

Environmental Cost Element Structure at Levels 3, 4, and 5 with Definitions

Adjunct

to

ASTM Classification Standard E2150-02 □ Standard
Classification for Life-Cycle Environmental Work
Elements □ Environmental Cost Element Structure

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ACRONYMS

Acronym	Terms
A/E	Architect Engineer
A/PEG	Glycolate/Alkali Metal//Polyethylene Glycol
ACE Team	Applied Cost Engineering Team
ACM	Asbestos Containing Material
ALARA	As Low as Reasonably Achievable
ARAR	Applicable or relevant and appropriate requirement
AST	Aboveground Storage Tank
BRA	Baseline Risk Assessment
BTEX	Benzene, Toluene, Ethyl benzene, and Xylene
BTU	British Thermal Unit
CDF	Confined Disposal Facility
CEP	Catalytic Extraction Process
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CLP	Certified Laboratory Procedure
CMS	Corrective Measure Study
COA	Code of Accounts
COE	Corps of Engineers
CW	Circulating Well
CWM	Chemical Warfare Materials
D&D	Decontamination and Decommissioning
DDT	1,1,1-trichloro-2,2-bis(p-chlorophenyl)ethane
DNAPL	Dense Non-Aqueous Phase Liquids
DOD	Department of Defense
DOE	Department of Energy
EA	Each
EA/YR	Each per Year
EC ²	Environmental Cost Engineering Committee
ECAS	Environmental Cost Analysis System
ECES	Environmental Cost Element Structure
EM	Environmental Management
EPA	Environmental Protection Agency
ER	Environmental Restoration
FRTR	Federal Remediation Technology Roundtable
FS	Feasibility Study
GAC	Granular Activated Carbon
GIS	Geographical Information System

HEC	High Energy Corona
HEPA	High Efficiency Particulate Air
HQ	Headquarters
Hr.	Hour
HRS	Hazard Ranking System
HTRW	Hazardous, Toxic, and Radioactive Waste
HVAC	Heating, Ventilation, and Air Conditioning
ICEG	Interagency Cost Estimating Group
ISM	Integrated Safety Management
ISV	In-situ Vitrification
KG	Kilogram
KM	Kilometer
KWH	Kilowatt hour
LNAPL	Light Non-Aqueous Phase Liquids
LS	Lump Sum
LS/YR	Lump Sum per Year
LSA	Low Specific Activity
LTS	Long-Term Stewardship
LTSM	Long-Term Surveillance and Maintenance
M	Meter
MO	Month
M/YR	Meters per Year
M ²	Square Meters
M ² /YR	Square Meters per Year
M ³	Cubic Meter
M ³ /YR	Cubic Meters per Year
MGD	Million Gallons per Day
NEPA	National Environmental Policy Act
NPDES	National Pollution Discharge Elimination System
O&M	Operations and Maintenance
OB	Open Burn
OD	Open Detonation
OE	Ordnance and Explosives
OECD	Organization of Economic Cooperation and Development
OR	Oak Ridge
PA/SI	Preliminary Assessment/Site Investigation
PAH	Polycyclic Aromatic Hydrocarbons
PCB	Polychlorinated Biphenyls
PCP	Pentachlorophenol
POTW	Publicly Owned Treatment Works
PPE	Personal Protection Equipment

PRP	Potentially Responsible Party
PSI	Pounds per Square Inch
PSIG	Pounds per Square Inch Gauge
QA	Quality Assurance
QC	Quality Control
RA	Remedial Action
RBC	Rotating Biological Contactor
RCRA	Resource Conservation and Recovery Act
RD	Remedial Design
RFA	RCRA Facility Assessment
RFI	RCRA Facility Investigation
RI	Remedial Investigation
RL	Richland
RSA	Reactor Scram Assembly
SLTM	Surveillance and Long-Term Maintenance
SRS	Savannah River Site
SVE	Soil Vapor Extraction
SVOC	Semi-Volatile Organic Compound
TCE	Trichlorethylene
TNT	Tri-Nitro-Toluene
UOM	Unit of Measure
UST	Underground Storage Tanks
UV	Ultraviolet
UXO	Unexploded Ordnance
VE	Value Engineering
VOC	Volatile Organic Compound
WBS	Work Breakdown Structure
WIPP	Waste Isolation Pilot Plant
WM	Waste Management

INTRODUCTION

ASTM Standard E2150-02, Standard Classification for Life-Cycle Environmental Work Elements—Environmental Cost Element Structure, establishes the first two levels of the cost structure. In many cases, users may require more details of environmental costs than are contained in the Standard. This Adjunct provides more detailed elements and definitions of the Environmental Cost Element Structure (ECES) at Levels 3, 4, and 5 that are needed to support the Standard.

The ECES is a comprehensive hierarchical list of elements (tasks, items, or products) required to accomplish an environmental management project. The ECES concept was conceived by the Interagency Environmental Cost Engineering Committee consisting of members from the Department of Energy, the Environmental Protection Agency, the Corps of Engineers, the Navy, the Air Force, NASA, and Department of the Interior. The ECES Standard and this Adjunct together contain up to five levels of detail. Level 1 (uppermost tier) elements encompass the life-cycle phases of an environmental program, Level 2 elements list major work products or categories of work generally required to accomplish the Level 1 elements, and Level 3 elements provide a more detailed breakdown of elements required to perform environmental work. The elements at Levels 4 and 5 are further extensions of Level 3 and Level 4 elements providing more details to describe the work.

The Adjunct includes a table with all five levels of the ECES structure. The descriptions, however, focus on the detailed elements of work established at Levels 3, 4, and 5. The descriptions indicate what items are included, and as appropriate, not included for the element and refer to those elements that are more applicable when performing environmental management work. Each detailed element also includes the phase number, a list of subordinate elements, supplemental notes as required, and units of measure (UOM). For those programs, projects, or organizations that have a need for a more detailed breakdown of cost elements than is available in this Adjunct, it is recommended that the detailed breakdown summarize at least to the level provided in the Adjunct.

It should be noted that the environmental technologies included in this document are currently known technologies. When new technologies for environmental cleanup are developed and deployed the Standard and the Adjunct will be updated. Use of these technologies or other new technologies will depend on site conditions, and input from users, stakeholders and/or regulators.

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ALL LEVEL MATRIX

Print the Excel file and insert the matrix pages here.

DEFINITIONS

.01.00 Program Management, Support, and Infrastructure (Optional)

.01.01 Program Management

All Phases—Activities by personnel who plan and oversee and plan the environmental program and develop and coordinate policy. Activities include develop guidance, resolve of environmental compliance and project integration issues, and management of multiple projects. UOM=LS

.01.01.01 Program Planning

All Phases—Plan and establish goals, missions, organizational hierarchy, and strategies; coordinate and evaluate work; evaluate contracting approaches; and related tasks. Obtain personnel and other resources (e.g., computers, travel funds, supplies) needed for planning such activities. UOM=LS

.01.01.02 Compliance Management

All Phases—Manage and supervise to ensure that the program remains compliant with regulatory and technical requirements and development of program procedures and policies. UOM=LS

.01.01.03 Pollution Prevention Management

All Phases—Establish policies, develop documents, and perform activities to ensure program is conducting pollution prevention and waste minimization activities. UOM=LS

.01.01.04 Conservation/Environmental Program Management

All Phases—Manage and supervise other managers and manage the program wide activities, including coordinate-work, evaluate personnel, and provide overall guidance. UOM=LS

.01.01.05 Meetings and Interfaces

All Phases—Attend, participate in, and conduct meetings and interfaces to discuss issues, plan activities, coordinate efforts, support auditors, or address other program needs. Cost of travel and per diem for attending and participating in meetings are included here. UOM=LS

.01.01.06 Budgeting and Financial Controls/Tracking/Reporting

All Phases—Prepare, consolidate, update, allocate, manage, track, control, and report cost, budgets, and financial information. Also, respond to budget requests from various organizations, draft congressional reports, and compile questions and answers. UOM=LS

.01.01.9X Other

All Phases—Other activities associated with personnel resources. UOM=LS

.01.02 Program Support

All Phases—Provide support to the program including travel, training, public affairs, community relations, engineering support, legal support, administrative support, regulatory agency support, and procurement of equipment and supplies for offices. Consultants who provide program planning and program management support are also included. . UOM=LS

.01.02.01 Training/Certification

All Phases—Develop training course and/or costs to train and certify personnel that are funded at the program level. Element includes costs for computer based training, and for instructors, classrooms, equipment rentals, supplies, and record keeping of training and certifications. UOM=Hr.

.01.02.01.01 HAZWOPER Training

All Phases—Develop training course and/or costs to train and maintain qualification of personnel on hazardous waste operation initial and refresher training course and requirements. UOM=Hr.

.01.02.01.02 Site Orientation/Emergency Training

All Phases—Develop training course and/or costs to train personnel on site orientation, dosimeter usage, site rules, policies (i.e., diversity, sensitivity, benefits, etc.), and emergency procedures (exit routes, exposure minimization, emergency announcement and phone numbers, etc.). UOM=Hr.

.01.02.01.03 Security Training

All Phases—Develop training course and/or costs to train personnel on security procedures and rules. UOM=Hr.

.01.02.01.04 Ethics Training

All Phases—Develop training course and/or costs to train personnel on ethics procedures and rules. UOM=Hr.

.01.02.01.05 Waste Containment, Handling, Labeling, Packaging, Transportation, and Disposal

All Phases—Develop training course and/or costs to train personnel on handling, packaging, labeling, transportation, and disposal of waste including hazardous, mixed, and radioactive waste. UOM=Hr.

.01.02.01.9X Other Training and Certification

All Phases—Other training and certification courses not mentioned above. UOM=Hr.

.01.02.02 Public Affairs/Community Relations

All Phases—Activities and costs associated with public affairs and community relations such as tours of the site, interaction with news media, distribution of videos, and other similar tasks. UOM=LS

.01.02.03 Administrative Support

All Phases—Provide clerical/secretarial support such as word processing, collecting and compile administrative information, process travel and procurement, track time and review timesheets for completeness and accuracy, answer phones, and similar tasks captured under program account. UOM=LS

.01.02.04 Procurement and Contracting - Equipment, Material, and Labor

All Phases—Support contracting or procurement activities (e.g., obtain site-wide contractors; track status of site contracts; track procurements; purchase items for use at site; and establish procurement strategy, goals, and policies). UOM=LS

.01.02.05 Engineering and Supervision

All Phases—Provide technical support, engineering, and supervision for the program. UOM=LS

.01.02.06 Surveying and Quality Control

All Phases—Survey the site or program and ensure quality assurance and control of on-site activities and programs. Activities include: Conduct self-assessments, inspect products and equipment, review policies and business practices, and related activities. The survey or inspection may be technical (e.g., engineering inspection of program, completeness and quality of work) or administrative type (e.g., ensuring correct hours and charge codes are used). UOM=LS

.01.02.07 Legal Support/Regulatory Interaction

All Phases—Provide legal and regulatory support for law suits, interpretation of contracts and regulations, regulatory interaction, labor arbitration and mediation, fraud issues, and other similar tasks at the program level. UOM=LS

.01.02.08 Medical/Health and Safety

All Phases—Develop and implement medical, health, and safety program such as personnel dosimetry, radiation counting and portal access monitoring, and related tasks at the program level. UOM=LS

.01.02.08.01 Personnel Dosimetry

All Phases—Personnel dosimetry activities (i.e., read, keep records, track exposure, issue reports, develop and maintain procedures, etc.) that are captured at the site/program account. UOM=LS

.01.02.08.02 Personnel Radiation Counting

All Phases—Personnel radiation counting activities (i.e., read, keep records, track exposure, issue reports, develop and maintain procedures, etc.) that are captured at the site/program account. UOM=LS

.01.02.08.03 Personal Protective Equipment/Respirators/Ventilators

All Phases—Purchase, store, track, calibrate, repair, and maintain personnel protective equipment that is captured at the site/program account. UOM=LS

.01.02.08.04 Industrial Safety (Heat, Cold, Stress, Noise, Odor Monitoring; Industrial Hygiene, Confined Space, Etc)

All Phases—Support and oversee industrial safety activities that are captured at the site/program account. UOM=LS

.01.02.08.05 First Aid/Emergency Response

All Phases—Perform first aid and emergency response at the site/program level. Includes site emergency preparedness such as conduct and participate in emergency drills and evacuations. UOM=LS

.01.02.08.06 General Safety Monitor

All Phases—Perform support and oversight for general safety monitoring that is captured at the site/program account. UOM=LS

.01.02.08.07 Safety Evaluation and Investigations

All Phases—Perform support and oversight for safety evaluation and investigation activities that are captured at the site/program account. UOM=LS

.01.02.08.08 Dosimetry System (Electronic And Thermoluminescence Dosimeter Reader)

All Phases—Issue and maintain dosimetry readers that are captured at the site/program account.. UOM=LS

.01.02.08.09 Instrument Calibration, Health and Safety QA/QC

All Phases—Calibrate medical, safety, and health equipment, and ensure that the quality assurance and quality control of the equipment are met. These costs are captured at the site/program account. UOM=LS

.01.02.08.10 Medical Examinations

All Phases—Provide for personnel medical examinations that are captured at the site/program account. UOM=EA

.01.02.08.11 Portal or Access Monitoring

All Phases—Support for portal or access monitoring that is captured at the site/program account. UOM=LS

.01.02.08.12 Criticality Safety Program

All Phases—Developoversee, and implement nuclear criticality and radiation safety program, Activities including ALARA program, and records management. Also includes: drafting policies on radiation exposure and nuclear safety, reviewing and update of documents, and related activities. UOM=LS

.01.02.09 Consultants and Expertss

All Phases—Obtaining and utilize consultants and experts. UOM=LS

.01.02.10 Human Resources

All Phases—Perform benefits administration, including: negotiate employee salary/payroll, investigate and resolve employee complaints, interact with unions, develop and distribute job descriptions, advertise, screen and test employees, check references, ensure diversity and equal employment opportunity, maintain employee records and data, develop and establish human resource policies, and related services.. UOM=LS

.01.02.9X Other

All Phases—Other activities associated with performing program support requirements. UOM=LS

.01.03 Program Infrastructure

All Phases—This element accounts for resources associated with development and maintaining infrastructure and property ownership. This includes overhead elements such as: insurance, interest, fees, rent, warehousing, building maintenance, and equipment maintenance. UOM=LS

.01.03.01 Cost of Ownership

All Phases—Costs associated with owning the program or site such as leasing space, housing, or facilities; owning or leasing equipment; and other fixed costs related to environmental work. UOM=LS

.01.03.01.01 Rent for Office Space and Housing

All Phases—Rent or lease office space and/or housing. UOM=MO

.01.03.01.02 Fixed Costs Related to Environmental Work

All Phases—Fixed costs such as depreciation expenses, cost of storage, maintenance of unused equipment, and other similar costs. UOM=LS

.01.03.01.03 Ownership of Temporary Construction Facilities

All Phases—Cost associated with ownership of temporary construction facilities such as depreciation, inspection, maintenance, and storage fees. UOM=LS

.01.03.01.9X Other

All Phases—Other costs associated with owning the site. UOM=LS

.01.03.02 Interest and Fees and Cost of Money

All Phases—Interests and fees paid or earned on loans. Cost of commissions and fees associated with investments are included with this element. UOM=LS

.01.03.03 Reserved for Future Use

.01.03.04 General and Administrative

All Phases—Provide for accounting, payroll, office supplies, corporate officers, travel for corporate officers, marketing, office moves and relocations, and other miscellaneous costs not captured in other ECES elements such as .01.02.10 or .01.03.07. UOM=LS

.01.03.05 Award Fee

All Phases—Incentive fees, in addition to fixed fees associated with performance on a contract. UOM=LS

.01.03.06 Fixed Fee

All Phases—Fees associated with performance on a contract minus less incentives. UOM=LS

.01.03.07 Support Services

All Phases—Services provided to support the functioning and operations of a program or site. UOM=LS

.01.03.07.01 Computer Support/Hotline

All Phases—Provide computer hardware, software, and Internet support such as installation of hardware and software, testing, homepage development and hosting, e-mail services, hotline help, and related tasks. Programming and database development for specific applications should be captured under .09 or .10.10. . UOM=LS

.01.03.07.02 Cafeteria/food Services

All Phases—Provide snack, food, and cafeteria services to the site. UOM=LS

.01.03.07.03 Cleaning/Janitorial

All Phases—Provide cleaning and janitorial services to offices, housing, and other facilities. UOM=LS

.01.03.07.04 Laundry

All Phases—Provide hot and cold laundry services at the site.. UOM=LS

.01.03.07.05 Transportation Services

All Phases—Establish and provide services for employees to travel by bus, van, automobile, or bicycle between offices, sites, and other locations.. UOM=KM

.01.03.07.06 Mail Services

All Phases—Establish and provide service for sending, collecting, receiving, delivering, and distributing mail and packages for the site.. UOM=LS

.01.03.07.07 Library Services

All Phases—Establish and provide library services such as purchase and organize of books, records, videos, and documents; maintain and track borrowed items; research and find articles, documents, and other information; and other library services. UOM=LS

.01.03.07.08 Video and Photography

All Phases—Establish and provide services for video taping, filming, and photographing and for the editing and development of these products.. UOM=LS

.01.03.07.9X Other

All Phases—Other support services not identified above. UOM=LS

.01.03.08 Project Utilities

All Phases—Cost of utilities that is captured under the program account. UOM=LS

.01.03.08.01 Telephone Usage

All Phases—Cost of telephone, faxes, Internet access, and other communication media that is captured under the program account. UOM=LS

.01.03.08.02 Electrical Usage

All Phases—Cost of electrical/electricity use that is captured under the program account. UOM=KWH

.01.03.08.03 Sewer Usage

All Phases—Cost associated with sewer service that is captured under the program account. UOM=M³

.01.03.08.04 Water Usage

All Phases—Cost associated with clean water distribution, maintenance, and usage that is captured under the program account. UOM=M³

.01.03.08.05 Gas Usage

All Phases—Cost associated with gas usage that is captured under the program account. UOM=M³

.01.03.08.9X Other

All Phases—Cost associated with other utilities that are not captured by above elements. UOM=LS

.01.03.09 Miscellaneous Project Expenses

All Phases—Miscellaneous or minor project expenses that are not captured under Program Infrastructure. UOM=LS

.01.03.10 Equipment Maintenance and Storage (Motor Pool)

All Phases—Establish and operate the shop area for maintenance and storage (i.e., equipment and motor pool) of equipment (i.e., forklifts, cranes), trucks, automobiles, and other items. Cost of transfer of equipment to pool and storage area is also included. UOM=M²

.01.03.11 Traffic Control and Security (.01.02.08)

All Phases—Establish the initial traffic and security program and operate the traffic control and security systems. Activities include: develop traffic and security policies and training. UOM=LS

.01.03.11.01 Guardhouses

All Phases—Install or construct and operate and maintain guardhouses. UOM=M²

.01.03.11.02 Access Monitoring, Protection, and Control

All Phases—Construct access facilities, and perform access monitoring, protection, and control operations. Costs also include badging and the development of policies and training to implement this element. UOM=LS

.01.03.11.03 Barricades and Barriers

All Phases—Establish and remove, if needed, barricades and barriers for security of facilities and personnel. UOM=M

.01.03.11.04 Administrative Controls

All Phases—Develop, install, and implement administrative controls (e.g., signs, markers, access policies) for traffic and security. UOM=LS

.01.03.11.05 Deployment of Guards and Security Forces

All Phases—Deploy guards and security forces for various purposes. UOM=EA

.01.03.11.06 Traffic Control, Signs and Markers, Barricades, Road Markings, Etc.

All Phases—Install and maintain controls, signs, markers, lights, barricades and other items for traffic management. UOM=LS

.01.03.11.9X Other

All Phases—Other costs associated with traffic control and security. UOM=LS

.01.03.12 General Site Maintenance (Road Clearing, Snow Removal, Site Cleanup, Etc.)

All Phases—Perform general site maintenance such as road clearing, lawn upkeep, snow removal, site cleanup, and road and facility maintenance. UOM=M²

.01.03.13 Contingency

All Phases—The amount set aside to account for unforeseen events and other risks. UOM=LS

.01.03.14 Taxes

All Phases—Taxes that are included in the cost of the program. These do not include payroll taxes such as social security, unemployment, or worker's compensation that are part of the labor personnel cost. UOM=LS

.01.03.14.01 Federal Tax

All Phases—Taxes that are levied by the Federal Government against income of a company. UOM=LS

.01.03.14.02 State Tax

All Phases—Taxes that are levied by the state Government against income of a company. UOM=LS

.01.03.14.03 Local or County Taxes

All Phases—Taxes levied by the city, communities or the county for use of its facilities or services, or for being located in specialty areas such as a flood control district.. UOM=LS

.01.03.14.04 Sale Taxes

All Phases—Taxes on the sale on material and equipment purchased. UOM=LS

.01.03.14.9X Other

All Phases—Other taxes such as property taxes or foreign taxes that may apply. UOM=LS

.01.03.15 Insurance

All Phases—Cost for insurance such as liability, builder's risk, bid bond, performance bond, payment bond, and other insurance that may be needed. UOM=LS

.01.03.16 Work Force Transition

All Phases—Transitioning the work force from current work type to another field or for reducing the work force. UOM=LS

.01.03.16.01 Orderly Progression From Operations to Shutdown

All Phases—Activities associated with progression from operations to shutdown such as development of policies and procedures, closing of facilities and offices, shutdown of areas, and movement of personnel. UOM=LS

.01.03.16.02 Staff Reduction

All Phases—Cost associated with staff reduction such as severance pay, counseling, identifying areas of need, mailing and announcements, reassignment of personnel, and related tasks. UOM=LS

.01.03.16.03 Re-assignment/Training

All Phases—Reassign personnel and provide training for new responsibilities. UOM=EA

.01.03.16.04 Key Employee Retention/Incentive Programs

All Phases—Incentives to retain employees or to encourage early retirement and resignations. UOM=LS

.01.03.16.9X Other

All Phases—Other costs associated with work force transition. UOM=LS

.01.03.17 Fire Protection

All Phases—Establish, operate, and maintain the site fire protection program. UOM=LS

.01.03.18 Refueling Station/Maintenance Shop

All Phases— Establish, operate, and maintain the refueling station and shop for minor maintenance of vehicles (e.g., filling windshield wiper and radiator fluids, cleaning of windshields, vacuuming, etc). UOM=LS

.01.03.19 Asset Recovery

All Phases—Sale of equipment and material such as clean or unused pumps, precious materials, facilities, land and other items. UOM=LS

.01.03.20 Contractor Transition Cost

All Phases—Costs associated with transitioning of contractors such as changing documents, establishing new policies, establishing offices, reorganizing, accommodating new accounting structures, and similar activities. UOM=LS

.01.03.9X Other

All Phases—Other costs associated with Program Infrastructure. UOM=LS

.01.04 Government-Personnel Resources

All Phases—Government personnel who oversee and plan the environmental program, and develop and coordinate policy. Activities include development of guidance, resolution of environmental compliance and project integration issues, and management of multiple projects. UOM=LS

.01.05 Government-Program Support

All Phases—Government resources to provide support to the environmental program. This would include resources for travel, training, public affairs, community relations, engineering support, legal support, administrative support, regulatory agency support, procurement of equipment and supplies for offices, and consultants who provide program planning and program management support. UOM=LS

.01.06 Government-Program Infrastructure

All Phases—Government resources associated with maintaining a Government agency's infrastructure and property ownership. This includes overhead elements such as insurance, interest, fees, rent, warehousing, building maintenance, equipment maintenance, etc. required to implement environmental programs. UOM=LS

.01.9X Other

All Phases—Other costs associated with program management, support, and infrastructure. UOM=LS

.02.00 Project Management and Support (Operable Unit/Solid Waste Management Unit)

.02.01 Project Management/Support/Administration

All Phases—Personnel and resources for the management and control of project activities. The element also includes scoping: scope, plan, estimate, execute, track, control, report, analyze, and close the project. This element also includes direct management of the project and the support and administrative functions needed for successful project management. UOM=LS

.02.01.01 Project Management

All Phases—Manage the project to ensure the scope, cost, and schedule are established and maintained. UOM=LS

.02.01.01.01 Develop Cost Estimate

All Phases—Initiate, develop, revise, and maintain project cost estimate for baselines, bids, change orders, and other uses. UOM=LS

.02.01.01.02 Cost/Schedule Control System

All Phases—Develop, track, and control cost and schedule; develop and print reports and charts; and update the cost/schedule control system. UOM=LS

.02.01.01.03 Value Engineering/Cost Analysis

All Phases—Establish and implement an organized application of common sense and technical knowledge directed at finding and eliminating unnecessary costs in a project. UOM=LS

.02.01.01.04 Engineering Network Analysis

All Phases—Develop and upgrade the engineering network analysis, develop and print reports and charts, and maintain the network system. UOM=LS

.02.01.01.05 Equipment Status

All Phases—Personnel and systems to manage, track, and report the status of equipment and equipment inventory. UOM=LS

.02.01.01.06 Scoping Meetings to Define Project Scope and Clean-Up Goals

Phases 1-3—Attend meetings with management, clients, regulators, stakeholders, and other parties to discuss and present issues. UOM=LS

.02.01.01.07 Site Visit

All Phases—Travel and personnel cost associated with going to site to review status of project, to survey site, and perform other activities. UOM=LS

.02.01.01.08 Data Evaluation

All Phases—Evaluate data, reports, and documents. Also includes developing forecasts and trends based on the evaluations. UOM=LS

.02.01.01.09 Public Meetings/Hearings (i.e., With Potentially Responsible Parties)
Phases 1-3—Attend public meetings/hearings with potentially responsible parties (PRP), stakeholders, regulators, management, and other personnel or organizations. UOM=LS

.02.01.01.10 Reviews and Reports
All Phases—Participate in reviews such as cost audits, engineering design reviews, schedule review, document reviews, and document reviews and develop presentations and reports on review findings. UOM=EA

.02.01.01.11 Proposed Plan
Phases 1-3—Provide support and input to the development of a plan which outlines the nature and extent of contamination at the site, the alternatives evaluated, and the preferred approach to remediation, and distribute plan to the public for input and comment. UOM=LS

.02.01.01.12 Responsiveness Summary Report
All Phases—Review comments, and draft, review, and update reports that summarize the agency/organization responses to public, stakeholder, and regulatory concerns and comments. UOM=EA

.02.01.01.13 Work Assignment Closeout
All Phases—Activities involved with closing out a work assignment such as: ensure all work assignment requirements and criteria have been met; and financial closure, such as ensure all money has been paid and funds deobligated. UOM=EA

.02.01.01.14 Project Closeout
All Phases—Activities involved with closing out projects such as: ensure all project criteria have been met satisfactorily, plan physical closure of site or project, and ensure financial closure (e.g., ensure all bills have been paid, funds deobligated, and money is removed from accounts). UOM=EA

.02.01.01.15 Field Supervision
All Phases—Coordinate, report, and supervise labor and professional personnel at the work or project site. This activity also includes field- engineering activities. UOM=LS

