow (ADF). A Post EQ basin sized at 150% of the design flow shall be priced as Alternative 4.

B. All equipment and instrumentation in the Post EQ basin shall be accessible from the walkway.

C. If hydraulic grade allows, discharge flow from the Post EQ basin shall be regulated by an electrically actuated modulating plug valve and flow meter. Otherwise, a system of submersible pumps (N+1) with variable frequency drives (VFDs) shall be installed in the Post

EQ tank to control flow out of the Post EQ basin.

D. Hose bibbs (3/4-in.) shall be installed on the operating level of the Post EQ basin. Individual hose bibbs shall be separated by no more than 50 feet and shall be installed on both ends of the basin so that equipment in the basin and inner basin walls can be cleaned from the operating level. Hose bibbs shall be constructed from stainless steel components when installed in locations subject to hydrogen sulfide gas exposure.

1.13 AEROBIC DIGESTER BASIN

A. The aerobic digester shall be sized to hold 30 days of waste solids. Assume solids are discharged to the aerobic digester at a concentration of between 0.5% and 1.0% at the average design waste activated sludge (WAS) flow. An aerobic digester sized at 150% of the average design flow shall be priced as as Alternative 5.

B. A floating decanter shall be included to allow solids to be thickened prior to dewatering. Decant shall be returned to the treatment process.

C. Digested solids from the digester shall be pumped from the digester to the solids processing building with a rotary lobe pump and an in-line grinder.

D. Pump motors shall operate at 1800 rotations per minute (rpm) or less.

E. Hose bibbs (3/4-in.) shall be installed on the operating level of the aerobic digester basin. Individual hose bibbs shall be separated by no more than 50 ft. and shall be installed on both ends of the basin so that equipment in the basin and inner basin walls can be cleaned from the operating level. Hose bibbs shall be constructed from stainless steel components when installed in locations subject to hydrogen sulfide gas exposure.

1.14 PAA DISINFECTION

A. PAA shall be flow-paced using the effluent flow meter.

B. Contact chamber shall be sized for the residence time established by the pilot study with a safety factor of 2.0 (50 minutes, minimum).

C. Redundancy based on TDEC guidance shall be provided.

D. “Superior baffling” as defined in TDEC guidance shall be provided.

E. Length to width ratio shall be 30:1.

F. A new PAA Facility shall be provided to contain (2) 100% redundant pumps, pump controllers, residual PAA monitor, residual hydrogen peroxide monitor, and other appurtenances as currently installed in the existing PAA Building. Bulk chemical storage shall be outside of the PAA Facility, located on a double containment pallet and shielded from the sun

G. Chemical diffusers shall be installed in each of the contact basins and plumbed to the PAA Facility.

H. A hose bibb (3/4-in.) shall be installed within 10 ft. of the PAA contact basin. Hose bibbs shall be constructed from stainless steel components when installed in locations subject to hydrogen sulfide gas exposure.

I. See Section 1.21 for Environmental Sampling requirements.

1.15 TERTIARY FILTER

A. The tertiary filter shall be a disk-type filter sized for the peak day flow.

B. Size filters at < 6 gpm/ft^2 and <2 ppd/ft^2 at peak day flow.

C. Redundancy requirements based on TDEC guidance shall be provided.

D. Disks shall be able to be serviced / replaced by disassembling disks through an access port on the filter.

E. Integral backwash shall use filtrate for spray / backwash water. Include strainer and filter on backwash pump discharge. Spray nozzles shall be removable for cleaning.

F. Assume 15 mg/L total suspended solids (TSS) maximum in effluent from Post EQ.

G. Backwash water shall be returned to the treatment process via the influent pump station if the hydraulic grade permits gravity flow. If gravity flow to the influent pump station is not possible, a plant lift station shall be included to convey flow to the influent pump station.

H. A hose bibb (3/4-in.) shall be installed within 10 ft. of the tertiary filter. Hose bibbs shall be constructed from stainless steel components when installed in locations subject to hydrogen sulfide gas exposure.

I. Approved filter manufacturers are Kruger, Evoqua, and Aqua Aerobics.

1.16 MIXING EQUIPMENT

A. Mixing shall be independent from aeration. Floating surface mixers or jets are acceptable.

B. If jets are selected, motive pumps shall be installed external to the tank and must remain operational through the 500-yr flood.

C. SBR floating mixers shall be designed to apply at least 30 HP/MG for all operating conditions.

D. If applicable, operators must be able to retrieve surface mixers from the basin without entering the basin and must be able to service the unit from the operating platform. Any necessary hoists shall be provided. Hoists shall be fabricated of stainless steel.

Table 1.9: Motive Pump Design Requirements

Characteristic	Value
Body	Cast iron or ductile iron, 125 lb. flanges compatible with ANSI 16B.1, Stainless steel nuts, bolts, washers, O-rings at mated surfaces (No paper gaskets)
Hydraulic Efficiency	Greater than or equal to 70% at duty point
Impeller	Non-clog, cast iron, solids handling, must pass a spherical, nondeformable 3-in. solid, no threaded connections between impeller and shaft
Wear rings	(For enclosed impellers) provide drive fitted stainless steel wear rings on casing and impeller. (For semi open impeller) provide a cast iron (Class 30B or higher) wear plate mounted to volute
Shaft	316 stainless steel, single piece construction, lower (2) and upper (1) permanently lubed and sealed bearings, L10 = 50,000 hours, 1.5 safety factor for shaft design
Seals	Block mechanical seals, stainless steel, Si-C/Si-C faces, mounted in seal chamber. Provide moisture sensor
Power and control cables	Furnished in required lengths un-spliced
Removal system	(For wet pit) base elbow, pump coupling, 1 ¼-in.(minimum) schedule 40 stainless steel guide rails, stainless steel lifting chain. (For dry pit) provide a steel support stand to resist torsion, vibration.
Motor	Squirrel cage, air-filled induction motor in water-tight housing suitable for wet pit or dry pit insulation
	For constant speed pumps 1.15 service factor, continuous duty non-overloading, 15 starts/hr.For variable speed systems, 1.0 service factor, unlimited starts
	Copper wound stator, statically and dynamically balanced rotor
	Insulation class H, NEMA B
	Water/glycol cooling system if necessary for proper cooling, field serviceable, bearing life of 50,000 hr. mechanical seals to isolate cooling system
	Classified consistent with NFPA 820
	Provide temperature switch
Approved Manufacturers	Flygt, Sulzer, Wilo USA

E. If a floating surface mixer is chosen for tank mixing, then one mixer, consisting of a motor, a direct-drive, constant speed impeller, an integral floatation unit, and an impeller volute shall be supplied per basin.

Table 1.10: Floating Mixer Design Requirements

Characteristic	Value
Motor	Premium efficient, vertical P base design, 460 V, 60 Hz, 3 ph power, 900 rpm, 1.15 service factor. Rated for severe duty.
	Non hygroscopic winding, insulation equal to or exceed NEMA Class F. Provide a labyrinth seal below bottom bearing and a condensate drain at the lowest point in the lower end bell housing.
Shaft	17-4 PH stainless steel, one-piece continuous construction, threaded below bottom bearing with a keyway cut into shaft. Mounting hardware shall lock the impeller in place to prevent nut and washer from backing off.
Bearings	Regreasable. Top and bottom bearings of the radial and axial thrust type. Top bearing: shielded on bottom side only. Bottom: open.
Base	All components of the motor mounting base, including the base itself, shall be 304 stainless steel.
Seals	Two independent acting air seals capable of sealing off air flow during pumping and prevent backflow during reversal. A maintenance free rotating backflow seal on the motor base extension shall prevent grit accumulation.
Impeller	Downward pumping, 316 stainless steel, two blade, dynamically and hydraulically balanced marine type casting designed for mixing wastewater. Shall be capable of reverse pumping without damage to mixer chassis or motor bearing/windings. Impeller attached to shaft with with hardened pin and set screw. No spray or liquid leakage upward onto the motor support surface is allowed.
	The entire rotating assembly shall be dynamically balanced within 2.0 mils peak-to-peak horizontal displacement measured at the upper and lower motor bearing at the motor RPM. Measurements should be taken with the motor in a vertical shaft-down position.
Volute	304 stainless steel, 3/16 in thickness, minimum.
Floatation unit	Polyurethane closed cell foam fill, fiber reinforced polyester or stainless steel skin, totally sealed.
Cable moorings	Mooring cable, clips, thimbles, quick connects, and extension springs shall be 304 stainless steel. Cables shall be accessible from the operating platform walkways.
Approved Manufacturers	Aqua Aerobics, Parkson, Evoqua

1.17 AERATION

A. SBRs
   1. The design depth for aeration equipment in the batch tanks shall be the average water level in the batch tank, not the maximum water level.
   2. For sizing of SBR aeration equipment, base biochemical oxygen demand (BOD) and total kjeldahl nitrogen (TKN) load on maximum month average daily design flows applied to the system. Assume all BOD and TKN applied to the system is removed. Take no credit

for denitrification.

3. Design solids retention time (SRT) in SBR tanks shall be calculated based on the theoretical SRT for nitrification at the minimum design wastewater temperature and a safety factor calculated as the ratio of peak total nitrogen (TN) load to average TN load.
4. Kinetic coefficients and temperature correction factors shall be taken from Table 8-14 of the 5th edition of Metcalf and Eddy.
5. The aeration system for the SBR tanks shall be designed to transfer the required amount of oxygen for the design condition using the aeration criteria listed in the table below. All oxygen transfer efficiencies shall be based on field test data performed in accordance with ASCE Standards.
6. Fine bubble aeration with either submerged jets or membrane diffusers is acceptable for SBRs.
7. Jet aeration systems shall include an integral and flanged manifold composed of a cylindrical liquid line, a cylindrical air line, and jet nozzle assemblies. For jet aeration systems, all air lines above the low water level shall be stainless steel. Provide isolation valve for each drop.
8. Each jet assembly shall be composed of an inner liquid nozzle and outer air/liquid nozzle laminated to the air and liquid ducts to form a single unit. Systems with nonintegral jets are unacceptable.
9. A pneumatic flush system composed of an air lift riser, flushout butterfly valve, and supports shall be included to maintain jets and shall be accessible from a walkway on the operating level.
10. Tube-style membrane diffusers shall be provided on stainless steel retrievable racks with stainless steel leveling rods to rest on the bottom of the basin.
11. Membranes shall be made from EPDM rubber and designed with check valve capabilities to prevent mixed liquor from entering the diffuser unit.
12. Racks shall include a stainless-steel vertical retrieval track to allow units to be pulled from the basin. Racks shall be able to rotate 180 degrees for inspection and maintenance.
13. For removable air diffusers, air shall be delivered via a flexible 4-inch wire reinforced neoprene upper section and a rigid stainless-steel lower section connected by a quick disconnect adapter. Drops shall include a manual butterfly valve at the operating level to allow each rack to be isolated and taken offline. Racks and isolation valves shall be accessible from walkways.
14. A portable electric (115 V, single phase, 60 Hz) winch shall be provided to extract racks from the SBR basin.

Table 1.11: Aeration System Design Criteria

Parameter	Value	Units
Maximum ambient temperature	105	°F
Minimum ambient temperature	17	°F
Maximum relative humidity	100	%
Site elevation	850	ft. MSL
Actual oxygen requirement, carbon	1.3	lb. O_2/lb. BOD applied
Actual oxygen requirement, Ammonia	4.6	lb. O_2/lb. TKN applied
Denitrification credit	0	lb. O_2/lb. NO_3-N reduced
Alpha, jets	0. 7	Unitless
Alpha, diffusers	0.5	Unitless
Beta	0.95	Unitless

Parameter		Value Units
Theta	1.024	Unitless
DO saturation at STP[a]	9.09	mg/L
Residual DO Concentration	2.0	mg/L, minimum
Specific weight of air at STP[a]	0.075	lb. air/ft^3
Fouling factor (diffusers only)	0.75	

[a] STP for aeration: 68°F, 1 atm, relative humidity 36%

B. Aerobic Digestion
   1. In addition to the aeration systems identified above, coarse bubble aeration is acceptable for aerobic digestion.
   2. Coarse bubble aerators shall be designed to transfer the required amount of oxygen for the design condition using the aeration criteria listed in the table below. All oxygen transfer efficiencies shall be based on field test data performed in accordance with ASCE Standards.
   3. Aeration in aerobic digestion shall be based on maintaining a residual dissolved oxygen concentration of 2.0 mg/L in the basin for all operating conditions.
   4. Aerobic digester design criteria are provided below:

Table 1.12: Aerobic Digester Design Criteria

Parameter	Value	Units
Volatile solids loading, minimum	0.1 – 0.3	lbs./ft^3-d
Oxygen requirements, actual conditions	2.3	lbs. O_2/lb. VS destroyed
Energy requirements – mixing	0.75 – 1.5	hp/1000 ft^3
Residual dissolved oxygen requirement	2	mg/L
Volatile solids reduction	>38	%

C. Post EQ
   1. A submersible aspirating aerator shall be installed in the Post EQ basin.
   2. Post aeration shall be provided in the Post EQ basin to meet the permit limits of 6 mg/L dissolved oxygen.

Table 1.13: Post EQ Design Criteria

Characteristic	Value
Minimum energy requirements – mixing	0.15 – 0.3 hp/1000 ft^3
Minimum oxygen requirements	15 ft^3/1000 ft^3-min
Body	Cast iron or ductile iron, 125 lb. flanges compatible with ANSI 16B.1
Impeller	stainless steel
Shaft	Stainless steel, single piece construction, 1.5 safety factor for shaft design
Seals	Mechanical seals, Si-C/Si-C (medium side) Carbon/chrome steel (motor side)
Power and control cables	Furnished in required lengths un-spliced

Removal system	Pump coupling system, stainless steel guide rails, stainless steel lifting chain stainless steel fasteners.
Motor	Squirrel cage induction motor, 460V 3 pH, 60 Hz, soft start
	1.15 safety factor
	Continuous duty non-overloading, 15 starts/hr. at constant speed
	Cast iron motor housing
	Insulation class F or greater
	Maximum motor speed: 1800 rpm
	Provide temperature and moisture sensors
Approved Manufacturers	Flygt, Sulzer

D. Air Supply
1. Air piping outside of the basin shall be schedule 10S stainless steel, ductile iron (DI, no liner), or FRP. FRP pipe shall be de-rated based on actual pressure and temperature operating conditions. Piping inside the basin shall be stainless steel or PVC (under water only). If retrievable diffusers are used, stainless steel piping is required for support. Use high temperature Ethylene-Propylene-Diene-Monomer (EPDM) components (tubing, gaskets, membranes, expansion joints) in the air system.
2. Size pipe to provide acceptable head loss at maximum air flow. Headloss between the last positive flow split and the farthest diffuser shall not exceed 10% of the loss through the diffuser. Initial pipe sizing shall target the following air velocities:

Table 1.14: Recommended Air Velocities in Pipe

Pipe size (inch)	Velocity (fpm)
1 to 3	1,200-1,800
4-10	1,800-3,000
12-24	2,700-4,000
30-60	3,800-6,500

3. Air flow between basins shall be controlled by electrically-actuated butterfly valves.

E. Blowers
1. Aeration is required for the batch tanks, the aerobic digester, and the Post EQ tank. Separate dedicated blower systems shall be provided for the SBR aeration system and the aerobic digester system. A submersible aspirating aerator shall be installed in the Post EQ basin for dissolved oxygen polishing.
2. Losses through the blower inlet filter, control valves, and fittings shall be considered in the determination of total blower discharge pressure requirements.
3. Blowers shall be either rotary lobe or multistage centrifugal with inlet throttling (butterfly valves).
4. Rotary lobe blowers shall include inlet and outlet silencers and enclosures to attenuate noise to less than 85 decibels. Include weighted type pressure-relief valves on rotary lobe blowers. Maximum acceptable speed for rotary lobe blowers is 2,400 rpm. Blower shall be installed on a base mount with anti-vibration mountings.
5. For multistage centrifugal blowers, provide minimum ½ psi rise to surge at maximum water depth. Include vibration sensing system on centrifugal blowers. Blower

manufactuer to supply all throttling valves, shut-off valves, expansion joints, check valves, and controls to form a completely operating system.

6. Blower capacity (icfm) shall be based on supplying the volume of air required at the maximum inlet temperature.
7. Blower systems shall cover the maximum day air demands at maximum inlet temperature and design flows and loads and shall have turn down sufficient to deliver minimum required air flows at start up and minimum diurnal loads. Provide pressure and temperature gages on air inlet and outlet.
8. Redundancy shall allow for the blower systems to meet the maximum demand with one blower out of service.
9. Blower motor sizing shall be based on blower operation at full capacity at minimum inlet temperature. Size blowers for a minimum three hot starts per hour.
10. For positive displacement blowers, include belts and sheaves, discharge check valve, rubber inlet sleeve, discharge connection, pressure relief valve, and rubber expansion joint. Blowers utilizing belts shall have a minimum of two belts.
11. Provide manufacturer-recommended maintenance clearance around blowers for routine service.
12. Blower filters shall be installed in an accessible location to facilitate maintenance.
13. Blowers shall be installed under a shed to protect equipment from the weather.
    a. The shed foundation shall be a concrete slab with suitable footings.
    b. Slab shall be large enough to accommodate the blowers and controls with required walkways between and around equipment. The slab shall include space to add one additional blower with required clearances.
    c. Blowers and controls shall be installed on 4-inch (minimum) housekeeping pads.
    d. Clearance around blowers shall be a minimum of four feet in each direction or the minimum manufacturer's recommended clearance, whichever is greater.
    e. Clearances shall be wide enough to allow access for a gantry crane.
    f. The shed shall be constructed from structural steel posts and a standing seam metal roof.
    g. Steel posts and shed roof shall be sized to support overhead crane capable of lifting a single blower unit. Lighting shall not interfere with the operation of the overhead crane.
    h. Steel posts shall be galvanized or painted to limit corrosion.
    i. Standing seam metal roof shall comply with UL90 and building codes, shall be mechanically seamed, and a minimum of 22 gauge. Roof shall completely overhang the entire slab including walkways around equipment.
    j. Panels shall be Galvalume with Kynar fluoropolymer coating.
    k. Coating color shall be selected by Owner from manufacturer's full color range.
    l. All fasteners shall be of corrosion-resistant materials.
    m. The shed shall be designed to resist wind loads per code requirements.
    n. Gutters/downspouts shall be installed to direct precipitation away from walkways and the blower slab. Provide splashblock at downspout discharge.
    o. Lighting shall be sufficient to allow maintenance on blowers and controls at night.
    p. Provide sufficient headspace below lights and above equipment to allow lifting blower motor (by overhead crane or gantry) over adjacent blower with a minimum of one-foot clearance.

Table 1.15: Rotary Lobe Blower Design Criteria

Characteristic	Value
Base frame	Industrial grade steel, integral pulsation dampener rated for 18 psig and 15 to 320°F.
Enclosure	Sheet metal acoustic enclosure with air inlet baffling, 83 dB(A) max., fan cooled.
	Access to all service points by removable door panels.
Inlet air filter	High filtration efficiency, installed within enclosure, easy & independent access.
Pressure relief valve	Weighted type
Blower element	Two ductile iron rotors, each with three lobes, finned, cast iron casing.
Timing gears	Spur type, intermeshing, alloy steel, case hardened.
Seal	Piston-ring oil seal at each bearing
Startup and blow off valve	Open at off, open at start, closed pneumatically. Automatic relief at high pressure set point.
Check valve	Disk-type, Viton seat, rated for >285°F, integral to the blower package, mounted within the blower enclosure.
Oil system	For bearings and timing gears, sight glass on blower casing
Drive motor	Horizontal, TEFC, 1.15 SF, NEMA high efficiency, 480 V, 3 ph, 60 Hz, rated for temperatures up to 120°F.
Bearings	Double row roller bearings sized for 50,000 hr. B-10. Time between overhaul 5 yr. minimum.
Drive	V-belt assembly with sheaves, detachable bushings, sliding motor base. 1.4 SF based on motor HP, minimum two belts in OSHA style steel belt guard
Controller	Microprocessor based, alarms, overrides, service warning, automatic restarts after voltage failure, automatic shutdowns.
	Run time, loaded hours, number of starts. Time based changeover and start/stops
	Remote monitoring capable, including alarms and service warnings.
Approved Manufacturers	Atlas Copco, Aerzen, Kaeser

16.6 Multistage Centrifugal Blower Design Criteria

Characteristic	Value
Housing	Vertically split, cast iron, high strength steel tie rod connectors, rated for 25 psi. Integrally cast inlet and outlet shall match 125 pound drilling pattern.
Impellers	High strength cast or fabricated composite Al construction securely keyed to blower shaft, statically and dynamically balanced, maximum vibration level of 1.25 mils in the vertical plane when measured on the bearing housing
Diffusers / Baffle Rings	Integral diffusing vanes shall be provided as part of the intermediate housing. One piece stainless steel baffle rings, if provided, shall be securely mounted to the head and sections directly or with stainless

Characteristic	Value
	steel brackets.
Shaft	High grade carbon steel, fully ground, sized to operate at a minimum of 20% below first critical speed. Shaft speed shall not exceed 3600 rpm.
Seals	Labyrinth seals through inlet and outlet heads.
Bearings	Oil lubricated, anti-friction, designed for radial and thrust loads. Minimum life 10 years L-10 standard.
	Constant level oiler including a filler cap, bearing lubrication, air vent piped back to housing, reservoir, float switch, Al body.
Bearing Housing	Cast iron, outboard construction, thermally isolated from blower. Housings shall be removable and replacable without dismantling the machine or piping.
Flexible Coupling	Dry type, sleeve coupling (Thomas XTSR52) with 5-inch spacer and guard, minimum service factor of 1.5 over nameplate rating. Torsional shock / vibration shall be absorbed and limited angular and parallel misalignment / shaft-end float shall be allowed for without transfer of thrust loads.
Base Plate	Single, full length structural steel designed to permit lifting of entire assembly without distortion or damage to base. Include mounting pads, jacking screws, for horizontal and axial adjustment of motor, vibration pads (Korfund Elasto-Rib).
Motor	Constant speed, squirrel cage, CISD-TEFC, 1.15 service factor, 3600 rpm, 3 ph, 60 hz, 460 v. three hot starts per hour. Installed on each unit.
Filter / Silencer	Panel type, sized for 150% of inlet air flow,Equivalent to Universal Silencer Series FSH. Filter shall be disposable type, 90% efficient, polyester felt with 1-in. pleat separation. Installed on each unit.
Butterfly Valves	Inlet: wafer style, inlet throttling. Discharge: wafer or lug, shut-off. Installed on each unit.
Check Valve	Discharge: double door, flange or wafer, 125 pound cold working pressure, cast iron body, aluminum bronze internals, low torque spring. EPDM seal material. Installed on each unit.
Expansion Joint	Inlet and outlet connectors of EPDM with expansion control units (Proco Series 230). Installed on each unit.
Gauges	Inlet: 0-30 in wc vacuum, Outlet: 0 – 15 psi. 4-inch dial. Installed on each unit.
Vibration Sensor	PMC Beta Vibration Switch
Control Panel	Free-standing NEMA 4X, 304 stainless steel, factory-tested and wired, with surge shutdown system to operate blower assemblies. Include surge protection, vibration shut-down, and double set point ammeter calibrated in SCFM.
Approved Manufacturers	Gardner-Denver (Hoffman or Lamson Division), Continental Blower LLC, Atlas Copco, HSI

1.18 DECANTING EQUIPMENT

A. Decanters shall be fiber reinforced plastic or stainless steel and withdraw clarified water from four to six inches below the water surface regardless of tank elevation. Decanters shall not

include any electromechanical components that cannot be serviced from the walkway without personnel entry into the basin.

B. Decanters shall be sized to allow the maximum decantable volume over the minimum decant cycle.

1.19 WAS PUMPS

A. WAS pumps shall be solids handling (minimum 3-inch solid), non-clog submersible centrifugal pumps for wet pit installation. Impeller shall be cast iron and of the semi-open type.

B. Pumps shall be installed on dual guide rails and shall be accessible from the operating platform.

C. The minimum hydraulic efficiency at the duty point shall be 65%. WAS pumps shall be designed to allow 15 starts per hour.

D. WAS pumps shall include 125-lb. flanged connections, pump coupling, and base elbow.

E. WAS pumps shall draw from a perforated suction manifold to pull sludge from across the basin.

F. WAS pumps shall include a check valve and plug isolation valve to prevent back flow into the basin. Valves must be accessible without special equipment and installed outside the fluid to permit access.

G. Include moisture and temperature sensors.

H. A single shelf spare WAS pump shall be provided (common to both basins).

I. Acceptable manufacturers are Flygt, Wilo USA, and Sulzer.

J. WAS pump design criteria is provided below:

Table 1.16 WAS Pump Design Criteria

Characteristic	Value
Body	Cast iron or ductile iron, 125 lb. flanges compatible with ANSI 16B.1, Stainless steel nuts, bolts, washers, O-rings at mated surfaces (No paper gaskets)
Hydraulic Efficiency	Greater than or equal to 65% at duty point
Impeller	Non-clog, cast iron, solids handling, must pass a spherical, nondeformable 3-in. solid, no threaded connections between impeller and shaft
Wear rings	Provide a cast iron (Class 30B or higher) wear plate mounted to volute
Shaft	316 stainless steel, single piece construction, lower (2) and upper (1) permanently lubed and sealed bearings, L10 = 50,000 hours, 1.5 safety factor for shaft design
Seals	Block mechanical seals, stainless steel, Si-C/Si-C faces, mounted in seal chamber. Provide moisture sensor

Characteristic	Value
Power and control cables	Furnished in required lengths un-spliced
Removal system	(For wet pit) base elbow, pump coupling, 1 ¼-in.(minimum) schedule 40 stainless steel guide rails (min 2), stainless steel lifting chain. (For dry pit) provide a steel support stand to resist torsion, vibration.
Motor	Squirrel cage, air-filled induction motor in water-tight housing suitable for wet pit or dry pit insulation
	1.15 safety factor, continuous duty non-overloading, 15 starts/hr. at constant speed, unlimited at variable speed
	Copper wound stator, statically and dynamically balanced rotor
	Insulation class H, NEMA B
	Water/glycol cooling system if required for proper cooling, field serviceable, bearing life of 50,000 hr. mechanical seals to isolate cooling system
	Classified consistent with NFPA 820
	Provide temperature switch
Approved Manufacturers	Flygt, Sulzer, Wilo USA

1.20 ROTARY LOBE PUMPS

A. Rotary lobe pumps will transfer digested sludge (approximately 2% solids, specific gravity of 1.01) from the aerobic digester to the existing dewatering building. Pumps will be of heavy duty, positive displacement rotary lobe design, grey cast iron ASTM A536, 230 – 260 Brinell hardness and 700 Brinell hardness on end coverplate, .

B. The rotor lobes shall be designed to provide uniform pulse free flow throughout the entire operating range and will be specifically designed for pumping aerobically digested sludge. Rotors shall be cast iron with Buna-N covering and accessible for maintenance without disturbing piping, bearings, or mechanical seals.

C. Pump shafts shall be 1.75-in. (minimum) carbon steel ASTM 293 with replaceable stainless steel sleeves where the shaft passes through the seal. Maximum shaft deflection as measured at end of shaft at operating pressure shall be 0.0034 inch. Threaded shafts will not be acceptable.

D. Bearings shall be rated for a minimum ABMA B-10 Life of 100,000 hours.

E. Port connections shall be ANSI Class 150# raised-face flanges.

F. No significant change in vibration and noise level over the entire listed range of operating conditions

G. Pumps shall be driven by a TEFC, in-line geared inverter duty motor. Motor speed shall be limited to 1800 rpm or less. Motor sizing shall provide a minimum reserve of 10% of the required horsepower as evidenced by specific horsepower requirements at the maximum design condition on the certified performance curve. Motor insulation is class F.

H. Include pump suction and discharge gauges, as well as pump discharge pressure switch. Include plug isolation valves on the suction and discharge of the pump.

I. An inline grinder will be installed downstream of the rotary lobe pump to macerate any solids prior to dewatering.

J. Acceptable pump manufacturers are Vogelsang, LobePro, and Boerger.

K. Acceptable grinder manufacturers are JWC Environmental, Franklin Miller, and Vogelsang.

1.21 ENVIRONMENTAL MONITORING STATION

A. Provide a conditioned facility to house environmental monitoring equipment. Equipment includes water samplers and computer/sampler-controller/data recorder.
   1. Appropriately-sized, pre-fabricated flume (e.g., Plasti-Fab) for gauging treated effluent flow rates that includes the following:
      a. upstream and downstream stilling wells sized to accommodate inactive zone below water level gauge
      b. field-installed brackets in each stilling well to accommodate primary and secondary water level sensors
      c. mounting bracket for a point gauge or hook gauge
      d. staff gauge mounted inside stilling well(s).
   2. One Manning S-5200 refrigerated water sampler (dual concurrent flow proportional sampling) with two 5-gallon poly-ethylene bottles or two Manning S-5000 refrigerated water samplers (single flow proportional sampling) with one 5-gallon polyethylene bottle each.. Size building to accommodate two water level samplers. Provide and install two independent sampler intake tubings (one for each water sampler) running from the samplers to a constantly submerged point in the effluent stream that is located downstream of the final stage of treatment and prior to the effluent mixing with the receiving stream or other sources of water. The tubing shall be 5/8 inch internal diameter and constructed of polytetrafluoroethylene (Teflon or equivalent). The polytetrafluoroethylene tubing shall be installed in conduit to protect it from physical damage. All bends in conduit shall be gradual enough to facilitate tubing replacement (i.e., of appropriate radii for pulling or pushing polytetrafluoroethylene tubing from one end of the installation to the other). Sections of tubing that are above grade and outside of conditioned spaces shall be protected from freezing. The length of the sampler tubing (from point of connection on the sampler to the withdrawal point in the effluent stream) shall be kept to the minimum practicable length. The tubing shall be installed without low sections that would hold water between sample draws (i.e. proper slope is to be maintained between the sampling building and the effluent stream). Take precautions during installation to ensure that insides of sample tubing remain clean.
   3. A primary and a secondary water level gauges for each stilling well:
      a. Primary sensor: MTS brand, Level Plus/RefineME; output signal: Direct Digital Access (DDA); material: stainless Steel or Hastelloy C; units of measure: inches (contact ORNL Environmental Protection Services Division for full part number)
      b. Secondary sensor: Greenspan PS7000 pressure transmitter.
      c. Two point gauges or hook gauges

B. Provide a sampling port for the collection of manual grab samples of final effluent. The sampling port must be constructed to allow the collection of grab samples by a sample container emersion technique (i.e. dipping the sample bottle into the effluent) and must be located downstream of the final stage of treatment and prior to the effluent mixing with the receiving stream or other sources of water. When effluent is present at the sampling port, water depth must be at least six inches to allow for full emersion of sampler containers, or there must be a physical drop of at least 6 inches.

Table 1.17: Parshall Flume Design Criteria

Characteristic	Value
Flume selection/sizing	The device selected shall be capable of measuring flows with a maximum deviation of less than plus or minus 10% from the true discharge rates throughout the range of expected discharge volumes.
Body	Individually molded, single piece construction, fiberglass reinforced polyester reinforced with stiffeners down the side and across the bottom at maximum 12-in spacing
Dimensions	Construct according to Dr. Ralph L Parshall's dimensions
Wall and floor thickness	¼-in. minimum
Interior surface	Smooth, white, UV resistant gel coat, 10 – 20 mil, free of reinforcing fiber on all surfaces
Glass content	30% minimum
Resin	Isophthalic polyester
Accessories	Upstream and downstream stilling wells, molded in staff gage in both inches and centimeters, ultrasonic mounting bracket, stainless steel sampling pipe, inlet and outlet end connections, removable grating over flume
Approved Manufacturers	Plasti-Fab, Tracom
Primary Level sensor	MTS Level Plus/RefineMe
Secondary sensor	Greenspan PS7000 pressure transmitter

1.22 CONTROLS

A. A process control panel to control the sequencing and operation of the SBR shall be provided by the SBR equipment manufacturer.

B. SBR control system shall be timer-based with level overrides and shall provide cycle control, storm flow control, aeration control, component monitoring and auxiliary functions by controlling mixers, blowers, pumps, influent and effluent valves and actuators, air control valves and actuators, instrumentation signals, and alarms. Control of process equipment shall be possible from the operating platform of the SBR system.

C. The control system for the new system shall be designed to automatically accommodate the plant's full range of flows and loads. See Section 2.23A,

D. Additional control and integration shall follow the goals of the control narrative found in the following section.

E. A programmable logic controller (PLC) shall be utilized to control sequencing of the SBR. Controller shall be Allen Bradley CompactLogix series as manufactured by Rockwell Automation.

F. Operator interface shall be a minimum 10-inch viewable thin-film transistor (TFT) color touch screen. Interface shall provide the operator access to timer values and set points. If installed outdoors, screen shall be installed behind a panel to prevent damage to the screen caused by sunlight.

G. A dissolved oxygen (DO) control system shall be provided that utilizes operator adjustable DO setpoints to control blower on / off operation during the aeration period. DO probes shall be mounted in the basin, shall be removable without entering the basin, and shall utilize luminescent sensor technology.

1.23 HIGH LEVEL CONTROLS NARRATIVE

A. General
1. All new hardware and wiring shall be designed and installed to also accommodate monitoring, alarm notification and remote control from the existing Wonderware® HMI system in the control room in Building 2536, including interconnection pathways, fiber optic wiring and cable termination to interface with the existing HMI system.
2. All instrumentation not wired back to the Allen-Bradley PLC control system for the SBR shall include Modbus TCP or Ethernet I/P communication protocols and all necessary hardware and wiring shall to accommodate monitoring by the HMI system in Building 2536. All data mapping shall be included in the instrumentation and equipment submittals.

B. The design-builder shall create operating screens to run required equipment at the Central Electrical Facility human machine interface. Data shall be transferred to ORNL's steam plant network. Programming for remote control of additional Wonderware screens shall not be part of this contract.

C. Existing Intermediate Pump Station
1. The intermediate pump station receives flow from the headworks and will pump it to the SBR. An existing magnetic flow meter on the discharge of this station will transmit flow rate to the new central electrical building and the SBR control panel which controls the SBR and the Post EQ basin. The intermediate pumps will operate on level in the wet well based on set points entered locally. A high-level alarm, triggered by a float switch, will be annunciated locally and in the new central electrical facility.

D. SBR
1. The SBR system will be supplied with a control panel that will operate the SBR basins and Post EQ basin. A pressure transducer will monitor basin level in each SBR basin. Float switches will trigger an alarm at high water level. Probes located in each basin will monitor dissolved oxygen and, based on operator-entered set points, will energize or de-energize blowers for each basin. The SBR control panel also will control the opening and closing of influent control valves, the opening and closing of the basin decanters, the operation of the motive pumps in each basin, and the operation of the WAS pumps. The

control panel also will monitor influent flow and basin level and, based on algorithms in the software, will change the SBR cycle times to accommodate peak loading due to wet weather events (not mitigated by the Preliminary EQ basin or existing west lagoon). Many of these signals will need to be transmitted to the new central electrical facility and Building 2536 for monitoring (flow rate, status of pumps, valves, etc.) Control of blowers, pumps or mixers, decanters, and actuated valves will be possible from the control panel and operating platform. Local indicators for pH and level will be installed on the operating platform.

E. Post EQ
   1. Decanted flow from the SBRs will be discharged by gravity to the Post EQ basin. The flow from the Post EQ basin will be controlled preferrably through a system composed of the influent flow meter, the effluent flow meter, an electrically actuated control valve, an in-basin pressure transducer, and an in-basin float switch. If the hydraulic grade does not permit the use of a flow control valve, discharge will be controlled with a system of submersible pumps installed in the Post EQ basin and operated on VFDs. Discharge will be controlled in one of two ways:
      a. Using the signal from the plant effluent flow meter, the control valve (or submersible pump system) will attempt to match the effluent flow rate to an operator-provided set point entered locally.
      b. Using the signal from the influent flow meter, the control valve (or submersible pump system) will attempt to match the effluent discharge to a moving average of recent (12 to 24 hours) influent flows. The duration of the moving averaging will be an operator set value entered locally.
   2. Secondary set points entered by the operator and triggered by basin level will allow the system to bias the effluent flow by reducing effluent flows at low basin level and increasing effluent flows at high basin level. A high-level alarm will be included locally and in the new central electrical facility. Monitoring and alarm notication for decant status, control valve status, level and alarm notification shall also be provided to Building 2536.

F. Aerobic Digester
   1. WAS from both SBR basins will be pumped to the aerobic digester. A timer will provide automatic control of the digester blowers to allow them to be de-energized for short periods for denitrification. The operating schedule for the blowers will be entered by the operator locally.
   2. Periodically, the operator will manually turn off the aeration system and allow the solids in the digester tank to settle for an extended time to thicken the digester contents. After settling is complete, the operator will locally open a decanter and the supernatant in the digester tank will be decanted from the tank. At a preset level, a float switch in the basin will close the decanter and the operator will manually bring the digester back online. The digester will require the following controls for local operation: control of the aeration system (on/off, locking out the automatic time-based operation of the blowers) and opening of the decanter. Automatic controls will be: time-based operation of the blowers (schedule entered locally), closing of the decanter at a preset level (entered locally) and high level alarm and lock out of WAS pumps at a preset level entered locally. The decanter will also close if a high-level alarm is received from the plant lift station. (See below.) Remote monitoring from the aerobic digester will include level in the tank, status of the aeration system, status of the decanter, and all alarms, and will be sent the new

central electrical facility and Building 2536.

G. Digested Solids Transfer
   1. Solids from the digester will be pumped to the existing dewatering building. A rotary lobe transfer pump will convey solids through an inline grinder and to the dewatering building. An operator in the dewatering building will be able to control this solids transfer pump (on/off/speed) to operate the dewatering press. A high-pressure alarm (setpoint entered locally by an operator) will annunciate in the dewatering building and the control room when a given pressure is reached. A high-high level will de-energize the pump. Status of the pump and grinder will be sent to the new central electrical facility and Building 2536.

H. Tertiary Filter
   1. Post EQ flow will be discharged to a tertiary filter. The filter will be supplied with a control panel that monitors headloss across the filter and automatically engages a backwash pump to rotate and clean the dirty filter. Backwash will be discharged to a pump station that returns filtrate to the treatment system. The headloss setpoint that triggers backwash will be entered locally. Status of the backwash pump, the headloss setpoint, and high level alarm will be transmitted to the new central electrical facility and Building 2536.

I. PAA Facility
   1. PAA will be dosed at the head of the contact basins. A signal from the effluent flow monitor will be sent to the dosing pumps that will adjust pump speed to pace the dose of disinfectant. The dosing pump rate, dose set point, pump status, and bulk tank level will be transmitted to Building 2536 for monitoring.

J. Environmental Compliance Facility
   1. An ORNL-built flow computer/sampler controller/data recorder will be housed in the Environmental Sampling Facility. This instrument will receive input signals from water level sensors and from thermocouples (for monitoring temperatures in sampler refrigerators). The instrument will have the capability of flume submergence detection and submergence correction. The instrument will output discrete signals to control the water samplers for proportional-to-flow sample collection. The instrument will be programmed to output an analog signal that is proportional to flow rate. Effluent flow ratewill be sent to Building 2536 for monitoring.

K. Plant Lift Station
   1. A local submersible pump station (the Plant Lift Station) may be necessary to transfer decant flows, filter backwash, and plant drain to the influent pump station. Specifications for this pump station may be found in Section 01 89 19 - Site Plumbing Utilities. The pump will operate on level based on operator entered set points entered locally. A high-level alarm will be annunciated locally and in the new central electrical facility. A high-level alarm will be sent to the aerobic digester to close the decanter. Pump status and alarm notification shall also be sent to Building 2536.