.02.01.01.16 QA/QC and Site Inspection
All Phases—Perform quality assurance, quality control, and site inspection to ensure compliance with technical specifications, environmental laws, health and safety regulations, and other requirements. UOM=LS

.02.01.01.17 Schedules and Schedule Estimates
All Phases—Determine, develop, and refine the schedule, including schedule contingency, for the project. UOM=LS

.02.01.01.18 Product Review, Inspection, Testing, and Acceptance

Phases 3 and 4—Review, test, evaluate, and inspect products and services prior to acceptance to ensure the products or services meet the specifications. UOM=LS

.02.01.01.9X Other

All Phases—Other project management activities. UOM=LS

.02.01.02 Support Subcontracting Activities

All Phases—Support for subcontracting activities such as procurement, management, and oversight of subcontractor. UOM=LS

.02.01.02.01 Procurement of Subcontractors

All Phases—Support for the procurement of subcontractors. UOM=LS

.02.01.02.02 Subcontract Management

All Phases—Manage and oversee subcontractors. UOM=LS

.02.01.02.03 Contractor QA Program

All Phases—Develop, implement, and perform contractor quality assurance program. UOM=LS

.02.01.02.04 Coordination With Analytical Laboratory

All Phases—Coordinate and integrate activities with analytical laboratories. UOM=LS

.02.01.02.9X Other

All Phases—Other costs associated with supporting subcontracting activities. UOM=LS

.02.01.03 Administration/Reporting

All Phases—Provide for project administration and reporting tasks and supports such as preparing agenda, attending and participating in meetings, coordinating with personnel, and related tasks. UOM=LS

.02.01.03.01 Meeting Participation/Routine Communications

All Phases—Participate in meetings and conduct routine coordination, communications, and briefings. UOM=LS

.02.01.03.02 Presentation Materials

All Phases—Prepare and print presentation and briefing materials. UOM=LS

.02.01.03.03 Preparation of Documents

All Phases—Assist with and input to preparation of reports, summaries, memos, and other documents. UOM=LS

.02.01.03.04 Compile Documents

All Phases—Draft and write documents including solicit comments, identify comment resolutions, incorporate comments, and other activities. UOM=EA

.02.01.03.05 Assemble/Update Record and Index

All Phases—Collect, organize, assemble, and update records and indexes. UOM=LS

.02.01.03.06 Cost and Performance Status

All Phases—Document and provide reports on status of cost, schedule, and performance of the project. UOM=LS

.02.01.03.07 Billings

All Phases—Provide support and oversight for billing clients and paying vendors that is captured under the specific project. UOM=LS

.02.01.03.9X Other

All Phases—Other activities associated with administration/reporting. UOM=LS

.02.01.04 Studies and Post-Design Support

Phases 2-4—Provide technical support to studies and engineering design. UOM=LS

.02.01.04.01 Technical Assistance—Responsiveness Summary

Phases 2-4—Provide technical and administrative support and assistance to develop responsiveness summary including draft the summary, collect comments, develop responses, and update the summary. UOM=LS

.02.01.04.02 Technical Assistance-Proposed Plan and Record of Decision

Phases 2-4—Provide technical support and assistance to develop Proposed Plan and Record of Decision including draft the documents, collect comments, develop responses, and update the documents. UOM=LS

.02.01.04.03 Feasibility Addendum

Phases 2-4—Provide technical support and assistance to prepare and update addendum, supplements, or additional data to the feasibility study. UOM=LS

.02.01.04.9X Other

Phases 2-4—Provide other technical and administrative support for post studies and design tasks. UOM=LS

.02.01.05 Negotiation Support

All Phases—Provide technical support and assistance to negotiation with regulators, stakeholders, contractors, or other parties. UOM=LS

.02.01.05.01 Negotiation Sessions and Meetings

All Phases—Attend meetings with management, clients, regulators, stakeholders, and other parties for negotiation purposes. UOM=LS

.02.01.05.02 Review of Potential Responsible Party (PRP) Documents

All Phases—Perform technical support and assistance with review of PRP documents. UOM=LS

.02.01.05.03 Technical Memorandums

All Phases—Perform technical support and assistance to develop and update technical memorandums. UOM=LS

.02.01.05.9X Other

All Phases—Provide support for other tasks needed for negotiation support. UOM=LS

.02.01.06 Administration Record

All Phases—Costs to initiate, maintain, and update administrative records. UOM=LS

.02.01.06.01 Coordinate With Administrative Record Coordinator

All Phases—Coordinate work with the administrative record coordinator. . UOM=LS

.02.01.06.02 Assistance in Document Compilation

All Phases—Provide assistance with the document compilation. UOM=LS

.02.01.06.03 Draft Administrative Record Index

All Phases—Draft administrative record index. UOM=LS

.02.01.06.04 Administrative Record Index

All Phases—Prepare, update, and maintain administrative record index and record system. UOM=LS

.02.01.06.05 Duplication of Administrative Record Index

All Phases—Coordinate duplication of the administrative record or backup files. . UOM=LS

.02.01.06.06 Assembly of Administrative Record And Index

All Phases—Costs associated with gathering and assembling administrative records and indexes. UOM=LS

.02.01.06.9X Other

All Phases—Provide for other tasks associated with administration records. UOM=LS

.02.01.9X Other

All Phases—Provide other tasks associated with project management, support, and administration. UOM=LS

.02.02 Community Relations

All Phases—Activities required to inform the public of project activities and appropriately involve the public in decisions related to environmental management activities of sites. UOM=LS

.02.02.01 Community Interviews

Phases 1-3—Conduct interviews and surveys of the community, stakeholders, and public on various issues. UOM=LS

.02.02.02 Support for Community Relations

Phases 1-3—Provide community relations support such as: hold stakeholder meetings; draft, update, print, and distribute factsheets and project summary information; organize and give facility or project tours; and similar activities. UOM=LS

.02.02.02.01 Fact Sheets

All Phases—Prepare, update, print, and distribute project fact sheets and project summary descriptions. UOM=LS

.02.02.02.02 Public Meetings/Hearings

All Phases—Prepare, participate, and conduct meetings/hearing with stakeholders. UOM=LS

.02.02.02.03 Support Briefings

All Phases—Provide clerical and technical support for briefings, presentations, reports, and other activities for the public and community. UOM=LS

.02.02.02.04 Facility Tours

All Phases—Organize and provide facility tours and demonstrations. UOM=LS

.02.02.02.9X Other

All Phases—Provide support for other community-relations activities. UOM=LS

.02.02.03 Public Information Repository

All Phases—Establish, operate, and maintain public information repository. UOM=LS

.02.02.9X Other

All Phases—Provide support for other tasks related to community relations. UOM=LS

.02.03 Regulatory Interaction

All Phases—Submittals and interface activities with local, state, and Federal regulatory agencies. UOM=LS

.02.03.01 Support to Meetings with Regulators

All Phases—Provide clerical and technical support for meetings with regulators such as establish agenda, set up rooms, record and distribute minutes, and other tasks.
UOM=LS

.02.03.02 Coordination of Laws and Regulations

All Phases—Costs to coordinate of laws and regulations, and coordinate efforts to reduce redundancy and omissions. UOM=LS

.02.03.02.01 Preparation of Initial Notification

Phases 1 and 2—Draft, review, and finalize the initial notification letter.
UOM=LS

.02.03.02.9X Other

All Phases—Other costs associated with coordination of laws and regulations.
UOM=LS

.02.03.03 Interagency Agreements

Phases 1-5—Provide for technical, logistical, and administrative support to development of interagency agreements UOM=LS

.02.03.03.01 Agency Review

Phases 1-5—Provide support (administrative and contracting) to coordinate and obtain state and local agencies and non-profit personnel for review of documents, data, and other information. UOM=LS

.02.03.03.02 State and Local Agency Review

Phases 1-5—Provide funding for review of documents, data, and other information by state and local agency and other non-profit organization personnel. UOM=LS

.02.03.03.9X Other

Phases 1-5—Other tasks associated with developing interagency agreements.
UOM=LS

.02.03.04 Regulatory Reports/Reviews

All Phases—Develop regulatory reports and participate in review of regulatory reports.
UOM=EA

.02.03.04.01 Post-construction/Removal Report

Phases 4-6—Develop post construction/removal reports including soliciting, collecting, organizing, responding to, and incorporating comments. UOM=EA

.02.03.04.02 Preliminary Closeout Report

Phases 4-6—Develop preliminary closeout reports including distributing report; and soliciting, collecting, organizing, responding to, and incorporating comments.
UOM=EA

.02.03.04.03 Final Close-Out Report

Phases 4-6—Develop final closeout reports including distributing report; and soliciting, collecting, organizing, responding to, and incorporation of comments. UOM=EA

.02.03.04.04 Five-Year Reviews

Phases 5 and 6—Perform and participate in five-year reviews for CERCLA sites that still have certain amounts of contaminants remaining at site after or as a result of remedial action. UOM=EA

.02.03.04.05 Notice of Site Deletion

All Phases—Develop a memo and the supporting documentation to delete a site from the National Priority List. UOM=EA

.02.03.04.9X Others

All Phases—Other costs associated with regulatory reports/reviews. UOM=EA

.02.03.05 *Regulatory Permits (e.g., RCRA Part B Permit)*

All Phases—Obtain and maintain regulatory permits. UOM=EA

.02.03.05.01 RCRA Permits (see also .03.19)

All Phases—Obtain and maintain RCRA permits. Users need to ensure that there is no duplication of cost captured under .02.03.05.09. UOM=EA

.02.03.05.02 CERCLA Permits

All Phases—Obtain and maintain CERCLA permits. Note: There is no specific permit required under CERCLA for on-site cleanup work nor does CERCLA require a state, Federal, or local permit for on-site cleanup per se; however, the cleanup remedy chosen must comply with all applicable substantive requirements that would be included in a permit. For example, CERCLA (per EPA) preempts RCRA: a Superfund cleanup does not require a RCRA permit but as a policy matter, EPA says that a cleanup should attain or exceed any applicable or relevant and appropriate requirements (ARARs) as long as they are substantive and not procedural. UOM=EA

.02.03.05.03 NRC Permits

All Phases—Obtain and maintain Nuclear Regulatory Commission permits. UOM=EA

.02.03.05.04 NPDES Permits

All Phases—Obtain and maintain NPDES permits. UOM=EA

.02.03.05.05 Transportation Permits

All Phases—Obtain and maintain transportation permits. UOM=EA

.02.03.05.06 Wetland Permits

All Phases—Obtain and maintain wetland permits. UOM=EA

.02.03.05.07 State and Local Permits

All Phases—Obtain and maintain state and local permits. UOM=EA

.02.03.05.08 Air Emissions Permits

All Phases—Obtain and maintain air emission permits.. UOM=EA

.02.03.05.09 Dangerous Waste Permit Application

All Phases—Prepare, apply for, and obtain dangerous waste permit that is issued under the provisions of RCRA and state’s dangerous waste regulations. Users need to ensure that this cost in not captured under .02.03.05.01 or .02.03.05.09. .

UOM=EA

.02.03.05.10 Limited Construction Authorization Request

All Phases—Prepare, apply for, and obtain the limited construction authorization request.. UOM=EA

.02.03.05.11 Construction Authorization Request

All Phases—Prepare, apply for, and obtain the construction authorization request.

UOM=EA

.02.03.05.12 Operations Authorization Request

All Phases—Clerical and technical personnel as well as cost of equipment and material to prepare, apply for, and obtain the operations authorization request.

UOM=EA

.02.03.05.9X Other

All Phases—Obtain other permits. UOM=EA

.02.03.06 Updated Regulatory Permits (e.g., RCRA Part B Permit)

All Phases—Update and modify regulatory permits. UOM=EA

.02.03.07 Action Memorandum

All Phases—Develop Action Memorandum documents for non-time-critical and time-critical removal actions. UOM=EA

.02.03.9X Other

All Phases—Other costs associated with regulatory permits. UOM=EA

.02.04 Institutional Controls

Phases 1-4—Take measures to protect the public health and safety from hazardous, toxic, and radioactive contaminants. This can include such measures as: post warning signs and place fencing around the site. See also Fencing in ECES .05.14. UOM=LS

Phases 5 and 6—Maintain and inspect institutional controls such as repair or replace signs, fencing, gates, documents, and similar activities. If institutional controls are installed during the LTSM Phase, use 4.02.04 to capture the construction cost. UOM=LS/YR

Cross Cut—Implement and maintain site-wide institutional controls that cannot be allocated

to distinct projects. If institutional costs are already included under .01.xx, Program Management, Support, and Infrastructure, do not include in this element. UOM=LS

.02.04.01 Signs and Markers

Phases 1-4 and Cross Cut—Construct and install signs and markers that provide warning and information. UOM=EA

Phases 5-6 and Cross Cut—Costs to maintain, update, or repair signs and markers. UOM=EA/YR

.02.04.02 Conduct Procedures and Manuals

Phases 1-4 and Cross Cut—Develop and implement conduct procedures and manuals. UOM=EA

Phases 5-6 and Cross Cut—Maintain and update conduct procedures and manuals. UOM=EA/YR

.02.04.03 Fencing/Barriers

Phases 1-4 and Cross Cut—Construct and install fencing or barriers. UOM=M

Phases 5-6 and Cross Cut—Maintain and repair fencing and barriers. UOM=M/YR

.02.04.04 Land Record Management

Phase 6—Costs for legal and real estate professionals to incorporate appropriate notifications and restrictions into land record documents for property subject to long-term stewardship (LTS), including property to be transferred from DOE to other parties. This element also includes reviews of all contracts, leases, rights, and access agreements involving property subject to LTS to assure that adequate controls will be maintained. UOM=LS

.02.04.05 Transferred Property Restriction

Phase 6—Reviews of deeds, leases, access agreements, and rights of way for land formerly owned by Government agencies (e.g., DOE), subsequent to transfer of this land from DOE, to evaluate whether appropriate land use restrictions have been incorporated into those documents. UOM=LS

.02.04.06 Verification of Institutional Controls

Phase 6—Audits and inspections to verify that land record restrictions for lands owned by Government agencies (e.g., DOE) and land transferred from Government agencies (e.g., DOE) to other parties, are being maintained and that those restrictions are being implemented. UOM=LS

.02.04.9X Other

All Phases—Other costs associated with institutional controls. UOM=LS

.02.05 Post-design Support

Phases 3 and 4—Engineering and design activities for support of procuring construction (e.g., remediation, decontamination and decommissioning [D&D]) and identifying long-lead items, and pre-bid and pre-award activities. UOM=LS

.02.05.01 Identify Long-Lead Items

Phase 3—Review and identify items, equipment, systems, and activities that may need long-lead time for procurement, installation, regulatory permitting, or other requirements. UOM=LS

.02.05.02 Perform Pre-bid (Pre-solicitation) Activities

Phases 3 and 4—Provide technical and administrative support for pre-bid and pre-solicitation activities. UOM=LS

.02.05.02.01 Support Preparation of Solicitation Package

Phases 3 and 4—Provide technical and clerical support for development and preparation of solicitation packages. UOM=LS

.02.05.02.02 Printing and distribution of contract documents

Phases 3 and 4—Provide support for printing and distribution of contract documents. UOM=EA

.02.05.02.03 Advertising/Soliciting of Bids

Phases 3 and 4—Develop and place advertisements and announcements to solicit bids or interests. UOM=EA

.02.05.02.04 Issuing Addenda

Phases 3 and 4—Develop and issue solicitation addenda. UOM=EA

.02.05.02.05 Pre-Bid (Pre-Solicitation) Meetings

Phases 3 and 4—Plan, attend, and participate in pre-bid and pre-solicitation meetings. UOM=EA

.02.05.02.06 Resolution of Bidder (Offerer) Inquiries

Phases 3 and 4—Collect and develop resolutions on, bidders' inquiries.. UOM=LS

.02.05.02.07 On-site Visits

Phases 3 and 4—Perform on-site visits and tours of the project to potential bidders and other parties. UOM=EA

.02.05.02.9X Other

Phases 3 and 4—Other costs associated with pre-bid support. UOM=LS

.02.05.03 Perform Pre-Award Activities

Phases 3 and 4—Perform pre-award activities such as receiving, collecting, compiling, evaluating, and checking bids. UOM=LS

.02.05.03.01 Receipt of Bids (Offers)

Phases 3 and 4—Collect, store, and track bids and bidder information received. UOM=LS

.02.05.03.02 Determination of Responsive/Responsible Bidders

Phases 3 and 4—Review, evaluate, and determine responsive and responsible bidders. UOM=LS

.02.05.03.03 Bid Tabulation

Phases 3 and 4—Tabulate and organize the bids received. UOM=LS

.02.05.03.04 Bid Analysis

Phases 3 and 4—Review, evaluate, and analyze the bids and bidders. UOM=LS

.02.05.03.05 Follow-Up Items From Lowest Responsible Bidder

Phases 3 and 4—Receive, collect, and track follow-up items from the lowest responsible bidder. UOM=LS

.02.05.03.06 Review of EEO, MBE Requirements, SDB Subcontractor Plans

Phases 3 and 4—Review of Equal Employment Opportunity, Minority Business Enterprise, Small and Disadvantage Business requirements and plans. UOM=LS

.02.05.03.07 Reference Checks

Phases 3 and 4—Conduct research and check references of the bidder. UOM=LS

.02.05.03.08 Request for Consent From EPA

Phases 3 and 4—Draft, finalize, and submit the Request for Consent from EPA. UOM=LS

.02.05.03.09 Support Preparation of Contract Documents

Phases 3 and 4—Help prepare contract documents. UOM=LS

.02.05.03.9X Other

Phases 3 and 4—Other costs associated with pre-award activities. UOM=LS

.02.05.04 Evaluation of Contracting Approaches, Management Options, and Management Approaches

Phases 3 and 4—Evaluate contracting approaches, management options, and management approaches. UOM=LS

.02.05.9X Other

Phases 3 and 4—Other costs associated with post-design support. UOM=LS

.02.06 Procurement and Warehousing of Equipment and Material

Phases 2-5—Personnel and resources used in the procurement and warehousing of the project equipment and materials. Note: Charges for procurement could be included in the cost of the equipment and materials under the various technologies and structure elements. UOM=LS

.02.07 A/E Support

Phases 2-5—Architectural and engineering oversight and support during various phases of the project or site. UOM=LS

.02.07.01 Submittal Reviews

Phases 2-5—Perform technical review of submittals such as designs, specifications, and regulatory requirements. UOM=EA

.02.07.02 Site Inspection and Surveys

Phases 2-5—Travel to site and inspect and survey the site to determine progress and quality of work/product, to determine adherence to specification and designs, and other requirements. UOM=M²

.02.07.03 Document Activities

Phases 2-5—Document, log, and record important or relevant project activities. UOM=LS

.02.07.04 Participate in Construction Management Meetings

Phases 2-5—Prepare and participate in construction management meetings. UOM=EA

.02.07.9X Other

Phases 2-5—Provide support for other A/E activities. UOM=LS

.02.08 Contractor Construction Management

Phases 2 to 4—Oversight of construction projects and oversight of AE contractors by non-Government personnel. UOM=LS

.02.09 Government Construction Management

Phases 2-4—Oversight of construction projects and oversight of AE contractors by Government personnel. UOM=LS

.02.10 Independent Contractor Verification of Cleanup or Reuse

Phases 4-6—Costs associated with obtaining an independent third-party verification that environmental goals and performance have been obtained. UOM=LS

.02.11 Enforcement

Phases 1 and 2—Activities related to the identification and enforcement of responsibilities of the potential responsible party (PRP). Includes PRP searches, negotiation support, and documentation of finding. UOM=LS

.02.11.01 PRP Searches/Field Investigations

Phases 1 and 2—Perform PRP searches and field investigations. UOM=LS

.02.11.02 PRP Negotiation Support

Phases 1 and 2—Support for negotiation with PRP. UOM=LS

.02.11.02.01 Attend Negotiation Sessions And Meetings

Phases 1 and 2—Plan, attend, and participate in meetings and negotiations.

UOM=EA

.02.11.02.02 Review of PRP Documents

Phases 1 and 2—Technical, regulatory, and other review of PRP documents.

UOM=EA

.02.11.02.03 Document Findings

Phases 1 and 2—Document findings and agreements during PRP negotiation process. UOM=LS

.02.11.02.9X Other

Phases 1 and 2—Other costs associated with PRP negotiation support. UOM=LS

.02.12 Asset Recovery

All Phases—This element captures the money received from sale of project assets such as clean equipment, facilities, and materials. UOM=LS

.02.13 Configuration Management

All Phases—This element provides for an integrated management program that establishes accuracy and consistency among design requirements, physical configuration, and facility documentation and that maintains this consistency throughout the life of the facility as changes occur. UOM=LS

.02.14 Project Safety and Health

All Phases—Safety and health costs specifically associated with the project. Example of such costs include support and participation in Integrated Safety Management (ISM) Team; development of Hazard and Safety Analysis Reports; reviewing, updating and maintaining hazard and Safety Analysis Reports; implementation of project-specific health and safety requirements; and other health and safety costs. UOM=LS

.02.14.01 Project Integrated Safety Management

All Phases—Development and participation in the project ISM effort and providing support to the site safety related efforts. UOM=LS

.02.14.01.01 Support, Coordination, and Participation in ISM Teams

All Phases—Provide support to, coordination of, and participation in ISM teams. UOM=LS

.02.14.01.02 ISM Documents Development and Maintenance

All Phases—Develop, review, update, and maintain ISM documents. UOM=LS

.02.14.01.03 Project ISM Implementation Costs

All Phases—Implement requirements, recommendations, and suggestions made by the ISM team. UOM=LS

.02.14.01.9x Other

All Phases—Other activities associated with project safety and health. UOM=LS

.02.14.02 Accident Analysis

All Phases—Conduct safety analysis and identify accidents that could occur at the site and determine measures to minimize the impacts of and occurrences of accidents. This element also includes evaluating and investigating accidents or events that have occurred. Activities include reviewing designs, procedures, material storage, and evaluating work processes, safety equipment, and other factors. UOM=LS

.02.14.03 Risk and Reliability

All Phases—Identify and calculate the risk and reliability of equipment, technologies, procedures, design, and other factors. UOM=LS

.02.14.04 Fire Hazard Analysis

All Phases—Identify measures to minimize the occurrence of fires and impacts of fire accidents. This element also includes evaluating and investigating fires that have occurred. Activities include reviewing designs, procedures, material storage; and evaluating work processes, safety equipment, and other factors. UOM=LS

.02.14.05 Safety Analysis Reports

All Phases—Draft, finalize, update, and maintain Safety Analysis Reports. UOM=EA

.02.14.05.01 Preliminary Safety Analysis Report

All Phases—Draft the Preliminary Safety Analysis Report that includes information such as accident scenarios, accident minimization effort and procedures, and a list of hazardous materials for distribution and comment. Also provide responses to comments and questions. UOM=EA

.02.14.05.02 Final Safety Analysis Report

All Phases—Incorporate comments, finalize, update, and maintain the Final Safety Analysis Report. UOM=EA

02.14.05.9x Other

All Phases—Other activities associated with development and maintenance of Safety Analysis Report. UOM=EA

.02.14.06 Hazard Analysis Reports

All Phases—Draft, finalize, update, and maintain Hazard Analysis Report that identifies hazards; lists the potential hazards and accident scenarios; lists the hazardous materials; and provide other information. UOM=EA

.02.14.07 Project Industrial Safety and Health

All Phases—Provide personnel, material, and equipment for project industrial safety and health. Activities include monitoring, developing procedures and plans, isolating areas, briefing management, supporting assessments, providing recommendations, and related efforts. UOM=LS

.02.14.08 Project Safety Monitoring

All Phases—Provide personnel, material, and equipment needed for project safety monitoring including maintaining safety record, reporting safety data, performing surveillance, providing safety and health physics support, ALARA reviews and implementation, and related efforts. UOM=LS

.02.14.9x Other

All Phases—Other activities associated with project safety monitoring. UOM=LS

.02.15 Contract Closeout

All Phases—Contract closeout activities that carryover to LTS following closure of the site. These activities are associated with former operating contracts that were issued before site closure. Activities associated with administration of contracts issued during LTS are included in element. UOM=LS

.02.16 Realty Services

All Phases—Professional realty services associated with transfer of property from Federal agencies (e.g., DOE) to other parties. Establishment and maintenance of institutional controls in land records for transferred property is included in .02.04, Institutional Control. UOM=LS

.02.17 Regulatory Agency Oversight Staff

All Phases—Costs for direct funding of regulatory agency staff providing oversight to LTS activities. UOM=LS

.02.18 Information Management

All Phases—Activities associated with management of site records and other information related to the site. Level 3 elements address operation of a records management facility; management of records at an off-site archive; management of records in electronic format, including maintenance of hardware, software, and storage media; and records declassification. UOM=LS

.02.18.01 Records Management Facility

All Phases—Operation of a records management facility on site, or at an alternate location, as described in planning documents. This facility maintains site administrative records; provides public access to available records; processes requests for information, including Freedom of Information Act requests; and coordinate retrieval of records from archived and electronic storage. This element includes staff labor and facility rent. UOM=LS

.02.18.02 Archived Records Management

All Phases—Off-site storage of records in a Government-owned archive. This element includes storage fees, costs for record retrieval and shipment, and record destruction at the end of the retention period. UOM=LS

.02.18.03 Electronic Records Management

All Phases—Storage of records in electronic format. This element includes staff labor for operation of the records storage system, facility rental, hardware maintenance, hardware upgrades, software maintenance, and management of storage media.
UOM=LS

.02.18.04 Records Declassification

All Phases—Costs for periodic review and declassification of classified records.
UOM=LS

.02.18.9x Other

All Phases—Other activities associated with information management. UOM=LS

.02.19 Litigation Support

All Phases—Costs for staff labor providing litigation support. UOM=LS

.02.19.01 Workers Compensation Cases

All Phases—Review and responding to workers compensation claims associated with long latency period illnesses. UOM=LS

.02.19.02 Claims Review

All Phases—Receive, evaluate, and initially respond to claims against the site.
UOM=LS

.02.19.03 Claims Management

All Phases—Manage claims after the initial review and response. UOM=LS

.02.19.04 Discovery Review

All Phases—Activities related to discovery including document searches, reviews, and copying. UOM=LS

.02.19.05 Discovery Litigation

All Phases—Support for litigation of claims that are not resolved by alternate means and includes legal services, professional experts, and depositions. UOM=LS

.02.19.06 Freedom of Information Act Reviews

All Phases—Legal reviews of Freedom of Information Act requests. UOM=LS

.02.19.9x

All Phases—Other activities associated with litigation support. UOM=LS

.02.20 Lessons Learned Management

All Phases—Costs for lessons learned management such as writing and posting/sharing lessons learned, inputting into database, tracking, and maintenance and management of collected data
UOM=LS/YR

.02.9X Other

All Phases—Project management activities not described by the above-listed subsystems.
UOM=LS

.03.00 Preparation of Plans and Specifications

.03.01 Workplan

All Phases—Individual generic project workplans identifying the scope of work, schedule, resource requirements, execution, and associated activities. See also .03.14—Environmental Workplan, .03.15□Decommissioning Plan, .03.17 for Combined Workplan, or other elements in .03.xx for specific plans. . UOM=EA