1.24 ELECTRICAL DESIGN CRITERIA

A. The electrical scope at the sewage treatment plant includes the following:
   1. Electrical equipment for the SBR, Post EQ, aerobic digester, WAS pumps, digested sludge pumps, tertiary filter, PAA facility, environmental compliance facility, wastewater plant lift station and other requirements listed in paragraph 1.2.
   2. A 480Y/277 V Diesel fuel generator sized to maintain full functionality for a 24-hour period. See Section 01 86 26-3.3.C, Electrical for additional generator details. Generator shall be equipped with monitoring panel that includes status signals, generator low-fuel alarm, and generator failure alarm. All status symbols and alarms shall be transmitted to and monitored at Building 2536.
   3. A new central electrical facility to house the main switchboard/motor control center (MCC) and additional monitoring equipment. All loads are to be fed from the central electrical facility.
   4. A switchboard/MCC, a 480 – 208Y/120V transformer, an automatic transfer switch to transfer between the incoming service and the generator with status indicators, a house maintenance panel to serve lighting, convenience receptacles, the main control panel, and a network communications panel.
   5. Provide communications connectivity between the main control panel in the new central electrical facility, Building 2536 (Sewer Lab) and Building 2519 (Steam Plant) control room.
   6. Provide short circuit study, coordination study and arc-flash study for all new equipment.
   7. Provide Area Classification drawings as numbered drawings. All enclosures construction shall be corrosion resistant and suitable for area classifications as indicated in NFPA 820. All conduit and wiring crossing classification boundaries shall have boundary seals within 10 ft. of the area classification boundary.
   8. Provide a 480 – 208Y/120V transformer and local 208Y/120V panel to feed power at each of the two prefabricated facilities indicated above (PAA Facility and Environmental Monitoring Facility). In addition, provide a network panel to send and receive data between the Building 2536 and prefabricated facilities as required.
   9. Each structure shall have rack-mounted disconnects for large pieces of equipment, a 208Y/120V panelboard to power a local control panel, convenience receptacles and all other appurtenances requiring power. These may be placed outside of classified areas in lieu of construction that meets area classification requirements.
   10. All signal and control wiring, and all equipment shall be installed in construction that is suitable for Area Classifications as described by NFPA 820. Each structure shall have a local control panel with local and remote functionality. Control shall be designed around Allen Bradley PLCs. The control panels shall contain required analog and discrete input/output (I/O) modules for all monitoring and control devices and network capability to send required signal and control to Building 2536 (or other client determined locations). Interconnection between control panels shall conform to plant telecommunication standards. Local controls panels shall be constructed per Area Classifications as described by NFPA 820.
   11. Lighting fixtures shall be mounted outside of classified areas whenever possible. All lighting fixtures shall be LED and meet ORNL standards regarding color temperature, CRI, and control scheme. Lighting levels shall be per ORNL standards or recommended levels indicated IES Lighting Handbook. In the case of discrepancies use the higher lighting levels. Emergency and egress lighting shall be installed in accordance with or exceed requirements as stated in UL924 & NFPA 101. Exit light fixtures will be

installed per NFPA 101.

12. Provide a grounding plan for each structure or group of structures. Provide ground rods spaced as required. At each corner provide a ground test well. Provide a lightning protection system in accordance NFPA 780 as required.
13. Receptacles shall be GFCI type.

B. New Sequencing Batch Reactors (SBRs)
1. There are two new SBRs (with provisions for a third in the future). The SBRs require blowers and motive pumps or mixers. Pump or mixer and blower motors shall be controlled via VFDs/starter (as required) located in the new central electrical facility. Provide rack mount disconnects, a step-down transformer and two panelboards - one 480Y/277V and one 208Y/120V, convenience receptacle, and control panels at each location. In addition, provide power and control signaling and a remote control-panel located on the walkways above the SBR structure. Control panels shall have a display and touch pad suitable for viewing plant information and alarm acknowledgement. Instrumentation used for the purpose of equipment protection shall be hard-wired to equipment VFD/starter in the new central electrical facility and shall send an alarm via the control panel to Building 2536. Instrumentation required for process control shall be fed back to the nearest control panel associated with the equipment. In addition, provide conduit path and wiring for remote monitoring and control from Building 2536 (Sewer Lab). Programming for remote control shall be provided under a separate contract.
2. Lighting shall be exterior pole-mounted fixtures.

C. Post EQ and Aerobic Digestor Basins
1. The aerobic digestion basin requires an aeration system for mixing and aeration, a pump system to transfer solids to the existing dewatering building and a decanter to periodically decant supernatant from the digester tank.
2. The aeration system is comprised of a blower, a diffused air mixing system, and level indication. Power to the blower and mixing system shall be via a VFD/starter located in the new central electrical facility with local rack-mounted disconnects. Instrumentation shall be fed from the local control panel and local 120V panel. Blower set-points based on a timer. Blower shutdown and alarm shall occur on equipment fault conditions.
3. The pump system transferring solids to the existing dewatering building shall be powered via a VFD from the new central electrical facility. Provide three control panels for this system. A local control panel for use in a manual mode shall be located near the solids transfer pump with jogging functionality for maintenance and repair. A remote-control panel shall be located in the existing dewatering building to control solids transfer from that remote location. Coordinate additional controls with existing dewatering equipment. Provide a control panel in the new central electrical facility at the VFD in order to collect control inputs and to display status information. Provide a hard-wire interconnect associated with high-high pressure or low-low tank level alarm to prevent the pump from operating and signal conditions to existing dewatering equipment.
4. Decanter shall be powered from the new central electrical facility. Provide hard-wire interconnect with low level alarm in the aerobic digestor basin.
5. WAS pumps located in the SBR basins and feeding the digester basin shall be powered from the new central electrical facility via a VFD (or starter as required). Provide hard-wire shutdown with high level alarm in the digester basin. Provide local control panel as well as a remote-control panel in the new central electrical facility in order to collect control inputs and to display status information.

6. Refer to process description for additional information regarding pump speed and control and provide corresponding instrumentation as required. Where possible to group equipment in unclassified areas, group rack-mounted disconnects, and provide a step-down transformer and two panelboards - one 480Y/277V and one 208Y/120V, convenience receptacle, and local control panels. Provide convenience receptacles fed from new central electrical facility at all other unclassified area locations.
7. Provide power, signal monitoring and control wiring to the modulation valve in the post-eq basin. Route monitoring and control back to Building 2536.
8. Should pumping be required to evacuate the Post EQ basin, the pump stations shall consist of a minimum of two submersible pumps with level control and flow monitoring. Pumps shall be controlled by VFDs/starters located in the new central electrical facility. Provide rack-mounted disconnects, a step-down transformer and two panelboards - one 480Y/277V and one 208Y/120V, convenience receptacle, and local control panel. Route all monitoring and control signal wiring to the main control panel in the new electrical facility. Programming for remote control shall be provided under a separate contract.

D. Tertiary Filter
1. The filter periodically requires a backwash cycle to rotate and clean the filter. The backwash discharges to the influent pump station or, if necessary, to the plant lift station (see below.) Backwash pump for cleaning the filter shall be powered from the new central electrical facility. Provide circuit breaker, a step-down transformer and two panelboards - one 480Y/277V and one 208Y/120V, convenience receptacle, and local control panel.
2. Monitoring and control signals shall be sent to the main control panel in the new central electrical facility. Programming for remote control shall be provided under a separate contract.
3. Provide exterior pole-mounted light fixtures around the filter structure.

E. New PAA Facility
1. Provide conduit and wiring to new slab from the new central electrical facility. Provide a step-down transformer and disconnect on both primary and secondary sides as required. Provide a local control panel with remote access and control as required. Programming for remote control shall be provided under a separate contract.
2. Provide a network panel to route environmental information back to Building 2536 (Sewer Lab).
3. The PAA contact structure will require instrumentation to dose the effluent stream. Power for pumps, convenience receptacles and instrumentation shall be fed from the relocated or replaced PAA facility. Control and monitoring signals shall be fed from the control panel in the replaced PAA facility.

F. New Environmental Compliance Facility
1. Provide conduit and wiring to new slab from the new central electrical facility. Provide a step-down transformer and disconnect on both primary and secondary sides as required. Provide a 280Y/120V panel. Provide dedicated receptacles for all environmental monitoring equipment and convenience receptacles. Lighting, both interior and exterior, shall be LED and provide 2x4 troffers in finished areas and suspended LED fixtures in unfinished areas.
2. Provide ORNL-built flow computer, sample controller, data recorder, refrigerated water sampler (Manning S-5200 or 2 Manning S-5000), and corresponding instrumentation as

required by Environmental Protection Services Division.

3. Provide a network panel and route environmental information back to Building 2536 (Sewer Lab).

G. Plant Lift Station (if required)
   1. A plant lift station may be required to transport decant flows, filter backwash, and plant drain to the influent pump station. The plant lift station will consist of a minimum of two submersible pumps with level control and flow monitoring. Pumps shall be controlled by VFDs/starters located in the new central electrical building. Provide rack-mounted disconnects, a step-down transformer and two panelboards - one 480Y/277V and one 208Y/120V, convenience receptacle, and local control panel.
   2. Route all monitoring and control signal wiring to the main control panel in the new electrical facility. Programming for remote control at Building 2536 shall be provided under a separate contract.

H. Preliminary Equalization Tank (Additive Alternate 1)
   1. Provide 480V power for a mixer, a step-down transformer, convenience receptacle, a local disconnect, and a remote start for the mixer fed from the existing headworks building. Provide level indication and other instrumentation as required. This shall also be routed from the adjacent headworks building. Reference previously designed 2015 Sewage Treatment Plant Headworks project drawings and specifications.

I. Governing Codes and Standards
   1. The project shall comply with all Federal codes and standards including, but not limited to, those listed in Section 01 82 00, Electrical.

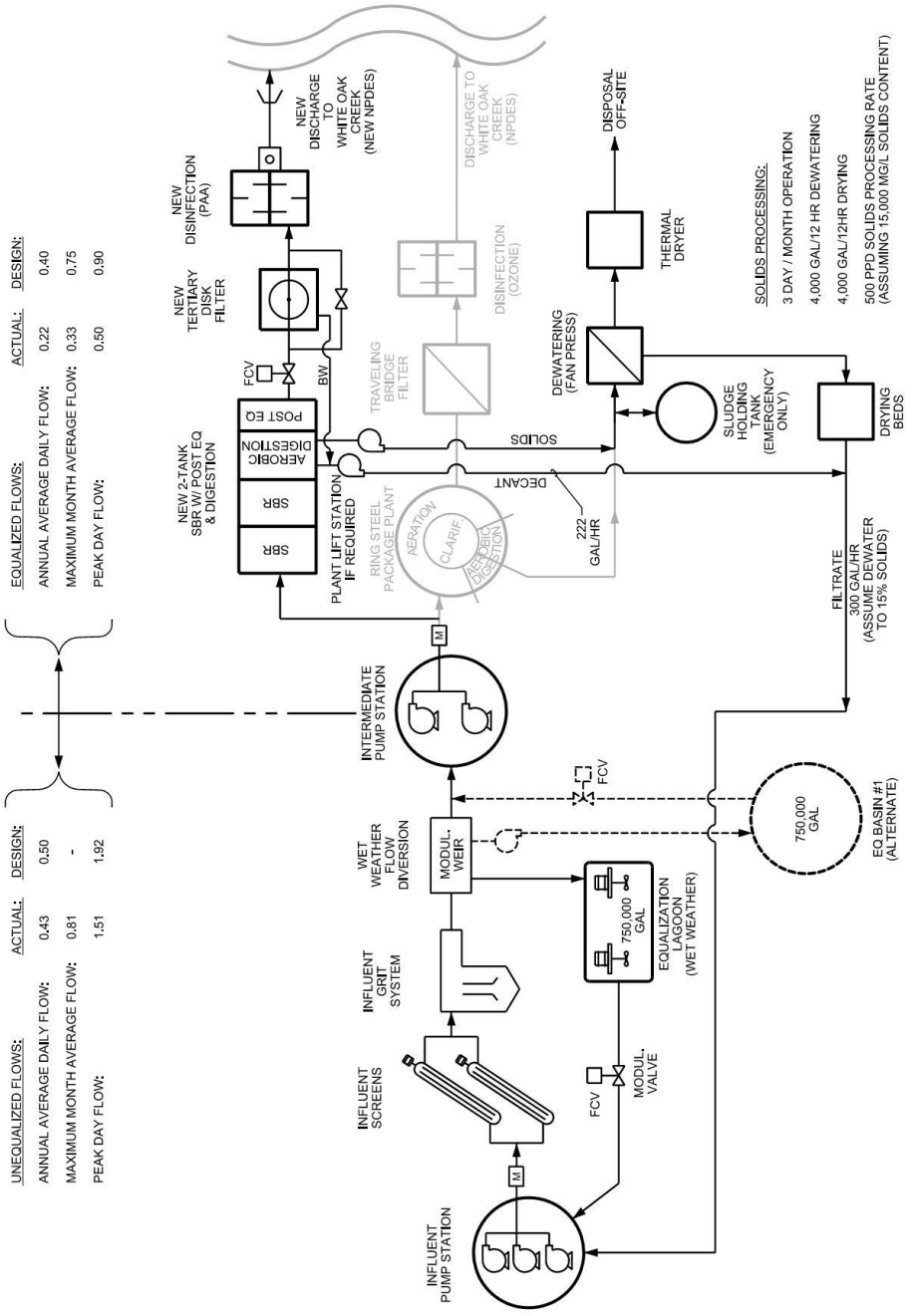
J. Existing Power Feed
   1. Building 2644 is fed from a 3-167 KVA pole-mounted transformer bank. The secondary voltage is 4 wire, 277/480V. The max available capacity is 600A continuous or 800A non-continuous at 480V.

K. Calculations
   1. Calculations shall be prepared by or under the supervision of a professional engineer licensed in the State of Tennessee. Calculations shall be sealed and signed by said engineer and shall be submitted.

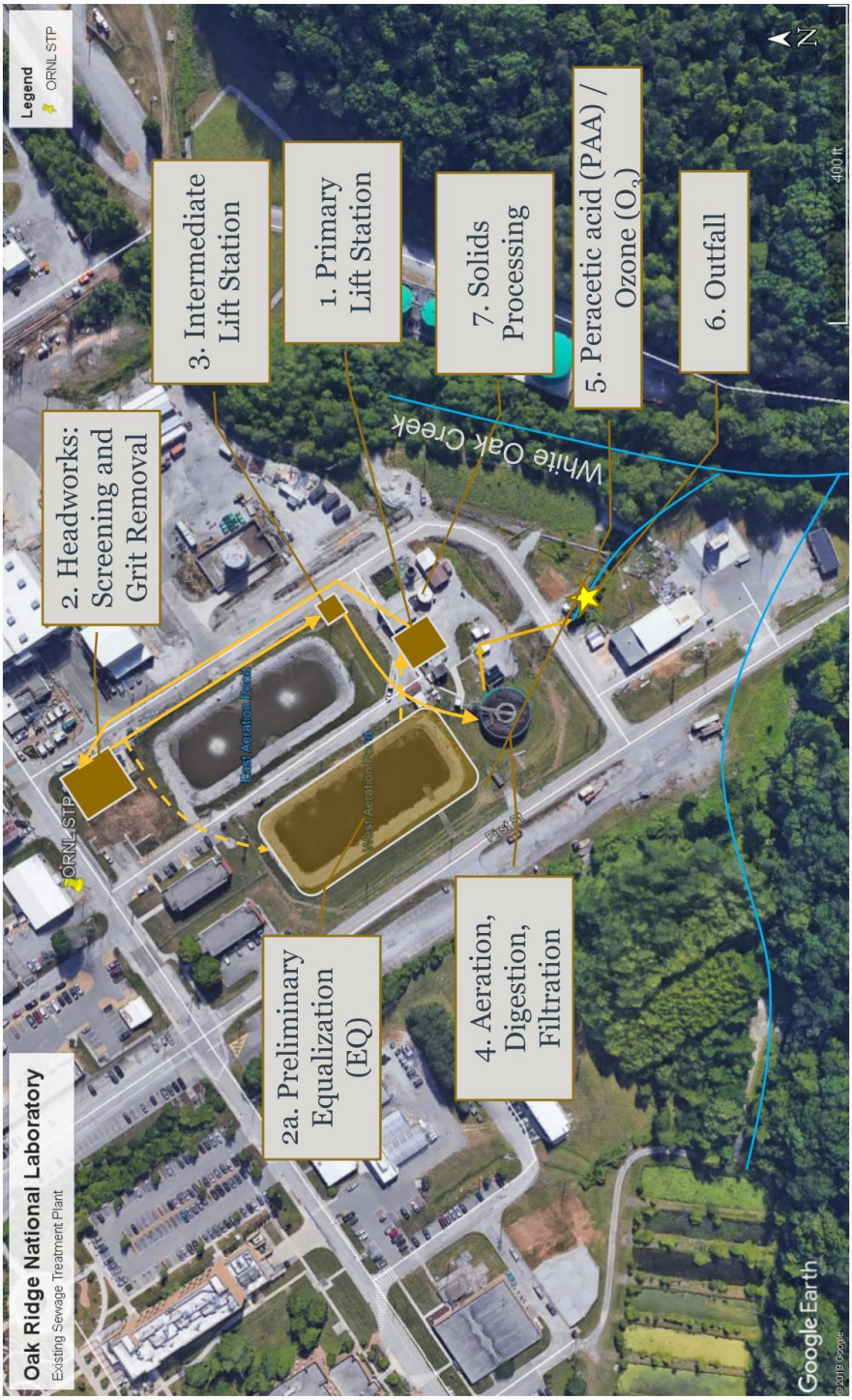
L. Drawings
   1. Drawings shall be prepared by or under the direct supervision of a professional engineer licensed in the State of Tennessee. Drawings shall be sealed, signed and dated by a licensed engineer in responsible charge in the State of Tennessee.

END OF SECTION 01 81 00

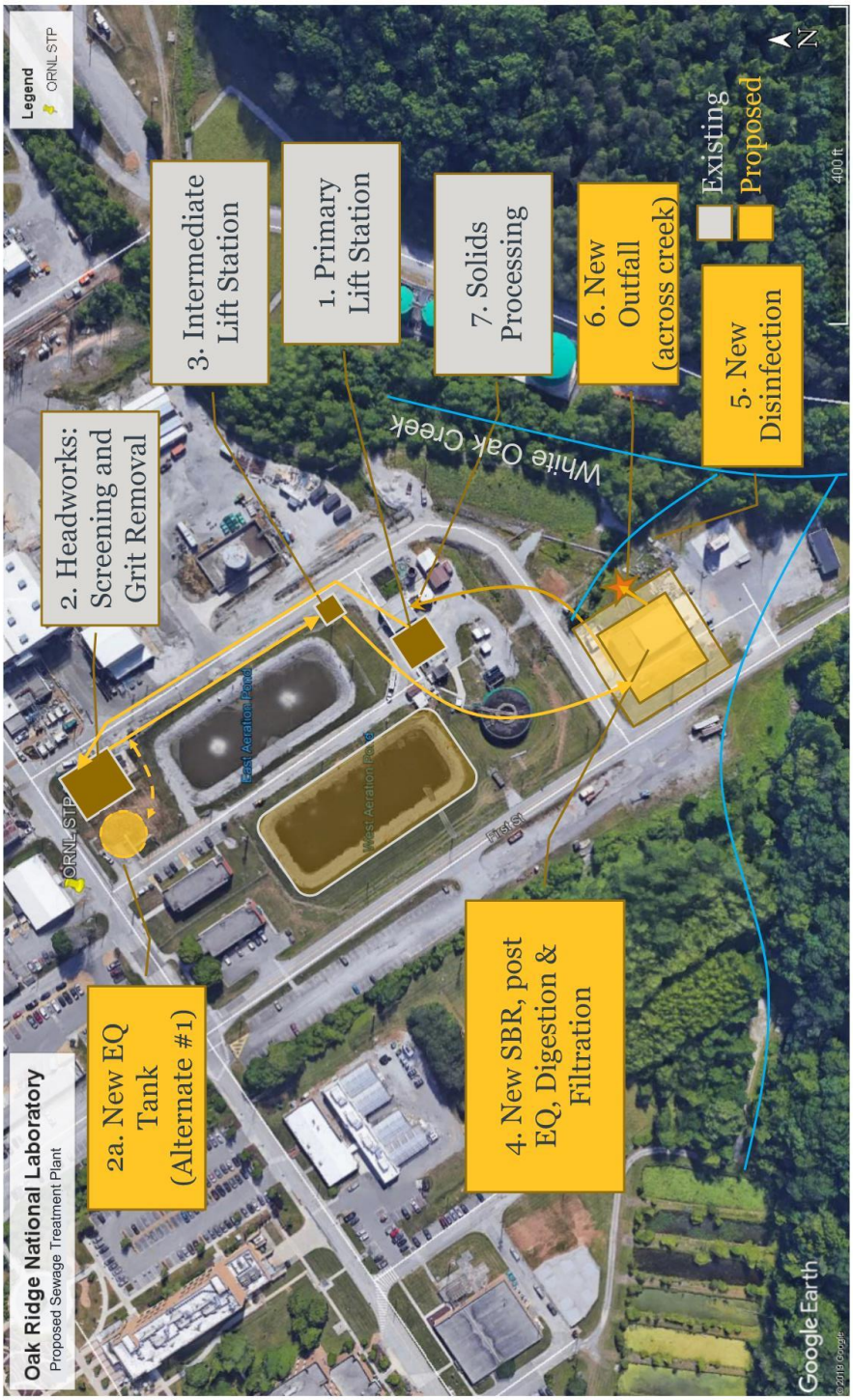
SECTION 01 81 00.01 PROCESS FLOW DIAGRAM



SECTION 01 81 00.02 SITE PLAN EXISTING CONDITIONS



SECTION 01 81 00.03 SITE PLAN – PROPOSED SEWAGE TREATMENT PLANT SITE



SECTION 01 81 00.04 SITE PLAN – OPTIONAL PROPOSED LAYOUT

SECTION 01 81 00.05 SITE PLAN – CONSTRUCTION LIMITS

SECTION 01 82 00 – STRUCTURAL

PART 1 - PROJECT REQUIREMENTS

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

PART 2 - CODES AND STANDARDS

2.1 DESIGN STANDARDS

A. Work Smart Standards referenced in Section 01 41 00 apply to this Section.

B. Additional Codes & Standards.
1. 29 CFR 1910 Subpart D, Walk – Working Surfaces.
2. 29 CFR 1926 Subpart M, Fall Protection.
3. ANSI A14.3-2008, American National Standard for Ladders – Fixed - Safety Requirements.
4. ANSI/ASSE Z359.6-2009, Specifications and Design Requirements for Active Fall Protection Systems.
5. American Society of Civil Engineers (ASCE) ASCE 7-10, Minimum Design Loads for Buildings and Other Structures.
6. DOE STD-1020-2012, Natural Phenomena Hazards Design & Evaluation Criteria for DOE Facilities.

PART 3 - TECHNICAL REQUIREMENTS

3.1 GENERAL

A. For facilities other than Hazard Category 1, 2, and 3 Nuclear Facilities, the structural design will fulfill the requirements of DOE O-420.1C and DOE-STD-1020 by complying with the ASCE 7 with the following requirements listed below:
1. Wind loads shall be determined using Risk Category III a basic wind speed of 120 mph, Exposure Group B.
2. Earthquake loads shall be determined using Risk Category III and Importance Factor 1.25.
3. All structural drawings, specifications, and calculations shall be sealed by a PE licensed in the State of Tennessee.

4. Roofs shall be designed for the loads prescribed in paragraph 3.3 of this criteria section, except the minimum roof live load shall be 20 psf (non-reducible), and there shall also be an additional 5 psf collateral load.
5. Floor areas that will serve as corridors for the movement of equipment shall have a minimum live load capacity equal to the largest live load of any room to which they are connected.

3.2 STRUCTURAL SYSTEMS

A. General.
1. A description of the structural systems, including the lateral force resisting system, geotechnical parameters, design loads, site class, and seismic design category shall be summarized on the design drawings and any design assumptions.
2. Any structural feature requiring concrete shall contain a minimum of 20% flyash in the mix, unless performance requirements dictate otherwise.
3. Walls used to support equipment; cabinetry, etc. shall be designed to safely carry all imposed loads.

B. Foundations.
1. The facility's foundations shall be designed to support all design loads within the allowable soil parameters defined in the Geotechnical Report.
2. Field testing shall be performed during construction to verify that actual bearing pressure capacities meet or exceed the design values.
3. Provide waterproofing for all below grade exterior walls and water stops in all construction joints.
4. Design of concrete slabs on grade shall utilize the subsurface soil parameters defined the Geotechnical Report. Minimum concrete strength shall be 4000 psi.

C. Prefabricated Facilities.
1. Design of the prefabricated facility system shall be the responsibility of the facility manufacturer, however Design-Builder shall be responsible to assure that the provisions indicated below are incorporated into the design.
2. The design and installation of the prefabricated facility system shall comply with the MBMA Metal Building Systems manual, and this design criteria.
3. Cables are not permitted as vertical or horizontal bracing.
4. A new prefabricated electrical facility shall be provided to house electrical switchgear and controls equipment specified in Section 01 81 00, Facility Performance Requirements.
5. There are two facilities on site that will be provided as a new facility meeting the requirements listed in this section.
    A. Facility 2663 – PAA Facility
        1. Extend utilities to the new location and reconnect to the existing system bringing the facility back in full working order.
        2. A new facility shall be provided in lieu of relocating the existing facility. A shared wall with the new Environmental Compliance Facility may be considered.
        3. Manufacturers based on PortaFab, Panel Built, Guard Buildings or equal may be utilized for the pre-manufactured facilities.
        4. Facility may be assembled on site or shipped in a single piece and placed on site.

5. Provide insulated, weather resistant exterior walls composed of materials that are of non-combustible construction, maintenance free with no need for future painting. Exterior walls shall be insulated to meet the current energy code standards and lined for a smooth interior finish.
6. Roof shall be sloped to provide adequate drainage and prevent leaks from occurring with minimum overhand of 3-inches from the face of the exterior walls. Roof shall be insulated to provide the minimum insulation values as required in the energy code.
7. Ceiling shall be composed of a smooth material covering all roof support structure, non-combustible in nature and white in color.
8. Structure shall be designed to attach to a new poured-in-place concrete floor slab.
9. Provide a single 3-foot wide by 7-foot high, hollow metal door and frame with no glazing, insulated for exterior use. Door shall have hardware consisting of weatherstripping, hinges, threshold, lever handle with locksets keyed to ORNL standards.
10. Provide minimum 4-foot deep canopy above the door for the full width of the door. Canopy shall be made of same material as the facility roof, and shall be pitched a minimum of ½ inch/foot to shed water away from the facility and door entry walk path.
11. A concrete pad shall be placed at each door. The pad shall be twice the swing radius of the door and extend beyond the width of the door.
12. Provide concrete pad and canopy over the bulk PAA chemical drums that prevents the drums from direct sun exposure. Drums shall be placed on a double containment pallet. Canopy shall be made of same material as the facility roof, and shall be pitched a minimum of ½ inch/foot to shed water away from the facility and entry walk path.
13. Provide LED lighting inside the facility connected to a single light switch beside the doorway on the interior side. Lighting can be ceiling or wall mounted maintaining the minimum foot-candle requirements per the ORNL Work Smart Standards.
14. Mechanical systems shall include a single through wall mounted HVAC unit capable of heat and cooling needs. Unit can be mounted at floor or ceiling levels.
15. Electrical shall pre-wire the facility for lighting and 120V wall outlets meeting the electrical code. Provide a single power connection to the facility site electrical feed and size the facility service for power needs required for the operation of the equipment inside the facility.
16. Touch up any areas where paint has been damaged or if a new structure is provided, paint new doors, frames, and other metal items not factory protected.

B. Facility 2656 – Environmental Compliance Facility
1. The existing 8-foot by 8-foot facility is to remain in place as-is.
2. Provide a new premanufactured facility in the new location with a minimum clear inside footprint dimension of 8-feet by 8-feet minimum. Clear height inside the facility will be 89-inches minimum above the finished floor with no exterior windows and a single-entry doorway.
3. Manufacturers based on PortaFab, Panel Built, Guard Buildings or equal may be utilized for the pre-manufactured facility.
4. Facility may be assembled on site or shipped in a single piece and placed on site.
5. Provide insulated, weather resistant exterior walls composed of materials that are of non-combustible construction, maintenance free with no need for future

painting. Exterior walls shall be insulated to meet the current energy code standards and lined for a smooth interior finish.

6. Roof shall be sloped to provide adequate drainage and prevent leaks from occurring with minimum overhand of 3-inches from the face of the exterior walls. Roof shall be insulated to provide the minimum insulation values as required in the energy code.
7. Ceiling shall be composed of a smooth material covering all roof support structure, non-combustible in nature and white in color.
8. Structure shall be designed to attach to a new poured-in-place concrete floor slab.
9. Provide a single 3-foot wide by 7-foot high, hollow metal door and frame with no glazing, insulated for exterior use. Door shall have hardware consisting of weatherstripping, hinges, threshold, lever handle with locksets keyed to ORNL standards.
10. Provide minimum 4-foot deep canopy above the door for the full width of the door. Canopy shall be made of same material as the facility roof, and shall be pitched a minimum of ½ inch/foot to shed water away from the facility and door entry walk path.
11. A concrete pad shall be at placed each door. The pad shall be twice the swing radius of the door and extend beyond the width of the door.
12. Provide LED lighting inside the facility connected to a single light switch beside the doorway on the interior side. Lighting can be ceiling or wall mounted maintaining the minimum foot-candle requirements per the ORNL Work Smart Standards. Provide a single exterior light outside the facility doorway to operate via light sensor.
13. Mechanical systems shall include a single through wall mounted HVAC unit capable of heat and cooling needs. Unit can be mounted at floor or ceiling levels.
14. Electrical shall pre-wire the facility for lighting and 120V wall outlets meeting the electrical code. Provide a single power connection to the facility site electrical feed and size the facility service for power needs required for the operation of the equipment inside the facility.

6. Central Electrical Facility
   A. Provide a new premanufactured facility in the new location sized to fit all required electrical equipment needed for the project. Clear height of the facility will also be based on the required clearances required for the new equipment. A single pair of doors and no windows will be required.
      1. Manufacturers based on PortaFab, Panel Built, Guard Buildings or equal may be utilized for the pre-manufactured facilities.
      2. Facility may be assembled on site or shipped in a single piece and placed on site.
      3. Provide insulated, weather resistant exterior walls composed of materials that are of non-combustible construction, maintenance free with no need for future painting. Exterior walls shall be insulated to meet the current energy code standards and lined for a smooth interior finish.
      4. Roof shall be sloped to provide adequate drainage and prevent leaks from occurring with minimum overhand of 3-inches from the face of the exterior walls. Roof shall be insulated to provide the minimum insulation values as required in the energy code. Provide a prefinished gutter and downspouts as required to meet the current plumbing codes with the downspouts to spill onto grade over a precast splash block at each downspout.

5. Ceiling shall be composed of a smooth material covering all roof support structure, non-combustible in nature and white in color.
6. Structure shall be designed to attach to a new poured-in-place concrete floor slab designed for the loading required for the facility and equipment support.
7. Provide concrete housekeeping pads as required for electrical equipment.
8. No interior floor drains or other plumbing needs are required.
9. Provide a pair of 3-foot wide by 7-foot high, hollow metal door and frame with no glazing, insulated for exterior use. Doors shall have hardware consisting of weatherstripping, hinges, threshold, lever handle with locksets keyed to ORNL standards. Provide panic bars on the interior if required by codes. If facility or equipment size requires another door for emergency exiting, provide a single 3-foot wide by 7-foot high, hollow metal door and frame with no glazing and appropriate hardware in the appropriate location.
10. Provide minimum 4-foot deep canopy above the door for the full width of the door. Canopy shall be made of same material as the facility roof, and shall be pitched a minimum of ½ inch/foot to shed water away from the facility and door entry walk path.
11. A concrete pad shall be placed each door. The pad shall be twice the swing radius of the door and extend beyond the width of the door.
12. Provide LED lighting inside the facility connected to a single light switch beside the doorway on the interior side. Lighting can be ceiling or wall mounted maintaining the minimum foot-candle requirements per the ORNL Work Smart Standards. Provide LED exterior lighting at the doorway to meet electrical codes.
13. Mechanical systems shall include ventilation as required to maintain the proper temperature inside the facility to not damage the electrical equipment. Louvers with fans will be designed and placed where appropriate inside the facility.
14. Electrical shall include all lighting and 120V wall outlets meeting the electrical code. Provide below grade conduits as required to other facilities on the site to extend below grade into the new facility.
15. Provide support as required (Unistrut or equal) for all wall mounted electrical equipment needed. Equipment may be supported from the new concrete floor if adequately designed for the load.
16. Provide space inside the facility to meet all electrical clearances around and above equipment. Facility size will be based on the equipment inside including the code required clearances.
17. Floor elevation shall not be where stairs or ramps are required for facility entry.
18. Paint all non-prefinished items such as doors and frames provided to match the existing.

D. Cast in Place Concrete
   1. Codes and Standards
      a. ACI 301 – Specification for Structural Concrete
      b. ACI 318 – Building Code Requirements for Structural Concrete
      c. ACI-350 – Code Requirements for Environmental Engineering Concrete Structures

3.3 EQUIPMENT SUPPORTS

A. Seismic design of equipment supports and anchorage shall be in accordance with IBC 2012.

3.4 FIXED EQUIPMENT ACCESS

A. Access to structures and equipment shall be provided by means of stairs in lieu of ladders or ships ladders.

END OF SECTION 01 82 00

SECTION 01 86 13 - FIRE PROTECTION

PART 1 - PROJECT REQUIREMENTS

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Based on the currently proposed size of the facility and operations within, the following project specific fire protection requirements and features are anticipated. The designer has the responsibility to confirm and/or alter the design approach as the design matures to maintain compliance with applicable project requirements, as accepted by the Company.

B. The design of this DOE facility shall satisfy the concepts for a Highly Protected Risk (HPR) facility as required in DOE Order 420.1C Change 2 and further detailed in DOE Standard 1066-2016. HPR is a term applied to property deemed to have a much lower than normal probability for loss by virtue of superior construction, special fire protection equipment and procedures, and management commitment to loss prevention. The requirements of the International Building Code (2012) (IBC) and applicable National Fire Protection Association (NFPA) codes and associated standards (such as NFPA 1 [*Fire Code*®], NFPA 820 [*Standard for Fire Protection in Wastewater Treatment and Collection Facilities]*, etc.) and references shall also be met but are considered minimum levels of protection and do not necessarily meet the HPR status.

C. The facility occupancy classification and construction type shall be in accordance with the IBC based on the building area, height, and intended use. The NFPA occupancy classification shall also be determined, documented, and coordinated into the facility's design solution. The occupancy classification and construction type shall be coordinated with the Architectural section.

D. The building's electrical system shall be designed and installed in accordance with the current edition of NFPA 70®, the *National Electrical Code*®. Interior electrical transformers shall be dry-type unless documented relief is provided by the AHJ. Exterior transformers shall be Factory Mutual (FM)-approved containing FM-approved transformer fluid or otherwise properly protected and/or located.

E. Commissioning and integrated system testing of all fire protection and life safety systems shall be conducted in accordance with NFPA 3, *Standard for Commissioning of Fire Protection and Life Safety Systems* and NFPA 4, *Standard for Integrated Fire Protection and Life Safety System Testing*.

PART 2 - CODES AND STANDARDS

2.1 CODES, STANDARDS, AND SPECIFICATIONS

A. DOE requirements: DOE Order 420.1C and DOE Standard 1066-2016.

B. Work Smart Standards (WSS) referenced in Section 01 41 00 apply to this Section.

C. The design and construction shall comply with the following commercial requirements:
1. International Building Code, (IBC, 2012 (Exceptions: Replace all references to the ICC Electrical Code with the NFPA 70® *National Electrical Code*®, latest edition; All appendices; See additional exceptions identified in the WSS ID Team Report, Attachment B IBC matrix).
2. International Fire Code, (IFC), 2012 (Include Appendix B through I as reference only; Exception: Appendix A – Board of Appeals) Note: Per the WSS Implementation Matrix for the IFC: The IFC will be used primarily for the coordination and management of Hazardous Materials Management requirements such as establishing HMCAs (per the IBC) and establishing Maximum Allowable Quantities (MAQs) for Chemical inventories for the IBC-related Control Areas. All fire code requirements must meet and/or be coordinated with NFPA 1 and NFPA 101®. Conflicts shall be resolved by the AHJ.
3. International Fuel Gas Code, (IFGC), 2012. (Include Appendix B through I as reference only).
4. International Mechanical Code, (IMC), 2012 (Exceptions: All Appendices).
5. International Plumbing Code, (IPC), 2012 (Include Appendix B through G as reference only).

D. The design and construction shall also comply with the following NFPA requirements:
a. NFPA 1, *Fire Code*®. (NFPA 1 is the predominate Fire Code for ORNL Facilities)
b. NFPA 3, *Standard for Commissioning of Fire Protection and Life Safety Systems*
c. NFPA 4, *Standard for Integrated Fire Protection and Life Safety System Testing*
d. NFPA 70®, the *National Electrical Code*®
e. NFPA 72, *National Fire Alarm and Signaling Code*® (only if required by NFPA 820)
f. NFPA 820, *Standard for Fire Protection in Wastewater Treatment and Collection Facilities*
g. All other NFPA Codes and Standards (except NFPA 5000), as applicable as determined by the Authority Having Jurisdiction (AHJ).

E. Engineering Standards
1. See ProjectWise.

2.2 AUTHORITY HAVING JURISDICTION (CODE COMPLIANCE REVIEW AND ACCEPTANCE AUTHORITY)

A. Pertaining to subjects included in this section, the Company representative for code compliance design review and acceptance, as generally specified in NFPA 1, NFPA 101®, and the

International Building Code Chapter 1, is ORNL FPE. Non-fire protection related issues may require involvement by the ORNL Chief Engineering or subject matter experts such as a Facilities Development Division electrical engineer, etc.

PART 3 - TECHNICAL REQUIREMENTS

3.1 FIRE PROTECTION SYSTEM DESIGN AND INSTALLATION REQUIREMENTS

A. Qualifications.
   1. All fire protection design packages, including fire suppression, fire detection and fire alarm drawings, specifications, and calculations, shall be prepared by a Tennessee licensed engineer in accordance with applicable state law, rules, regulations, and the guidance and policies promulgated by the Tennessee Board of Architectural and Engineering Examiners. Design and installation activities of all fire protection systems shall comply with the State of Tennessee requirements for such systems, including contractor licensing and documentation. Designs shall be submitted to the Company for review and acceptance. Fire Protection System design submittals shall comply with the applicable I-Codes and references, NFPA 1, Fire Code and references, the submittal requirements of this section, and the requirements of the applicable codes and/or standards for the particular type of system.
   2. Fire Explosion and Prevention.
      a. The minimum requirements for overall protection against fire and explosion hazards in wastewater facilities and associated collection systems shall comply with NFPA 820.
   3. Fire Detection and Alarm Systems.
      a. If required by NFPA 820, all fire alarm system designs shall be sealed, signed, and dated by a registered engineer (or a NICET Level IV certified fire alarm designer) competent in the design of alarm systems as required by this section.
      b. All system installations shall be performed by a fire protection alarm system contractor licensed as required by this section. All fire detection and alarm systems shall be installed under the supervision of a competent registered engineer or NICET Level II engineering technician.

B. Acceptance testing shall be witnessed by a representative of the Company, and shall be in accordance with NFPA 3 and 4 as well as the applicable codes and standards for the type of system (e.g. NFPA 72 for fire alarm systems). Required documentation shall include marked-up drawings at acceptance. Complete as-built drawings (CAD) shall be completed and submitted to the Company upon completion of the job.

3.2 CALCULATIONS

A. Fire detection and alarm system power supply calculations for both primary and secondary (battery) shall be provided in accordance with NFPA 72®, if required by NFPA 820. A 20 percent margin for additional field devices (inputs and notification appliances) shall be provided in the design and calculations.

3.3 DOCUMENTATION

A. Fire protection systems design, calculations, acceptance testing, drawings and other as-built documentation shall be in accordance with the applicable NFPA and IBC requirements, the submittal requirements of this section, the requirements of the applicable codes and/or standards for the particular type of system, and State of Tennessee requirements for such systems. The following specific documentation is required as a minimum.

1. Fire detection and alarm submittals shall include:
   a. Calculations, drawings, and equipment data as required by NFPA 72®.
   b. Device and circuit layout including device logical address in coordination with the riser and input/output matrices.
   c. Riser drawings.
   d. Input/output matrices.
   e. Fire alarm control panel detail drawings.
   f. Fire alarm interface details.

3.4 SUBMITTALS

A. Formal design reviews shall be performed by the Company, and documentation of acceptance of the reviewed design will be accomplished before any work involving the reviewed material begins. The reviews will be conducted on submittals which meet the Company's requirements as follows:

1. Plans and specifications for fire protection systems meeting the documentation requirements of the pertinent code and/or standard.