.03.02 Chemical Data Acquisition Plan

All Phases—Prepare, update, and maintain chemical data acquisition plans and tracing the path of the data from receipt in the field or laboratory to the use or storage of the final reported form. The plan addresses standard record-keeping procedures, document control system, and data storage and retrieval. It includes control mechanisms for detecting and correcting paperwork errors and preventing loss of data during data reduction, data reporting, and data entry to forms, reports and databases. . UOM=EA

.03.03 Sampling and Analysis Plan

All Phases—Prepare, update, and maintain sampling and analysis plans that describe how air, water, and soil samples will be collected and analyzed in accordance with technically acceptable protocols. A sampling and analysis plan consists of two parts: (1) a quality assurance project plan, and (2) the field sampling plan. . UOM=EA

.03.03.01 Quality Assurance Project Plan

All Phases—Prepare, maintain, and update the Quality Assurance Project Plan for sampling and analysis.. UOM=EA

.03.03.02 Field Sampling Plan

All Phases—Prepare, maintain, and update the Field Sampling Plan for sampling and analysis.. UOM=EA

.03.03.9X Other

All Phases—Other work performed as part of the sampling and analysis plan..
UOM=EA

.03.04 Health and Safety Plan

Phases 1-5—Prepare, update, and maintain health and safety plans that specify the procedures that are sufficient to protect on-site personnel and surrounding communities from the physical, chemical, or biological hazards. The plan outlines hazards, work areas and lists control procedures, air surveillance procedures, levels of protection, decontamination and emergency plans, arrangements for weather-related problems, and responsibilities for implementing the health and safety plan. . UOM=EA

Cross Cut—This phase includes the health and safety plan developed for the site or program. Use Phases 1-5 if the plan is project specific. . UOM=EA

.03.05 Pollution Control and Mitigation Plan

All Phases—Prepare pollution control and mitigation plans developed to prevent or reduce the impact of a hazardous materials incident on people, property, and the environment. The plan addresses the following response elements: recognizing the type and degree of the hazard present; determining its effect or potential impact on public health, property, and the environment; control measures to reduce or prevent contact of people with the hazardous materials; and cleanup measures for restoring the area to pre-release conditions. UOM=EA

.03.06 Data Management Plan

Phases 1-5—Prepare data management plans that discuss how environmental data will be managed. Environmental data include chemical, physical, risk, hydrological, geological, and economic information. The plan addresses the type of database used, software programs, sample tracking, and how the data will be analyzed and displayed. . UOM=EA

.03.07 Community Relations Plan

All Phases—Prepare community relation plans that outline the community relations history, issues of community concern, and specific community relations activities to be undertaken during the course of a response action. The plan is designed to facilitate two-way communication between the affected community and the agencies responsible for conducting a response action. . UOM=EA

.03.08 Transportation and Disposal Plan (Waste Management Plan)

All Phases—Prepare transportation and disposal plans that address environmental mitigation procedures for hazardous substances that are transported from the site. The plan addresses handling/transporting and disposing of hazardous materials. . UOM=EA

.03.09 Management Plan

Phases 1-5—Prepare a management plan that addresses site specific actions and schedules for implementing response actions necessary to protect human health and the environment.. UOM=EA

Cross Cut—Management plans developed for the program or the site. Use All Phases if the plan is developed for a specific project. . UOM=EA

.03.10 Risk Assessment Plan

Phase 2—Prepare risk assessment plans. These plans provide a qualitative and quantitative evaluation of the risk posed to human health or the environment by the actual or potential presence or use of specific pollutants. The assessment includes contaminant identification, exposure assessment, toxicity assessment, and risk characterization. . UOM=EA

Cross Cut—Risk assessment plans developed for the program or the site. Use All Phases if the plan is developed for a specific project. UOM=EA

.03.11 Technical Project Goals and Objectives

Phases 1-3—Define the scope of response actions to mitigate potential threats to human health and the environment, prevent further environmental degradation, and significantly reduce risks. This includes: develop a conceptual site model, identify data needs and data quality objectives, identify preliminary construction/work objectives and potential alternatives, identify treatability studies, preliminary identification of ARARs of STDs, identify NEPA requirements, and identify other regulatory requirements. UOM=LS

.03.11.01 Develop Conceptual Site Model

Phases 2 and 3—Develop conceptual site models and general project and site goals. UOM=LS

.03.11.02 Identify Data Needs and Data Quality Objectives

Phases 1-3—Establish data criteria and identify data needs and collection process, and other Data Quality Objective activities. UOM=LS

.03.11.03 Identify Preliminary Environmental Action Objectives and Potential Alternatives

Phases 2 and 3—Identify preliminary environmental action objectives and potential alternatives. UOM=LS

.03.11.04 Identify Treatability Studies

Phases 2 and 3—Preliminary identification of goals and objectives of treatability studies. UOM=LS

.03.11.05 Preliminary Identification of ARARs of Standards

Phases 1-3—Preliminary identification of all ARARs of standards. UOM=LS

.03.11.06 Identify NEPA Requirements

Phases 1-3—Identify National Environmental Policy Act requirements. UOM=LS

.03.11.07 Identify Other Regulatory Requirements

Phases 1-3—Identify other regulatory requirements. UOM=LS

.03.11.9X Other

Phases 1-3—Other tasks associated with identifying and establishing technical project goals and objectives. UOM=LS

.03.12 Implementation Plans

All Phases—Work incurred to obtain all necessary plans and permits. including QA/QC plans, workplans, shop drawings, demolition plans, environmental control plans, pollution control plans, site Safety and Health Plans, site security plan, materials handling/transportation/disposal plan and all local, state, and Federal permits. UOM=EA

.03.12.01 Spill Control Plan

Phases 3-5—Develop, update, and maintain the Spill Control Plan. UOM=EA

.03.12.02 Erosion Control Plan

Phases 3-5—Develop, update, and maintain the Erosion Control Plan. UOM=EA

.03.12.03 Environmental Protection Plan

All Phases—Develop, update, and maintain the Environmental Protection Plan.
UOM=EA

.03.12.04 Sediment Control Plan

Phases 3-5—Develop, update, and maintain the Sediment Control Plan. UOM=EA

.03.12.05 Letter of Commitment

All Phases—Draft and finalize the Letter of Commitment. UOM=EA

.03.12.06 Air Monitoring Plan

All Phases—Develop, update, and maintain the Air Monitoring Plan. UOM=EA

.03.12.07 Traffic Control Plan

All Phases—Develop, update, and maintain the Traffic Control Plan. UOM=EA

.03.12.08 Site Security Plan

All Phases—Develop, update, and maintain the Site Security Plan. UOM=EA

.03.12.09 Contaminated Water Storage and Treatment Plan

All Phases—Develop, update, and maintain the Contaminated Water Storage and Treatment Plan. UOM=EA

.03.12.10 General Site Work Plan

All Phases—Develop, update, and maintain the General Site Work Plan. UOM=EA

.03.12.11 Construction Quality Control Plan

All Phases—Develop, update, and maintain the Construction Quality Control Plan.
UOM=EA

.03.12.12 Asbestos Hazard Abatement Plan

All Phases—Develop, update, and maintain the Asbestos Hazard Abatement Plan.
UOM=EA

.03.12.13 Phase-Out Report

All Phases—Draft and finalize Phase-Out Report. UOM=EA

.03.12.14 Accident Prevention Plan

All Phases—Develop, update, and maintain the Accident Prevention Plan. UOM=EA

.03.12.15 Phase Safety Plan

All Phases—Develop, update, and maintain the Phase Safety Plan. UOM=EA

.03.12.16 Trial Burn Plan

Phases 1-4—Develop, update, and maintain the Trial Burn Plan. UOM=EA

.03.12.17 Property Equipment Plan

All Phases—Develop, update, and maintain the Property Equipment Plan. UOM=EA

.03.12.18 Location Survey and Mapping Plan

Phases 1-3—Develop, update, and maintain the Location Survey and Mapping Plan. UOM=EA

.03.12.19 Work, Data, and Cost Management Plan

All Phases—Develop, update, and maintain the Work, Data, and Cost Management Plan. UOM=EA

.03.12.20 Chemical Accident or Incident Response and Assistance Plan

All Phases—Develop, update, and maintain the Chemical Accident or Incident Response and Assistance Plan. UOM=EA

.03.12.21 Performance and Compliance Monitoring Plan

All Phases—Develop, update, and maintain the Performance and Compliance Monitoring Plan. UOM=EA

.03.12.22 Site Safety Submission

All Phases—Develop, update, and maintain the submission documents and data needed for site safety. UOM=EA

.03.12.23 Other Technology Plans

All Phases—Develop, update, and maintain other technology plans. UOM=EA

.03.12.24 Experience Record

All Phases—Collect and compile experience records. UOM=LS

.03.12.25 Financial Statement

All Phases—Collect required data and compile the financial statement. UOM=EA

.03.12.26 Small Business Plan

All Phases—Develop, update, and maintain the Small Business Plan. UOM=EA

.03.12.27 Subcontracting Plan

All Phases—Develop the Subcontracting Plan. UOM=EA

.03.12.28 Patent Fees

All Phases—Costs to apply for or obtain a patent or to pay patent fees. UOM=EA

.03.12.9X Other

All Phases—Costs associated with other implementation plans. UOM=LS

.03.13 Emergency Response Plans/Report/Approval

Phases 1-4—Identify procedures to follow in responding to a hazardous, toxic, and radioactive materials incident. UOM=LS

.03.13.01 Engineering Evaluation and Cost Analyses

Phases 1-3—Develop and update the engineering evaluation and cost analyses documents. UOM=EA

.03.13.02 Action Memo Preparation

Phases 1-3—Prepare, draft, and finalize the Action Memorandum. UOM=EA

.03.13.03 Removal Action Plans and Specifications

Phases 1-3—Develop and finalize the Removal Action Plans and Specifications. UOM=EA

.03.13.9X Other

Phases 1-4—Develop other emergency response plan/report/approval documents. UOM=LS

.03.14 Environmental Workplans

Phases 1-4—Prepare workplans required for performing environmental projects. Examples of plans are: Remedial Investigation Workplan, Remedial Design Workplan, Remedial Action Workplans, or other environmental workplans. Use element .03.01 for more generic workplans. UOM=EA

.03.15 Decommissioning Plan

Phases 1-3—Prepare decommissioning plans, which describe the method to be used to prepare to decommission a hazardous and/or radiation contaminated facility. Also includes information on facility history, characterization, and status; alternative selection; decommissioning activities; program management; worker and environmental protection; environmental management; and final survey plan. Use element .03.01 for generic workplans. UOM=EA

.03.16 Post RA/D&D Monitoring Plan

Phases 4-6—Prepare a post RA/D&D monitoring plan to ensure the site remains safe. The plan includes discussion of final site configuration, periodic inspection and monitoring, maintenance of barriers to prevent intrusion, and prevention of activities that might impair those barriers. UOM=EA.

.03.17 Combined Workplan

All Phases—Prepare, maintain, and update a combined workplan. A combined workplan includes workplans (e.g., Sampling and Analysis Plan, Health and Safety Plan, etc.) in one document. An example of a combined workplan is the RFI/RI/BRA workplan which provides information on detailed work to be performed, history of waste units and previous characterization activities, risk assessment, contaminant migration criteria, technical analysis and approach, and other related information. UOM=EA

.03.18 Proposed Plan

Phases 1-3—Prepare a proposed plan/document that describes the preferred treatment alternative to the general public. Activities include the development of scoping packages, preparation of revision 0 document, resolution and incorporation of comments, and the preparation of revision 1 document. Also, the attendance at public meetings may be included in the cost of preparing this plan. UOM=EA

.03.19 RCRA Permit Preparation/Modification

Phase 3—All activities associated with preparing or modifying RCRA permits. Also see .02.03.06, Update Regulatory Permits to prevent duplication of costs. UOM=EA

.03.20 Environmental Action Implementation Plan

Phases 3 and 4—Activities associated with preparing workplan that provides a general description of the remedial action and the construction work to be performed as well as a schedule for construction and implementation of the remedial action. This report provides a description of how changes to the remedial design will be managed and how state environmental agencies and the EPA will be notified of any changes. Also included with this document are any requirements and plans for any waste disposal and transport activities that will occur as a part of the remedial action. A discussion of the actions required to close out the remedial action project (e.g., equipment startup and testing, O&M plan, as-built drawings) will also be provided. UOM=EA

.03.21 Waste Site Work Permits

All Phases—All activities associated with the preparation or modification of site-required permits. Includes Site Clearance, Site Use, and Work Clearance. UOM=EA

.03.22 Corrective Action Plan Reporting

All Phases—Actions proposed and implemented to correct problems identified in non-conformance documents. UOM=EA

.03.23 Material Disposition Plan

Phases 4-6—Prepare plans for final disposition of radioactive materials and waste for which no means of final disposition is identified at the project beginning. These plans will be prepared when a means of final disposition is identified and will specify all activities leading to final disposition. UOM=EA

.03.9X Other

All Phases—All other activities involved in preparing plans not described by the above-listed elements UOM=EA

.04.00 Studies/Design and Documentation

.04.01 Hazardous, Toxic, or Radioactivity Ranking System

Phases 1 and 2—Implement the hazard ranking system (HRS). This system is the principal screening tool used by the EPA to evaluate risks to public health and the environment associated with abandoned or uncontrolled hazardous, toxic, or radioactive contaminated sites. The HRS calculates a score based on the potential of hazardous, toxic, or radioactive substances spreading from the site through the air, surface water, or groundwater, and on other factors such as density and proximity of human population. This score is the primary factor in deciding if the site should be on the National Priorities List (NPL), and if so, what ranking it should have. (Minimum score for NPL is 28.5) UOM=LS

.04.02 Human Health Risk Assessment

Phases 1 and 2—Execute a human health risk assessment. The assessment provides for the qualitative and quantitative evaluation of risk. The following items are included: hazard, toxic, and radiological identification (sources), dose-response assessment, pathway analysis, characterization of the site and potential receptors, exposure assessment, risk characterization, limitations/uncertainties, and a site conceptual model. UOM=LS

.04.02.01 Hazard Identification (Sources)

Phases 1 and 2—Identify hazards including the type of hazard, its source, and the amount of hazard posed to humans. UOM=LS

.04.02.02 Dose-Response Assessment

Phases 1 and 2—Assess the various contaminant doses and the corresponding responses to the doses by humans. UOM=LS

.04.02.03 Prepare Conceptual Experiment/Pathway Analysis

Phases 1 and 2—Prepare and conduct human hazard exposure pathway analysis. UOM=LS

.04.02.04 Characterization of Site and Potential Receptors

Phases 1 and 2—Site characterization and identification of potential human receptors to contaminants and hazards. UOM=LS

.04.02.05 Exposure Assessment

Phases 1 and 2—Assess the exposure to humans from the hazards and contaminants. UOM=LS

.04.02.06 Risk Characterization

Phases 1 and 2—Characterize and prioritize the risk to human health. UOM=LS

.04.02.07 Limitations/Uncertainties

Phases 1 and 2—Identify and evaluate limitations, uncertainties, and sensitivities associated with human health risk determination. UOM=LS

.04.02.08 Site Conceptual Model

Phases 1 and 2—Develop and use site conceptual risk model for humans. UOM=LS

.04.02.9X Other

Phases 1 and 2—Perform other human health risk assessment activities. UOM=LS

.04.03 Ecological Risk Assessment

Phases 1 and 2—Perform an ecological risk assessment. This assessment provides a qualitative or quantitative appraisal of the actual or potential effects of a hazardous waste site on plants and animals other than people and domesticated species. However, information from ecological studies may point to new or unexpected exposure pathways for human populations, and a health assessment may help identify environmental threats.

UOM=LS

.04.03.01 Hazard Identification (Sources)

Phases 1 and 2—Identify hazards including the type of hazard and the source, and the amount of hazard posed to the ecology. UOM=LS

.04.03.02 Dose-Response Assessment

Phases 1 and 2—Assess the various hazard doses and the corresponding responses to the hazards by the ecology and ecosystems. UOM=LS

.04.03.03 Conceptual Exposure/Pathway Analysis

Phases 1 and 2—Prepare and conduct ecological hazard exposure pathway analysis. UOM=LS

.04.03.04 Characterization of Site and Potential Receptors

Phases 1 and 2—Characterize the site and potential ecological receptors of the project hazards and contaminants. UOM=LS

.04.03.05 Select Chemicals, Indicator Species, and End Points

Phases 1 and 2—Selecting chemicals, the indicator species, and the end point for the ecological receptors. UOM=LS

.04.03.06 Exposure Assessment

Phases 1 and 2—Assess the exposure to ecology from the hazards and contaminants. UOM=LS

.04.03.07 Toxicity Assessment/Ecological Effects Assessment

Phases 1 and 2—Assess the toxicity and its ecological effects from the project contaminants and hazards posed by the project activities. UOM=LS

.04.03.08 Risk Characterization

Phases 1 and 2—Characterize and prioritize ecological risk. UOM=LS

.04.03.09 Limitations/Uncertainties

Phases 1 and 2—Identify and evaluate limitations, uncertainties, and sensitivities to the ecology from the project activities. UOM=LS

.04.03.10 Site Conceptual Model

Phases 1 and 2—Develop and use site conceptual risk model for the ecology. UOM=LS

.04.03.9X Other

Phases 1 and 2—Costs associated with ecological risk assessment.. UOM=LS

.04.04 Risk Assessment Documentation

Phases 1 and 2—Prepare a baseline risk report that analyzes potential adverse health effects (current or future) caused by hazardous substance releases from a site in the absence of any actions to control or mitigate these releases (i.e., under an assumption of no action). See also .04.15, Combined Report for applicability. UOM=LS

.04.04.01 Compose Draft Reports

Phases 1 and 2—Draft and distribute the draft risk assessment document. UOM=EA

.04.04.01.01 Perform Data Compilation

Phases 1 and 2—Evaluate and compile data for the draft risk assessment document. UOM=LS

.04.04.01.02 Present Data (Format Tables And Prepare Graphics)

Phases 1 and 2—Prepare and present data in an organized fashion via, for example tables, charts, pictures, etc. UOM=LS

.04.04.01.03 Site Background

Phases 1 and 2—Research and draft the site background information. UOM=LS

.04.04.01.04 Investigation

Phases 1 and 2—Describe, draft, and present the site investigation data. UOM=LS

.04.04.01.05 Site Characteristics

Phases 1 and 2—Describe, draft, and present the site characteristics and associated information. UOM=LS

.04.04.01.06 Nature and Extent of Contamination

Phases 1 and 2—Describe, draft, and present the nature and extent of contamination. UOM=LS

.04.04.01.07 Fate and Transport

Phases 1 and 2—Describe, draft, and present the fate and transport of contaminants and hazards. UOM=LS

.04.04.01.08 Summary and Conclusions

Phases 1 and 2—Describe, draft, and present the document summary and conclusions. UOM=LS

.04.04.01.09 Reproduction/Distribution

Phases 1 and 2—Reproduce, package, and distribute the draft document. UOM=EA

.04.04.01.9X Other

Phases 1 and 2—Other costs associated with composing draft risk document.
UOM=LS

.04.04.02 *Respond to Comments*

Phases 1 and 2—Collect and develop responses to comments received from the draft risk document. UOM=LS

.04.04.03 *Finalize Report*

Phases 1 and 2—Incorporate comments and make changes to the document as necessary to finalize the document. UOM=LS

.04.04.03.01 Reproduction/Distribution

Phases 1 and 2—Reproduce, package, and distribute the final documents.
UOM=EA

.04.04.03.9X Other

Phases 1 and 2—Other costs associated with composing final risk document.
UOM=LS

.04.04.9X *Other*

Phases 1 and 2—Other costs associated with risk assessment documentation.
UOM=LS

.04.05 Environmental Investigation Report

Phases 1 and 2—Produce a document that presents the results of the remedial investigation (RI) or RCRA facility investigation (RFI). This activity includes drafting reports, responding to draft report comments, and finalizing the report. The report discusses site background, investigation, site characteristics, nature and extent of contamination, fate and transport, and conclusions. UOM=EA

.04.05.01 *Site Background*

Phases 1 and 2—Research and draft the site background information. UOM=EA

.04.05.02 *Investigation*

Phases 1 and 2—Describe, draft, and present the site investigation information.
UOM=EA

.04.05.02.01 Field Investigation and Technical Approach

Phases 1 and 2—Describe, draft, and present the field investigation and technical approach information. UOM=EA

.04.05.02.02 Chemical Analysis and Analytical Methods

Phases 1 and 2—Describe, draft, and present the chemical analysis and analytical methods information. UOM=EA

.04.05.02.03 Field Methodologies

Phases 1 and 2—Describe, draft, and present the field methodologies information.
UOM=EA

.04.05.02.9X Other

Phases 1 and 2—Describe, draft, and present other site investigation information.
UOM=EA

.04.05.03 Site Characteristics

Phases 1 and 2—Describe, draft, and present the site characteristics and associated information. UOM=EA

.04.05.03.01 Geology

Phases 1 and 2—Describe, draft, and present site geology information. UOM=EA

.04.05.03.02 Hydrology

Phases 1 and 2—Describe, draft, and present site hydrology information.
UOM=EA

.04.05.03.03 Meteorology

Phases 1 and 2—Describe, draft, and present site meteorology information.
UOM=EA

.04.05.03.04 Demographics and Land Use

Phases 1 and 2—Describe, draft, and present site demographic and land use information. UOM=EA

.04.05.03.05 Ecological Assessment

Phases 1 and 2—Describe, draft, and present site ecological assessment information. UOM=EA

.04.05.03.9X Other

Phases 1 and 2—Describe, draft, and present other site characteristic information.
UOM=EA

.04.05.04 Nature and Extent of Contamination

Phases 1 and 2—Describe, draft, and present the nature and extent of contamination.
UOM=EA

.04.05.04.01 Contaminant Sources

Phases 1 and 2—Describe, draft, and present contamination source data.
UOM=EA

.04.05.04.02 Contaminant Distribution and Trends

Phases 1 and 2—Describe, draft, and present contamination distribution and trend data. UOM=EA

.04.05.04.9X Other

Phases 1 and 2—Describe, draft, and present other data on the nature and extent of contamination. UOM=EA

.04.05.05 *Fate and Transport*

Phases 1 and 2—Describe, draft, and present the fate and transport of contaminants and hazards. UOM=EA

.04.05.05.01 Contaminant Characteristics

Phases 1 and 2—Describe, draft, and present the contaminant characteristics data. UOM=EA

.04.05.05.02 Transport Process

Phases 1 and 2—Describe, draft, and present data on transport of contaminants. UOM=EA

.04.05.05.03 Contaminant Migration Trends

Phases 1 and 2—Describe, draft, and present the contaminants migration trends. UOM=EA

.04.05.05.9X Other

Phases 1 and 2—Describe, draft, and present other data on fate and transport of contaminants and hazards. UOM=EA

.04.05.06 *Summary and Conclusions*

Phases 1 and 2—Describe, draft, and present the document summary and conclusions. UOM=EA

.04.05.9X *Other*

Phases 1 and 2—Other costs associated with environmental investigation document. UOM=EA

.04.06 Develop Environmental Alternatives

Phase 2—Develop environmental alternatives that involve applying site-specific factors to candidate remediation, waste treatment or environmental treatment technologies. The activity includes establishing objectives and general response actions, identifying preliminary alternatives, identifying and screening applicable technologies, developing alternatives, identifying requirements for treatability studies, assembling technologies into actions, and developing a conceptual site model. See also .04.18, Combined Feasibility Document for applicability. UOM=LS

.04.06.01 *Environmental Action Objectives*

Phase 2—Draft and review documents, attend meetings, travel, and perform other activities associated with establishing environmental action objectives. UOM=LS

.04.06.02 General Response Actions

Phase 2—Review documents, attend meetings, travel, and perform other activities associated with establishing general response actions. UOM=LS

.04.06.03 Preliminary Alternatives

Phase 2—Draft and review documents, attend meetings, travel, and perform other activities associated with identifying preliminary environmental alternatives. UOM=LS

.04.06.04 Applicable Environmental Technologies

Phase 2—Review documents, attend meetings, travel, and perform other activities associated with identifying and screening applicable environmental technologies. UOM=LS

.04.06.05 Environmental Alternatives in Accordance with National Contingency Plan

Phase 2—Draft and review documents, attend meetings, travel, and perform other activities associated with developing environmental alternatives in accordance with the National Contingency Plan. UOM=LS

.04.06.06 Treatability Study Requirements

Phase 2—Draft and review documents, attend meetings, travel, and perform other activities associated with identifying treatability study requirements. ~~UOM=~~ UOM=LS

.04.06.07 Technologies Applications Into Actions

Phase 2—Assemble or put together technologies for application. . UOM=LS

.04.06.08 Conceptual Site Model

Phase 2—Develop conceptual site models. UOM=LS

.04.06.9X Other

Phase 2—Other costs associated with developing environmental alternatives. ~~UOM=~~ UOM=LS

.04.07 Select Environmental Alternatives

Phase 2—Select applicable remedial waste treatment or environmental alternatives by applying specific criteria. See also .04.18, Combined Feasibility Document for applicability. UOM=LS

.04.07.01 Select Environmental Alternatives Based on Specific Criteria

Phase 2—Draft and review documents, attend meetings, travel, and perform other activities associated with screening environmental alternatives based on selected criteria. UOM=LS

.04.07.02 Action-Specific ARARs

Phase 2—Draft and review documents, attend meetings, travel, and perform other activities associated with identifying and evaluating action-specific ARARs. ~~UOM=~~ UOM=LS

.04.07.03 Refined List of Alternatives

Phase 2—Draft and review documents, attend meetings, travel, and perform other activities associated with refining the list of alternatives. UOM=LS

.04.07.9X Other

Phase 2—Other costs associated with screening environmental alternatives. UOM=LS

.04.08 Evaluate Alternatives

Phase 2—Evaluate the treatment alternatives by comparing alternatives based on the identified criteria such as protection of human health and the environment, compliance with ARARs, long-term effectiveness and permanence, reduction in toxicity/mobility/volume, short-term effectiveness, implementability, cost, and state and community acceptance. See also .04.18, Combined Feasibility Document for applicability. UOM=LS

.04.08.01 Overall Protection of Human Health and the Environment

Phase 2—Draft and review documents, attend meetings, travel, and perform other activities associated with evaluating alternative for overall protection of human health and the environment. UOM=LS

.04.08.02 Compliance with ARARs

Phase 2—Draft and review documents, attend meetings, travel, and other activities associated with evaluating alternative for compliance with ARARs. UOM=LS

.04.08.03 Long-Term Effectiveness and Permanence

Phase 2—Draft and review documents, attend meetings, travel, and perform other activities associated with evaluating alternatives for long-term effectiveness and permanence. UOM=LS

.04.08.04 Reduction in Toxicity, Mobility, or Volume

Phase 2—Draft and review documents, attend meetings, travel, and perform other activities associated with evaluating alternatives for reduction in toxicity, mobility, or volume. UOM=LS

.04.08.05 Short-Term Effectiveness

Phase 2—Draft and review documents, attend meetings, travel, and perform other activities associated with evaluating alternatives for short-term effectiveness. UOM=LS

.04.08.06 Implementability - Technical and Administrative

Phase 2—Draft and review documents, attend meetings, travel, and perform other activities associated with evaluating alternatives for technical and administrative implementability. UOM=LS

.04.08.07 Cost

Phase 2—Draft and review documents, attend meetings, travel, and perform other activities associated with evaluating alternatives for overall cost. UOM=LS

.04.08.08 State Acceptance

Phase 2—Draft and review documents, attend meetings, travel, and perform other activities associated with evaluating alternatives for state acceptance. UOM=LS

.04.08.09 Community Acceptance

Phase 2—Draft and review documents, attend meetings, travel, and other activities associated with evaluating alternative for community acceptance. UOM=LS

.04.08.9X Other

Phase 2—Other costs associated with evaluating alternatives. UOM=LS

.04.09 Refinement of Alternatives

Phase 2—Refine environmental alternatives to maximize the goals of the action, their ability to meet the established criteria, and improve the probability that the state and community will accept the alternatives. See also. 04.18, Combined Feasibility Document for applicability. UOM=LS

.04.09.01 Priority Model Scoring

Phase 2—Draft and review documents, attend meetings, travel, and perform other activities associated with priority model scoring. UOM=LS

.04.09.02 Selection of Remedy/Documentation

Phase 2—Draft and review documents, attend meetings, travel, and perform other activities associated with selection of remedies and documentation of findings. UOM=LS

.04.09.9X Other

Phase 2—Other costs associated with refining alternatives. UOM=LS

.04.10 Document Feasibility Study (or Corrective Measure Study)

Phase 2—Perform a study to identify and evaluate options for environmental projects. The Feasibility Study (FS) is generally performed concurrently and interactively with the investigation processes. Activities include drafting the FS report, responding to comments, and finalizing the report. See also .04.18, Combined Feasibility Document for applicability. UOM=LS

.04.10.01 Compose Draft Feasibility Study (or Corrective Measure Study) Report

Phase 2—Develop and use site conceptual risk model for the ecology. UOM=LS

.04.10.01.01 Perform Data Compilation

Phase 2—Compile and evaluate data. UOM=LS

.04.10.01.02 Present Data (Format Tables and Prepare Graphics)

Phase 2—Prepare and present data in an organized fashion. UOM=LS

.04.10.01.03 Feasibility Study Objectives

Phase 2—Describe, present, and draft the Feasibility Study objectives. UOM=LS

.04.10.01.04 Remedial Objectives

Phase 2—Describe, present, and draft the remedial objectives.. UOM=LS

.04.10.01.05 General Response Actions

Phase 2—Describe, present, and draft the general response actions. ~~UOM=~~
UOM=LS

.04.10.01.06 Identification and Screening of Environmental Technologies

Phase 2—Describe, present, and draft the process and the result of identifying and screening environmental technologies. UOM=LS

.04.10.01.07 Environmental Alternatives Description

Phase 2—Describe, present, and draft the section on the environmental alternatives. UOM=LS

.04.10.01.08 Detailed Analysis of Environmental Technologies

Phase 2—Describe, present, and draft the process to analyze environmental technologies in detail. UOM=LS

.04.10.01.09 Engineering Cost Analysis of Selected Alternative

Phase 2—Describe, present, and draft the process and results of the engineering cost analysis of selected alternatives. UOM=LS

.04.10.01.10 Summary and Conclusions

Phase 2—Draft and present the summary and conclusion of the document. UOM=LS

.04.10.01.11 Reproduction/Distribution

Phase 2—Package, reproduce, and distribute the draft FS document. UOM=EA

.04.10.01.9X Other

Phase 2—Other costs associated with composing draft FS document. UOM=LS

.04.10.02 Respond to Comments

Phase 2—Collect and develop responses to comments received from the draft FS document. UOM=LS

.04.10.03 Finalize Report

Phase 2—Incorporate comments and make changes to the document as necessary to finalize the FS document. UOM=LS

.04.10.03.01 Reproduction/Distribution

Phase 2—Reproduce, package, and distribute final FS documents. UOM=EA

.04.10.03.9X Other

Phase 2—Other costs associated with composing FS or Corrective Measure Study (CMS) document. UOM=LS

.04.10.04 *Prepare Feasibility Study Addendum*

Phase 2—Draft and finalize the Feasibility Study Addendum. UOM=LS

.04.10.9X *Other*

Phase 2—Other costs associated with FS/CMS documentation. UOM=LS

.04.11 Environmental Management Project Design

Phases 3 and 4—Prepare the preliminary, intermediate, and final design for applicable environmental projects (e.g., Underground Storage Tanks, Waste Management, or Environmental Restoration). The design stage encompasses developing the design of the selected remedy includes the preparation of detailed plans, drawings, and specifications for construction. Office-based engineering support during construction is included in Phase 3; field-based engineering support during construction is included in Phase 4. UOM=EA

.04.11.01 *Preliminary Design*

Phase 3—Develop preliminary engineering designs, drawings, approaches, specifications, reports, and initial cost estimates and schedules. UOM=EA

.04.11.01.01 Recommend Project Delivery Strategy and Scheduling

Phase 3—Develop and provide recommendation of project delivery strategy and general scheduling. UOM=LS

.04.11.01.02 Prepare Preliminary Construction Schedule

Phase 3—Develop preliminary construction schedule. See also .02.01.01.17 for development of schedule. UOM=EA

.04.11.01.03 Prepare Specifications Outline

Phase 3—Prepare and develop specifications outline. UOM=EA

.04.11.01.04 Prepare Preliminary Drawings

Phase 3—Develop preliminary drawings for project. UOM=EA

.04.11.01.05 Prepare Basis of Design Report/Design Analysis

Phase 3—Develop basis of design report/design analysis. UOM=EA

.04.11.01.06 Prepare Preliminary Cost Estimate

Phase 3—Develop preliminary cost estimate. See also .02.01.01.01 for development of cost estimate. UOM=EA

.04.11.01.9X Other

Phase 3—Develop other preliminary designs, specifications, and drawings for other needs. UOM=EA

.04.11.02 Intermediate Design

Phase 3—Develop intermediate engineering designs, drawings, approaches, specifications, reports, and initial cost estimates and schedules. UOM=EA

.04.11.02.01 Update Construction Schedule

Phase 3—Update project delivery strategy and scheduling. UOM=EA

.04.11.02.02 Prepare Preliminary Specifications

Phase 3—Develop preliminary specifications. UOM=EA

.04.11.02.03 Prepare Intermediate Drawings

Phase 3—Develop intermediate drawings. UOM=EA

.04.11.02.04 Prepare Basis of Design Report/Design Analysis

Phase 3—Develop basis of design report/design analysis. UOM=EA

.04.11.02.05 Prepare Revised Cost Estimate

Phase 3—Develop revised cost estimate. See also .02.01.01.01 for development of cost estimate. UOM=EA

.04.11.02.06 Participate in Intermediate Design Review/Briefing

Phase 3—Attend and participate in intermediate design review/briefing. UOM=EA

.04.11.02.9X Other

Phase 3—Develop other items needed for intermediate design. UOM=EA

.04.11.03 Pre-Final/Final Design

Phases 3 and 4—Develop pre-final/final engineering designs, drawings, specifications, reports, and initial cost estimates and schedules. UOM=EA

.04.11.03.01 Prepare Pre-Final Design Specifications

Phases 3 and 4—Develop pre-final/final design specifications. UOM=EA

.04.11.03.02 Prepare Pre-Final Drawings

Phases 3 and 4—Develop pre-final drawings. UOM=EA

.04.11.03.03 Prepare Basis of Design Report/Design Analysis

Phases 3 and 4—Develop basis of design report/design analysis. UOM=EA

.04.11.03.04 Prepare Revised Cost Estimate

Phases 3 and 4—Develop revised cost estimate. See also .02.01.01.01 for development of cost estimate. UOM=EA

.04.11.03.05 Participate in Pre-Final/Final Design Review

Phases 3 and 4—Attend and participate in pre-final/final design review/briefing. UOM=EA

.04.11.03.06 Prepare 100% Design Submittal

Phases 3 and 4—Develop and submit 100% design. UOM=EA

.04.11.03.07 Revised Schedules

Phases 3 and 4—Develop revised schedule. UOM=EA

.04.11.03.9X Other

Phases 3 and 4—Develop other items needed for pre-final/final design. UOM=EA

.04.11.9X Other

Phases 3 and 4—Other tasks associated with environmental management project design. UOM=EA

.04.12 Decontamination/Dismantlement Project Design

Phases 3 and 4—Provide decommissioning, decontamination, and dismantlement design preparation including preliminary design, intermediate design, and final design. The decommissioning, decontamination, and dismantlement design stage includes the development of the actual design of the selected remedy including the preparation of detailed plans, drawings, and specifications for decommissioning, decontamination, and dismantlement. Office-based engineering support during construction is included in Phase 3; field-based engineering support during construction is included in Phase 4. UOM=EA

.04.12.01 Preliminary Design

Phase 3—Develop preliminary engineering designs, drawings, approaches, specifications, reports, and initial cost estimates and schedules. UOM=EA

.04.12.01.01 Recommend Project Delivery Strategy And Scheduling

Phase 3—Develop and recommend project delivery strategy and scheduling. UOM=LS

.04.12.01.02 Prepare Preliminary Construction Schedule

Phase 3—Prepare preliminary construction schedule. See also .02.01.01.17 for development of schedules. UOM=EA

.04.12.01.03 Prepare Specifications Outline

Phase 3—Develop specifications outline. UOM=EA

.04.12.01.04 Prepare Preliminary Drawings

Phase 3—Develop preliminary drawings. UOM=EA

.04.12.01.05 Prepare Basis of Design Report/Design Analysis

Phase 3—Develop basis of design report/design analysis. UOM=EA

.04.12.01.06 Prepare Preliminary Cost Estimate
Phase 3—Develop preliminary cost estimate. See also .02.01.01.01 for development of cost estimate. UOM=EA

.04.12.01.9X Other
Phase 3—Develop other preliminary design tasks and activities. UOM=EA

.04.12.02 Intermediate Design

Phase 3—Develop intermediate engineering designs, drawings, approaches, specifications, reports, and intermediate cost estimates and schedules. UOM=EA

.04.12.02.01 Update Construction Schedule
Phase 3—Update project delivery strategy and schedule. See also .02.01.01.17 for development of schedules. UOM=EA

.04.12.02.02 Prepare Preliminary Specifications
Phase 3—Develop preliminary design specifications. UOM=EA

.04.12.02.03 Prepare Intermediate Drawings
Phase 3—Develop intermediate drawings. UOM=EA

.04.12.02.04 Prepare Basis of Design Report/Design Analysis
Phase 3—Develop basis of design report/design analysis. UOM=EA

.04.12.02.05 Prepare Revised Cost Estimate
Phase 3—Develop revised cost estimate. See also .02.01.01.01 for development of cost estimate. UOM=EA

.04.12.02.06 Participate in Intermediate Design Review/Briefing
Phase 3—Attend and participate in intermediate design review/briefing. UOM=EA

.04.12.02.9X Other
Phase 3—Other tasks needed for intermediate design. UOM=EA

.04.12.03 Pre-Final/Final Design

Phases 3 and 4—Develop pre-final/final engineering designs, drawings, approaches, specifications, reports, and pre-final/final cost estimates and schedules. UOM=EA

.04.12.03.01 Prepare Pre-Final Design Specifications
Phases 3 and 4—Develop pre-final/final design specifications. UOM=EA

.04.12.03.02 Prepare Pre-Final Drawings
Phases 3 and 4—Develop pre-final drawings. UOM=EA

.04.12.03.03 Prepare Basis of Design Report/Design Analysis
Phases 3 and 4—Develop basis of design report/design analysis. UOM=EA

.04.12.03.04 Prepare Revised Cost Estimate

Phases 3 and 4—Develop revised cost estimate. See also .02.01.01.01 for development of cost estimate. UOM=EA

.04.12.03.05 Participate in Pre-Final/Final Design Review

Phases 3 and 4—Attend and participate in pre-final/final design review/briefing. UOM=EA

.04.12.03.06 Prepare 100% Design Submittal

Phases 3 and 4—Develop and submit 100% design. UOM=EA

.04.12.03.9X Other

Phases 3 and 4—Other items needed for performing pre-final/final design. UOM=EA

.04.12.9X Other

Phases 3 and 4—Other D&D project design. UOM=EA

.04.13 Facility Design

Phases 3 and 4—Facility design preparation including preliminary design, intermediate design, and final design. The facility design stage includes the development of the actual design of the facility including the preparation of detailed plans, drawings, and specifications for the facility. Office-based engineering support during construction is included in Phase 3; field-based engineering support during construction is included in Phase 4. UOM=EA

.04.13.01 Preliminary Design

Phase 3—Develop preliminary engineering designs, drawings, approaches, specifications, reports, and initial cost estimates and schedules. UOM=EA

.04.13.01.01 Recommend Project Delivery Strategy And Scheduling

Phase 3—Develop and recommend project delivery strategy and scheduling. See also .02.01.01.17 for development of schedules. UOM=LS

.04.13.01.02 Prepare Preliminary Construction Schedule

Phase 3—Develop preliminary construction schedule. See also .02.01.01.17 for development of schedules. UOM=EA

.04.13.01.03 Prepare Specifications Outline

Phase 3—Develop specifications outline. UOM=EA

.04.13.01.04 Prepare Preliminary Drawings

Phase 3—Develop preliminary drawings. UOM=EA

.04.13.01.05 Prepare Basis of Design Report/Design Analysis

Phase 3—Develop basis of design report/design analysis. UOM=EA

.04.13.01.06 Prepare Preliminary Cost Estimate

Phase 3—Develop preliminary cost estimate. See also .02.01.01.01 for development of cost estimate. UOM=EA

.04.13.01.9X Other

Phases 3 and 4—Develop other preliminary design items and tasks. UOM=EA

.04.13.02 Intermediate Design

Phase 3—Develop intermediate engineering designs, drawings, approaches, specifications, reports, and intermediate cost estimates and schedules. UOM=EA

.04.13.02.01 Update Construction Schedule

Phase 3—Update project delivery strategy and schedule. See also .02.01.01.01 for development of schedules. UOM=EA

.04.13.02.02 Prepare Preliminary Specifications

Phase 3—Develop and update intermediate specifications. UOM=EA

.04.13.02.03 Prepare Intermediate Drawings

Phase 3—Develop and update intermediate drawings. UOM=EA

.04.13.02.04 Prepare basis of design report/design analysis

Phase 3—Develop and update basis of design report/design analysis. UOM=EA

.04.13.02.05 Prepare Revised Cost Estimate

Phase 3—Prepare revised cost estimate. See also .02.01.01.01 for development of cost estimate. UOM=EA

.04.13.02.06 Participate in Intermediate Design Review/Briefing

Phase 3—Attend and participate in intermediate design review/briefing. UOM=EA

.04.13.02.9X Other

Phase 3—Other activities associated with developing intermediate design. UOM=EA

.04.13.03 Pre-Final/Final Design

Phases 3 and 4—Develop pre-final/final engineering designs, drawings, approaches, specifications, reports, and pre-final/final cost estimates and schedules. UOM=EA

.04.13.03.01 Prepare Pre-Final Design Specifications

Phases 3 and 4—Develop pre-final/final design specifications. UOM=EA

.04.13.03.02 Prepare Pre-Final Drawings

Phases 3 and 4—Develop pre-final drawings. UOM=EA

.04.13.03.03 Prepare Basis Of Design Report/Design Analysis

Phases 3 and 4—Develop basis of design report/design analysis. UOM=EA

.04.13.03.04 Prepare Revised Cost Estimate

Phases 3 and 4—Develop pre-final/final cost estimate. See also .02.01.01.01 for development of cost estimate. UOM=EA

.04.13.03.05 Participate in Pre-Final/Final Design Review

Phases 3 and 4—Attend and participate in pre-final/final design review/briefing. UOM=EA

.04.13.03.06 Prepare 100% Design Submittal

Phases 3 and 4—Develop and submit 100% design. UOM=EA

.04.13.03.9X Other

Phases 3 and 4—Other activities associated with developing pre-final/final design. UOM=EA

.04.13.9X Other

Phases 3 and 4—Other costs associated with facility design. UOM=EA

.04.14 Value Engineering/Special Studies

Phases 3 and 4—Value engineering (VE) during design and construction. VE during design is a function-oriented, multi disciplinary team approach used to eliminate unnecessary design costs without sacrificing performance or quality. It provides an effective method for defining a problem and a system for achieving the best value. Identification, classification, and analysis of functions are used to resolve a problem or determine how to meet a need. VE during construction encourages the construction contractor to propose changes in construction to provide the most up-to-date construction solutions. The value engineering change proposal is an incentive clause in the contract that provides the contractor and the Federal agency a monetary benefit. Office-based engineering support during construction is included in Phase 3; fields-based engineering support during construction is included in Phase 4. UOM=LS

.04.14.01 Perform Value Engineering Screening

Phase 3—Perform VE screenings such as review of project goals and objectives and evaluation of technology alternatives. UOM=LS

.04.14.02 Perform Value Engineering Study

Phase 3—Perform VE study by providing detailed review of technologies, study of options, and other tasks. UOM=LS

.04.14.03 Document Value Engineering Study Results

Phase 3—Document VE study results. UOM=LS

.04.14.04 Develop Land Acquisition/Easement Requirements

Phase 3—Develop land acquisition/easement requirements. UOM=LS

.04.14.04.01 Provide Technical Support in Land Acquisition
Phase 3—Provide technical support in land acquisition. UOM=LS

.04.14.04.9X Other
Phases 3 and 4—Other activities associated with developing land acquisition/easement requirements. UOM=LS

.04.14.05 Bidability/Constructability Reviews
Phase 3—Project technical and administrative personnel participating in biddability/constructability reviews. UOM=LS

.04.14.9X Other
Phases 3 and 4—Other costs associated with VE and special studies. UOM=LS

.04.15 Combined Report

All Phases—All efforts related to the preparation of findings during environmental investigation and related technical analyses. For example, the RFI/RI/BRA report includes a unit characterization summary, presentation of the unit data, analysis of contaminant fate and transport, human health risk assessment, ecological risk assessment, and the determination of appropriate treatment goal options. This element includes all activities required to prepare, review, revise, and approve the combined report. This element may also include the development of a scoping package, the first draft document, comment resolutions, comment incorporation, and the preparation of revision 1 documents. UOM=EA

.04.16 Engineering Evaluation/Cost Analysis Report

Phases 2 and 3—Prepare an engineering evaluation/cost analysis report based on-site characterization results, and contaminant of concern and concentrations. This report contains evaluation results of various treatment alternatives, and the cost for these alternatives. UOM=EA

.04.17 Record of Decision

Phases 2 and 3—Prepare a Record of Decision. The Record of decision is the document that describes the treatment options agreed upon by the EPA, state, and responsible party. The scope of the document includes the development of scoping packages, revision 0 document preparation, comment resolution, comment incorporation and the preparation of a revision 1 document. The document may also include attendance at public meetings. UOM=EA

.04.18 Combined Feasibility Document

Phase 2—This element includes elements, which combine several of the structure elements (i.e., .04.06—.04.10) into one element. UOM=LS

.04.19 Post-Construction Design Report

Phase 4—Prepare a post-construction design report. This document provides a general narrative of the construction activity that has been performed for the environmental project. It includes a brief discussion of unexpected conditions encountered in the field, particularly those that affected the scope or schedule of the construction work. It also identifies design

changes that were required during construction and provides required certifications, verifications and as-built for the environmental project. UOM=EA

.04.20 Task Requirements and Criteria

Phase 3—During the preliminary design phase, define the requirements and criteria for the remedial action. UOM=LS

.04.21 Submittals

Phases 3 and 4—Reports and documents submitted during or after completion of design and construction. Examples of submittals include punch list, project acceptance report, survey results, final Quality Assurance/Quality Control (QA/QC) reports, and as-built drawings. UOM=EA

.04.21.01 Punch List

Phase 4—Develop and submit the Punch List. UOM=EA

.04.21.02 Project Acceptance

Phase 4—Develop and submit project acceptance document. UOM=EA

.04.21.03 Survey Information

Phases 3 and 4—Develop and submit survey information. UOM=EA

.04.21.04 Final Quality Assurance/Quality Control Reports

Phase 4—Develop and submit final QA/QC report. UOM=EA

.04.21.05 As-Built Drawings

Phases 3 and 4—Develop and submit as-built drawings. UOM=EA

.04.21.9X Other

Phases 3 and 4—Develop and submit other submittals. UOM=EA

.04.9X Other

All Phases—All other activities involved in the studies/design and documentation not described by the above-listed categories. UOM=EA

.05.00 Site Work

.05.01 Mobilization

All Phases—Transport of equipment, personnel, and facilities to the site, and construction of temporary facilities and utilities. UOM=LS

.05.01.01 Mobilization of Construction Equipment and Facilities

All Phases—Mobilization and set up of construction equipment and facilities. UOM=EA

.05.01.01.01 Transport Vehicles, Equipment, Drivers and Operators
All Phases—Transport vehicles, equipment, drivers, and operators as part of the mobilization effort. UOM=EA

.05.01.01.02 Manifests, Tolls, Permits for Mobilization
All Phases—Obtain manifests, tolls, permits, and other documentation for mobilization of equipment, facilities, operators, and drivers. UOM=EA

.05.01.01.03 Escort Vehicles Ownership and Operation
All Phases—Use and ownership of escort vehicles during the mobilization effort. UOM=EA

.05.01.01.04 Construction Equipment Operators
All Phases—Transport construction equipment operators during the mobilization effort. UOM=EA

.05.01.01.05 Set-up and Assembly of Equipment for Operations
All Phases—Set up and assemble construction equipment for operators during the mobilization effort. UOM=EA

.05.01.01.9X Other
All Phases—Other costs associated with mobilization and set up of construction equipment and facilities. UOM=EA

.05.01.02 Mobilization of Personnel
All Phases—Mobilization or relocation of personnel. UOM=EA

.05.01.02.01 Relocation of Personnel
All Phases—Mobilization or relocation of personnel including dependents. Tasks include house hunting trip; per diem; packing and unpacking; shipment and storage of goods; and other related costs. UOM=EA

.05.01.02.9X Other
All Phases—Other costs associated with mobilization of personnel. UOM=EA

.05.01.03 Temporary Facilities
All Phases—Mobilization, assembly, and set up of temporary facilities. UOM=EA

.05.01.03.01 Office Trailers
All Phases—Mobilization, assembly, and set up of office trailers. UOM=EA

.05.01.03.02 Lunch/Break Trailer
All Phases—Mobilization, assembly, and set up of lunch/break trailers. UOM=EA

- .05.01.03.03 Emergency Medical Facilities Trailers
All Phases—Mobilization, assembly, and set up of emergency medical facilities trailers. UOM=EA
- .05.01.03.04 Storage Facilities and Warehouses
All Phases—Mobilization, assembly, and set up of storage facilities and warehouses. UOM=EA
- .05.01.03.05 Laundry Facilities
All Phases—Mobilization, assembly, and set up of laundry facilities. UOM=EA
- .05.01.03.06 Toilets
All Phases—Mobilization, assembly, and set up of toilets. UOM=EA
- .05.01.03.07 Temporary Laboratory
All Phases—Mobilization, assembly, and set up of temporary laboratory. UOM=EA
- .05.01.03.08 Maintenance Shop
All Phases—Mobilization, assembly, and set up of maintenance shop. UOM=EA
- .05.01.03.09 Truck Scales
All Phases—Mobilization, assembly, and set up of truck scales. UOM=EA
- .05.01.03.10 Observation Towers
All Phases—Mobilization, assembly, and set up of observation towers. UOM=EA
- .05.01.03.11 Decontamination Facilities for Personnel
All Phases—Mobilization, assembly, and set up of decontamination facilities for personnel. UOM=M²
- .05.01.03.12 Decontamination Facilities for Construction Equipment and Vehicles
All Phases—Mobilization, assembly, and set up of decontamination facilities for construction equipment and vehicles. UOM=M²
- .05.01.03.13 Temporary Cover Structure Over Contaminated Area
All Phases—Mobilization, assembly, and set up of temporary cover structure over contaminated area. UOM=M²
- .05.01.03.14 Barricades
All Phases—Mobilization, Assembly, and Set-Up of Temporary barricades. UOM=M
- .05.01.03.15 Fire Suppression Systems
All Phases—Mobilization, assembly, and set up of fire suppression systems.. UOM=EA

- .05.01.03.16 Petroleum, Oil, and Lubricant Dispensing Station
All Phases—Mobilization, assembly, and set up of petroleum, oil, and lubricant dispensing station. UOM=EA
- .05.01.03.17 Guardhouses
All Phases—Mobilization, assembly, and set up of guardhouses. UOM=M²
- .05.01.03.18 Wastewater Holding Tanks
All Phases—Mobilization, assembly, and set up of wastewater holding tanks.
UOM=M³
- .05.01.03.19 Housing
All Phases—Mobilization, assembly, and set up of temporary housing. UOM=M²
- .05.01.03.20 Aggregate Surfacing
All Phases—Placement of aggregate surface needed for mobilization and set up of temporary facilities. UOM=M²
- .05.01.03.21 Security Fencing
All Phases—Mobilization, assembly, and set up of security fencing. UOM=M
- .05.01.03.22 Roads and Parking
All Phases—Mobilization, assembly, and set up of roads and parking. UOM=M²
- .05.01.03.23 Culverts
All Phases—Mobilization, assembly, and set up of culverts. UOM=M
- .05.01.03.24 Walks
All Phases—Mobilization, assembly, and set up of walks. UOM=M²
- .05.01.03.25 Signs
All Phases—Mobilization and assembly of temporary signs. UOM=EA
- .05.01.03.26 Grading
All Phases—Grade site as required for assembly and set up of temporary facilities.
UOM=M²
- .05.01.03.27 Erosion Control
All Phases—Perform erosion control as a result of mobilization, assembly, and set up of temporary facilities. UOM=M²
- .05.01.03.9X Others
All Phases—All other costs associated with mobilization, assembly, and set up of temporary utilities. UOM=LS

.05.01.04 Temporary Utilities

Phases 2-6—Mobilization, assembly, and set up of temporary utilities. UOM=M

.05.01.04.01 Site Lighting

Phases 2-6—Mobilization, assembly, and set up of site lighting. UOM=EA

.05.01.04.02 Power connection/distribution

Phases 2-6—Mobilization, assembly, and set up of power connection and distribution. UOM=M

.05.01.04.03 Telephone/Communications Hook-Up

Phases 2-6—Mobilization, assembly, and set up of telephone/communications hook-up including faxes and Internet or networking connections. UOM=M

.05.01.04.04 Water Connection/Distribution

Phases 2-6—Mobilization, assembly, and set up of water connection/distribution. UOM=M

.05.01.04.05 Sewer Connection/Distribution

Phases 2-6—Mobilization, assembly, and set up of sewer connection/distribution. UOM=M