3.5 ROLES AND RESPONSIBILITIES

A. The designer shall be responsible for compliance with, and coordination of, the requirements in the applicable DOE Orders and referenced DOE Standards, the applicable building code, and applicable NFPA Codes and Standards and referenced material, regardless of whether or not any reviews are conducted, and regardless of any acceptance or rejection of any review items or elements. It shall be the designer's role to evaluate any alternative or equivalent methods, materials, or systems proposed for use in the design, and the designer shall present justification documentation to the Company for acceptance according to the documentation requirements in this section. Any features or elements of the design solution which meet the intent of the code and standards, and are accepted by the Company as an appropriate alternative or equivalent approach to compliance, in accordance with DOE, NFPA, and/or the IBC, shall be documented according to the documentation requirements in this section.

B. Design, installation, testing, and acceptance of fire protection systems shall be performed by entities meeting the requirements of Tennessee state law concerning licensing and practice standards for work involving fire protection systems. Compliance with the applicable NFPA codes, standards, and references and applicable I-Code requirements shall be demonstrated in design, installation, testing, and acceptance of fire protection systems.

END OF SECTION 01 86 13

SECTION 01 86 19 - HEATING, VENTILATING AND AIR-CONDITIONING (HVAC)

PART 1 - PROJECT REQUIREMENTS

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Space ventilation.

PART 2 - CODES AND STANDARDS

2.1 DESIGN STANDARDS

A. Work Smart Standards referenced in Section 01 41 00 apply to this Section.

PART 3 - TECHNICAL REQUIREMENTS

3.1 HVAC DESIGN REQUIREMENTS

A. Design Conditions.
   1. Inside Design Temperature
      a. Ventilation design for general heat relief shall limit the temperature rise of spaces to 10°F maximum above the outside design dry bulb temperature.
      b. Occupied spaces shall be heated to maintain a minimum 68°F.
   2. Outside Design Temperature
      a. 17°F winter
      b. 92.7°F summer

3.2 EXHAUST, RETURN AND OUTSIDE AIR VENTILATION AND FILTRATION SYSTEMS

A. General.
   1. Fresh air intakes shall be located where incoming air will be relatively free of exhaust effluent gases and particulates. Debris screens shall be accessible for cleaning.

B. Ventilation for Heat Control
   1. Provide thermostat control of exhaust fan operation.
   2. Provide operable damper at air intake openings.

3. Damper operator shall be 24 volt and interlocked with exhaust fan operation.

C. Ventilation for Health & Safety
   1. Provide local exhaust ventilation in the new PAA building (and elsewhere as applicable) to keep contaminants in air concentrations below the TLV of each constituent.
   2. Exhaust air from local hoods shall be discharged into the atmosphere from vertical stacks of sufficient height and velocity to prevent re-entrainment into building air intakes.
      a. Design submittal shall include calculations depicting satisfactory effective plume height to prevent re-entrainment.
      b. Project commissioning and/or closeout specifications shall include verification procedures ensuring that the installation and operation of exhaust systems with vertical stacks meet design intent.

END OF SECTION 01 86 19

SECTION 01 86 26 – ELECTRICAL

PART 1 - PROJECT REQUIREMENTS

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

PART 2 - CODES AND STANDARDS

2.1 STANDARDS AND SPECIFICATIONS

A. Work Smart Standards referenced in Section 01 41 00 apply to this Section.

B. This document contains references to the general codes, standards, procedures, specifications, and technical definitions that are applicable to the design work to be performed, to the electrical equipment and materials to be furnished, to the methods of installation, to the requirements for inspection and testing, and to acceptance criteria. Requirements of the latest editions shall apply.
   1. American National Standards Institute (ANSI).
   2. Code of Federal Regulations (CFR).
   3. Factory Mutual Engineering and Research Corp.
   4. Illuminating Engineering Society of North America (IESNA).
   5. Institute of Electrical and Electronic Engineers (IEEE).
   6. National Electrical Manufacturer's Association (NEMA).
   7. National Fire Protection Association (NFPA).
   8. ORNL Electrical Engineering Standards.
   9. Underwriters Laboratories Inc. (UL).

PART 3 - TECHNICAL REQUIREMENTS

3.1 GENERAL DESIGN REQUIREMENTS

A. Electrical safety shall be the foremost consideration in the design of all facilities and equipment.
   1. Consideration shall be given to the electrical design to minimize the necessity of working on or near energized parts and equipment during construction, operation, and maintenance activities.
   2. The design shall mitigate excessive arc flash hazards at all electrical equipment with special consideration given to those that typically exist at the secondary of transformers. This shall be accomplished by providing upstream overcurrent devices that utilize static trip circuit breakers or current limiting fuses.

B. Electrical design shall be in accordance the National Electrical Safety Code (IEEE C2), the National Electrical Code (NFPA 70), Standard for Fire Protection in Wastewater Treatment and Collection Facilities (NFPA 820), and other applicable National Fire Protection Association codes, Occupational Safety and Health Act (OSHA) standards, and any other applicable codes and standards. Materials and utilization equipment shall conform to applicable ANSI, IEEE, NEMA, NFPA and UL standards.

C. Design analysis and calculations.
   1. Calculations shall include but are not limited to the following:
      a. Short circuit currents.
      b. Arc flash hazard analysis (select a specific equipment manufacturer as a design basis).
      c. Connected load, demand load, demand factor, and diversity factor for overall building and for emergency standby and uninterruptible loads.
      d. Voltage drop.
      e. Conductor ampacities.
      f. Lighting foot-candle level.
      g. Electric heat tracing (including in rush current).
      h. Raceway/cable tray sizes.
      i. Pull/junction box/enclosure sizes.
      j. Cable bending radius.
      k. Conduit sizes.
      l. Grounding and bonding conductor sizes.
   2. Hard copy and electronic files (in native format) for calculations and design analysis shall be provided.
   3. SKM Power Tools software shall be utilized for short circuit, and arc flash hazard analysis. The complete SKM model shall be provided to ORNL.
      a. Ensure that the name of each component in the SKM model is the same on the one line diagram that's part of the construction document package.
      b. Provide an arc-flash specification that shall include the requirement for the contractor to update the SKM model using the specific electrical equipment provided and other as-built characteristics of the electrical system. The updated assessment shall be performed by a qualified professional engineer. If an equipment vendor performs the assessment, it must be stressed that the model needs to encompass the entire electrical system that includes local disconnects, mechanical equipment, etc.
      c. Specifications shall include the requirement for the contractor to install arc flash hazard warning and danger labels that include the information from the arc flash hazard assessment. A standard ORNL label format is required which will be provided.
      d. This updated assessment shall also include an overcurrent device coordination study which shall incorporate the mitigation of arc flash energy levels to the maximum extent possible.
      e. Hard copies and the updated SKM model (complete native files) shall be provided to the Company.

D. One-line diagrams.
   1. A one line diagram of the electrical system shall be provided. A riser diagram may also be provided but a riser diagram in lieu of a one line diagram is not acceptable.

E. Working clearance detail.
1. Provide a detail that illustrates the required depth and width of working space around electrical equipment in accordance with NFPA 70, Article 110.26 and 110.34.

F. Electrical load, demand factors and diversity factors.
1. Electrical load, demand, and diversity factor calculations shall be prepared for each new facility and shall be performed in accordance with chapter 2 of IEEE 241, Electric Power Systems in Commercial Buildings and chapter 2 of IEEE 141, Electric Power Distribution for Industrial Plants. Feeder and service calculations shall comply with Article 220 of NFPA 70.

G. Electrical energy usage metering.
1. Metering shall be provided at each facility's service entrance equipment. The metering equipment shall consist of a Schneider / Square D PM8000 series meter. The meter shall include a telecommunication drop. The meter shall be connected to ORNL's industrial control network and will require the telecommunication line to be routed in conduit.

3.2 POWER DISTRIBUTION SYSTEMS

A. Consideration shall be given to supplying a main breaker ahead of the electrical gear that contains the facility main service equipment to reduce arc flash levels within the main service equipment and to provide isolation to the main service equipment without a utility outage.

B. Series rated equipment
1. Series rated equipment shall not be utilized.

C. Circuit breakers
1. Static trip circuit breakers shall be supplied throughout the electrical system where the use of such breakers will be beneficial to reduce arc flash hazards.

D. Medium voltage transformers.
1. Medium voltage transformers will be provided by the Company.

E. Low voltage metal-enclosed switchgear.
1. In general, low voltage metal-enclosed switchgear shall be utilized where the service entrance equipment is sized 1600 amperes or greater. Buses shall be copper with tin plating at contact points. Switchgear located outside shall be provided with lighting, convenience receptacle(s), and heat. See this section for metering requirements.

F. Distribution switchboards.
1. In general, low voltage distribution switchboards may be utilized as service entrance equipment if sized at 1200 amperes or less. See this section for metering requirements.

G. Distribution panelboards.
1. 480V distribution panelboards may be utilized as service entrance equipment if sized at 800 amperes or less. See this section for metering requirements.
2. The (continuous demand load x 125%) plus (non-continuous demand load) shall not exceed 75% of the panelboard's rated capacity.
3. Provide 30% spare breaker mounting space for future loads.

H. Lighting and power panelboards.
1. Dedicated panelboards for lighting are preferred.
2. Lighting and power panelboards shall be provided with copper buses and bolt-on circuit breakers.
3. The (continuous demand load x 125%) plus (non-continuous demand load) shall not exceed 75% of the panelboard's rated capacity.
4. Provide 30% spare breaker mounting space for future loads.
5. Panel schedules shall be provided for each panelboard and shall indicate which circuits require ground fault protection (equipment and personal), shunt trip, etc.

I. Motor control and motor control centers.
1. Except where special conditions require, motors smaller than ½ HP shall be specified as single phase.
2. Single phase motors may be controlled manually by devices of adequate rating. Polyphase motors greater than 1 HP shall have magnetic starters.
3. Control devices shall be of adequate voltage and current rating for the duty to be performed. Control circuits shall operate with one side grounded, at 24V preferred, but no greater than 120V.
4. Motors ½ HP or larger shall be supplied by 480V, three phase.
5. All 480V, three phase, 60-Hz motor control centers (MCCs) shall be NEMA 1, Class B.
6. All motor control shall use Allen Bradley CompactLogix series as manufactured by Rockwell Automation. In addition, provide additional hardware requirements suitable to transmit control & signal I/O to the plant network for remote monitoring and control.
7. VFD's shall be manufactured by ABB or Square D.
All switchgear and electrical equipment shall be Square D or Siemens unless specifically noted otherwise.

J. Low voltage transformers (600V).
1. Interior step-down low voltage transformers (480:120/208V; 480:120/240V; etc.) for lighting, receptacle and miscellaneous loads shall be dry type, floor or wall mounted, with a minimum of four full capacity 2-1/2% taps, with two taps above and two taps below rated voltage.
2. Transformers shall be copper wound, 115° C temperature rise with 220°C insulation.

K. Interior distribution voltage levels.
1. Power shall be distributed at 480Y/277V three phase, four wire, grounded; 208Y/120V, three phase, four wire with grounded neutral; and/or 120/240V, single phase with grounded neutral. A grounded conductor (neutral) shall be routed to all service entrance equipment served by a grounded system.

L. Power quality requirements.
1. Where required, sensitive electrical equipment, such as data processing equipment, shall be isolated from the facility electrical power system. Uninterruptible power supplies, isolation transformers, or power conditioners may be used for isolation.

M. Electrical distribution equipment identification.
1. In each building or facility, equipment that distributes electrical power (480V switchgear, 480V motor control centers, 480V panelboards, electrical plug-in busways, distribution

switchboards, distribution racks, load centers, lighting and power panelboards; etc.) shall be identified with a unique designation number.

2. The designation number shall consist of voltage (H=480, L=208V); N (normal) or E (emergency or standby); floor or level (B, G, 1, 2… R); and designation letter (A through Z).
3. Each piece of electrical distribution equipment (switches, starters, panelboards, receptacles, etc.) shall be clearly marked with the voltage, number of phases, source of supply (panel and circuit; etc.), and where applicable, the equipment being served.

3.3 EMERGENCY AND STANDBY POWER SYSTEMS

A. Emergency power systems.
   1. Emergency power systems shall comply with NFPA 37, NFPA 70, NFPA 101, NFPA 110 and IEEE 446. The systems shall automatically supply power and illumination essential to human life safety during any interruption of the normal electrical supply. In addition to supplying emergency illumination for safe exiting, emergency systems may also provide power for such functions as ventilation equipment when essential to maintain life, fire detection and alarm systems, elevators, fire pumps, public safety communication systems, and industrial processes where current interruptions would produce serious life safety hazards.

B. Standby power systems.
   1. Standby power systems shall comply with Articles 701 and 702 of NFPA 70. The systems shall supply power to selected loads such as heating and refrigeration systems, data processing and communication systems, ventilation and smoke removal systems, sewage disposal systems, lighting systems, and industrial processes, that when interrupted during a power outage, would create hazards, damage to product or process, or severe monetary loss.

C. Packaged Diesel generator sets and automatic transfer switches.
   1. The standby power system for the sewage treatment plant shall be capable of providing full standby power in this scope including, but not limited to, SBRs, Post EQ, aerobic digester, tertiary filter, PAA building, pumps, environmental compliance building, instrumentation, controls, and site lighting.
   2. The generator set covered by these specifications shall be designed, tested, rated, assembled and installed in strict accordance with CSA C22.2 No14, CSA 282, CSA 100, EN61000-6, EN55011, FCC Part 15 Subpart B, ISO8528, IEC61000, UL508, UL2200, UL142 and designed to allow for installed compliance to NFPA 70, NFPA99 and NFPA 110.
   3. Emergency and standby power generators shall be exterior concrete pad mounted, diesel engine-generator type, and shall include a weatherproof enclosure, integral UL listed sub-base double wall fuel tank with leak detection, battery, battery heater, battery charger and starting system, exhaust silencer, jacket heater, output circuit breaker, microprocessor based control panel and remote annunciator panel. Generators and appurtenances shall be manufactured by Caterpillar.
   4. The standard generator specification includes permanently installed load banks. Concrete pads and branch circuits for cooling fans may be required.
   5. Generator set shall be sized to operate at a maximum ambient of 105°F and altitude of 1,000.0 feet MSL. The average power output shall be 70% of standby power.
   6. Provide a fully solid-state, microprocessor based, generator set control. The control panel shall be designed and built by the engine manufacturer. The control shall provide all

operating, monitoring, and control functions for the generator set. The control panel shall provide real time digital communications to all engine and regulator controls via SAE J1939.

7. Provide a double wall sub-base tank constructed to meet all local codes and requirements. A fuel tank base of 24-hour capacity shall be provided as an integral part of the enclosure. It shall be contained in a rupture basin with 110% capacity. The tank shall meet UL142 standards. A locking fill cap, a mechanical reading fuel level gauge, low fuel level alarm contact, and fuel tank rupture alarm contact shall be provided.
8. A residential grade silencer, companion flanges, and flexible stainless steel exhaust fitting properly sized shall be furnished and installed according to the manufacturer's recommendation. Mounting shall be provided by the contractor as shown on the drawings. The silencer shall be mounted so that its weight is not supported by the engine nor will exhaust system growth due to thermal expansion be imposed on the engine. Exhaust pipe size shall be sufficient to ensure that exhaust backpressure does not exceed the maximum limitations specified by the engine manufacturer
9. An access platform shall be provided at both sides of the generator set. The platform shall be 3 feet wide minimum and include stairs and railings.
10. Automatic transfer switches shall be manufactured by Russelectric. Automatic transfer shall be open transition.
11. Generators shall be connected by Modbus to the building automation system (Johnson Controls - Metasys). Generators shall also include a local annunciator panel.
12. Design-Builder shall provide all fuel for testing applications. A full tank of diesel fuel shall be also be provided after completion of all testing.
13. Provide 2-year Manufacturer’s and Dealer’s warranties

D. Uninterruptible power systems.
1. Uninterruptible Power Sources (UPSs) shall be provided for those loads requiring guaranteed continuous power. Where used for telecommunication, emergency, or legally required standby systems, installation shall comply with NFPA 70.
2. UPS’s shall comply with NFPA 855.
3. UPS’s used for emergency lighting systems shall be UL 924 listed.

3.4 LIGHTING SYSTEMS

A. General.
1. All lighting shall be LED type.
2. Exterior lighting systems.
   a. Exterior lighting shall comply with the IESNA Lighting Handbook, and applicable Recommended Practice (RP) manuals. Exterior street lighting and bollard fixtures shall be standard ORNL assemblies using LED fixtures.
   b. Photocell or astronomic time clock control shall be implemented to control nighttime illumination. Provide lighting contactor(s) for installations involving multiple luminaires rather than individual photocells at each luminaire.
3. Interior lighting systems.
   a. Interior lighting shall comply with the IESNA Lighting Handbook.
   b. Interior fixtures shall be LED type for all applications where LED type fixtures are readily available.

c. Light loss factors for LED fixtures shall be based on the manufacturer's 10 year depreciation output. LED fixtures shall include the proper light loss factor when located in high heat areas.

B. Lighting circuit voltage levels.
1. Interior lighting shall operate at 120V. Exterior lighting luminaires shall typically be served by 208V, 240V or 277V circuits. Luminaires operating above 277V shall be in accordance with NFPA 70.

C. Illumination levels.
1. Lighting calculations shall be prepared for each area. Unless provided in other programming information, lighting level in each interior area shall be in accordance with IESNA. Exterior lighting levels shall be based on high security areas.

D. Lighting controls.
1. Interior areas served by emergency lighting from a generator, shall be controlled by a mechanical timer. Otherwise, multi-level switches, occupancy sensors, timers, photoelectric (PE) controls, or other energy saving means shall be provided. Conventional wiring devices shall be commercial specification grade.
2. Exterior lighting shall be photoelectric controlled.

E. Lighting circuits.
1. Wiring for lighting circuits shall be run in conduit.

F. Exit (indicating) lighting.
1. Exit lighting fixtures shall be provided to indicate building exits. Exit lighting shall comply with NFPA 101 and NFPA 110.

G. Emergency egress lighting.
1. Emergency egress lighting systems shall comply with NFPA 101 and NFPA 110.
2. Exterior emergency lighting shall be provided at personnel exit doors.

H. Personnel entrance lighting.
1. All exterior personnel entrance doors shall be illuminated.

I. Lighting circuit identification.
1. Electrical service for exit indicating fixtures shall be supplied from a dedicated circuit. These circuits shall be clearly identified on panel directories as supplying emergency lighting.

3.5 GROUNDING AND BONDING

A. General.
1. A grounding electrode system, in conjunction with grounding and bonding requirements for electrical systems, building structural steel, and facility equipment, shall be provided and installed per NFPA 70. The supplemental grounding electrode(s) required by NFPA 70 shall be either a grounding triad or a grounding grid. Grounding triads shall typically be used where the ungrounded service entrance conductors are 350 KCM or less.

2. Where utilized or required, ground buses and ground floor inserts, metal fences and gates, outdoor structures and pipelines, flammable compressed gas cylinder manifolds, drilling and cutting equipment, flammable liquids storage cabinets, and tanks shall be grounded.
3. Grounding and bonding systems designed and installed in accordance with NFPA 70 are intended to protect equipment and personnel. Additional consideration shall be given for installations involving sensitive electronic equipment and networks.
4. Grounding grids, triads, loops, ground buses, etc., shall be tested by the contractor using the fall of potential method in IEEE Standard 81.

B. Grounding triad.
1. Grounding triads shall consist of a buried No. 2/0 bare copper cable and driven ground rods located outside the perimeter of the building. The cable shall be buried a minimum of 30 in. deep. Driven ground rods shall be 3/4 in. diameter X 10 ft long and be spaced at nominal 10-ft intervals from one another. The grounding triad shall be designed and tested so that the resistance to earth does not exceed 5 ohms.

C. Ground grid.
1. Ground grid systems shall consist of a buried No. 4/0 bare copper cable and driven ground rods located around the perimeter of the building. The cable shall be buried a minimum of 30 in. deep and be located a minimum 18 in. away from the building. Driven ground rods shall be 3/4 in. diameter X 10 ft long and be spaced at nominal 25-ft intervals around the perimeter of the building. The grounding system shall be designed and tested so that the resistance to earth does not exceed 1 ohm.