.05.01.04.06 Gas Connection/Distribution

Phases 2-6—Mobilization, assembly, and set up of gas connection/distribution. UOM=M

.05.01.04.9X Other

Phases 2-6—Mobilization, assembly, and set up of other temporary utilities. UOM=LS

.05.01.05 Construction Plant Erection

Phase 4—Mobilization, assembly, and set up of temporary construction plants. UOM=EA

.05.01.05.01 Concrete Batch Plant

Phase 4—Mobilization, assembly, and set up of concrete batch. plant. UOM=EA

.05.01.05.02 Block Plant

Phase 4—Mobilization, assembly, and set up of construction plant for blocks. UOM=EA

.05.01.05.03 Precast Concrete Plant

Phase 4—Mobilization, assembly, and set up of construction plant for precast concrete. UOM=EA

.05.01.05.04 Asphalt Plant

Phase 4—Mobilization, assembly, and set up of construction plant for asphalt plant. UOM=EA

.05.01.05.05 Quarry Crusher/Screens

Phase 4—Mobilization, assembly, and set up of construction plant for quarry crusher/screen systems. UOM=EA

.05.01.05.9X Other

Phase 4—Mobilization, assembly, and set up of other construction plants. UOM=EA

.05.01.06 Radiological Protection Laboratory

All Phases—Mobilization, assembly, and set up of radiological Protection Laboratory. UOM=EA

.05.01.07 Temporary Relocations/Roads/Structures/Utilities

All Phases—Mobilization, assembly, and set up of temporary relocations/roads/structures/utilities. UOM=M

.05.01.07.01 Roads

All Phases—Mobilization, assembly, and set up of temporary road relocations. UOM=M

.05.01.07.02 Structures

All Phases—Mobilization, assembly, and set up of temporary relocations of structures. UOM=EA

.05.01.07.03 Utilities

All Phases—Mobilization, assembly, and set up of temporary utility relocations. UOM=M

.05.01.07.04 Other

All Phases—Mobilization, assembly, and set up of other temporary relocations/roads/structures/utilities. UOM=LS

.05.01.9X Other

All Phases—Mobilization, assembly, and set up of other mobilization activities. UOM=LS

.05.02 Cleanup/Landscaping/Revegetation

All Phases—Cleanup activities consisting of general area cleanup, removal of trash and debris, and washing or sweeping of roads and parking lots usually as a concluding activity in a project or program. This element also includes landscaping activities consisting of land preparation for, and execution of, seeding, planting, sodding, revegetation of site; slope protection; fertilization; watering; and mowing and trimming as required at the site. UOM=M²

.05.02.01 Removal of Trash and Debris

All Phases—Removal of trash and debris at a site. UOM=M²

.05.02.02 Washing or Sweeping

All Phases—Washing or sweeping of areas. UOM=M²

.05.02.03 Fine Grading and Soil Preparation

All Phases—Fine grading and soil preparation at a site. UOM=M²

.05.02.04 Erosion Control

All Phases—Initial installation, construction, and maintenance of erosion control devices at a site. UOM=M²

.05.02.05 Sodding and Seeding

All Phases—Initial sodding and seeding and continual maintenance of a site. UOM=M²

.05.02.06 Planting of Trees, Shrubs, Plants

All Phases—Plant and maintain trees, shrubs, and plants at a site. UOM=M²

.05.02.07 Revegetation

All Phases—Revegetation and maintenance of vegetation at a site. UOM=M²

.05.02.08 Irrigation System

All Phases—Installation, operation, and maintenance of an irrigation system at a site. UOM=M²

.05.02.09 Topsoil

All Phases—Initial placement and maintenance placement of topsoil at a site. UOM=M²

.05.02.10 Mulch/Fertilizer

All Phases—Initial placement and continual maintenance placement of mulch and fertilizer at the site. UOM=M²

.05.02.9X Other

All Phases—Other costs associated with cleanup/landscaping/revegetation. UOM=M²

.05.03 Clear and Grub

Phases 1-4—Clear and grub as necessary to prepare the site for construction, remediation, treatment, or other activities. Clearing is the process of removing vegetation such as trees, shrubs, brush, grass, and other plants. Grubbing is the removal of stumps, roots, and debris from soil by heavy equipment such as dozer, scrapers, and excavators UOM=M²

.05.03.01 Cut and Chip Trees

Phases 1-4—Cut and chip trees, shrubs, and other plants. UOM=EA

.05.03.02 Removal of Stumps

Phases 1-4—Removal of tree stumps. UOM=EA

.05.03.03 Clearing Brush

Phases 1-4—Clearing of brushes and plants. UOM=M²

.05.03.04 Strip Topsoil

Phases 1-4—Stripping of topsoil. UOM=M³

.05.03.05 Tree Removal

Phases 1-4—Removal of trees, shrubs, plants, and other large items. UOM=EA

.05.03.9X Other

Phases 1-4—Other costs associated with clear and grub. UOM=M²

.05.04 Dismantling and Demolition (Non-Hazardous)

Phases 1-5—Demolish or dismantle structures and facilities such as buildings, roads, pavements, fencing, pipes, and underground utilities in a **non-hazardous area**. This activity also includes the removal of barriers and other structures. Dismantling and demolition in hazardous areas should use treatment technologies and Facility D&D activities in sections .21.xx—.31.xx, and .34.xx to decontaminate the structures. See .14.01 also for Demolition for OE Removal. UOM=M²

.05.04.01 Dismantling or Demolition of Non-Usable, Clean Balance of Plant Systems

Phases 1-5—Dismantle or demolish non-usable, clean balance of plant systems. UOM=M²

.05.04.01.01 Office Space Structures

Phases 1-5—Dismantle or demolish office space structures. UOM=M²

.05.04.01.02 Laboratory Space/Research Space Structures

Phases 1-5—Dismantle or demolish laboratory space/research space structures. UOM=M²

.05.04.01.03 Storage or Warehouse Structures

Phases 1-5—Dismantle or demolish storage or warehouse structures. UOM=M²

.05.04.01.04 Treatment Facility Structure

Phases 1-5—Dismantle or demolish facility structures. UOM=M²

.05.04.01.05 Component Cooling Systems

Phases 1-5—Dismantle or demolish component cooling systems. UOM=M²

.05.04.01.06 Make-Up Water Systems

Phases 1-5—Dismantle or demolish make-up water systems. UOM=M³

.05.04.01.07 Feedwater Systems

Phases 1-5—Dismantle or demolish feedwater systems. UOM=M³

.05.04.01.08 Condenser Cooling Systems

Phases 1-5—Dismantle or demolish condenser cooling systems. UOM=M³

.05.04.01.09 Sampling Systems

Phases 1-5—Dismantle or demolish sampling systems. UOM=M³

.05.04.01.10 Turbine Generator

Phases 1-5—Dismantle or demolish turbine generator. UOM=MW

.05.04.01.11 Electrical Motor Control Center

Phases 1-5—Dismantle or demolish electrical motor control center. UOM=M²

.05.04.01.12 Instrumentation Systems

Phases 1-5—Dismantle or demolish instrumentation systems. UOM=M²

.05.04.01.13 Cable Trays and Conduits

Phases 1-5—Dismantle or demolish cable trays and conduits. UOM=M

.05.04.01.14 Compressed Air Systems

Phases 1-5—Dismantle or demolish compressed air systems. UOM=M

.05.04.01.15 Instrument Air Systems

Phases 1-5—Dismantle or demolish instrument air systems. UOM=M

.05.04.01.16 Security Systems

Phases 1-5—Dismantle or demolish security systems. UOM=M²

.05.04.01.17 Fire Protection Systems

Phases 1-5—Dismantle or demolish fire protection systems. UOM=M²

.05.04.01.18 HVAC

Phases 1-5—Dismantle or demolish HVAC systems. UOM=M³

.05.04.01.19 Security Fencing

Phases 1-5—Dismantle or demolish security fencing systems. UOM=M

.05.04.01.20 Cooling Towers and Stacks

Phases 1-5—Dismantle or demolish cooling tower and stacks systems. UOM=M²

.05.04.01.21 Roads and Parking Space

Phases 1-5—Dismantle or demolish roads and parking space systems. UOM=M²

.05.04.01.22 Railroads

Phases 1-5—Dismantling or demolition of railroads. UOM=M

.05.04.01.23 Security Building Structures

Phases 1-5—Dismantle or demolish security building or structures. UOM=M²

.05.04.01.9X Other

Phases 1-5—Dismantle or demolish other non-usable, clean balance-of-plant systems. UOM=M²

.05.04.9X Other

Phases 1-5—Dismantle or demolish other structures and systems. UOM=M²

.05.05 Excavation and Earthwork

Phases 1-4—Excavate as necessary for site improvements; preparation for construction; installation of pipes, installation of underground utilities, treatment units and facilities; roadways; foundation; and other cut and fill requirements. This element includes removal of large rocks or excavation of various types of soils, grading, backfilling, stripping topsoil, soil compaction, and other miscellaneous activities. Methods include blasting, excavating with dragline, clamshell, or excavators. Other activities in the Site work assume excavation is not included. Therefore use this element when excavation and earthwork are necessary. It should be noted that if excavation is already included as part of other specific elements, the user should not double count by using this element again. This element does not include substructure removal under D&D. See Element .31.17. UOM=M³

.05.05.01 Excavation of Soils, Rocks, Solids and Sludges

Phases 1-4—Excavate soils, rocks, solids and sludges. UOM=M³

.05.05.02 Scarification

Phases 1-4—Scarify soil. UOM=M³

.05.05.03 Harrowing and Furrowing

Phases 1-4—Harrow and furrow the ground. UOM=M³

.05.05.04 Tracking

Phases 1-4—Track soil and land. UOM=M³

.05.05.05 Grading

Phases 1-4—Grade soil and land. UOM=M³

.05.05.06 Backfilling

Phases 1-4—Backfill soil and other material. UOM=M³

.05.05.07 Spreading

Phases 1-4—Spread soil, gravel, or other materials. UOM=M³

.05.05.08 Compaction

Phases 1-4—Compact the soil, or other materials. UOM=M³

.05.05.09 Stockpiling

Phases 1-4—Stockpile soil and other materials. UOM=M³

.05.05.10 Settlement Markers

Phases 1-4—Place and remove settlement markers. UOM=EA

.05.05.9X Other

Phases 1-4—Other activities associated with excavation and earthwork. UOM=M³

.05.06 Load and Haul

Phases 1-5—Load and haul excavation cut-and-fill materials, debris and trash, stockpiled materials, and other materials that may be needed for transport to and from other locations such as disposal facilities or material plants. Also includes handling and dumping fees. Dump trucks, loaders, and haulers may be used. Other activities in the Site work Element assume load and haul is not included. Therefore use this activity when loading and hauling are necessary. UOM=M³

.05.07 Borrow Pit/Haul Roads

Phases 1-4—A borrow pit is the location to obtain fill material for earthwork that meets certain specifications. A haul road is used to transport the borrowed material to the construction site. This element includes the construction and excavation of Haul Roads and Borrow Pits where necessary. UOM=M³

.05.08 Access Roads

Phases 1-4—Access to a site is often a major concern in any project where heavy equipment must be moved or transported. This element includes construction of access roads for construction sites or other facilities when such access is not possible or does not exist. The access road can consist of one lane dirt or gravel road to more complex multi-lane asphalt and concrete systems. UOM=M²

Phases 5 and 6—Inspect, clear, clean, repair, and maintenance access roads during normal use UOM=M²/YR

.05.09 Arterial Roads/Divided Highways

Phases 1-4—Construct permanent arterial roads or divided highways for public or private use due to the change of traffic patterns caused by the project construction or ongoing facility O&M. Costs in this element include components such as: road construction materials, barricades, equipment, guardrails, curbs and gutters, and other integral components not already included by using other elements. It is assumed that excavation/earthwork is not included in this element. If excavation/earthwork is necessary, use .05.05, Excavation and Earthwork. UOM=M²

Phases 5 and 6—Inspect, clear, clean, repair, and maintain roads and highways during normal use. UOM=M²/YR

.05.10 Diesel Generator

Phases 1-4—Cost to purchase and install diesel generators that usually provides stand-by and emergency power. UOM=EA

Phase 5-6—Cost associated with operating and maintaining the diesel generator. Examples of cost includes: oil and lubrication, replacing parts, inspection of system components, cleaning of area, and other operation and maintenance costs. UOM=EA/YR

.05.11 Access Control Facility

Phases 1-4—Construction of a facility that controls entrance and exit of personnel, material, equipment, automobiles and other items. UOM=M²

Phase 5-6—This element includes cost associated with operating and maintaining the access control facility. UOM=M²/YR

.05.12 Railroad Tracks and Crossing

Phases 1-4—This element is used when there is a need to construct railroad tracks or a crossing for the transport of materials to the site. Activities include preparation of track bed, tracks, ties, materials, markings, and other required items. UOM=M

Phases 5 and 6—Inspect, clear, repair, and maintain the tracks and crossing. UOM=M/YR

.05.13 Bridges

Phases 1-4—Cost to construct bridges necessary for site or project construction and operations. Types of bridges include timber or wooden structures, concrete structures, iron or steel structures, or composite material structures. UOM=M²

Phases 5 and 6—Inspect, clean, clear, repair, and maintain bridges during normal use
UOM= M²/YR

.05.14 Fencing

Phases 1-4—Construct various types of fencing and gates for boundary placement, security, safety, privacy, or other purposes. If minor excavation and earthwork are necessary to install the fence, the cost should be included in this element. See also Institutional Controls, .02.04. UOM=M

Phases 5 and 6—Inspect, repair, and maintain fences and boundary placements during normal operations. UOM=M/YR

.05.15 Parking Lots

Phases 1-4—Construct gravel, asphalt, or concrete parking lots as needed for site/facility construction and for personnel during O&M of the facility. See also .05.11, Resurfacing Roadways/Parking Lots. UOM=M²

Phases 5 and 6—Inspect, clear, clean, repair, and maintain parking lots during normal use. This includes the placement of a new surface cover over the existing surface. This may be required due to deteriorated condition of the surface, or because of changes to the marking. Existing concrete or asphalt surfaces will be resurfaced with asphalt surfaces or concrete, and gravel surfaces will be resurfaced with gravel. UOM=M²/YR

.05.16 Retaining Wall

Phases 1-4—Construct retaining walls designed to hold back soil or other loose material and prevent these materials from falling or sliding. Costs in this element include the retaining wall structure components, footing, construction, and minor trenching. If major excavation and earthwork are necessary, use element .05.05. UOM=M²

Phases 5 and 6—Inspect, repair, and maintain the retaining wall. UOM=M²/YR

.05.17 Sidewalks

Phases 1-4—Construct gravel, asphalt, brick, or reinforced concrete sidewalks for pedestrian traffic. UOM=M²

Phases 5 and 6—Routinely inspect, clear, clean, repair, and maintain the sidewalks during normal use. UOM=M²/YR

.05.18 Sprinkler System

Phases 1-4—Construct sprinkler systems for landscaping irrigation or for dust suppression during construction and facility operations. This element includes piping, pumping, sprinkler heads, valves, reducers, and control system. UOM=M

Phases 5 and 6—Inspect, and maintain sprinkler systems during normal use. UOM=M/YR

.05.19 Structures/Culverts

Phases 1-4—Construct or place cast-in-place concrete pipes or barrels, or large corrugated metal pipes culverts. These culverts, usually installed under roadways, are used for storm-water collection, directing the flow of water, and for transport of runoff. This element includes piping, fittings, manholes, and other work integral to construction of structure/culverts. Major earthwork and excavations are not included in the costs for this element. UOM=M

Phases 5 and 6—Inspect, clear, clean, repair, and maintain structures and culverts during normal use. UOM=M²/YR

.05.20 Gas Distribution Pipelines

Phases 1-4—Construct or place gas distribution pipelines from the main distribution to site locations. Costs in this element include pipe supports and foundation, piping, valves and switches, and other miscellaneous costs. Major excavation and earthwork are excluded from this element. UOM=M

Phases 5 and 6—Inspect, repair, and maintain gas distribution pipelines during normal use. UOM=M/YR

.05.21 Fuel Distribution Pipelines

Phases 1-4—Construct or place pipelines for fuels distribution (excluding gas distribution) from the distribution main to required site locations. Costs for this element include foundations/supports, switches and valves, pumps, piping, and other auxiliary components. This element does not include major excavation or earthwork. Use .05.05 to account for Excavation and Earthwork. UOM=M

Phases 5 and 6—Inspect, repair, and maintain fuel line distribution during normal use. UOM=M/YR

.05.22 Fuel Storage Tanks

Phases 1-4—Install or construct storage tanks for fuel during site construction or facility operation and maintenance. It also includes foundation or support for the tanks and meters and controls. This element does not include major excavation or earthwork. Use .05.05 to account for Excavation and Earthwork. UOM=EA

Phases 5 and 6—Inspect, repair and maintain fuel storage tanks during normal use. UOM=EA/YR

.05.23 Heating/Cooling Distribution System

Phases 1-4—Construct or install heating and cooling distribution systems from a central plant source to the construction site or for facility O&M. A distribution system consists of supply pipe for chilled water and a separate pipe for hot water. Also included is a separate

return pipe from the site to the central plant. This element includes support frames and structures, system instrumentation and controls, valves, fittings, flow measures, and other appurtenance. Use .05.05 to account for Excavation and Earthwork. UOM=M

Phases 5 and 6—Inspect, repair, and maintain heating and cooling distribution system during normal use. UOM=M/YR

.05.24 Steam Distribution and Condensate Return Systems

Phases 1-4—Construct or install steam and condensate distribution systems from a central plant source to the construction site or for facility O&M. Distribution systems consist of a supply pipe for steam and a separate pipe for condensate. Also included is a separate return pipe from the site to the central plant. This element includes support frames and structures, system instrumentation and controls, valves, fittings, flow measures, access ways, and other appurtenance. Use .05.05 to account for Excavation and Earthwork. UOM=M

Phases 5 and 6—Inspect, repair, and maintain steam and condensate distribution systems during normal use. UOM=M/YR

.05.25 Treatment Plants/Lift Stations

Phases 1-4—Construct treatment plants and lift stations used to treat and transport non-contaminated or non-hazardous fluids. This element includes water or wastewater treatment unit construction and installation, piping, valves and fittings, instrumentation and control, supporting frames and structures, and other necessary appurtenances. This element does not include excavation and earthwork. Use .05.05 to account for Excavation and Earthwork. UOM=M²

Phases 5 and 6—Inspect, repair, and maintain the treatment plant or the lift station during normal use. UOM=M²/YR

.05.26 Water Distribution

Phases 1-4—Install or construct a system to distribute potable or irrigation water to construction sites or facilities from a central location. This element includes piping, valves and fittings, instrumentation and controls, pumps, manholes, and other required appurtenances. Use .05.05 to account for Excavation and Earthwork. UOM=M

Phases 5 and 6—Inspect, clear, clean, repair, and maintain the water distribution system during normal use. UOM=M/YR

.05.27 Water Storage Tanks

Phases 1-4—Install or construct tanks to store potable or irrigation water for construction sites or facilities. This element includes tanks, piping, valves and fittings, instrumentation and controls, pumps, and other required appurtenances. Use .05.05 to account for Excavation and Earthwork. UOM=EA

Phases 5 and 6—Inspect, clear, clean, repair, and maintain water storage tanks during normal use. UOM=EA/YR

.05.28 Storm Sewer Systems

Phases 1-4—Install or construct systems to collect, redirect, and transport storm water at the construction site or for the facility to a central treatment plant. This element includes piping, valves and fittings, instrumentation and controls, pumps, manholes, and other required appurtenances. Use .05.05 to account for Excavation and Earthwork. UOM=M

Phases 5 and 6—Inspect, clear, clean, repair, and maintain storm sewers during normal use. UOM=M/YR

.05.29 Communications Systems

Phases 1-4—Construct and install underground or aboveground communication systems including phones, fax, video, or e-mails. Included in the element are the installation of cables and wires, hardware, switches, conduits, and other equipment. UOM=M²

Phases 5 and 6—Inspect, and maintain communication systems during normal use. UOM=M²/YR

.05.30 Lighting

Phases 1-4—Install or fabricate illuminating devices at the construction site, roadways, facilities, and other areas at the site. It includes switches, light bulbs, poles, foundation, and other fixtures. Use .05.05 to account for Excavation and Earthwork. UOM=M

Phases 5 and 6—Inspect, clear, clean, repair, and maintain lighting systems during normal use. UOM=M/YR

.05.31 Overhead Electrical Distribution

Phases 1-4—Install or construct devices for overhead electrical distribution to construction sites or facilities from a central location. This element assumes there is no excavation for distribution line installations, but includes wires, poles, switches, transformers, and other related items. UOM=M

Phases 5 and 6—Inspect, repair, and maintain overhead electrical distribution during normal use. UOM=M/YR

.05.32 Underground Electrical Distribution

Phases 1-4—Install or construct buried electrical power distribution enclosures, wires, cables, switches, fixtures, transformers, and other appurtenances from a central location to a construction site or to a facility. Use .05.05 to account for Excavation and Earthwork. UOM=M

Phases 5 and 6—Inspect, repair, and maintain underground electrical distribution systems during normal use. UOM=M/YR

.05.33 Sanitary Sewer Systems

Phases 1-4—Install and construct systems to collect and transport aqueous sanitary waste to a central treatment location from a construction site or a facility. Items include piping, pumps, instrumentation and control, valves and fittings, storage tanks, and other necessary appurtenances. Use .05.05 to account for Excavation and Earthwork. UOM=M

Phases 5 and 6—Inspect, clear, clean, repair, and maintain sanitary sewers during normal use. UOM=M/YR

.05.34 Restoration of Buildings After D&D

Phases 4-6—Restore buildings and facilities for reuse after D&D. UOM=M³

.05.35 Compressed Air/Nitrogen Systems

Phases 1-4—Install and construct systems to supply compressed air and nitrogen. Items include piping, compressors, instrumentation and control, valves and fittings, storage tanks, and other necessary appurtenances. Use .05.05 to account for Excavation and Earthwork. UOM=M³

Phases 5 and 6—Inspect, clear, clean, repair, and maintain compressed air and nitrogen system during normal use. UOM=M³/YR

.05.36 Demobilization

All Phases—Transport equipment back to owner and personnel back to their permanent place of residence. This element provides for all work associated with plant takedown and removal of temporary facilities, utilities, equipment, material, and personnel. UOM=LS

.05.36.01 Remove Temporary Facilities

All Phases—Disassembly, removal, and demobilization of temporary facilities. UOM=EA

.05.36.01.01 Office Trailers

All Phases—Disassemble, remove, and demobilize office trailers. UOM=EA

.05.36.01.02 Lunch/Break Trailer

All Phases—Disassemble, remove, and demobilize lunch/break trailers. UOM=EA

.05.36.01.03 Emergency Medical Facilities Trailers

All Phases—Disassemble, remove, and demobilize emergency medical facilities trailers. UOM=EA

.05.36.01.04 Storage Facilities

All Phases—Disassemble, remove, and demobilize of storage facilities and warehouses. UOM=EA

.05.36.01.05 Laundry Facilities

All Phases—Disassemble, remove, and demobilize laundry facilities. UOM=EA

.05.36.01.06 Toilets

All Phases—Disassemble, remove, and demobilize toilets. UOM=EA

.05.36.01.07 Temporary Laboratory

All Phases—Disassemble, remove, and demobilize temporary laboratory. UOM=EA

.05.36.01.08 Maintenance Shop

All Phases—Disassemble, remove, and demobilize maintenance shop. UOM=EA

.05.36.01.09 Truck Scales

All Phases—Disassemble, remove, and demobilize truck scales. UOM=EA

- .05.36.01.10 Observation Towers
All Phases—Disassemble, remove, and demobilize observation towers. UOM=EA
- .05.36.01.11 Decontamination Facilities for Personnel
All Phases—Disassemble, remove, and demobilize decontamination facilities for personnel. UOM=M²
- .05.36.01.12 Decontamination Facilities for Construction Equipment and Vehicles
All Phases—Disassemble, remove, and demobilize decontamination facilities for construction equipment and vehicles. UOM=M²
- .05.36.01.13 Temporary Cover Structure Over Contaminated Area
All Phases—Disassemble, remove, and demobilize temporary cover structure over contaminated area. UOM=M²
- .05.36.01.14 Barricades
All Phases—Disassemble, remove, and demobilize temporary barricades.
UOM=M
- .05.36.01.15 Fire Suppression Systems
All Phases—Disassemble, remove, and demobilize fire suppression systems.
UOM=EA
- .05.36.01.16 Petroleum, Oil, Lubricant Dispensing Station
All Phases—Disassemble, remove, and demobilize petroleum, oil, and lubricant dispensing station. UOM=EA
- .05.36.01.17 Guardhouses
All Phases—Disassemble, remove, and demobilize guardhouses. UOM=M²
- .05.36.01.18 Wastewater Holding Tanks
All Phases—Disassemble, remove, and demobilize wastewater holding tanks.
UOM=M³
- .05.36.01.19 Housing
All Phases—Disassemble, remove, and demobilize temporary housing. UOM=M²
- .05.36.01.20 Aggregate Surfacing
All Phases—Place aggregate surface needed for demobilization effort. UOM=M²
- .05.36.01.21 Security Fencing
All Phases—Disassemble, remove, and demobilize security fencing. UOM=M
- .05.36.01.22 Roads and Parking
All Phases—Place roads and parking needed for demobilization effort. UOM=M²
- .05.36.01.23 Culverts

All Phases—Place culverts needed for demobilization effort. UOM=M

.05.36.01.24 Walks

All Phases—Disassemble, remove, and demobilize walks. UOM=M²

.05.36.01.25 Signs

All Phases—Demobilize and remove temporary signs.. UOM=EA

.05.36.01.26 Grading

All Phases—Grading activities performed as part of demobilization of temporary facilities. UOM=M²

.05.36.01.27 Erosion Control

All Phases—Erosion control activities required by mobilization, assembly, and set up of temporary facilities. UOM=M²

.05.36.01.9X Others

All Phases—Remove other facilities, material, equipment, and items. UOM=LS

.05.36.02 Removd Temporary Utilities

Phases 2-5—Disassemble, remove, and demobilize temporary utilities. UOM=M

.05.36.02.01 Site Lighting

Phases 2-5—Disassemble, remove, and demobilize site lighting. UOM=M

.05.36.02.02 Power Connection/Distribution

Phases 2-5—Disassemble, remove, and demobilize power connection and distribution. UOM=M

.05.36.02.03 Telephone/Communications Hook-Up

Phases 2-5—Disassemble, remove, and demobilize telephone/communications hook-up. UOM=M

.05.36.02.04 Water Connection/Distribution

Phases 2-5—Disassemble, remove, and demobilize water connection/distribution. UOM=M

.05.36.02.05 Sewer Connection/Distribution

Phases 2-5—Disassemble, remove, and demobilize sewer connection/distribution. UOM=M

.05.36.02.06 Gas Connection/Distribution

Phases 2-5—Disassemble, remove, and demobilize gas connection/distribution. UOM=M

.05.36.02.9X Other

Phases 2-5—Disassemble, remove, and demobilize other temporary utilities. UOM=M

.05.36.03 Final Decontamination

Phases 2-5—All costs associated with final decontamination of temporary facilities, equipment, and structures. UOM=M²

.05.36.04 Construction Equipment and Facilities

Phases 2-5—Disassembly and demobilization of construction equipment and facilities. UOM=EA

.05.36.04.01 Transport Vehicles, Equipment, Drivers and Operators

Phases 2-5—Transportation of vehicles, equipment, drivers, and operators as part of the demobilization effort. UOM=EA

.05.36.04.02 Manifests, Tolls, Permits for Mobilization

Phases 2-5—Obtain manifests, tolls, permits, and other documentation for demobilization of equipment, facilities, operators, and drivers. UOM=EA

.05.36.04.03 Escort Vehicles Ownership and Operation

Phases 2-5—All costs associated with use and ownership of escort vehicles. UOM=EA

.05.36.04.04 Construction Equipment Operators

Phases 2-5—Transportation of construction equipment operators during demobilization effort. UOM=EA

.05.36.04.05 Disassembly of Equipment and Takedown

Phases 2-5—Disassemble and takedown construction equipment. UOM=EA

.05.36.04.06 Turn in Government Furnished Equipment

Phases 2-5—Demobilize and turn in Government furnished equipment. UOM=EA

.05.36.04.9X Other

Phases 2-5—Disassemble and demobilize other construction equipment and facilities. UOM=EA

.05.36.05 Demobilization of Personnel

Phases 2-5—Demobilize or relocate professional personnel. UOM=EA

.05.36.05.01 Relocation of Personnel

Phases 2-5—Relocate personnel. UOM=EA

.05.36.05.9X Other

Phases 2-5—Other costs associated with demobilizing of personnel. UOM=EA

.05.36.06 Construction Plant Takedown

Phases 2-5—Disassemble and takedown construction plant. UOM=EA

.05.36.07 Radiological Protection Laboratory

Phases 2-5—Demobilize radiological protection laboratory. UOM=EA

.05.36.9X Other

All Phases—Demobilize other equipment, facility, and items. UOM=LS

.05.37 Population Relocation

All Phases—Relocate residents or users during a project due to the contamination of a site or potential risk posed to the citizens. UOM=EA

Cross Cut—Relocate residents to reduce the risk of exposure or potential for contamination due to site- wide or base-wide activities. UOM=EA

.05.38 Relocated Distribution Systems

Phases 1-4—Relocate distribution systems such as gas, fuel, water, communications, and electrical. This task may include remove old distribution systems and install and connect new systems. Excavation to install the distribution systems is included in this element. See also elements .05.04 and .05.36 to ensure that costs have not been duplicated. UOM=M

Phases 5 and 6—Operate, inspect, maintain, repair, and clean and clear the distribution systems during normal use. UOM=M/YR

.05.38.01 Gas Distribution System

Phases 1-4—Remove old line or installation and connect new gas distribution.

UOM=M

Phases 5 and 6—Operate, inspect, maintain, repair, clean and clear the gas distribution system during normal use. UOM=M/YR

.05.38.02 Fuel Distribution System

Phases 1-4—Remove old line or installation and connect new fuel line distribution..

UOM=M

Phases 5 and 6—Operate, inspect, maintain, repair, clean and clear the fuel line distribution system during normal use. UOM=M/YR

.05.38.03 Heating/Cooling Distribution System

Phases 1-4—Remove old line or installation and connect new heating/cooling distribution system.. UOM=M

Phases 5 and 6—Operate, inspection, maintain, repair, and clean and clear the heating/cooling distribution system during normal use. UOM=M/YR

.05.38.04 Steam and Condensate Systems

Phases 1-4—Remove old lines or install and connect steam distribution and condensate return system. UOM=M

Phases 5 and 6—Operate, inspect, maintain, repair, clean and clear the steam distribution and condensate return system during normal use. UOM=M/YR

.05.38.05 Water Distribution System

Phases 1-4—Remove old line or install and connect water distribution. UOM=M

Phases 5 and 6—Operate, inspect, maintain, repair, clean and clear the water distribution system during normal use. UOM=M/YR

.05.38.06 Storm Sewer System

Phases 1-4—Remove old line or install and connect storm sewer system. UOM=M

Phases 5 and 6—Operate, inspect, maintain, repair, clean and clear the storm sewer system during normal use. UOM=M/YR

.05.38.07 Communications Systems

Phases 1-4—Remove old line or install and connect new communication lines.

UOM=M

Phases 5 and 6—Operate, inspect, maintain, and repair of the communication system during normal use.. UOM=M/YR

.05.38.08 Overhead Electrical Distribution System

Phases 1-4—Remove old line or install and connect new overhead electrical distribution. UOM=M

Phases 5 and 6—Operate, inspect, maintain, repair, clean and clear the overhead electrical distribution system during normal use. UOM=M/YR

.05.38.09 Underground Electrical Distribution System

Phases 1-4—Remove old line or install and connect new underground electrical distribution. UOM=M

Phases 5 and 6—Operate, inspect, maintain, repair, clean and clear the underground electrical distribution system during normal use. UOM=M/YR

.05.38.10 Sanitary Sewer System

Phases 1-4—Remove old line or install and connect new sanitary sewer system.

UOM=M

Phases 5 and 6—Operate, inspect, maintain, repair, clean and clear the sanitary sewer system during normal use. UOM=M/YR

.05.38.9X Other

Phases 1-4—Remove old line or install and connect other distribution systems.

UOM=M

Phases 5 and 6—Operate, inspect, maintain, repair, clean and clear other distribution system during normal use. UOM=M/YR

.05.39 Steam Plant Facility

Phases 1-4—Construct a facility that produces the steam required for each of the major facilities. The steam plant facility includes the steam plant building, the boiler, the fuel oil day tank area adjacent to the steam plant building, and a condensate return to the boiler.

UOM=M²

Phases 5 and 6—Operate and maintain the steam plant facility and associated equipment. Examples of cost include operation of steam plant, replacing parts, regular inspection of system components, cleaning of area, and other operation and maintenance costs.

UOM=M²/YR

.05.40 Switch Gear Building

Phases 1-4—Construct a facility that distributes incoming power from the DOE substation

to all site facilities. UOM=M²

Phases 5 and 6—Operate and maintain the switch gear building. Examples of cost include operating the facility, replacing parts, regularly inspecting system components, cleaning and clearing of areas, and other operation and maintenance costs. UOM=M²/YR

.05.41 Switch Gear Building for Important-to-Safety Systems

Phases 1-4—Constructing a facility that distributes incoming power from the diesel generators to important-to-safety systems. UOM=M²

Phases 5 and 6—Operate and maintain the switch gear building. Examples of costs include operating the facility, replacing parts, regularly inspecting system components, cleaning and clearing of areas, and other operation and maintenance activities. UOM=M²/YR

.05.43 Reserved for Future Use

.05.44 Reserved for Future Use

.05.45 Reserved for Future Use

.05.46 Reserved for Future Use

.05.47 Reserved for Future Use

.05.48 Reserved for Future Use

.05.49 Reserved for Future Use

.05.50 Reserved for Future Use

.05.51 General Requirements

All Phases—Work and costs *not covered elsewhere* that is associated with initial set up and final closeout of the site such as mobilization and demobilization, and temporary construction of roads and fencing to access and secure the site. UOM=LS

.05.51.01 Mobilization

All Phases—Mobilization activities for the project. UOM=LS

.05.51.02 Demobilization

All Phases—Demobilization activities for the project. UOM=LS

.05.51.03 Temporary Construction of Roads, Walks, Fences

All Phases—Temporary construction of roads, walks, and fences. UOM=M

.05.51.9X Other

All Phases—Work associated with performing other general requirement needs. UOM=LS

.05.52 Clean Site Work

All Phases—Conduct initial site visit and preparations; excavation and other earthwork; load, haul, and dump; clear and grub; pave and surface; build bridges and railroads; provide for piped utilities, sewage and drainage; and landscaping, etc. Also see 05.51 UOM=LS

.05.52.01 Landscaping

All Phases—Perform site landscaping work. UOM=M²

.05.52.02 Site Clearing and Grubbing

All Phases—Perform site clearing and grubbing. work UOM=M²

.05.52.03 Dismantle

All Phases—Perform clean dismantling work at the site. UOM=M²

.05.52.04 Excavation

All Phases—Material, labor, and equipment costs associated with excavation work. UOM=M³

.05.52.05 Loading/Hauling and Dumping

All Phases—Load, haul, and dump soil, rocks, gravel, and other materials. UOM=M³

.05.52.06 Permanent Rock and Gravel Roads

All Phases—Construct and maintain permanent rock and gravel roads. UOM=M²

.05.52.07 Permanent Bituminous Paving

All Phases—Construct and maintain permanent bituminous paving. UOM=M²

.05.52.08 Railroads

All Phases—Construct and maintain railroad tracks. UOM=M

.05.52.09 Bridges

All Phases—Construct and maintain bridges. UOM=M²

.05.52.10 Permanent Fences

All Phases—Construct and maintain permanent fences. UOM=M

.05.52.11 Permanent Road, Walks, and Parking

All Phases—Construct and maintain permanent road, walks, and parking. UOM=M²

.05.52.12 Retaining Wall

All Phases—Construct and maintain retaining wall. UOM=M²

.05.52.13 Bituminous Sidewalks

All Phases—Construct and maintain bituminous sidewalks. UOM=M²

.05.52.14 Sprinkler System

All Phases—Construct and maintain sprinkler system. UOM=M

.05.52.15 Culverts

All Phases—Construct and maintain culverts. UOM=M

.05.52.16 Special Pipe Installation

All Phases—Install and maintain special pipes. UOM=M

.05.52.17 Drainage and Utilities

All Phases—Construct and maintain drainage and utilities. UOM=M

.05.52.18 Sewer Line

All Phases—Construct and maintain sewer lines. UOM=M

.05.52.9X Other

All Phases—Construct and maintain other site work elements. UOM=M

.05.53 Concrete

All Phases—Work associated with placing concrete such as formwork, reinforcement, cast-in-place concrete, and transporting and installing precast concrete. Also see 05.51.

UOM=M³

.05.54 Masonry

All Phases—Material, labor, and equipment costs associated with installing masonry units such as bricks, blocks, stones, ties, reinforcing, scaffolding, sand blasting, cleaning, and performing other masonry tasks. Also see 05.51 UOM=M²

.05.55 Metals

All Phases—Costs associated with installing or constructing metal components in buildings and structures. Examples of cost components include metal specialties such as: fasteners, metal framing, structural steel and aluminum, metal joists, metal decking, stairs, ladders, rails, floor plates and grating, and metal roping. Also see 05.51 UOM=KG

.05.56 Wood and Plastics

All Phases—Costs associated with installing wood or plastic buildings and structures. Examples of wood cost components include: fasteners and adhesives, wood framing, columns and other structural supports, roofs, sheathing, flooring, decking, millwork molding, shelving, plastic laminate, paneling, finish carpentry, preservation and treatment, stairs and handrails, cabinets.

Examples of cost associated with plastics include fiberglass columns and rails, grating, vanity and counter tops, and other plastic products. Also see 05.51 UOM=LS

.05.57 Thermal and Moisture Protection

All Phases—Costs associated with installing thermal and moisture protection such as waterproofing and damp proofing; insulation and fireproofing; shingles, roofing, and siding; membrane roofing; flashing and sheet metals; skylights; and joint sealers. Also see 05.51 UOM=M²

.05.58 Doors and Windows

All Phases—Metal, wood, glass, and plastic doors, frames, and windows. This element also includes miscellaneous costs such as hinges, glazing, screens, locks, doorstops, bumpers, and similar items. Also see 05.51 UOM=EA

.05.59 Finishes

All Phases—Finish buildings and rooms and install aesthetic features. Examples of costs include: lathing, plastering, and boarding; flooring and carpeting; interior painting, wall papers, and wall coverings; tiling and terrazzo; ceilings; trims; exterior painting; and other finishing work. Also see 05.51 UOM=M²

.05.60 Specialties

All Phases—Specialty items for facilities such as visual display boards, bathroom partitions and compartments, bath accessories, prefabricated fireplaces, stoves, flagpole, lockers, fire protection equipment, and other specialty items. Also see 05.51 UOM=EA

.05.61 Specialized Building Equipment

All Phases—Equipment and building features such as vaults, bullet-resistant windows, church alters, seating, surveillance equipment, movie screens and projectors, stage equipment, curtains, laundry and dry cleaning equipment, cash registers, food services equipment and appliances, health club equipment, laboratory equipment, shop equipment, and medical equipment. Also see 05.51 UOM=EA

.05.62 Furnishings

All Phases—Furnishings for offices, buildings, or facilities. Examples of furnishing include blinds or shades, display cases, cabinets, furniture, interior plants, and other furnishing items. Also see 05.51 UOM=EA

.05.63 Special Facilities Construction

All Phases—Construct special facilities such as gymnasiums, greenhouses, darkrooms, clean rooms, pre-engineered buildings, underground and above-ground storage tanks, swimming pools and enclosures, air control towers, ice rinks, and other specialty facilities. UOM=M²

.05.63.01 Tanks

All Phases—Construct or install and maintain tanks. UOM=M³

.05.63.9X Other

All Phases—Construct or install and maintain other special construction. UOM=M²

.05.64 Conveying Systems

All Phases—Items such as elevators, escalators, lifts, hoists, cranes, moving walks, dumbwaiters, and other systems to convey people, material, and equipment from one location to another. UOM=EA

.05.65 Mechanical

All Phases—Construct or install pipes and fittings; conduits and ducts; plumbing fixtures; pumps; water appliances; fire protection; heating, air conditioning and ventilation; and other mechanical equipment. UOM=LS

.05.65.01 Heaters and Exchangers

All Phases—Construct or install and maintain heaters and exchangers. UOM=EA

.05.65.02 Special Pipe Installation

All Phases—Construct or install and maintain special piping. UOM=M

.05.65.03 Pumps and Drivers

All Phases—Construct or install and maintain pumps and drivers. UOM=M³

.05.65.04 Compressors, Blowers, Fans, and Drivers

All Phases—Construct or install and maintain compressors, blowers, fans, and drivers. UOM=M³

.05.65.9X Other

All Phases—Construct or install and maintain other mechanical construction. UOM=EA

.05.66 Electrical

All Phases—Construct or install power distribution, lighting, conductors and grounding, electrical boxes and wiring, controls, motors, starters, boards, switches, transformers, bus ducts, and other electrical specialty and miscellaneous items. UOM=LS

05.66.01 Communication Devices

All Phases—Construct or install and maintain communication devices. UOM=EA

.05.66.02 Lighting Fixtures

All Phases—Construct or install and maintain lighting fixtures. UOM=EA

.05.66.03 Power Transmission and Distribution

All Phases—Construct or install and maintain power transmission and distribution. UOM=M

.05.66.04 Electric Utilities

All Phases—Construct or install and maintain electrical utilities. UOM=M

.05.66.05 Instrumentation and controls

All Phases—Construct or install and maintain instrumentation and controls. UOM=EA

.05.66.9X Other

All Phases—Construct or install and maintain other electrical devices. UOM=EA

.05.9X Other

All Phases—Other activities associated with clean site work. UOM=LS

.06.00 Surveillance and Maintenance

.06.01 Facility Transition

All Phases—Plan for acceptance criteria and end-point development and for end-point criteria verification. UOM=LS

06.01.01 End-Point Criteria

All Phases—Provide technical support and assistance to develop end-point criteria. UOM=LS

.06.01.02 End-Point Criteria Verification

All Phases—Provide technical support and assistance with verification of end point criteria. UOM=LS

.06.01.9X Other

All Phases—Provide technical support and assistance with other facility transition work. UOM=LS

.06.02 Outdoor Surveillance and Maintenance

All Phases—Manage inactive waste sites to minimize the spread of surface soil contamination and to comply with regulatory requirements. UOM=M²/YR

.06.02.01 Surveillance and Inspections

All Phases—Perform outdoor surveillance and inspection. UOM=M²/YR

.06.02.02 Routine Radiological Surveys

All Phases—Perform routine outdoor radiological survey. UOM=M²/YR

.06.02.03 Maintenance and Revegetation

All Phases—Maintain grounds and revegetation of contaminated site or area. UOM=M²/YR

.06.02.04 Corrective Actions

All Phases—Conduct outdoor corrective actions. UOM=M²/YR

.06.02.05 Herbicide and Pesticide Applications

All Phases—Apply herbicides and pesticides. UOM=M²/YR

.06.02.9X Other

All Phases—Perform other outdoor surveillance and maintenance activities.

UOM=M²/YR

.06.03 Indoor Surveillance and Maintenance

All Phases—Minimize the risks to the environment and human health and safety posed by the radiological and hazardous materials inventory. UOM=M²/YR

.06.03.01 Surveillance and Inspections

All Phases—Perform indoor surveillance and inspection. UOM=M²/YR

.06.03.02 Facility/Building Maintenance

All Phases—Perform indoor facility and building maintenance. UOM=M²/YR

.06.03.03 Facility Risk Assessment

All Phases—Perform facility risk assessment. UOM=M²/YR

.06.03.04 Major Facility Repairs

All Phases—Perform major facility repairs. UOM=M²/YR

.06.03.05 Facility System Replacement

All Phases—Perform facility system replacement. UOM=M²/YR

.06.03.06 Asbestos Containing Material Encapsulation (Also .15.04.08)

All Phases—Encapsulate asbestos containing materials. UOM=M²/YR

.06.03.07 Routine Radiological Surveys

All Phases—Perform routine indoor radiological survey. UOM=M²/YR

.06.03.9X Other

All Phases—Perform other indoor surveillance and maintenance activities.

UOM=M²/YR

.06.9x Other

All Phases—Perform other surveillance and maintenance activities. UOM=M²/YR

.07.00 Investigations and Monitoring/Sample Collection

.07.01 Site Reconnaissance

Phases 1-4—The general survey of a site to determine the situation or condition of the area. Activities include ecological resources reconnaissance, well inventory and sampling, land survey, topographic mapping, field screening, and historical investigation of the site.

UOM=M²

.07.01.01 Ecological Resources Identification

Phases 1-3—Perform reconnaissance inspection or exploration of the area to identify ecological resources. UOM=M²

.07.01.02 Well Inventory

Phases 1-3—Collect quantitative and qualitative information of wells within an area including marking/tagging/identification of wells, and recording well data. UOM=M²

.07.01.03 Residential Well Sampling

Phases 1-3—Perform sampling of residential wells. UOM=EA

.07.01.04 Land Survey (Above and Below Ground Level)

Phases 1-3—Perform above and below ground land survey. UOM=M²

.07.01.05 Topographic Maps

Phases 1-3—Perform topographic mapping of a site or an area. UOM=M²

.07.01.06 Field Screen

Phases 1-4—Conduct field screening activities. UOM=M²

.07.01.07 Facility Survey and Characterization

Phases 1-3—Conduct facility survey and characterization. UOM=M²

.07.01.07.01 Collection and Review of Existing Documents

Phases 1-3—Collect and review documents and interviews with personnel to determine site conditions and contamination. UOM=LS

.07.01.07.02 Inventory of Equipment and Materials

Phases 1-3—Take inventory of equipment and materials. UOM=LS

.07.01.07.03 Structural Characterization

Phases 1-3—Perform structural characterization and analysis. UOM=M²

.07.01.07.9X Other

Phases 1-3—Other facility survey and characterization efforts. UOM=LS

.07.01.9X Other

Phases 1-3—Perform other site reconnaissance activities. UOM=M²

.07.02 Meteorological Monitoring

All Phases—Measure wind, precipitation, barometric pressure, and other meteorological parameters. The element also includes procuring equipment; constructing monitoring stations; and the installing, setting up, testing, operating and maintaining meteorological stations and instrument shelters. UOM=EA

.07.02.01 Meteorological Monitoring Station

All Phases—Construct, operate, and maintain meteorological monitoring station.

UOM=EA

.07.02.02 Instrument Shelter

All Phases—Install, construct, and maintain meteorological instrument shelter.

UOM=EA

.07.02.9X Other

All Phases—Other activities associated with meteorological monitoring. UOM=EA

.07.03 Site Contaminant Surveys/Radiation Monitoring

All Phases—Conduct site contaminants surveys and monitor radiation. Site contaminant surveys include: determine the level of radiation or contamination present at the site or at a certain location. Radiation monitoring includes: measure radiation or personal body count levels and at specified site areas. Body count monitoring includes: personal dosimetry systems and hand, foot, and whole-body counters. Area monitoring includes remote monitoring, alarm systems, survey monitoring, and special-case area monitoring. Construct the monitoring station and purchase and install equipment and material also are included in site contaminant survey/radiation monitoring. UOM=EA

.07.04 Hydrogeological Investigations—Groundwater

All Phases—Investigate site hydrogeological characteristics such as gradient, depth and size of the water table, permeability or porosity, flow direction, well drawdown, and related activities. Mechanisms for investigation include hydro punch, tidal influence studies, pump tests, and groundwater elevation measurements. The purchase and installation of equipment and material are also included in this element. UOM=M²

.07.04.01 Hydro Punch

Phases 1-4—Conduct and report on investigation of the groundwater using hydro punch method. UOM=M²

.07.04.02 Tidal Influence Study

Phases 1-4—Conduct and report on investigation of the groundwater by studying the tidal influences. UOM=M²

.07.04.03 Hydraulic Tests (Pump Test)

Phases 1-4—Conduct and report on investigation of the groundwater using hydraulic or pump tests. UOM=M²

.07.04.04 Groundwater Elevation Measurement

Phases 1-4—Conduct and report on investigation of the groundwater using groundwater elevation measurement. UOM=M²

.07.04.9X Other

Phases 1-4—Conduct investigation of the groundwater using other methods and techniques. UOM=M²

.07.05 Hydrogeological Investigations - Surface Water

All Phases—Investigate the site hydrogeological characteristics such as flow, velocity, depth and size of the water body, flow direction, water source, and related activities. Mechanisms for investigation include tidal influence studies, elevation measurements, field surveys, and other tests. The purchase and installation of equipment and material are also included as part of this element. UOM=M²

.07.05.01 Tidal Influence Study

Phases 1-4—Conduct investigation of the surface water using tidal influence study. UOM=M²

.07.05.02 Surface Water Elevation Measurement

Phases 1-4—Conduct investigation of the surface water, using surface water elevation measurement. UOM=M²

.07.05.9X Other

Phases 1-4—Other work performed during hydrogeological investigation of surface water. UOM=M²

.07.06 Geophysical/Geotechnical Investigation

All Phases—Investigate surface and subsurface geological characteristics such as mineral, biological, organic composition of soil, soil moisture content, permeability, porosity, geological formations, soil conductivity, soil pressure, shear strength, soil classification, retardation or contaminant sorption capacity, and other physical properties of the soil. Activities include drilling, remote sensor surveys, review of site history, soil testing, seismic studies, and other techniques. UOM=M²

.07.06.01 Geological Investigations (Soils/Sediments)

Phases 1-4—Conduct geological investigation of soils and sediments. UOM=M²

.07.06.02 Surface Geophysical Activity

Phases 1-4—Conduct investigation of the surface geophysical activities. UOM=M²

.07.06.03 Magnetometer

Phases 1-4—Conduct investigation of site using a magnetometer. UOM=M²

.07.06.04 Electromagnetics

Phases 1-4—Conduct investigation using electromagnetic technique. UOM=M²

.07.06.05 Ground Penetration Radar

Phases 1-4—Conduct investigation using ground penetration radar. UOM=M²

.07.06.06 Seismic Refraction

Phases 1-4—Conduct investigation using seismic refraction methodology. UOM=M²

.07.06.07 Resistivity

Phases 1-4—Conduct investigation using resistivity technique. UOM=M²

.07.06.08 Site Meteorology

Phases 1-4—Conduct site meteorology investigation. UOM=M²

.07.06.09 Cone Penetrometer Survey

Phases 1-4—Conduct investigations and surveys using cone penetrometer. UOM=M²

.07.06.10 Remote Sensor Survey

Phases 1-4—Conduct investigations and surveys using remote sensors. UOM=M²

.07.06.11 Borehole Geophysics

Phases 1-4— Includes use of video, gamma spectroscopy induction, neutron density, and magnetic resonance logging activities to investigate sites UOM=M²

.07.06.9X Other

Phases 1-4—Perform other geophysical/geotechnical investigation. UOM=M²

.07.07 Ecological Investigation

All Phases—Conduct ecological investigation activities such as wetland and habitat delineation, wildlife observation, wildlife and habitat community characterization, identification of endangered species, and related activities to establish baseline conditions and to determine actions needed to reduce environmental and ecological impact during construction and facility operations. UOM=M²

.07.07.01 Wetland and Habitat Delineation

Phases 1-4—Identify the boundaries and extent of wetlands and habitats. UOM=M²

.07.07.02 Wildlife Observations

Phases 1-4—Conduct wildlife observations. UOM=M²

.07.07.03 Community Characterization

Phases 1-4—Characterize and study the ecological community. UOM=M²

.07.07.04 Identification of Endangered Species

Phases 1-4—Identify and establish a list on endangered species. UOM=M²

.07.07.9X Other

Phases 1-4—Perform other ecological investigation activities. UOM=M²

.07.08 Air Monitoring and Sampling

All Phases—Sample and monitor air for detection of hazardous, toxic, and radioactive contaminants to ensure compliance with clean air regulations. This element includes monitoring of asbestos; hazardous, toxic, and radioactive contaminants; and contaminated dust, gases, and vapors. See Asbestos Abatement (.15.04) for air monitoring during asbestos

abatement. Construction of the monitoring station and installation of hardware are included as part of air monitoring and sampling cost. UOM=EA

.07.08.01 Sample Collection

All Phases—Monitor, collect, and handle air samples. UOM=EA

.07.08.02 Air Monitoring Station

All Phases—Construct, maintain, and operate the air monitoring station. UOM=EA

.07.08.9X Other

All Phases—Other costs associated with air monitoring. UOM=EA

.07.09 Groundwater Sampling/Monitoring

All Phases—Sample and monitor groundwater to detect hazardous, toxic, and radioactive contaminants to ensure compliance with local, state, and Federal regulations. Costs for collecting routine samples and constructing the monitoring station are also included in this element. UOM=EA

.07.09.01 Sample Collection

All Phases—Monitor, collect, and handle groundwater samples. UOM=EA

.07.09.02 Well Refurbishment

All Phases—Perform well refurbishment activities. UOM=EA

.07.09.9X Other

All Phases—Costs for other activities associated with groundwater monitoring and sampling. UOM=EA

.07.10 Surface Water Sampling

All Phases—Sample and monitor surface water to detect hazardous, toxic, and radioactive contaminants to ensure compliance with local, state, and Federal regulations. Costs for collecting routine samples and constructing the monitoring station are associated with this activity. UOM=EA

.07.10.01 Sample Collection

All Phases—Collect and handle surface water samples. UOM=EA

.07.10.02 Decontamination of Equipment

All Phases—Decontaminate sampling and monitoring equipment after sample collection using various technologies. UOM=EA

.07.10.9X Other

All Phases—Cost of other activities associated with surface water monitoring and sampling. UOM=EA

.07.11 Soil/Sediment Sampling

All Phases—Sample soil and sediments to detect hazardous, toxic, and radioactive contaminants to ensure compliance with local, state, and Federal regulations. Costs for

collecting routine samples and constructing bore holes, drilling, and similar tasks are included in this element if the costs are not captured in Element .07.06, Geophysical/Geotechnical Investigation. UOM=EA

.07.11.01 Surface Soil Sample Collection

All Phases—Collect and handle surface soil samples. UOM=EA

.07.11.02 Subsurface Soil Sample Collection

All Phases—Collect and handle subsurface soil samples. UOM=EA

.07.11.03 Soil Boring/Permeability Sampling

All Phases—Collect and handle soil boring samples. UOM=EA

.07.11.04 Sediments Sample Collection

All Phases—Collect and handle sediment samples. UOM=EA

.07.11.05 Soil Gas Survey

All Phases—Conduct soil gas survey and sampling. UOM=EA

.07.11.06 Test Pit

All Phases—Develop test pit for soil and sediment sampling. UOM=EA

.07.11.9X Other

All Phases—Other sampling and monitoring activities involved with soil/sediment sampling. UOM=EA

.07.12 Ecological Sampling

All Phases—Sample the habitat or biota surrounding the construction site or the facility to ensure that hazardous, toxic, and radioactive contaminants have not affected species (such as causing changes to food supply, growth, reproduction, population, or other factors). This element also includes the cost of labor, equipment, and material required to obtain the samples. UOM=EA

.07.12.01 Biota Sampling/Population Studies

All Phases—Biota sample collection and handling and conducting population studies. UOM=EA

.07.12.9X Other

All Phases—Perform other ecological sampling activities. UOM=EA

.07.13 Material/Waste Sampling

All Phases—Material or waste sampling includes work associated with the retrieval of liquid, solid, sludge, and gas samples to determine the presence of hazardous, toxic, and radioactive contaminants. This element also includes sampling of leachate, residues, and treatment process effluents. Costs include the construction of monitoring and sampling stations and the cost of labor, equipment and material required to obtain the samples. UOM=EA

.07.13.01 Sample Collection—Gas

All Phases—Gaseous material or waste sample collection and handling. UOM=EA

.07.13.02 Sample Collection—Liquid

All Phases—Liquid material or waste sample collection and handling. UOM=EA

.07.13.03 Sample Collection—Solid

All Phases—Solid material or waste sample collection and handling. UOM=EA

.07.13.9X Other

All Phases—Other material/waste sampling and handling. UOM=EA

.07.14 Contaminated Building/Structures/Equipment Samples

All Phases—Sample equipment, furniture, building walls, and other structures for the presence of hazardous, toxic, and radioactive contaminants. UOM=EA

.07.14.01 Hand Scans

All Phases—Perform hand scanning of buildings, facilities, structures, equipment, and areas. UOM=M²

.07.14.02 Smears and Swipes

All Phases—Collect and handle smears and swipes of equipment, building, and other objects. UOM=EA

.07.14.03 Destructive Samples (Including Removal of Paints, Drilling, Cutting of Structures/Equipment, etc)

All Phases—Collect and handle samples obtained through destructive methods. UOM=EA

.07.14.04 Other

All Phases—Other activities associated with surveying and collecting and handling contaminated building structure and equipment samples. UOM=EA

.07.15 Monitoring Well

Phases 1-4—Drill, install, and construct monitoring wells needed during Phases 1-4.