D. Ground loop.
1. Provide a minimum of two ground rods, 3/4 in. diameter X 10 ft long, at each medium voltage transformer, switchgear, etc., and a ground loop consisting of a buried No. 4/0 bare copper cable circling the equipment pad. For medium voltage transformers with a secondary neutral bonded to the transformer enclosure, avoid connection of the ground loop to any facility grounding grid or triad to prevent paralleling of the service entrance grounded (neutral) conductor. Ground loops shall be designed and tested so that the resistance to earth does not exceed 5 ohms.

E. Grounding electrode conductor and bonding jumpers.
1. The size for grounding electrode conductors and bonding jumpers shall be, as a minimum, No. 2/0 bare copper or larger, as required by NFPA 70, Article 250. Grounding electrode conductors and bonding jumpers shall be extended from the ground grid or triad to the electrical service entrance equipment, foundation reinforcing steel, structural steel, internal step-down transformers, ground buses, fire alarm master box, and to dedicated telecommunication equipment areas. The secondary neutral of step-down transformers shall be grounded in accordance with Article 250 of NFPA 70.

F. Structural bonding and ground buses.
1. For facilities that utilize a ground grid, the structural steel shall be bonded at each alternate column by means of a No. 4/0 bare copper cable. Ground buses, as required, shall be connected to the ground grid or triad by means of a No. 4/0 bare copper cable. Ground inserts shall be used where ground cables extending through the surface of the concrete would be exposed to mechanical damage.

G. Equipment grounding and bonding.
1. Equipment which is electrically connected such as panelboards, junction boxes, safety switches, terminal boxes, transformers, etc., shall be grounded and bonded with a dedicated equipment grounding conductor run with the circuit conductors supplying the equipment as stated in Article 250 of NFPA 70. Metallic raceways, enclosure, etc., shall be bonded together to form an effective ground fault current path per NFPA 70, Article 250.
2. Other equipment such as motor control centers, switchboards, main distribution panels, etc., shall be connected to the grounding grid with No. 4/0 bare copper cable.
3. Non-electrical equipment as defined in article 250 of NFPA 70, which is required to be grounded, may be connected to ground buses strategically located on columns or walls.

H. Transient voltage surge suppression (TVSS).
1. Transient voltage surge suppression shall be provided as a system whereby multiple devices shall be installed at different levels of the power distribution system in order to provide a total coordinated, engineered system.
2. TVSS shall be provided for all facilities that require lightning protection systems.

3.6 MISCELLANEOUS SYSTEMS

A. Electric heat tracing systems.
1. Electric heat tracing systems for exterior piping and vessels shall be provided and installed in accordance with Article 427 of NFPA 70. Signs and labels shall be provided on pipelines and vessels to indicate the presence of heat trace systems. Branch circuits serving heat trace circuits shall be supplied with equipment ground fault protection (Class B). Electric heat trace cable shall be self-regulating type with tinned copper braid and overall jacket. Splicing of heat trace cable under pipe insulation is unacceptable. Heat trace systems shall be verified by a megger test before energization. Start up testing shall include in-rush and steady state current measurements.

B. Access controls.
1. Dedicated branch circuits shall be supplied for access control panels. Additional dedicated branch circuits shall be provided for power supplies serving electric latches and strikes. Power supplies for electric latches are located in the proximity of the latch. Power supplies for electric strikes are typically located adjacent to the access control panels. Dedicated branch circuits shall be supplied for electric door operators.

3.7 EQUIPMENT

A. Conductors and cable.
1. General.
a. The color coding system for branch circuits shall be provided at lighting and power panelboards in facilities where more than one nominal voltage system exists.
b. Phase and neutral (grounded) conductors shall be identified by circuit number at all accessible locations.
c. Conductors for interior electrical systems shall be copper. Conductors for power and lighting branch circuits shall not be smaller than No. 12 AWG.
d. Conductors for Class 1 non-powered limited remote-control and signaling circuits shall be enclosed in conduit and shall comply with NFPA 70.

e. Conductors for Class 2 low-energy remote-control and signaling circuits shall not be smaller than No. 18 AWG.
f. Megger tests are required for each 600V cable #4 and larger and may be performed by the contractor or independent testing agency.

2. Multi-wire circuits.
   a. Multi-wire circuits are not permitted.
3. Power and lighting cables.
   a. Type MC-cable, per Article 330 of NFPA 70, may be used whenever practical in lieu of conduit and conductors in concealed locations.
4. Shielded power cable.
   a. Shielded power cable shall be provided for all motors served by a VFD.
5. Tray cable.
   a. Wiring installed in cable trays shall be in strict accordance with Article 392 of NFPA 70. Multiconductor cables shall be UL-1277 Type TC tray cables in accordance with Article 336 or, when applicable, UL-1277 Type PLTC power limited tray cable, Article 725.
6. Electrical plug-in busway.
   a. Electrical plug-in busway may be used for the distribution of electrical power in areas of concentrated equipment or where frequent modifications are expected.
7. Medium voltage cables.
   a. Medium voltage cables shall be copper, rated 90 degrees C, 133% insulation level, copper tape shielded in accordance with NEMA WC74.

B. Conduit and raceways.
1. General.
   a. Raceways that penetrate fire-rated assemblies shall be metallic. All through penetration fire-stops shall be UL listed assemblies and be selected from the UL Fire Resistance Directory. Raceways shall be 1/2-in. minimum in diameter. Raceways embedded in concrete or masonry shall be 3/4-in. minimum.
2. Rigid metal conduit and intermediate metallic conduit.
   a. Galvanized rigid metal conduit (RMC) or intermediate metallic conduit (IMC) shall generally be used in industrial areas where conduits are exposed to damage from forklifts, trucks, cranes, etc., or where there is the possibility of leaking oil or water. Galvanized RMC or IMC shall also be used in classified locations and for outdoor and underground installations.
3. Electrical metallic tubing.
   a. Electrical metallic tubing (EMT) shall generally be used in office and similar areas and also in industrial areas where physical damage is unlikely, typically 10 feet above finished floor. EMT shall not be installed in wet areas, underground, or outdoors and shall not be encased in concrete.
4. Aluminum conduit.
   a. Aluminum conduit shall be used for high-frequency (HF) circuits where steel will cause magnetic problems or in atmospheres where steel conduit is unsuitable. Aluminum conduit shall not be installed underground, encased in concrete, or where the atmosphere is corrosive to aluminum.
5. Nonmetallic conduit.
   a. Nonmetallic conduit may be used where allowed by NFPA 70.

6. Flexible conduit.
   a. Flexible metal conduit shall be used for terminating rigid raceway at motor terminal boxes or other equipment subject to vibration and/or mechanical adjustment. It also shall be used for connection between junction boxes and recessed lighting luminaires.
   b. Liquid-tight flexible conduit shall be used outdoors and indoors where there is the possibility of leaking fluids.
   c. Provide special notation on design drawings to indicate that flexible liquid-tight conduit shall be UL listed.
7. Cable tray.
   a. Cable trays shall be provided for telecommunications horizontal wiring.
   b. Metal cable trays may be used for the installation of power cables, control cables, communications systems, and similar applications. Separate trays or trays with barriers shall be used to isolate power cables from instrumentation and other low-voltage signal cables.
   c. Cable tray routings shall avoid areas with high concentrations of oil and steam piping. Cable trays shall be spaced to provide a vertical distance of at least 12 in. and a horizontal distance of at least 36 in. between trays. Cable trays that penetrate fire rated floors or walls shall be sealed with a UL listed assembly.

C. Underground conduits.
1. General.
   a. All underground-conduit shall be installed within a concrete encased duct bank.
   b. Underground duct banks shall be topped with red dye (oxide dust) and reinforced per ORNL Engineering Standard ES-8-4. Heavy reinforced duct banks shall be provided under roadways.
   c. Underground conduits emerging from grade shall be galvanized rigid steel.
   d. Provide a tracer wire for duct banks. See Civil section for tracer wire requirements.
   e. Specifications or drawing notes shall indicate that a hold point is required for quality control inspections by the Company before underground duct banks are back filled.
   f. The quality control inspection shall include the performance of an underground survey (location and elevation). The specification shall indicate that the underground survey shall be provided by the Seller unless the Company chooses to self-perform the survey.
   g. The specifications shall require the Seller to provide accurate red-lined as-built drawings of underground circuits.
2. Medium voltage circuits.
   a. Underground conduits for medium voltage circuits shall be 5 inch. Underground conduit sweeps for medium voltage circuits, shall be galvanized RMC and have a 48 inch radius.
3. Telecommunication circuits.
   a. Underground telecommunication conduits shall be 4 inch.
   b. Underground conduit sweeps for telecommunication circuits shall have a 36 inch radius.

D. Receptacles.
1. General.
   a. Receptacles shall be commercial specification grade.
   b. As a minimum, 120V receptacles shall be provided in accordance with NFPA 70 and be consistent with established engineering practices.

c. Receptacles shall be labeled with panel name and circuit number.
d. Duplex receptacles installed on finished walls shall be recessed. Duplex receptacles installed in unfinished areas shall be surface mounted in cast boxes.
e. Receptacles within 6' of an exterior door, and exterior to buildings shall be ground fault circuit interrupter (GFCI) type, or be fed from branch circuits equipped with GFCI circuit breakers.

2. 208V and 240V receptacles.
   a. Single 208V and 240V receptacles shall be provided and located as required, based on equipment to be served in the facility. The number to be supplied by a circuit shall be determined by the demand.
3. 480V receptacles.
   a. Single 480V, three phase receptacles shall be provided and located as required, based on equipment to be served in the individual facility as well as for maintenance purposes. The number of receptacles to be supplied by a circuit shall be determined by the demand. Receptacles shall be pin and sleeve type, rated 600V, 60-A, and shall be compatible with Crouse-Hinds Cat. No. APJ6485 plug. Receptacles shall be provided with disconnect switch.
4. Exterior receptacles.
   a. Surface mounted exterior receptacles shall be housed in cast type conduit boxes.
   b. Exterior outlets shall be provided with "in-use" clear acrylic covers that form a rain-tight assembly with their respective boxes and maintain the rain-tight protection while the attachment cord and plug are in place.
   c. GFCI type receptacles shall be type WR.

E. Motors.
1. Permanently wired poly-phase motors of 1 HP or more shall be of a premium energy efficient design.
2. Motors shall have a sufficient rating for the duty they are to perform and shall not exceed their continuous HP rating, including service factor, when the driven equipment is operating at the greatest HP conditions it is likely to encounter. Starting and running characteristics shall be coordinated with the driven machine and the motor control equipment.
3. Motor enclosures shall be drip proof for indoor dry locations and totally enclosed or totally enclosed fan cooled for outdoor or other wet locations, unless special conditions require otherwise.
4. Variable Speed Drives (VSDs) shall be provided where motor speed requirements vary widely during normal operation or for energy conservation in regards to heating, ventilation and air conditioning (HVAC) systems. The driven motor shall be selected in accordance with the drive manufacturer's recommendations to ensure a coordinated system and to avoid overheating the motor. Motors shall be premium efficiency, inverter duty rated, and equipped with shaft grounding rings.

F. Cranes and hoists.
1. The design and installation of electrical equipment for cranes and hoists shall be in accordance with Article 610 of NFPA 70. Crane and hoist pendant control station enclosures shall be of nonmetallic construction. An equipment grounding conductor shall be routed to the pendant for ground testing purposes. A fourth bus rail shall be provided to serve as an equipment grounding conductor for the bridge and trolley.

G. Industrial control panels.
1. Control panels shall meet the requirements of NFPA 70, Article 409, and UL 508A.

H. Miscellaneous equipment.
1. Disconnect shall be heavy duty, single throw types and shall open all current carrying conductors. Local disconnect switches that are lockable in the open position shall be installed adjacent to the following equipment:
   a. Roof or outdoor mounted fan motors, pump motors, etc.
   b. HVAC equipment (indoor and outdoor), unless the local electrical control panel on the equipment has a main disconnect switch or main breaker that is lockable in the open position.
   c. Cranes, hoists, elevators, and conveyors.
   d. Pump motors, fan motors, and other motors that are out of sight of or more than 75 ft from the motor controller.
   e. Water heaters, except those operating at 120V in which case a grounding-type receptacle may serve as the local disconnect.
   f. Power distribution and lighting transformers (the primary circuit breaker shall be permitted to serve as the disconnecting means if capable of being locked in the open position).
   g. Machine tools, unless the local electrical control panel on the equipment has a main disconnect switch or circuit breaker that is lockable in the open position.
   h. Procured or shop-fabricated equipment assemblies containing electrical motors, solenoid valves, transformers, control devices, etc., unless the electrical control panel has a main disconnect switch or circuit breaker that is lockable in the open position.
   i. The provisions for locking shall remain in place with or without the lock installed.

I. Inspections and tests.
1. Inspection and testing of electrical equipment, such as motors, switchgear, lighting, power, and distribution panels, MCCs, power receptacles, power and lighting transformers, wire and cable, ground systems, etc., shall be provided for in the specifications.

END OF SECTION 01 86 26

SECTION 01 86 27 – COMMUNICATIONS

PART 1 - PROJECT REQUIREMENTS

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

PART 2 - CODES AND STANDARDS

2.1 DESIGN STANDARDS

A. Work Smart Standards referenced in Section 01 41 00 apply to this Section.

B. Additional standards include but are not limited to the following:
   1. TIA/EIA-568-B.1, Commercial Building Telecommunications Cabling Standard - Part 1.
   2. TIA/EIA-568-B.2, Commercial Building Telecommunications Cabling Standard - Part 2.
   3. TIA/EIA-568-B.3, Optical Fiber Cabling Components Standard.
   4. TIA/EIA-569-A, Commercial Building Standard for Telecommunications Pathways and Spaces.
   5. TIA/EIA-607, Commercial Building Grounding and Bonding Requirements for Telecommunications.

C. Engineering Standards
   1. Not applicable.

PART 3 - TECHNICAL REQUIREMENTS

3.1 NETWORK COMMUNICATION RACK

A. Provide a network communication rack for patch panels and network equipment in the central electrical building. The network communication rack shall have 3 feet of clear working space in the front and rear. The rack shall be a 45U two post rack with ample horizontal cable management and vertical cable management on both sides, front and rear. When required, 2U 48 port patch panels shall be provided for horizontal wiring and spaced at 1U intervals to allow space for Company provided network switches. Assume network equipment will be 30 inches deep so that each network rack will require 8’-6” x 36” of space. The clear working space around the communication rack can be shared working space for other equipment.

B. Overhead ladder or basket type cable trays shall be installed to provide proper cable management of telecommunication cables when not routed in conduit or raceway.

C. A central UPS shall be provided at the network communication rack. The UPS shall be a Schneider-APC Model No. SMT3000RM2U with a Model No. AP9630 network interface card. The UPS shall be monitored by the PLC for SBR control system for alarms. Provide a 120V 30A circuit with a NEMA L5-30R receptacle served by emergency or standby power.

D. Two convenience receptacles shall be provided near the communication rack and shall be served by emergency or standby power.

E. Grounding provisions shall be made per TIA/EIA-607.

F. See Electronic Safety and Security section for additional requirements.

3.2 OUTSIDE SERVICE CABLES

A. Fiber optic cables.
1. Fiber optic cables shall be installed by the Seller; detailed A-E design drawings and specifications are required.
2. The fiber optic cable between the central electrical building and Building 2536 (Sewer Lab) shall consist of one ribbon type 48 count single mode OS2 armored fiber optic cable, Corning part number 024EC5-14100D53.
3. Provide one Corning CCH-02U closet connector housing and four type LC-APC, Corning CCH-CS12-B3-P00RJ pigtailed cassettes at the central electrical building and at Building 2536 (Sewer Lab) to terminate the OS2 outside fiber. This cable can be routed aerially along existing pole lines where available and overhead clearance permits.
4. Existing fiber optic cable with spare fibers is available between 2536 (Sewer Lab) and 2519 (Steam Plant).
5. Optical fiber shall be installed and terminated by Building Industry Consulting Service International (BCSI) certified personnel, Technician level.
6. Optical fiber shall be tested and certified by using an Optical Loss Test Set (OLTS) Certification Kit.
7. A BICSI formatted Acceptance Test Report shall be generated and submitted to the company for audit and approval after testing is complete.

3.3 COMMUNICATIONS RACEWAYS AND MANHOLES BETWEEN BUILDNGS

A. Install necessary raceways and manholes to provide underground entrance for the outside service fiber optic cables.

B. All underground conduit shall be schedule 40 PVC, installed within a concrete encased ductbank.

C. Underground ductbanks shall be topped with red dye (oxide dust) and reinforced per ORNL Engineering Standard ES-8-4. Heavy reinforced ductbanks shall be provided under roadways.

D. All ductbanks shall include a minimum of two 4” diameter schedule 40 PVC conduits.
1. All conduits shall be installed with 36” radius sweeping elbows.

2. Provide MaxCell fabric type inner duct with cable pulling tape in all cells. Each inner duct shall provide for three cable placements (cells). Three inner ducts shall be installed per duct in conduit being utilized.
3. Install pull rope in vacant conduits.
4. Push inner duct and pull ropes back into the end of spare conduit runs and install cap to prevent mud and water from entering conduit.

E. Manholes.
1. Manholes installed in roadway or in locations subject to vehicular traffic shall be designed by a structural engineer for H20 loading per AASHTO.
2. Manholes that are higher in elevation than the facility's main telecommunication room shall have sump pumps installed to prevent accumulated water from draining into the main telecommunication room.

3.4 TELECOMMUNICATIONS EQUIPMENT COOLING

A. Adequate cooling shall be provided in the central electrical building to offset heat generated by electrical, control, networking and other telecommunication equipment for systems to properly function.

END OF SECTION 01 86 27

SECTION 01 86 28– ELECTRONIC SAFETY AND SECURITY

PART 1 - PROJECT REQUIREMENTS

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

PART 2 - CODES AND STANDARDS

2.1 DESIGN STANDARDS

A. Work Smart Standards referenced in Section 01 41 00 apply to this Section.

PART 3 - TECHNICAL REQUIREMENTS

3.1 GENERAL SECURITY AND ACCESS CONTROL REQUIREMENTS

A. The Seller to provide the following:
   1. All conduit, back boxes, and wiring necessary for connections between access control devices, access control panel and network switches.
   2. AC power for controllers and power supplies.
   3. Door hardware such as electric door strikes, electric door latches, automated door openers, push-to-exit buttons, and required power supplies.

B. Government furnished equipment (GFE).
   1. The government furnished equipment shall include access control system (ACS) controllers (enclosures and panels), badge readers and network devices.

C. Building access control shall be provided as follows:
   1. Exterior door(s) at the Central Electrical building, PAA building, and Environmental Compliance building shall be provided with access control, controlled by Company supplied access control panel(s) connected to ORNL's Site ACS.
   2. Electric door strikes and latches shall be served with power supplies that include battery backup.

D. All security features and functions will comply with the requirement of the IBC and ADA and shall not create any impairment of the means of egress. Initiation of a fire alarm shall not disable electric door latches and strikes.

E. All door locksets shall be provided with Best 7-pin A series lock cores, for master keying by the Company.

3.2 CONTROLLERS FOR ACCESS CONTROL

A. Control panels/enclosures will be provided and installed by the Company. The Seller shall provide rough in and cabling from the enclosure(s) to access control. A 6”x6” wireway shall be provided over the enclosures.

B. Provide space in the central electrical building for the quantity of enclosures required.

C. Provide space for one network interface cabinet in the Central Electrical building . The cabinet is approximately 24”(W) x 42”(D) x 7’(H). Additional cabinet shall be necessary at the PAA building and Environmental Compliance building if distances exceed 300 feet.

D. Provide a raceway (conduit) from the network interface cabinet to the network communication rack.

E. The Seller shall supply each control panel and door strike/latch power supplies with 120-volt AC emergency power.

F. Badge readers.
1. Badge readers shall be installed in accordance with Americans with Disabilities Act (ADA) standards.
2. Provide one #22 gauge, shielded twisted pair, Belden 6504FE or equivalent cable from the control panel to the door.
3. Provide rough in with single-gang, metal outlet box and wiring for separate card readers that shall be supplied for electric door operators used for handicap entrance.

G. Door hardware.
1. Where crash bars are required, door hardware shall be Von Duprin EL99, electric latch.
2. Where conventional door hardware is allowed, door strikes shall be a HES Model No. 5000-24D, 501 face plate.
3. Power supplies for electric latches and strikes shall be supplied by the Seller and shall include battery backup.
4. Power supplies shall be located with the access control panels. Provide rough in and wiring from the power supply/controller to electric strikes and latches using one 14 gauge, 2-conductor, Belden 6100FE or equivalent cable.