Costs also include tremmie pipe, casing, grouting, screening, filter pack, bentonite pellets, and other components essential for the monitoring well. UOM=EA

Phases 5 and 6—Maintain and operate monitoring wells, including well inspections and repairs, clearing of areas, ensuring integrity, and performing other activities. This element does not include taking samples at monitoring wells. See .07.09 for this cost.

UOM=EA/YR

.07.16 Site-Specific Geographical Information System (GIS)

All Phases—Develop a GIS system to assist in characterizing and investigating a site.

UOM=EA

.07.17 Historical/Cultural/Archeological Investigation

All Phases—Obtaining, collecting, and reviewing records and data to determine and identify whether the proposed project will have impact on historical, cultural, or archeological investigation. UOM=LS

.07.9X Other

All Phases—Other activities associated with investigation, monitoring, and sample collection. UOM=EA

.08.00 Sample Analysis

.08.01 Air/Gas Sample Analysis

All Phases—Analyze air and gas samples for hazardous, toxic, and radioactive contaminants and concentration levels. For off-site sample analysis, it is assumed that the samples need to be packaged and delivered/transported to an EPA-certified laboratory (see .09.01). For an on-site analysis, it is assumed that the laboratory is located at the site or facility, and may be operated and maintained by the site management organization.

UOM=EA

.08.01.01 Organic

All Phases—Perform analysis of air samples for organic constituents. UOM=EA

.08.01.02 Inorganic

All Phases—Perform analysis of air samples for inorganic constituents. UOM=EA

.08.01.03 Radiochemistry

All Phases—Perform radiochemistry analysis of air samples. UOM=EA

.08.01.9X Other

All Phases—Perform analysis of air samples for other characteristics. UOM=EA

.08.02 Groundwater Sample Analysis

All Phases—Analyze water samples for hazardous, toxic, and radioactive contaminants and concentration levels. For off-site sample analysis, it is assumed that the samples need to be packaged and delivered/transported to an EPA-certified laboratory (see .09.01). For on-site analysis, it is assumed that the laboratory is located at the site or facility, and may be operated and maintained by the site management organization. UOM=EA

.08.02.01 Organic

All Phases—Perform analysis of air samples for organic constituents. UOM=EA

.08.02.02 Inorganic

All Phases—Perform analysis of air samples for inorganic constituents. UOM=EA

.08.02.03 Radiochemistry

All Phases—Perform radiochemistry analysis of air samples. UOM=EA

.08.02.9X Other

All Phases—Perform analysis of air samples for other characteristics. UOM=EA

.08.03 Surface Water Sample Analysis

All Phases—Analyze surface water samples for hazardous, toxic, and radioactive contaminants and concentration levels. For off-site sample analysis, it is assumed that the samples need to be packaged and delivered/transported to an EPA-certified laboratory (see .09.01). For on-site analysis, it is assumed that the laboratory is located at the site or facility, and may be operated and maintained by the site management organization. UOM=EA

.08.03.01 Organic

All Phases—Perform analysis of groundwater samples for organic constituents. UOM=EA

.08.03.02 Inorganic

All Phases—Perform analysis of groundwater samples for inorganic constituents. UOM=EA

.08.03.03 Radiochemistry

All Phases—Perform radiochemistry analysis of groundwater samples. UOM=EA

.08.03.9X Other

All Phases—Perform analysis of groundwater samples for other characteristics. UOM=EA

.08.04 Soil/Sediment Sample Analysis

All Phases—Analyze soil and sediment samples for hazardous, toxic, and radioactive contaminants and concentration levels. For off-site sample analysis, it is assumed that the samples need to be packaged and delivered/transported to an EPA-certified laboratory (see .09.01). For on-site analysis, it is assumed that the laboratory is located at the site or facility, and may be operated and maintained by the site management organization. UOM=EA

.08.04.01 Organic

All Phases—Perform analysis of soil/sediment samples for organic constituents. UOM=EA

.08.04.02 Inorganic

All Phases—Perform analysis of soil/sediment samples for inorganic constituents.
UOM=EA

.08.04.03 Radiochemistry

All Phases—Perform radiochemistry analysis of soil/sediment samples. UOM=EA

.08.04.04 Physical Characteristics (e.g., Size Distribution, Moisture Content, Porosity, Etc)

All Phases—Perform analysis of physical characteristics of soil/sediment samples.
UOM=EA

.08.04.9X Other

All Phases—Perform analysis of soil/sediment samples for other characteristics.
UOM=EA

.08.05 Gas Waste Sample Analysis

All Phases—Analyze gaseous waste samples for hazardous, toxic, and radioactive contaminants and concentration levels. For off-site sample analysis, it is assumed that the samples need to be packaged and delivered/transported to an EPA-certified laboratory (see .09.01). For on-site analysis, it is assumed that the laboratory is located at the site or facility, and may be operated and maintained by the site management organization.
UOM=EA

.08.05.01 Organic

All Phases—Perform analysis of gas waste samples for organic constituents.
UOM=EA

.08.05.02 Inorganic

All Phases—Perform analysis of gas waste samples for inorganic constituents.
UOM=EA

.08.05.03 Radiochemistry

All Phases—Perform radiochemistry analysis of gas waste samples. UOM=EA

.08.05.9X Other

All Phases—Perform analysis of gas waste samples for other characteristics.
UOM=EA

.08.06 Liquid Material/Waste Sample Analysis

All Phases—Analyze aqueous samples for hazardous, toxic, and radioactive contaminants and concentration levels. For off-site sample analysis, it is assumed that the samples need to be packaged and delivered/transported to an EPA-certified laboratory (see .09.01). For on-site analysis, it is assumed that the laboratory is located at the site or facility, and may be operated and maintained by the site management organization. UOM=EA

.08.06.01 Organic

All Phases—Perform analysis of liquid material/waste samples for organic constituents.
UOM=EA

.08.06.02 Inorganic

All Phases—Perform analysis of liquid material/waste samples for inorganic constituents. UOM=EA

.08.06.03 Radiochemistry

All Phases—Perform radiochemistry analysis of liquid material/waste samples.
UOM=EA

.08.06.9X Other

All Phases—Perform analysis of liquid material/waste samples for other characteristics.
UOM=EA

.08.07 Solid Material/Waste Sample Analysis

All Phases—Analyze solid material or waste samples for hazardous, toxic, and radioactive contaminants and concentration levels. For off-site sample analysis, it is assumed that the samples need to be packaged and delivered/transported to an EPA-certified laboratory (see .09.01). For on-site analysis, it is assumed that the laboratory is located at the site or facility, and may be operated and maintained by the site management organization.
UOM=EA

.08.07.01 Organic

All Phases—Perform analysis of solid material/waste samples for organic constituents.
UOM=EA

.08.07.02 Inorganic

All Phases—Perform analysis of solid material/waste samples for inorganic constituents. UOM=EA

.08.07.03 Radiochemistry

All Phases—Perform radiochemistry analysis of solid material/waste samples.
UOM=EA

.08.07.9X Other

All Phases—Perform analysis of solid material/waste samples for other characteristics.
UOM=EA

.08.08 Biota Sample Analysis

All Phases—Analyze fauna and flora samples for hazardous, toxic, and radioactive contaminants and concentration levels. For off-site sample analysis, it is assumed that the samples need to be packaged and delivered/transported to an EPA-certified laboratory (see .09.01). For on-site analysis, it is assumed that the laboratory is located at the site or facility, and may be operated and maintained by the site management organization.
UOM=EA

.08.08.01 Organic

All Phases—Perform analysis of biota samples for organic constituents. UOM=EA

.08.08.02 Inorganic

All Phases—Perform analysis of biota samples for inorganic constituents. UOM=EA

.08.08.03 Radiochemistry

All Phases—Perform radiochemistry analysis of biota samples. UOM=EA

.08.08.9X Other

All Phases—Perform analysis of biota samples for other characteristics. UOM=EA

.08.09 Bioassay Sample Analysis

All Phases—Analyze samples to determine retention and internal depositions of hazardous, toxic, and radioactive contaminants in humans or animals. UOM=EA

.08.10 Bioaccumulation Studies

All Phases—Execute bioaccumulation studies. Bioaccumulation is the accumulation of a substance, such as a toxic chemical, in tissues of living organisms. Bioaccumulation studies analyze the presence of contaminants and their concentrations in organisms, and how these contaminants affect the organism. UOM=EA

.08.11 Mobile—Air/Gas Sample Analysis

All Phases—Analyze air and gas samples for hazardous, toxic, and radioactive contaminants and concentration levels using a mobile unit. A mobile unit is defined as a transportable unit such that an analysis unit can be brought on-site, near the sampling location. A mobile unit allows sample analysis to be completed with a very short turnaround time. UOM=EA

.08.12 Mobile—Groundwater Sample Analysis

All Phases—Analyze groundwater samples for hazardous, toxic, and radioactive contaminants and concentration levels using a mobile unit. A mobile unit is defined as a transportable unit such that an analysis unit can be brought on-site, near the sampling location. A mobile unit allows sample analysis to be completed with a very short turnaround time. UOM=EA

.08.13 Mobile—Surface Water Sample Analysis

All Phases—Analyze surface water samples for hazardous, toxic, and radioactive contaminants and concentration levels using a mobile unit. A mobile unit is defined as a transportable unit such that an analysis unit can be brought on-site, near the sampling location. A mobile unit allows sample analysis to be completed with a very short turnaround time. UOM=EA

.08.14 Mobile—Soil/Sediment Sample Analysis

All Phases—Analyze soil and sediment samples for hazardous, toxic, and radioactive contaminants and concentration levels using a mobile unit. A mobile unit is defined as a transportable unit such that an analysis unit can be brought on-site, near the sampling location. A mobile unit allows sample analysis to be completed with a very short turnaround time. UOM=EA

.08.15 Mobile—Gas Waste Sample Analysis

All Phases—Analyze gas waste samples for hazardous, toxic, and radioactive contaminants and concentration levels using the mobile unit. A mobile unit is defined as a transportable unit such that an analysis unit can be brought to the site, near the sampling location. A mobile unit allows sample analysis to be completed with a very short turnaround time. UOM=EA

.08.16 Mobile—Liquid Waste Sample Analysis

All Phases—Analyze liquid waste samples for hazardous, toxic, and radioactive contaminants and concentration levels using a mobile unit. A mobile unit is defined as a transportable unit such that an analysis unit can be brought on-site, near the sampling location. A mobile unit allows sample analysis to be completed with a very short turnaround time. UOM=EA

.08.17 Mobile—Solid Waste Sample Analysis

All Phases—Analyze solid waste samples for hazardous, toxic, and radioactive contaminants and concentration levels using a mobile unit. A mobile unit is defined as a transportable unit such that an analysis unit can be brought on-site, near the sampling location. A mobile unit allows sample analysis to be completed with a very short turnaround time. UOM=EA

.08.18 Mobile—Biota Sample Analysis

All Phases—Analyze flora and fauna samples for hazardous, toxic, and radioactive contaminants and concentration levels using a mobile unit. A mobile unit is defined as a transportable unit such that an analysis unit can be brought on-site, near the sampling location. A mobile unit allows sample analysis to be completed with a very short turnaround time. UOM=EA

.08.19 Real Time—Air/Gas Sample Analysis

All Phases—Analyze air and gas samples in real time for hazardous, toxic, and radioactive contaminants and concentration levels. A portable, hand held, or stationary analyzer such as Flame Ionization Detector, Photon Ionization Detector, portable gas chromatograph or other system that can analyze for the presence of contaminants immediately or within a few minutes. UOM=EA

08.19.01 Organic

All Phases—Perform real-time analysis of air/gas samples for organic. UOM=EA

.08.19.02 Inorganic

All Phases—Perform real-time analysis of air/gas samples for inorganic. UOM=EA

.08.19.03 Radiochemistry

All Phases—Perform real-time radiochemistry analysis of air/gas samples. UOM=EA

.08.19.9X Other

All Phases—Perform real-time analysis of air/gas samples for other characteristics.
UOM=EA

.08.20 Real Time—Groundwater Sample Analysis

All Phases—Analyze groundwater samples in real time for hazardous, toxic, and radioactive contaminants and concentration levels using a portable, hand held, or stationary analyzer such as pH meter, conductivity sensor, thermometer, or contaminant test kit to determine the contaminants and concentrations immediately or within a few minutes. UOM=EA

.08.20.01 Organic

All Phases—Perform real-time analysis of groundwater samples for organic.
UOM=EA

.08.20.02 Inorganic

All Phases—Perform real-time analysis of groundwater samples for inorganic.
UOM=EA

.08.20.03 Radiochemistry

All Phases—Perform real-time radiochemistry analysis of groundwater samples.
UOM=EA

.08.20.04 Physical Parameters (pH, Temperature, Turbidity, etc)

All Phases—Perform real-time analysis of physical characteristics of groundwater samples. UOM=EA

.08.20.9X Other

All Phases—Perform other analysis of groundwater samples. UOM=EA

.08.21 Real Time—Surface Water Sample Analysis

All Phases—Analyze surface water samples in real time for: hazardous, toxic, and radioactive contaminants and concentration levels using a portable, hand held, or stationary analyzer such as a pH meter, thermometer, flow meter, fluorescence analyzer, or other assay and test kit to determine the contaminants and concentrations immediately or within a few minutes. UOM=EA

.08.22 Real Time—Soil/Sediment Sample Analysis

All Phases—Analyze soil/sediment sample in real time for hazardous, toxic, and radioactive contaminants and concentration levels using a portable, hand held, or stationary analyzer such pH meter, thermometer, fluorescence analyzer, or other assay and

test kit to determine the contaminants and concentrations immediately or within a few minutes.

.08.23 Real Time—Gas Waste Sample Analysis

All Phases—Analyze waste gas samples in real time for hazardous, toxic, and radioactive contaminants and concentration levels, using a portable, hand held, or stationary analyzer such as: Flame Ionization Detector, Photon Ionization Detector, portable gas chromatograph or other system to determine the contaminants and concentrations immediately or within a few minutes. UOM=EA

.08.24 Real Time—Liquid Waste Sample Analysis

All Phases—Analyze liquid waste samples in real time for hazardous, toxic, and radioactive contaminants and concentration levels, using a portable, hand held, or stationary analyzer such as: pH meter, thermometer, conductivity probe, fluorescence analyzer, or other assay and test kits to determine the contaminants and concentrations immediately or within a few minutes. UOM=EA

.08.25 Real Time—Solid Waste Sample Analysis

All Phases—Analyze solid waste sample in real time for hazardous, toxic, and radioactive contaminants and concentration levels using a portable, hand held, or stationary analyzer such a Geiger counter, thermometer, fluorescence analyzer, or other assay and test kit, can be used to determine the contaminants and concentrations immediately or within a few minutes. UOM=EA

.08.9X Other

All Phases—This element includes Other sample monitoring activities. UOM=EA

.09.00 Sample Management/Data Validation/Data Evaluation

.09.01 Prepare and Ship Environmental Samples

All Phases—Preserve samples; handle and package samples; complete chain of custody form for transport; deliver or transport samples to analytical laboratory; and perform related activities. UOM=LS

.09.01.01 Groundwater Samples

All Phases—Package, handle, and ship groundwater samples. UOM=LS

.09.01.02 Surface and Subsurface Soil Samples

All Phases—Package, handle, and ship soil samples. UOM=LS

.09.01.03 Surface Water and Sediment Samples

All Phases—Package, handle, and ship surface water or sediment samples. UOM=LS

.09.01.04 Air Samples

All Phases—Package, handle, and ship air or gaseous samples. UOM=LS

.09.01.05 Biota Samples

All Phases—Package, handle, and ship biota samples. UOM=LS

.09.01.9X Other Types of Media Sampling and Screening

All Phases—Package, handle, and ship other types of media samples. UOM=LS

.09.02 Coordinate with Sample Management Personnel/Regulators

All Phases—Coordinate the sampling process with management, regulators, and other personnel to ensure that duplicative efforts are not being performed and appropriate activities are being conducted. UOM=LS.

.09.03 Implement EPA-Approved Laboratory QA Program

All Phases—Implement the total QA program designed to ensure the reliability of samples and their analytical results. UOM=LS

.09.04 Provide Sample Management

All Phases—Store, track, and manage samples. Includes administrative management of sampling personnel, ensuring that personnel adhere to QA/QC procedures, ensuring the receipt and delivery of samples for analysis, receiving sample analysis results, and other sample management functions. UOM=LS

.09.04.01 Chain of Custody

All Phases—Complete, track, and store chain of custody forms. UOM=LS

.09.04.02 Sample Retention

All Phases—Handle, store, and track samples. UOM=LS

.09.04.03 Data Storage/Data Management

All Phases—Develop database, and store, manage, and report data. UOM=LS

.09.04.9X Other

All Phases—Other activities associated with sample management. UOM=LS

.09.05 Derived Waste Disposal (Gas, Liquid, Solid)

All Phases—Dispose of waste derived from the sampling and analysis processes. See also disposal facilities and disposal fees associated with disposal facilities in .13.xx and .13.18. Commercial disposal of waste is under .33.xx. UOM=M³

.09.06 Perform Data Validation

All Phases—Support data validation. It is performed after samples have been analyzed. After analysis results have been received, the data, sampling, and the analysis process need to be reviewed to ensure that the analysis is valid. If the results are determined to be invalid, the data will be thrown out. Activities might include performing statistical analysis and reviewing outlying data. Written documentation of the validation process is also included. UOM=LS

.09.06.01 Review Analysis Results to Validation Criteria

All Phases—Review and analyze data results and validating criteria. UOM=LS

.09.06.02 Provide Written Documentation of Validation Effort

All Phases—Develop written documentation of validation effort. UOM=LS

.09.06.9X Other

All Phases—Other activities associated with performing data validations. UOM=LS

.09.07 Data Usability Evaluation/Field QA/QC

All Phases—Evaluate the site investigation, sampling analysis, and monitoring data to determine if the data can be used. It is accomplished by ensuring that all QA/QC procedures were followed in all the processes and by determining the relevancy of the data collected for use in technology selection and other project and program plans. Equipment calibration and maintenance are also included in this task. UOM=LS

.09.08 Data Reduction, Tabulation and Evaluation/Analysis

All Phases—Eliminate invalidated data, irrelevant data, or data that are statistically out of the acceptable range. After the data have been evaluated and reduced, the results will be tabulated and analyzed. UOM=LS

.09.08.01 Evaluate Geological Data (Soils/Sediments)

All Phases—Review, evaluate, organize, and tabulate soil/sediment data.

.09.08.02 Evaluate Air Data

All Phases—Review, evaluate, organize, and tabulate air/gaseous data. UOM=LS

.09.08.03 Evaluate Hydrogeological Data - Groundwater

All Phases—Review, evaluate, organize, and tabulate groundwater data. UOM=LS

.09.08.04 Evaluate Hydrogeological Data - Surface Water

All Phases—Review, evaluate, organize, and tabulate surface water data. UOM=LS

.09.08.05 Evaluate Waste Data

All Phases—Review, evaluate, organize, and tabulate waste data. UOM=LS

.09.08.06 Evaluate Geophysical Data

All Phases—Review, evaluate, organize, and tabulate geophysical data. UOM=LS

.09.08.07 Evaluate Ecological Data

All Phases—Review, evaluate, organize, and tabulate ecological data. UOM=LS

.09.08.08 Evaluate Historical/Cultural, Archeological Data

All Phases—Review, evaluate, organize, and tabulate historical/cultural, archeological data. UOM=LS

.09.08.9X Other

All Phases—Review, evaluate, organize, and tabulate other data. UOM=LS

.09.09 Modeling

All Phases—Develop and implement the computer model for surface and groundwater flow, transportation, retardation, and other relevant characteristics of the contaminant fate. Developing the model is based on information available from literature searches, site investigations, sampling data, and bench-scale studies. UOM=LS

.09.09.01 Contaminant Concentration, Location, Fate and Transport

All Phases—Develop, use, and update contaminant concentration, location, fate and transport models. UOM=LS

.09.09.02 Water Quality

All Phases—Develop, use, and update water quality models. UOM=LS

.09.09.03 Groundwater

All Phases—Develop, use, and update groundwater and transport models. UOM=LS

.09.09.04 Air

All Phases—Develop, use, and update air movement models. UOM=LS

.09.09.9X Other

All Phases—Develop, use, and update models. UOM=LS

.09.10 Document Data Evaluation

All Phases—Document and develop the data evaluation process. UOM=LS

.09.11 Combined Sample Management

All Phases—This element combines elements .09.01 Prepare and Ship Environmental Samples, .09.02 Coordinate with Sample MGT Personnel/Regulators, and .09.04 Provide Sample Management when performed as a single function. UOM=LS

.09.12 Combined Data Management

All Phases—This element combines data management elements .09.06 Perform Data Validation; .09.07 Data Usability Evaluation/Field QA/QC; .09.08 Data Reduction, Tabulation and Evaluation/Analysis when performed as a single function. UOM=LS

.09.13 Data Review for Effectiveness

Phases 4 and 5—Evaluate/review data to determine the performance of the remediation/treatment method (e.g., Pump and Treat). UOM=LS

.09.9X Other

All Phases—Other activities and costs associated with sample management, data validation, and data evaluation. UOM=LS

.10.00 Treatability/Research and Development

.10.01 Literature Search

Phases 2 and 3—Research and review journal articles, books, reports, and other documents to determine relevant and applicable technologies for the site and for the

contaminant to be treated. UOM=LS

.10.02 Data Collection

Phases 2 and 3—Collect essential site, chemical, thermal, technology, and other data for further screening of technology alternatives found from the literature search. The data also will be used for planning and preparing bench-scale or pilot testing. UOM=LS

.10.03 Develop Treatability Workplan

Phases 2 and 3—Develop and prepare the workplan for the treatability process. It includes determining the amount and size of materials, necessary equipment, additional information to be collected from the bench- scale testing, cost and schedule estimates, process for implementing the treatability study, and related procedures. UOM=EA

.10.04 Design/Procure New Equipment

Phases 2 and 3—Develop the detailed design and operating procedures for the bench-scale, pilot-scale, and field-demonstration test of equipment, processes, or materials unavailable commercially. UOM=EA

.10.04.01 Design and Procure New Equipment for Dismantling the Reactor Vessel and Internals

Phase 3—Design and procure equipment that is not commercially available for dismantling the reactor vessel and internals for bench-scale, pilot-scale, and field-demonstration studies. UOM=EA

.10.04.02 Design and Procure New Equipment for Remote Handling Device or Articulated Manipulators

Phase 3—Design and procure new equipment that is not commercially available for remote waste handling or articulated manipulator for bench-scale, pilot-scale, and field-demonstration studies. UOM=EA

.10.04.03 Design and Procure New Equipment for Constraint Handling, Packaging and Transportation Requirement

Phase 3—Design and procure new equipment that is not commercially available for constraint handling, packaging and transportation for bench-scale, pilot-scale, and field-demonstration studies. UOM=EA

.10.04.04 Design and Procure New Equipment for Remote Disassembly/Segmentation for Complex Subcomponents

Phase 3—Design and procure equipment that is not commercially available for remote disassembly, segmentation of complex subcomponents for the bench-scale, pilot-scale, and field-demonstration studies. UOM=EA

.10.04.05 Design and Procure New Equipment for Remote Underwater Work

Phase 3—Design and procure equipment that is not commercially available for remote underwater work for bench-scale, pilot-scale, and field-demonstration studies..