H. Access control material list.

MATERIAL	Part #
Hirsch M8 ACS Panel with Power Supply (22”H x 20”W x 6.25”D)	M8 (GFE)
Hirsch M2 ACS Panel with Power Supply (18”H x 15.25”W x 5.5”D)	M2 (GFE)
Von Duprin PS 914 Power Supply (14" x 12" x 4" (H x W x D))	PS914
Von Duprin 900-4R Power Supply 4 Relay Output Board	900-4R
Von Duprin 900-4R Power Supply 4 Relay Logic Board	900-4RL
Von Duprin 900-BB Battery Back-up Board	900-BB
PowerSonic 12V 7.5 AH Backup Battery	PS-1270 F1
Maxxess EP1501 Controller	EP1501 (GFE)
Maxxess MR50 Reader Board	MR50 (GFE)
PIVClass Standard Badge Reader RP40-H	920PHRNEK00005 (GFE)
PIVClass Standard Badge Reader RPK40-H	921PHRNEK0002H (GFE)

END OF SECTION 01 86 28

SECTION 01 89 00 – SITE IMPROVEMENTS

PART 1 - PROJECT REQUIREMENTS

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

PART 2 - CODES AND STANDARDS

2.1 DESIGN STANDARDS

A. Work Smart Standards referenced in Section 01 41 00 apply to this Section.

B. Additional standards/guides.
1. Department of Agriculture's Soil Conservation Service Technical Report TR55, Urban Hydrology for Small Watersheds.
2. American Society of Civil Engineers (ASCE), Manual of Standard Practice ASCE 77 - Design and Construction of Urban Storm Water Management Systems.
3. Tennessee Department of Environment & Conservation (TDEC) Erosion and Sediment Control Handbook, current edition.
4. Tennessee Department of Transportation (TDOT), Standard Specification for Road and Bridge Construction.
5. Tennessee Department of Transportation (TDOT), Drainage Manual.
6. DOE STD 1020 – 2002, Natural Phenomena Hazards and Evaluation Criteria for DOE Facilities.
7. American Society of Civil Engineers (ASCE), Standard Guideline for the Collection and Depiction of Existing Subsurface Utility Data, CI/ASCE 38-02.

PART 3 - TECHNICAL REQUIREMENTS

3.1 SITEWORK

A. Earthwork and Grading Plan facilities: to fit the topography with a minimum of grading, and to preserve the site character in an efficient and economical manner. Follow all applicable recommendations in the project geotechnical report.
1. Final grading design shall minimize the need for site retaining walls to the greatest extent possible.
2. Design the site grading in such a way as to balance the earthwork cut and fill quantities.
3. To prevent surface drainage from entering or ponding adjacent to the structure, place finished floor elevations sufficiently above the existing ground gradient or the roadway

grade, and slope the outside grade away from the building. A minimum slope of 5 percent shall be provided within a 10 foot distance of the building in landscaped areas. Pavement or sidewalk adjacent to a building shall be sloped away from the building a minimum of 1 percent while still meeting the Americans with Disabilities Act (ADA) slope requirements.

4. Erosion control measures shall be detailed on the design drawings, and shall be in accordance with the TDEC Erosion and Sediment Control Handbook, current edition and the Tennessee General Permit for Stormwater Discharges from Construction Activities (TNR100000).
   a. The Design-Build Contractor shall generate the project specific Storm Water Pollution Prevention Plan (SWPPP), if required
5. Eliminate/minimize construction activities which will require permits (i.e. TDEC's ARAP permit, etc.).
   a. A Notice of Intent (NOI) for General NPDES Permit for Stormwater Discharge from Construction Activities form (CN-0940) shall be completed by the Design-Build Contractor and submitted to TDEC along with a copy of the SWPPP and applicable permit fees. The Design-Build Contractor shall receive a Notice of Coverage from TDEC prior to any earthwork activities.
   b. Should a TDEC Aquatic Resource Alteration Permit be required, see Section 01 81 00-1.2, Facility Performance Requirements, for permits prior to any earthwork activities within the stream buffer.
6. Maximum finish graded slopes shall be 1V:3H, unless positive erosion protection is provided, such as rip rap, or another slope is recommended in the geotechnical report.
7. Coordinate the location of the building with surrounding structures to meet all codes and fire department setback issues.
8. Permanent seeding will be required on all disturbed areas. Seed mixture shall be a turf type tall fescue.

3.2 SIDEWALKS

A. Contraction and expansion joints shall be provided and shown on the drawings.

B. Walks and landings shall comply with ADA/UFAS requirements and have a medium to heavy broom finish for slip resistance.

C. Concrete mix shall be 4000 psi minimum with 5%-7% air entrainment to minimize damage due to freeze-thaw cycles/ice melt chemicals. Testing only required for air entrainment not strength.

D. Base the width of sidewalks on anticipated traffic, with a minimum width of 4 feet.

E. Sidewalks construction shall be 4 inches thick minimum over a 3 inch base of #57 stone. Also, sidewalks shall be reinforced with welded wire fabric.

3.3 ROADS AND PARKING

A. Design and details for construction of flexible and rigid pavements shall comply with Tennessee Department of Transportation (TDOT), Standard Specification for Road and Bridge Construction, and any recommendations made in the site geotechnical report.

B. Provide adequate access to existing traffic patterns.

C. Design of parking areas shall include 9 feet wide, 20 feet long spaces with 90 degree parking being preferred. Space shall be provided to park at least one vehicle at the Sewage Treatment Plant. Two-way parking aisles shall be 24 feet wide. All striping shall be 4" wide, white in color except blue for handicapped. Thermoplastic type paint shall not be utilized for marking pedestrian crosswalks.

D. Parking area circulation must allow for all types of traffic that may be associated with the facility, including deliveries, emergencies and garbage pick-up.

E. Clearly indicate turning radii requirements on parking area entrances and islands. If access for fire, maintenance and trash service vehicles is required for the facility and routing through the parking area is necessary, provide layout with turning radii in accordance with the latest edition of the AASHTO publication, A Policy on Geometric Design of Highways and Streets for the appropriate design vehicle type.

F. Geometric design and gradients of all roads, streets, access drives and parking areas shall comply with AASHTO - A Policy on Geometric Design of Highways and Streets (GDHS).

G. Design of bridges shall comply with AASHTO LRFD Bridge Design Specifications, US Units, 4th Edition, 2008 Interim Revisions.

H. Road and street grade changes in excess of 1% shall be accomplished by means of vertical curves; the length of vertical curves shall be determined in accordance with AASHTO - GDHS.

I. Roadway centerline gradient profiles shall be shown for vertical control.

J. Positive drainage shall be provided for parking area pavement. Slopes shall be 1% min/4% max.

K. Handicap parking allocations shall comply with ADA/UFAS.

L. Parking stops shall be manufactured from concrete with a minimum of 20% fly ash and shall be anchored to the pavement with rebar. Parking stops shall be provided adjacent to sidewalks without curb, buildings, fences, in areas where part of a vehicle extending past the striped space would likely cause property damage and in areas of extreme slope or areas adjacent to storm water management facilities. Locate the front face of the parking stop 30 inches from the edge of the pavement or sidewalk.

M. Bollards must be 4 feet high, 4-inch diameter steel pipe filled with concrete and painted. Plastic coated bollards may be used in lieu of painting steel bollards. Provide bollards around any structure subject to damage from vehicular damage by incidental contact. Ensure that an adequate concrete foundation is designed for the bollard.

N. Traffic control devices shall be in accordance with AASHTO - MUTCD. Provide signs, and associated pavement markings to facilitate proper utilization of the project site.

O. Flexible pavements shall be used for roadways, access drives, and parking areas. Rigid pavements shall be used for dumpster pads, loading dock aprons, and other pavement areas subjected to high stresses.

P. Pavement systems shall include provisions for under-pavement drainage, if required by the site geotechnical report.

3.4 DESIGN DRAWING INFORMATION

A. Design drawings shall use the ORNL grid system. A minimum of two survey control points with their coordinate values and elevations shall be shown on the project site drawings.

B. Provide ORNL north arrows and graphic scales on all applicable drawings.

C. Demolition plans shall clearly show what is to be demolished at an appropriate scale and shall indicate the beginning and ending points of utility removals and methods of plugging pipes. Show locations of valves for isolating work. Describe existing items to be removed in detail with supplemental descriptions if necessary. Provide a demolition sequence if necessary and include any known requirement for continuous operation and limited shutdown requirements. Do not show any items that are being demolished with the current project on subsequent Civil plan sheets. Provide an appropriate tree protection detail for existing trees which are to be preserved during construction.

D. Site plans shall show all new above ground features with adequate layout data and existing aboveground features after demolition has occurred. Show areas requiring pavement patching, repairs and new pavement. Provide pavement jointing plans for rigid pavement. Eliminate extraneous items which may congest the drawing and detract from the layout information. Show locations of any additional erosion and sedimentation control items not already identified on the demolition plan on the site plan or on subsequent erosion prevention and sedimentation control sheets. Indicate all trees and plant material to remain.

E. Utility plan sheets shall provide profiles where needed for clarity and to avoid potential conflicts. Indicate structure tops, pipe invert elevations, slopes, lengths and diameters of all new gravity lines. Reference the plan sheets where pipes/structures are shown. Show and label existing and new surface materials, concrete pads, curbs, roads, etc. traversed by the new lines. Accurately show the depths of existing pavements. Show and label all crossing utility lines, both existing and new. Indicate the method of new utility installation routing above or below conflicts, i.e. concrete encasement, pressure pipe, etc.

F. Grading plans shall provide spot elevations and existing contours at intervals to clearly indicate existing drainage patterns. Provide spot elevations and new contours when appropriate to clearly indicate new grading and drainage patterns. New spot elevations/contours must be easily distinguished (bolder font) from existing. Indicate where new grade ties to existing grading (limits) and verify that new work will not block existing adjacent drainage. Show all benchmarks, other vertical control and datum notes on this plan. Show finished floor elevations

on the grading plans. Provide numbers (or letters) for each drainage structure so that plans and profiles are easily coordinated. Erosion and sediment control details may be shown on these plans or on separate erosion and sediment control plans.

G. Details of items shown in TDOT's construction standards or other appropriate local/commercial standards are required to be included on the plan sheets.

H. An electronic copy of the Civil calculations (pdf file format) shall be provided to the Company by the Design-Build Contractor. The calculations shall be sealed by a Professional Engineer licensed in Tennessee for record purposes.

END OF SECTION 01 89 00

SECTION 01 89 19 – SITE PLUMBING UTILITIES

PART 1 - PROJECT REQUIREMENTS

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

B. Section 01 18 32, Site Utility Interface, for general requirements regarding drawings, surveying, specifications, etc.

C. Section 01 80 00, Design Build Requirements, for design submittals and design execution.

D. Section 01 89 00, Site Improvements, for storm water design criteria.

PART 2 - CODES AND STANDARDS

2.1 DESIGN STANDARDS

A. Work Smart Standards referenced in Section 01 41 00 apply to this Section.

PART 3 - TECHNICAL REQUIREMENTS

3.1 GENERAL

A. Code/ Design
   1. Above ground utilities shall be avoided if at all possible.
      a. Above ground features shall not be located in front of or in such a manner as to detract from the facilities.
      b. Maintain a minimum clear height of 23.5 feet at all overhead road crossings.
   2. Locate new utilities so as to minimize connection costs. Underground utilities shall not be routed under buildings or other permanent structures.
   3. If new buildings or other permanent structures are sited over active and existing underground utilities, then those underground utilities must be relocated.
   4. When flowable fill is required for trench backfill or other applications, it shall meet the minimum recycled content per the EPA's Comprehensive Procurement Guidelines.
   5. Provide coordinated locations for all underground utilities, indicating horizontal and vertical locations of connection points, abrupt changes in direction and system components, as well as enough locations along the lines to clearly establish their location.
   6. Refer to the Atlas Utility Drawings for the best known underground utility information. This information is provided for information only. The Design-Build Contractor is required to verify as-built conditions.

7. The Building Automation System, BAS, or ION shall collect, store and display the data from any installed flow meters.
8. Provide valving necessary for installation and operation of each piping system. Design shall consider safety, system operation, installation outages required, interface with new and existing portions of the system, reliability and maintainability at a minimum.

B. Materials
1. Buried piping.
   a. Indicator tape shall be laid 18" above buried piping.
   b. Tracer wire shall be laid continuously along the top of all buried piping.
   c. Attach the wire at five foot intervals to the pipeline with several wraps of tape.
   d. Tracer wire shall run up and down exterior side of valve boxes, looped but not cut, into the valve box just below the cover.
   e. Splices shall be avoided. Splices and wire ends shall be waterproofed.
   f. Verify electrical continuity by applying an electrical current.
   g. Wire Spec: 14 AWG conductor, solid white, TWH solid copper with plastic coat. Splice connectors: Burndy KS-90 16-10 wrapped with insulating mastic tape.
   h. The ends of the tracer wire shall terminate inside a valve or junction box. A minimum of twelve inches of wire shall be located within the box.
2. All materials/equipment shall bear the Underwriter's Laboratories (UL) label or be approved by Factory Mutual (FM) where UL labels or FM approval is available for the type of products specified.

3.2 UTILITIES

A. Potable Water and Firewater Piping
1. Code/Design
   a. The water main shall be designed, installed and tested according to the Potable Water Distribution System Description Document, UT-MECH_ADM_002. See Figure 2.3 for Code/Standard boundaries.
   b. The ORNL water supply system is a combined potable water and fire service main.
   c. Water mains shall be designed with 36" of cover.
   d. Design for normal operating pressure range of 40 - 100 psi.
   e. Test pressure 200 psi.
   f. Design the water main to use a looped – grid type system providing two-way flow with sectional valving arranged to provide alternate water flow paths to any point in the system.
   g. Design the water main to deliver peak potable flow of 2 ½ times the average daily demand plus any special demands, at a minimum residual pressure of 30 psi at ground elevation.
   h. Restraint systems shall be designed per AWWA M41, Manual of Water Supply Practices, Ductile Iron Pipe and Fittings. Restraint systems may consist of concrete thrust blocks, EBBA Megalugs, and/or US Pipe Field Lok gaskets. Pipe restraint locations and details shall be shown on the drawings.
   i. The building water supply and fire protection system water supply shall have separate piping feeding the building. The building water supply shall be isolatable without affecting the fire protection systems.

j. Water mains should maintain the following distances from building foundations: 8" diameter or less - ten feet clearance, greater than 8" diameter - twenty feet clearance.
k. Water piping shall be separated from other pipelines carrying nonpotable or other hazardous materials in accordance with the Potable Water Distribution System Description Document, UT-MECH_ADM_002.
l. SCADA information shall be transmitted to the Utilities Division Control Room in Building 2519.

2. Materials
   a. Coatings or linings for distribution system components that come into contact with potable water shall meet AWWA Standards, NSF/ANSI 61, or other appropriate standard.
   b. Exposed piping shall receive appropriate ANSI A13.1 color coded paint, marked with material conveyed and flow direction.
   c. Site Standards:
      1) Pipe: Ductile Iron
      2) Valves: Gate: Mueller 2360. Resilient Wedge Gate Valves with PIV Plate
      3) Fire Hydrant: Muller Super Centurion, 250 A-423
      4) Post Indicators: Mueller A20806
      5) Motor Actuators: See Section 01 81 00, Facility Performance Requirements
3. Construction
   a. Submit water quality reports for all modifications to the potable water distribution system.
   b. Disinfection of new or repaired pipes shall be in accordance with ANSI/AWWA C651.
   c. Submit disinfection plan to Company for approval, including chlorination, hold times, and bacteriological analysis.

B. Sanitary Sewer
1. Definitions.
   a. ORNL Sanitary Sewer System – The common sanitary sewer conveying sanitary sewage to, and within, the ORNL Sewage Treatment Plant.
   b. Building Sanitary Sewer – External sewer piping extending from the building sanitary drain to the ORNL Sanitary Sewer System.
   c. Building Sanitary Drain – The lowest piping of the building sanitary drainage system. It extends 30 inches beyond the face of the building and conveys sewage to the building sanitary sewer.
   d. Building Sanitary Drainage System – All of the piping within a building that conveys sewage to the building sanitary drain
2. Code/Design
   a. https://www.tn.gov/environment/program-areas/wr-water-resources/water-quality/water-quality-reports---publications.html
   b. Design, installation and testing of the ORNL Sanitary Sewer System and Building Sanitary Sewer shall be in accordance with the Design Criteria for Sewage Works, State of Tennessee and the requirements set forth in Division 01.
   c. Minimum sizes of gravity sewers shall be 6 inch for building connections and 8 inch for all other sewers.
   d. Septic tanks shall not be used.

e. SCADA information shall be transmitted to the Utilities Division Control Room in Building 2519.

3. Materials
   a. Site Standards:
      1) Wastewater Pumps/Pump Stations: Pump stations shall be wet pit submersible type and manufactured by Wilo, KSB, Flygt, or Sulzer unless specifically noted otherwise. Pump stations shall meet TDEC redundancy requirements, although duplex pumping shall be provided at a minimum.
      2) Waste activated sludge pumps are specified in Section 01 81 00, Facility Performance Requirements.
      3) Submittals shall be provided for details of construction and dimensions including pump mounting design on base discharge elbow; detailed description of the system operation, including pressure and flow ranges, pump sequencing, and controller functionality; guaranteed performance curves and data sheets on the pumps showing head, capacity, efficiency, NPSHR, maximum horsepower; total weight of the equipment; complete bill of materials for the system; electrical information, including control schematic and panel layout to scale; complete list of all field service offices, complete with phone numbers and contact information, having the field service office closest to the site clearly indicated; electrical characteristics of motors; motor characteristic curves or tabulated data (test or calculated) should indicate the speed, power factor, efficiency, current, and kilowatt input, all plotted or tabulated against percent load as abscissas.
      4) Operations and maintenance manuals shall be submitted.
      5) Pump casings shall be cast ductile iron. Fasteners shall be stainless steel.
      6) The volute shall be non-concentric design with centerline discharge and passages shall be smooth and large enough to pass any solids which may enter the impeller. Pumps shall pass a 3-inch minimum solid. Impeller shall be cast iron, semi-open, non-clogging, single vane design.
      7) The discharge flange design shall permit attachment to standard ANSI class 125 flanges. Proprietary or non-standard flange dimensions shall not be accepted.
      8) The pump shaft shall be one piece stainless steel integral with the motor with a factor of safety of five measured against the ultimate strength. The shaft shall be designed for all torque conditions during normal operation and for runaway speed during reverse flow.
      9) The bearings shall have a minimum B-10 bearing life of 100,000 hours. Each bearing shall be of the correct design to resist the radial and thrust loads applied. Enough bearings shall be provided to ensure the pump rotating elements are supported so that the possibility of excessive vibration is eliminated. Ball and roller bearings life and load ratings shall conform to ABMA 9 and ABMA 11. Bearing selection shall limit the bearing temperature rise to a maximum of 60C under full load operation.
      10) Provide two independent tungsten carbide or silicon carbide motor mechanical shaft seals, each with its own independent single spring system acting in a common direction. Install the upper seal in an oil filled chamber with drain and inspection plug with positive, anti-leak seal.
      11) The motor shall be submersible and conform to the requirements of NEMA MG 1. The motors shall be 3-phase, 60-Hz, 460 V, squirrel cage, induction

type, NEMA Design B Type, high efficiency design, housed in a completely watertight and air-filled chamber, with a minimum 1.15 service factor. The motor shall be sized to avoid overload when operating at any point along the characteristic curve of the pump.

12) The motor shall be rated for continuous duty when submerged at a maximum fluid temperature of 104 F (40C) and shall also be capable of operation in the dry for short periods of time for testing and maintenance purposes.
13) Motors shall be UL listed for use in Class 1, Division 1, Groups C&D hazardous locations as defined by the NEC. Motors shall be capable of withstanding up to 15 starts per hour and shall have a minimum 1.5 service factor at 40C.
14) Pumps shall be installed in a precast concrete wet well with Xypex admixture.
15) Pumps shall be installed with a stainless steel lifting chain rated for twice the weight of the pump and discharge base elbow on stainless steel guide rails to facilitate removal.
16) Wet well level shall be monitored primarily by ultrasonic transducer for pump controls. High level and low-level floats shall be provided as a backup.
17) Wastewater pump stations shall include a precast concrete valve vault that includes plug valves, check valves, and air release valves. The vault shall have a drain that flows back to the wet well.
18) Access hatch covers with safety grating shall be sized to provide adequate access and removal clearances to remove the pumps from the wet well. Provide matching cover for valve vault. Wet well and valve vault access hatch covers shall be aluminum.
19) Check Valves
    a) Swing Check Valves shall conform to AWWA C508, and have ASME B16.1 Class 125 flanged connections. Valves shall have a ductile iron body, ductile iron removable cover, and steel reinforced rubber or nylon flapper. Valve shall have a full waterway flow-through area. Valves shall be rated for 175 psig service. Check valves shall be ductile iron body with rubber flapper and be manufactured by APCO/DeZurik No. 100, Crispin RF series, VAG 200D series or Val-matic Swing Flex.
20) Plug valves
    a) Plug valves are specified in Section 01 81 00, Facility Performance Requirements.
21) Sewage Air Release Valves (through 4 inch)
    a) This specification covers automatic valves installed on wastewater mains to vent accumulated air under system pressure, and to provide air exhaust during initial fill. The air release valve shall be in compliance with AWWA C512. The valve shall be rated for 150 psig working pressure and built with a standard elongated body.
    b) Provide inlet and blow off valves, quick disconnect couplings and minimum 5 foot hose for flushing.

c) Cast iron valve body and cover shall be in accordance with ASTM A48-35 or ASTM A126 class B. Inlet sizes through 2 inches shall be screwed (NPT), larger sizes shall be flanged.
d) Metallic internal seat trim float arm and pivot pin shall be stainless steel type 303, 304 or 316. Metallic floats shall be stainless steel ASTM A240. Other stainless steel metal internal parts shall be stainless steel ASTM A240 or ASTM A276.
e) Valves requiring internal seats or orifice buttons shall be Buna-N rubber compounded for water service. For valves requiring cover gaskets, the cover gasket shall be composition type, equal to Armstrong CS-231, Garlock 3000, or Lexide NK-511. If an O-Ring is used to seal the cover, it shall be an NSF 61 certified rubber. Cover bolts shall be alloy steel.
f) Valve body shall have a test pressure rating of 500 psi and working pressure rating of 150 psi.
g) The air release valve shall be designed to vent accumulated air automatically. The outlet orifice shall be properly sized to facilitate valve operation at pressures up to 150 psi. The air release valve shall be simple-lever or compound-lever depending upon volume requirements and the design of the valve.
h) Manufacturer/Model: DeZurik/Apco 400/450, Crispin, VAG, or Valmatic.

22) Sewage Air and Vacuum Release Valves (through 4 inch)
a) This specification covers automatic valves installed on wastewater mains to vent accumulated air under system pressure, and to provide air exhaust during initial fill or to prevent a vacuum during draining or water column separation of the system. The air and vacuum valve shall comply with AWWA C512.
b) The air and vacuum valve shall be designed with the inlet and outlet of equal cross-sectional area where applicable. The valve shall be capable or automatically allowing large quantities of air to be exhausted during the filling cycle an also capable of automatically allowing air to re-enter the system to prevent a negative pressure at water column separation or during the draining cycle. The float shall be guided to minimize premature closure by air and to provide proper alignment for normal closure by floating on the water surface.
c) Provide inlet and blow off valves, quick disconnect couplings and minimum 5 foot hose for flushing.
d) Cast iron valve body and cover shall be in accordance with ASTM A48-35 or ASTM A126 class B. Inlet sizes through 2 inches shall be screwed (NPT), larger sizes shall be flanged.
e) Metallic internal seat trim float arm and pivot pin shall be stainless steel type 303, 304 or 316. Metallic floats shall be stainless steel ASTM A240. Other stainless steel metal internal parts shall be stainless steel ASTM A240 or ASTM A276.
f) Valves requiring internal seats or orifice buttons shall be Buna-N rubber compounded for water service. For valves requiring cover gaskets, the cover gasket shall be composition type, equal to Armstrong CS-231, Garlock 3000, or Lexide NK-511. If an O-Ring is

used to seal the cover, it shall be an NSF 61 certified rubber. Cover bolts shall be alloy steel.

g) Valve body shall have a test pressure rating of 500 psi and working pressure rating of 150 psi.

h) The air release valve shall be designed to vent accumulated air automatically. The outlet orifice shall be properly sized to facilitate valve operation at pressures up to 150 psi. The air release valve shall be simple-lever or compound-lever depending upon volume requirements and the design of the valve.

i) Manufacturer/Model: DeZurik/Apco 401, Crispin, VAG, or Val-matic.

23) Combination Air Release Valves for Wastewater Service

a) This specification covers automatic valves installed on wastewater mains to vent accumulated air under system pressure, and to provide air exhaust during initial fill or to prevent a vacuum during draining or water column separation of the system.

b) Combination air and vacuum relief valves shall provide for both automatic air release under system pressure and to allow air movement during filling or draining operations or water column separation. The combination valve may be housed in a single casting. The housing shall be designed to incorporate conventional or kinetic flow principles to properly vent the air without premature closure.

c) Flanged sized (4 inch and larger) may be furnished in a dual housing. When dual casings are used a bronze manual isolation valve shall be installed if indicated by the manufacturer. This will allow the air release valve to be serviced when the system is under pressure. Field service of the valve may also be performed by closing the isolation valve between the air valve and the pipe connection.

d) Provide inlet and blow off valves, quick disconnect couplings and minimum 5 foot hose for flushing.

e) Cast iron valve body and cover shall be in accordance with ASTM A48-35 or ASTM A126 class B. Inlet sizes through 2 inches shall be screwed (NPT), larger sizes shall be flanged.

f) Metallic internal seat trim float arm and pivot pin shall be stainless steel type 303, 304 or 316. Metallic floats shall be stainless steel ASTM A240. Other stainless steel metal internal parts shall be stainless steel ASTM A240 or ASTM A276.

g) Valves requiring internal seats or orifice buttons shall be Buna-N rubber compounded for water service. For valves requiring cover gaskets, the cover gasket shall be composition type, equal to Armstrong CS-231, Garlock 3000, or Lexide NK-511. If an O-Ring is used to seal the cover, it shall be an NSF 61 certified rubber. Cover bolts shall be alloy steel.

h) Valve body shall have a test pressure rating of 500 psi and working pressure rating of 150 psi.

i) The air release valve shall be designed to vent accumulated air automatically. The outlet orifice shall be properly sized to facilitate valve operation at pressures up to 150 psi. The air release valve shall

be simple-lever or compound-lever depending upon volume requirements and the design of the valve.

j) Manufacturer/Model: DeZurik/Apco 440, Crispin, VAG, or Val-matic.

24) Pipe

a) Polyvinyl chloride (PVC) is suitable for use as a gravity sewer conduit and shall meet and/or exceed the requirements of ASTM D3034, SDR 26.

b) Ductile iron pipe (DIP) shall be used for all pressurized and/or exposed piping and wastewater plant outfall unless specifically noted otherwise. Ductile iron pipe shall conform to ASTM A746. Fittings shall conform to AWWA C110/A21.10 or AWWA C153/A21.53. Fittings shall have strength at least equivalent to that of the pipe. Pipe and fittings shall be lined with Protecto 401, or Permox CTF. The outside coating shall be manufacturer's standard asphaltic coating. Pipe and fittings shall have push-on joints or mechanical joints for buried service and flanged joints for exposed service.

c) PVC Schedule 80 will be permissible for exposed process piping smaller than 4 inches in diameter.

25) All pipes, valves, equipment and appurtenances shall be provided with heat tracing, where such items could be endangered by freezing, and subsequently insulated with rubitex sections, sealed and weatherproofed. The heating cables shall be controlled from thermostats installed in representative locations and accessible for adjustment. The heat tracing systems shall be installed complete, including heating elements, power connections, end seals, and controlling thermostats in accordance with the manufacturer's printed installation instructions. All components of the insulation, including covering, mastics and adhesives shall have a flame-spread rating of not over 25, and a smoke development rating of not over 50.

26) All exposed piping shall be prepared, painted, labeled and marked. Surface preparation shall be determined by material and paint type. Color be as specified in the latest edition of Occupational Health and Safety Administration, and Recommended Standards for Wastewater Facilities. Pumps, valves and meters shall be painted the same color of line in which they are apart. Piping shall include stenciling to include pipe contents and flow direction.

27) A relocated wastewater plant outfall shall have a reinforced concrete headwall.

C. Storm Water Management System.

1. Code/Design

a. The Storm Water Management System shall be designed for not less than the 25-year, 24-hour storm. The existing storm drain system shall be analyzed to ensure adequate capacity for any new connections to the system as well as the effects that any additional runoff resulting from the new construction will have on the receiving water's downstream facilities. In lieu of the TR-55 Method, the Rational Method of analysis may be used to determine storm water runoff quantities for sizing and/or analyzing the storm water drainage system provided that the drainage area under investigation is no larger than 5 acres, and that the method is not used

for the design of storage facilities. No new discharge points to receiving waters will be allowed.

b. A hydrologic evaluation shall be performed to determine the impact (flooding) due to a 500year rainfall event (designated henceforth as the Design Basis Flood or DBFL). Based upon the results of the analysis, the minimum finished floor elevation and mechanical/electrical equipment pads shall be located above the DBFL elevation as determined from the study. In addition, due consideration shall be made to site access to the facility during the DBFL (see DOE publication DOE-STD-1020-2002). Criteria for run off rates shall be in accordance with NOAA's Atlas 14, Precipitation Frequency Atlas of the United States, and the Department of Agriculture's Soil Conservation Service Technical Report TR55, Urban Hydrology for Small Watersheds.

c. The total area to be drained shall be considered when analyzing and sizing the storm water system. All runoff shall be controlled and tied to the storm water system, as appropriate.

d. Hydraulic design of storm drainage systems shall comply with American Society of Civil Engineers' (ASCE), Manual of Standard Practice ASCE 77 - Design and Construction of Urban Storm Water Management Systems. The minimum storm drain pipe diameter shall be 12 inches. The minimum culvert diameter shall be 15 inches. For roof drains, the minimum pipe diameter for laterals and collectors shall be 4 inches.

e. Provide straight alignments for piping between storm drainage structures with deflection at structures no greater than 90 degrees for main line flow (24" diameter and greater) and 120 degrees for contributory flow lines. Use of curvilinear alignment is not allowed.

f. Provide a structure at collection and inlet points, at least every 300 feet for pipes 24 inches in diameter and less, pipe junctions and changes in horizontal or vertical alignment of a pipe run. Provide a structure at least every 400 feet for pipes up to and including 48 inches in diameter, and at least 800 feet for pipes larger than 48 inches in diameter.

g. Provide inlets on roads to reduce spread in accordance with the Tennessee Department of Transportation's (TDOT) Drainage Manual. The spread shall never be more than ½ of a driving lane based on a 5 year storm intensity.

h. In the design of culverts and storm drains, consider headwater and tailwater and their effects on hydraulic grade line and capacity. The hydraulic grade line for the drainage system shall not exceed an elevation one foot above the pipe crown, or one foot below the structure rim or gutter flow line at inlets, whichever is the lower elevation at each structure. Culverts shall not be surcharged more than one foot at either end. At structures, the inlet pipe crown elevation must be equal to or greater than the outlet pipe crown elevation to minimize hydraulic turbulence at the junction. Provide adequate slope in the structure's flow channel to accommodate the hydraulic losses through the structure.

i. The pipe size must not decrease downstream in the direction of the flow. This shall include connections of new collection systems to existing facilities.

j. Provide a minimum flow velocity of 2.5 feet per second and a maximum velocity of 10 feet per second using the Manning equation with the pipe flowing full and under no surcharge at peak flow conditions.

k. Locate drainage structures out of paved areas whenever possible. Adjust structure locations to avoid primary wheel tracks when structures must be located in

roadways. All drainage structures shall be specified to be in accordance with TDOT's Standard Specifications for Road and Bridge Construction.

l. The storm drainage system shall not be used for discharging of process or sanitary related waste.

m. Headwalls or flared end sections shall be provided at the ends of permanent culverts and at storm drain outfalls. Protection from erosion and scouring at headwalls and flared end section outfalls shall be provided as needed.

n. Limit maximum velocities and gradients on open channels to prevent erosion on soil type and lining in accordance with the TDOT Drainage Manual.

o. Any storm drain flows which are expected to contain suspended oils shall be routed through an appropriately sized oil/water separator prior to discharge to any outfalls.

p. Where roof drainage is discharged to grade, provide splash blocks/channels to direct the flow away from the structure. Eliminate safety hazards from ice, ponding, flooding etc. in pedestrian and vehicular traffic areas.

q. Wherever practical, all roof drains shall be tied into the storm drain system.

r. Storm drainage piping must be a parallel distance of at least 10 feet from building foundations for all diameter pipes.

2. Materials

a. New material shall be:

1) Reinforced concrete pipe (RCP) in accordance with ASTM C76/AASHTO M170, Class III, Wall B, with bell and spigot joints and gaskets per ASTM C443. RCP shall be used under all roadways.

2) High Density Polyethylene (HDPE), corrugated with smooth inner wall per AASHTO M-294, and rubber gasket joints per ASTM D3212.

3) Corrugated Metal Pipe (CMP), AASHTO M36.

4) Poly Vinyl Chloride (PVC), ANSI/ASTM D3034, Type PSM, Use PVC for storm drains 10 in. and smaller.

5) SR 35 pipe is unacceptable

3.3 DESIGN DRAWING INFORMATION

A. Design drawings shall use the ORNL grid system. A minimum of two survey control points with their coordinate values and elevations shall be shown on the project site drawings.

B. Provide ORNL north arrows and graphic scales on all applicable drawings.

C. Demolition

1. Plans shall clearly show what is to be demolished at an appropriate scale and shall indicate the beginning and ending points of utility removals and methods of plugging pipes.
2. Show locations of valves for isolating work.
3. Describe existing items to be removed in detail with supplemental descriptions if necessary.
4. Provide a demolition sequence if necessary and include any known requirement for continuous operation and limited shutdown requirements.
5. Do not show any items that are being demolished with the current project on subsequent Civil plan sheets.

6. Provide an appropriate tree protection detail for existing trees which are to be preserved during construction.

D. Site plans:
1. Show all new above ground features with adequate layout data and existing aboveground features after demolition has occurred.
2. Show areas requiring pavement patching, repairs and new pavement.
3. Provide pavement jointing plans for rigid pavement.
4. Eliminate extraneous items which may congest the drawing and detract from the layout information.
5. Show locations of any additional erosion and sedimentation control items not already identified on the demolition plan. Erosion prevention and sedimentation control (EPSC) items may also be shown on separate EPSC plan sheets.
6. Indicate all trees and plant material to remain.

E. Utility plan sheets
1. Shall provide profiles for gravity sewers 8 inches and larger and where needed for clarity to avoid potential conflicts.
2. Indicate structure tops, pipe invert elevations, slopes, lengths and diameters of all new gravity lines.
3. Reference the plan sheets where pipes/structures are shown.
4. Show and label existing and new surface materials, concrete pads, curbs, roads, etc. traversed by the new lines.
5. Accurately show the depths of existing pavements.
6. Show and label all crossing utility lines, both existing and new.
7. Indicate the method of new utility installation routing above or below conflicts, i.e. concrete encasement, pressure pipe, etc.

F. An electronic copy of the Civil calculations (pdf file format) shall be provided to the Company by the Design Build Contractor. The calculations shall be sealed by a Professional Engineer licensed in Tennessee for record purposes.

END OF SECTION 01 89 19

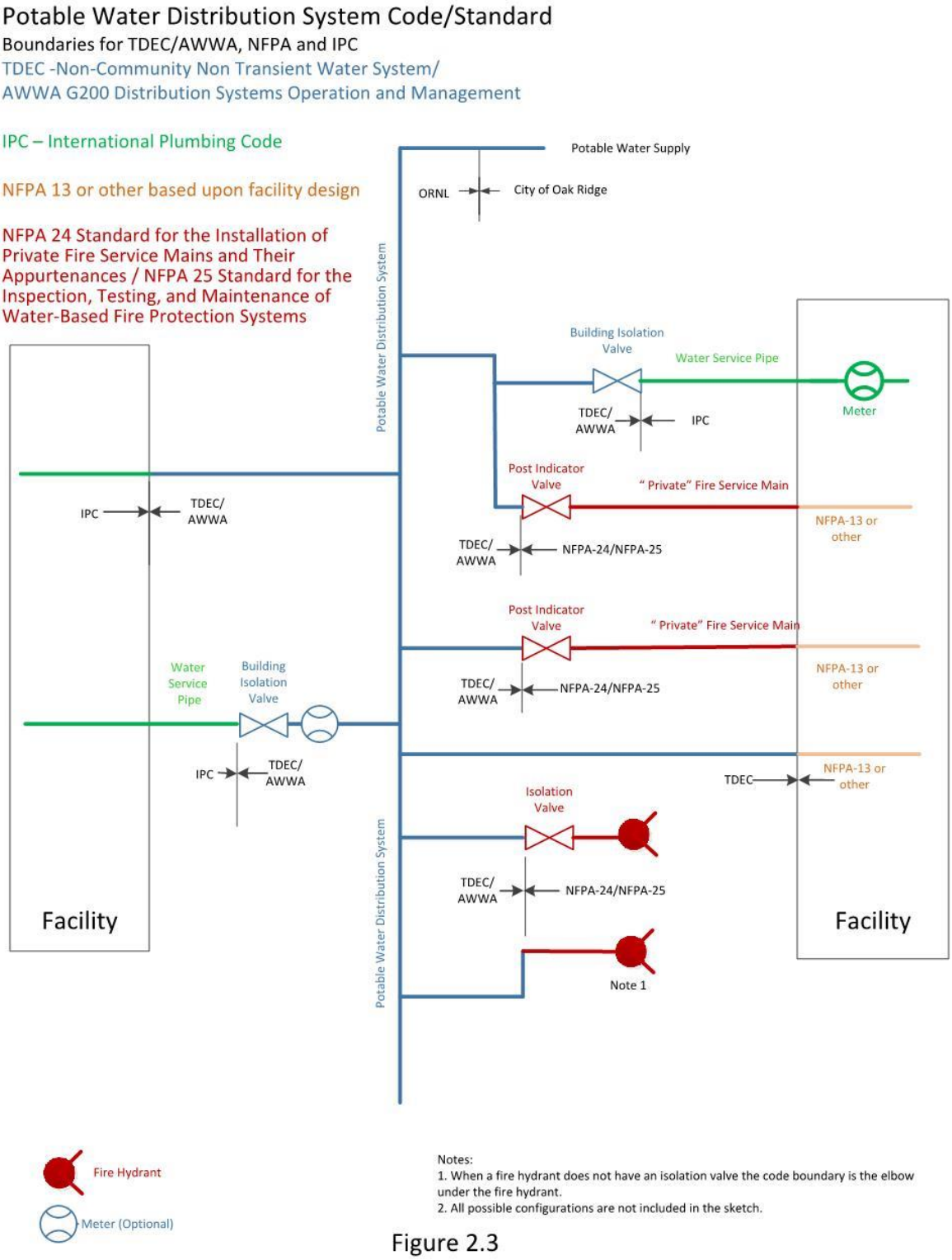

Potable Water Distribution System Code/Standard
Boundaries for TDEC/AWWA, NFPA and IPC
TDEC -Non-Community Non Transient Water System/
AWWA G200 Distribution Systems Operation and Management
IPC – International Plumbing Code
NFPA 13 or other based upon facility design
NFPA 24 Standard for the Installation of Private Fire Service Mains and Their Appurtenances / NFPA 25 Standard for the Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems
Potable Water Supply
ORNL
City of Oak Ridge
Potable Water Distribution System
Building Isolation Valve
Water Service Pipe
Meter
TDEC/ AWWA
IPC
Post Indicator Valve
" Private" Fire Service Main
NFPA-13 or other
TDEC/ AWWA
NFPA-24/NFPA-25
IPC
TDEC/ AWWA
Water Service Pipe
Building Isolation Valve
Isolation Valve
TDEC
Note 1
Facility
Facility
Fire Hydrant
Meter (Optional)
Notes:
1. When a fire hydrant does not have an isolation valve the code boundary is the elbow under the fire hydrant.
2. All possible configurations are not included in the sketch.

Figure 2.3