UOM=EA

.10.04.05 01 Remote-Viewing Systems for Underwater Operations

Phase 3—Design and procure remote-viewing system that is not commercially available for underwater operations for bench-scale, pilot-scale, and field-demonstration studies. UOM=EA

.10.04.05 02 Feedback and Control Systems for Underwater Operations

Phase 3—Design and procure for feedback and control systems that are not commercially available for underwater operations for bench-scale, pilot-scale, and field-demonstration studies. UOM= EA

.10.04.05 03 Turntables for Underwater Operations

Phase 3—Design and procure turntable that is not commercially available for underwater work for bench-scale, pilot-scale, and field-demonstration studies. UOM= EA

.10.04.05 04 Support Systems for Maintaining Water Clarity

Phase 3—Design and procure support systems that are not commercially available for maintaining water clarity for underwater work for bench-scale, pilot-scale, and field-demonstration studies. UOM= EA

.10.04.05 05 Support Systems for Collecting Cutting Fines

Phase 3—Design and procure support systems that are not commercially available for collecting cutting fines for underwater work for bench-scale, pilot-scale, and field-demonstration studies. UOM= EA

.10.04.05 06 Support System to Control/Eliminate Explosive Gas Mixtures Formation During Cutting or From Dissolution of H₂O. UOM= EA

Phase 3—Design and procure support systems that are not commercially available for controlling/eliminating explosive gas mixtures from forming during underwater work for bench-scale, pilot-scale, and field-demonstration studies. UOM= EA

.10 .04.05.9X Other

Phase 3—Design and procure other equipment that is not commercially available for remote underwater work. UOM= EA

.10.04.06 Design and Procure New Equipment for Complex Waste Treatment

Phase 3—Design and procure equipment that is not commercially available for complex waste treatment for bench-scale, pilot-scale, and field-demonstration studies. UOM= EA

.10.04.07 Design and Procure New Equipment for Complex Environmental Remediation Tasks

Phase 3—Design and procure equipment that is not commercially available for complex environmental remediation tasks for bench-scale, pilot-scale, and field-demonstration studies. UOM= EA

.10.04.08 Design and Procure New Equipment for Dismantling Other Components and Structures

Phase 3—Design and procure equipment that is not commercially available for dismantling other components and structures for bench-scale, pilot-scale, and field-demonstration studies. UOM= EA

.10.04.09 Leasing of New or Specialty Equipment

Phase 3—Lease new or specialty equipment for bench-scale, pilot-scale, and field-demonstration studies. UOM= EA

.10.04.10 Design and Procure New Measurement and Calculation Devices and Techniques

Phase 3—Design and procure new measurement and calculation devices and techniques that are not commercially available for the bench-scale, pilot-scale, and field-demonstration studies. UOM= EA

.10.04.9X Other

Phase 3—Other activities performed when designing and procuring new equipment. UOM=LS

.10.05 Bench Test

Phases 2 and 3—Perform bench-testing technologies and processes. It is normally performed in a laboratory, and surrogate materials may be used. The purpose is to obtain enough data on chemistry, kinetics or reaction rates, material balances, heat transfer rates, and other relevant factors to use to design and select equipment and to develop initial cost and schedule estimates. The purpose of the bench test is to determine the ability of a technology or process to treat waste. UOM=LS

.10.05.01 Test Facility and Equipment

Phases 2 and 3—Provide the facility to demonstrate the technologies and processes using actual or simulated waste. This element includes the permitting, constructing facilities, and operating the technology. UOM=LS

.10.05.02 Vendor and Analytical Service

Phases 2 and 3—Provide the vendor and analytical services to bench test technologies and processes. Tests are performed in the laboratory using simulated material to obtain data needed for equipment design and selection. UOM=LS

.10.05.03 Equipment Operation and Test

Phases 2 and 3—Test new equipment and procedures in the laboratory using a simulated material to obtain data needed for equipment design and selection. UOM=LS

.10.05.04 Retrieved Samples for Testing

Phases 2 and 3—Retrieve and handle samples from bench-test. UOM=EA

.10.05.05 Laboratory Analysis

Phases 2 and 3—Perform laboratory analysis on bench-test samples. UOM=EA

.10.05.06 Residual Characterization and Disposal of Residuals

Phases 2 and 3—Characterize and dispose of bench-test residuals. UOM=M³

.10.05.9X Other

Phases 2 and 3—Perform other bench-scale testing and demonstration activities.
UOM=LS

.10.06 Pilot-Scale Test

Phases 2 and 3—Pilot-test technologies and processes, usually at a smaller scale than the full-scale plant. It entails permitting, construction, testing, and operation of the pilot plant to evaluate performance data and to obtain more information on the construction and operation of the full-scale plant. See .04.11, Environmental Management Project Design for design of equipment and system design. The purpose of the pilot scale test is to determine the ability of a technology or process to treat waste and to confirm bench test results. UOM=LS

.10.06.01 Test Facility and Equipment

Phases 2 and 3—Provide the facility to demonstrate technologies and processes using actual or simulated waste. This element includes permitting, constructing facilities, and operating the technology. UOM=LS

.10.06.02 Vendor and Analytical Service

Phases 2 and 3—Provide vendor and analytical service to support the technologies and processes at the pilot-test scale including permitting, facilities construction, and operation of the technology. UOM=LS

.10.06.03 Test and Operate Equipment

Phases 2 and 3—Test the technologies and processes at the pilot-test scale. UOM=LS

.10.06.04 Retrieved Samples for Testing

Phases 2 and 3—Retrieve and handle pilot-test samples. UOM=EA

.10.06.05 Laboratory Analysis

Phases 2 and 3—Perform laboratory analysis on pilot-test samples. UOM=EA

.10.06.06 Residuals Characterization and Disposal of Residuals

Phases 2 and 3—Characterize and dispose of pilot-test residuals. UOM=M³

.10.06.9X Other

Phases 2 and 3—Perform other pilot-scale testing activities.. UOM=LS

.10.07 Field Test

Phases 2 and 3—Demonstrate technologies and processes at a contaminated site or facility, using actual waste. It includes permitting, constructing, and operating the plant or

technology. See .04.11 Environmental Management Project Design for design of project equipment and system design. The purpose of the field test is to determine the ability of a technology or process to treat waste and to confirm pilot-scale test results. UOM =LS

.10.07.01 Test Facility and Equipment

Phases 2 and 3—Provide the test facility and equipment to demonstrate the technologies and processes using actual waste. This element includes permitting, constructing facilities, and operating the technology. UOM=LS

.10.07.02 Vendor and Analytical Service

Phases 2 and 3—Provide the vendor and analytical service in support of the technologies and processes using actual waste including the permitting, facilities construction, and operation of the technology. UOM=LS

.10.07.03 Test and Operate Equipment

Phases 2 and 3—Test the technologies and processes using actual waste. UOM=LS

.10.07.04 Retrieved Samples for Testing

Phases 2 and 3—Retrieve and handle field-test samples. UOM=EA

.10.07.05 Laboratory Analysis

Phases 2 and 3—Perform laboratory analysis on field-test samples. UOM=EA

.10.07.06 Residual Characterization and Disposal of Residuals

Phases 2 and 3—Characterize and dispose of field-test residuals. UOM=M³

.10.07.9X Other

Phases 2 and 3—Perform other field-scale testing activities. UOM=LS

.10.08 Special Tools and Equipment Test

Phases 2 and 3—Test special tools and equipment before their final installation and use. Testing can be performed at testing facilities or laboratories. This element includes data collection relating to strength and durability, suitability to the proposed use, and efficiency and performance of the tools and equipment. UOM=LS

.10.09 Design, Procure, Test New Procedures/Specifications

Phases 2 and 3—Develop and test new procedures or new or improved methods of performing tasks and operations that can increase efficiency, minimize cost, increase safety, minimize waste, or provide other benefits. UOM=LS

.10.09.01 Hardware and Software

Phase 3—Develop and test new procedures to increase the efficiency of hardware and software, to better understand parameter, for training, and for other purposes.. UOM=LS

.10.09.02 Operations & Maintenance (O&M)

Phase 3—Develop and test new procedures to increase the efficiency of O&M procedures. UOM=LS

.10.09.03 Installation

Phase 3—Develop and test new procedures to increase the efficiency of installation procedures. UOM=LS

.10.09.04 Testing

Phase 3—Develop and test new procedures to increase the efficiency of testing procedures. UOM=LS

.10.09.05 Performance Measurement

Phase 3—Develop and test new performance measures to increase the efficiency of procedures. UOM=LS

.10.09.9X Other

Phase 3—Design, procure, and test other new procedures and specifications. UOM=LS

.10.10 Simulation/Modeling

Phases 2 and 3—Develop or use simulators at a facility to test materials and equipment or to simulate the operation of equipment or facility. Computer programs can also be developed to model the construction and operation of equipment, technology, or a facility. UOM=LS

.10.11 Document Treatability Study

Phases 2 and 3—Document the applicability of specific treatment technologies and results of treatability studies and research and development studies. UOM=LS

.10.11.01 Draft Report

Phases 2 and 3—Draft document on the applicability of specific treatment technologies and results of treatability studies and research and development studies. UOM=EA

.10.11.02 Comments Response/Finalize Report

Phases 2 and 3—Consolidate and respond to comments, incorporate comments and changes, and finalize the treatability study report. UOM=LS

.10.11.03 Report Reproduction/Distribution

Phases 2 and 3—Print, reproduce, and distribute the final version of the treatability study report. UOM=EA

.10.11.9X Other

Phases 2 and 3—Other activities involved in documenting treatability study. UOM=LS

.10.12 Status Review

Phases 2 and 3—Costs associated with reviewing technologies and comparing them to an innovative technology for performance, cost, reliability, waste generation, safety, and other factors. UOM=LS

.10.12.01 Technology Comparisons

Phases 2 and 3—Review the technologies and compare them to the innovative technology for reliability, safety, time required for processing, size, noise, pollution prevention, and similar factors. UOM=LS

.10.12.02 Performance Comparisons

Phases 2 and 3—Review technologies and compare them to the innovative technology for performance and effectiveness. UOM=LS

.10.12.03 Technology Review for Ease of Operations, Waste Generation, Future Decontamination and Decommissioning

Phases 2 and 3—Review the technologies and compare them to the innovative technology for ease of operations, waste generation, and future D&D needs. UOM=LS

.10.11.9X Other

Phases 2 and 3—Other activities involved in performing status reviews. UOM=LS

.10.13 Technology Transfer

Phases 2 and 3—Costs associated with transferring technology from research and testing stages to implementation and commercial application. UOM=LS

.10.14 Product Qualification, Characterization, and Certification

Phases 2 and 3—Costs associated with qualification, characterization, and certification of the innovative technology, product, or system. UOM=LS

.10.9X Other

Phases 2 and 3—Other costs associated with performing treatability research and development. UOM=LS

.11.00 Treatment Plant/Facility/Process

.11.01 Covered Treatment Train Technologies Unit

Phase 4—Construct a treatment train (a series of treatment technologies employed in one location) that contains multiple technologies and also includes rain covers, foundations and utilities. UOM=M²

Phase 5—O&M of the covered treatment train unit. UOM=M³/YR

.11.02 Sheds and Other Supporting Facilities

Phase 4—Construct permanent facilities including sheds, covers, and other facilities not included in the environmental management facility but that are required to support environmental management activities. UOM= M^2

Phase 5—Operate (e.g., receive, load, and unload) and maintain those facilities during the environmental management operations. UOM = M^3/YR

.11.03 Simple Treatment Facilities (e.g., Equipment Slabs, Foundations, Utilities)

Phase 4—Construct permanent facilities including equipment pads and utilities for a simple treatment, such as ozonation. This element is not intended to provide for larger treatment trains requiring rain covers (see Element .11.04 for that type of facility). UOM = M^2

Phase 5—Operate the associated utilities and maintain these facilities. UOM = M^3/YR

.11.04 Treatment Train Facility (e.g., Rain Covers, Foundations, Utilities)

Phase 4—Construct permanent facilities including rain covers, other structures, and utilities for treatment trains (a series of treatment technologies employed in one location) in the field. UOM = M^2

Phase 5—O&M of a facility where the operator or maintenance mechanic is not performing a task specifically identifiable to a treatment technology. For example, the recharge of the Ion Exchange unit will be included in Element .24.07. This element also includes operation and maintenance of associated utilities and facilities during the remedial action. UOM = M^3/YR

.11.05 Full-Scale Environmental Management Plant/Facility

Phase 4—Construct the entire environmental management facility with the exception of the functional space areas included in Elements .11.06 through .11.11 or the technology specific equipment found in Elements .21.xx—.30.xx and .34.xx. UOM = M^2

Phase 5—Operate and maintain the facility where the operator or maintenance mechanic is not performing a task specifically identifiable to a treatment technology. The O&M of a technology housed in the functional area will normally be included in the appropriate technology- specific Elements .21.xx—.30.xx and .34.xx. This element also includes the operation and maintenance of associated utilities and facilities during remedial action, waste management, or other environmental projects. UOM= M^3/YR

.11.06 Environmental Management Low/Moderate Hazard Treatment Front-End

Phase 4—Construct permanent facilities for receiving and inspection, container handling, open/dump/sort, and preparation of low/moderate hazardous waste streams for treatment. Low/moderate hazardous waste streams are those waste streams exclusively regulated under 40 CFR Part 261 and that require minimal health and safety personnel protection (PPE Level C or lower). UOM= M^2

Phase 5—Operate and maintain the facility for receiving and inspection, container handling, open/dump/sort, and preparation of low/moderate hazardous waste streams for treatment. It also includes the operation and maintenance of associated utilities and facilities during the environmental management operations. UOM= M^3/YR

.11.06.01 Receiving and Inspection

Phase 4—Construct permanent treatment facilities to receive and inspect low/moderate waste. UOM=M²

Phase 5—Operate and maintain the waste and material receiving and inspection system. UOM=M³/YR

.11.06.02 Assay

Phase 4—Construct permanent treatment facilities to assay low/moderate waste. UOM=M²

Phase 5—Operate and maintain the waste and material assay system. UOM=M³/YR

.11.06.03 Container Handling

Phase 4—Construct permanent treatment facilities to handle containers of low/moderate wastes. UOM=M²

Phase 5—Operate and maintain the container handling of low/moderate waste system. UOM=M³/YR

.11.06.04 Waste Stream Sort/Separation—Contact Handled

Phase 4—Construct permanent treatment facilities to sort and separate contact-handled low/moderate wastes. UOM=M²

Phase 5—Operate and maintain the contact-handled waste and material separation and sorting system. UOM=M³/YR

.11.06.05 Separation/Handling Special Materials/Wastes

Phase 4—Construct permanent treatment facilities to separate and handle special materials and wastes. UOM=M²

Phase 5—Operate and maintain the special materials/waste handling system. UOM=M³/YR

.11.06.9X Other

Phase 4—Perform other environmental management low/moderate hazard waste treatment activities. UOM=M²

Phase 5—Operate and maintain other environmental management low/moderate hazard waste treatment systems. UOM=M³/YR

.11.07 Environmental Management High Hazard/Remote Treatment Front-End

Phase 4—Construct permanent facilities for receiving and inspection, container-handling, open/dump/sort, and preparation of high hazardous waste and remote-handled waste streams for treatment. Highly hazardous or remote-handled wastes are those waste streams that are not exclusively regulated under 40 CFR Part 261 or that require high levels of personnel protection (PPE Level B or higher), engineering controls, personnel exposure monitoring, or other safeguard. UOM=M²

Phase 5—Operate and maintain the facilities for receiving and inspection, container handling, open/dump/sort, and preparation of high hazardous waste and remote-handled waste streams for treatment. Also includes operation and maintenance of associated utilities and facilities during the environmental management operations. UOM=M³/YR

.11.07.01 Receiving and Inspection

Phase 4—Construct permanent treatment facilities to receive and inspect high hazard/remote-handled waste. UOM=M²

Phase 5—Operate and maintain the waste and material receiving and inspection system. UOM=M³/YR

.11.07.02 Assay

Phase 4—Construct permanent treatment facilities to assay high hazard/remote-handled waste. UOM=M²

Phase 5—Operate and maintain the hazard/remote-handled waste and material assay system. UOM=M³/YR

.11.07.03 Waste Stream Sort/Separation - Remote Handled

Phase 4—Construct permanent treatment facilities to sort/separate high hazard/remote-handled wastes. UOM=M²

Phase 5—Operate and maintain the high hazard/remote-handled waste and material separation and sorting system. UOM=M³/YR

.11.07.04 Remote - Container Handling

Phase 4—Construct permanent treatment facilities for remote-handled containers. UOM=M²

Phase 5—Operate and maintain the remote-handled container system. UOM=M³/YR

.11.07.05 Separation/Handling Special Materials/Wastes

Phase 4—Construct permanent treatment facilities to separate and handle special materials and wastes. UOM=M²

Phase 5—Operate and maintain the special materials/waste separation/handling system. UOM=M³/YR

.11.07.9X Other

Phase 4—Construct other environmental management high hazard/remote-handled waste treatment activities. UOM=M²

Phase 5—Operate and maintain other environmental management high hazard/remote-handled waste hazard waste treatment systems. UOM=M³/YR

.11.08 Environmental Management Low Hazard Functional Area (e.g., Hazardous/Toxic)

Phase 4—Construct the functional space area of permanent facilities dealing with the treatment of low hazardous waste streams (e.g., typical hazardous materials not requiring respirators, PPE Level D. UOM=M²

Phase 5—Operate and maintain the functional space area of permanent facilities for the treatment of low hazardous waste streams (e.g., typical hazardous materials not requiring respirators). This element provides for the operation of the facility where the operator or maintenance mechanic is not performing a task specifically identifiable to a treatment technology. The O&M of a technology housed in the functional area will normally be included in the appropriate technology-specific Elements .21.xx□.30.xx and .34.xx. This element also includes O&M of associated utilities and facilities during the environmental management process. UOM=M³/YR

.11.09 Environmental Management Moderate Hazard Functional Area (e.g., Hazardous/Toxic, LLW and MLLW)

Phase 4—Construct functional space area of permanent facilities for treating moderate hazardous waste stream. Those waste streams exclusively regulated by 40 CFR Part 261 and require minimal health and safety personnel protection (PPE Level C). UOM=M²

Phase 5—Process the waste stream and operate functional areas of permanent facilities for the treatment of moderate hazardous waste streams. This element provides for the operation and maintenance of the space housing a technology application. The O&M of a technology housed in the functional area will normally be included in the appropriate technology specific Elements .21.xx—.30.xx and .34.xx. This element also includes O&M of associated utilities and facilities during environmental management operation. UOM=M³/YR

.11.10 Environmental Management High Hazard Functional Area (e.g., ALLW, MALLW, TRU, Spent Fuel, and CWM)

Phase 4—Construct the functional space area of permanent facilities dealing with the treatment of high hazardous waste streams (e.g., wastes including high-level radioactive waste and mixed waste). Highly hazardous wastes are those waste streams that are not exclusively regulated under 40 CFR Part 261 or that require high levels of personnel protection (PPE Level B or higher), engineering controls, personnel exposure monitoring, or other safeguards. UOM=M²

Phase 5—Process the high hazardous waste stream and operation of the functional space area of permanent facilities dealing with the treatment of high hazardous waste streams (e.g., wastes including high-level radioactive waste and mixed waste). This element provides for the operation of the facility where the operator or maintenance mechanic is not performing a task specifically identifiable to a treatment technology. The O&M of a technology housed in the functional area will normally be included in the appropriate technology-specific Elements .21.xx—.30.xx and .34.xx. This element also includes operation and maintenance of associated utilities and facilities during the environmental management operation. UOM=M³/YR

.11.11 Environmental Management Remote Functional Area (e.g., ALLW, MALLW, TRU, Spent Fuel, and CWM)

Phase 4—Construct the functional space area of permanent facilities for the treatment of high hazardous waste streams (e.g., wastes including high-level radioactive waste and alpha-contaminated waste) requiring remote handling. UOM=M²

Phase 5—Process the high hazardous waste stream and operate functional space area of permanent facilities for the treatment of high hazardous waste streams (e.g., wastes including high-level radioactive waste and alpha-contaminated waste) requiring remote handling. This element provides for the operation of the facility where the operator or maintenance mechanic is not performing a task specific to a treatment technology. The O&M of a technology housed in the functional area will normally be included in the appropriate technology-specific Elements .21.xx—.30.xx and .34.xx. This element also includes operation and maintenance of associated utilities and facilities during the environmental management process. UOM=M³/YR

.11.12 Waste Treatment Fees and Taxes

Phases 4 and 5—Cost of fees and taxes charged by one Government agency to another or fees charged by one organization to another for treatment of HTR waste. This element is primarily used for capturing waste management costs. See Element .32.xx for various disposal options applicable to some environmental restoration programs. UOM=M³

.11.13 Facility Commissioning Activities

Phase 4—Startup and test or commission the facility, systems, and equipment. Examples of activities included in this element are: testing using cold or simulated waste; testing using hot or actual waste; training O&M workers; establishing and refining operational parameters, safety, and accident procedures and protocol; performing optimization studies; selecting, establishing, and defining management and working teams. Testing and start up are considered complete when technology operations can be sustained at specified operational and quality standards. UOM=LS

.11.13.01 Pre-Operations

Phase 4—Perform activities such as testing the system, equipment, facility, and processes using cold or simulated waste to better refine parameters and maximize safety before testing with hot waste. UOM=LS

.11.13.02 Cold Commissioning

Phase 4—Perform activities such as testing of system, equipment, facility, and processes using cold or simulated waste prior to testing with actual waste prior to hot commissioning to better refine parameters, and to maximize safety. UOM=LS

.11.13.03 Hot Commissioning

Phase 4—Perform activities such as testing the system, equipment, facility, and processes using actual or hot waste to better refine parameters, and to maximize safety before O&M. UOM=LS

.11.13.9X Other

Phase 4—Other activities involved with facility commissioning. UOM=LS

.11.9X Other

Phase 4—Other costs associated with construction of treatment plant, facility, equipment, or processes. UOM=M²

Phase 5—Other costs associated with operation and maintenance of treatment plant, facility, equipment, or processes. UOM=M³/YR

.12.00 Storage Facility/Process

.12.01 Reserved for Future Use

.12.02 Conventional Storage/Warehouses

Phase 4—Construct permanent facilities including sheds, warehouses, and other facilities not included in the environmental management facility but that are required for storage of hazardous waste and materials. Low/moderate hazardous waste streams are those waste streams exclusively regulated under 40 CFR Part 261 and that require minimal health and safety personnel protection (PPE Level C or lower). UOM=M²

Phase 5—Operate and maintain the warehouse facilities (e.g., receiving, loading, and unloading) for as long as they are required. UOM=M³/YR

Phase 6—Long-term surveillance, monitoring, and maintenance of the facility, to ensure compliance with requirements after operations cease. UOM=M²/YR

.12.02.01 Waste Storage Area (Pads and Cribs)

Phase 4—Construct waste storage areas such as pads and cribs. UOM=M²

Phase 5—Operate and maintain the waste storage areas. UOM=M³/YR

Phase 6—Perform long-term surveillance and monitoring of the waste storage area after it has been closed. UOM=M²/YR

.12.02.02 Waste Storage Structure/Building

Phase 4—Construct waste storage structure or building. UOM=M²

Phase 5—Operate and maintain the waste storage structure or building. UOM=M³/YR

Phase 6—Perform long-term surveillance and monitoring of the waste storage structure and facility after it has been closed. UOM=M²/YR

.12.02.9X Other

Phase 4—Other activities associated with constructing conventional storage and warehouses. UOM=M²

Phase 5—Other activities associated with operation and maintenance of conventional storage and warehouses. UOM=M³/YR

Phase 6—Other activities associated with long-term surveillance and monitoring of conventional storage and warehouses. UOM=M²/YR

.12.03 Storage Facility Front-End—Low/Moderate Hazard

Phase 4—Construct permanent facilities for receiving and inspection, container handling, open/dump/sort, and preparation of low/moderate hazardous waste streams for storage. Low/moderate hazardous waste streams are those waste streams exclusively regulated under 40 CFR Part 261 and that require minimal health and safety personnel protection (PPE Level C or lower). UOM=M²

Phase 5—Operate and maintain the facilities for receiving and inspection, container handling, open/dump/sort, and preparation of low/moderate hazardous waste streams for waste storage. It also includes maintenance of these facilities during the waste storage period. UOM=M³/YR

Phase 6—Long-term surveillance, monitoring, and maintenance of the facility to ensure compliance with requirements after operations cease. UOM=M²/YR

.12.03.01 Receiving and Inspection

Phase 4—Construct storage facilities to receive and inspect low/moderate waste. UOM=M²

Phase 5—Operate and maintain the waste and material receiving and inspection system. UOM=M³/YR

Phase 6—Perform surveillance and long-term monitoring after closure of the receiving and inspection system. UOM=M²/YR

.12.03.02 Assay

Phase 4—Construct storage facilities to assay low/moderate waste. UOM=M²

Phase 5—Operate and maintain the waste-assay system. UOM=M³/YR

Phase 6—Perform long-term surveillance and monitoring after closure of the waste-assay system. UOM=M²/YR

.12.03.03 Container Handling

Phase 4—Construct storage facilities to handle containers of low/moderate wastes. UOM=M²

Phase 5—Operate and maintain the remote container handling system. UOM=M³/YR

Phase 6—Perform long-term surveillance and monitoring after closure of the remote container handling system. UOM=M²/YR

.12.03.04 Waste Stream Sort/Separation—Contact Handled

Phase 4—Construct storage facilities to sort and separate contact-handled low/moderate wastes. UOM=M²

Phase 5—Operate and maintain the contact-handled waste separation and sorting system. UOM=M³/YR

Phase 6—Perform long-term surveillance and monitoring after closure of the contact-handled waste separation and sorting system. UOM=M²/YR

.12.03.05 Separation/Handling Special Materials/Wastes

Phase 4—Construct storage facilities to separate and handle special materials and wastes. UOM=M²

Phase 5—Operate and maintain the special materials/waste special handling system. UOM=M³/YR

Phase 6—Perform long-term surveillance and monitoring after closure of the special materials/waste special handling system. UOM=M²/YR

.12.03.9X Other

Phase 4—Other costs associated with environmental management low/moderate hazard waste treatment. UOM=M²

Phase 5—Operate and maintain other environmental management low/moderate hazard waste front—end storage systems. UOM=M³/YR

Phase 6—Perform long-term surveillance and monitoring after closure of other environmental management low/moderate hazard waste front-end storage systems. UOM=M²/YR

.12.04 Storage Facility Front-End—High/Remote Hazard

Phase 4—Construct permanent facilities for receiving and inspection, container handling, open/dump/sort, and preparation of high hazardous and remote-handled waste streams for storage. UOM=M²

Phase 5—Operate and maintain the facilities for receiving and inspection, container handling, open/dump/sort, and preparation of high hazardous and remote-handled waste streams for waste storage. It also includes maintenance of these facilities during the waste-storage period. UOM=M³/YR

Phase 6—Long-term surveillance, monitoring, and maintenance of the facility to ensure compliance with requirements after operations cease. UOM=M²/YR

.12.04.01 Receiving and Inspection

Phase 4—Construct facilities to receive and inspect high hazard/remote waste for storage. UOM=M²

Phase 5—Operate and maintain the waste and material receiving and inspection system. UOM=M³/YR

Phase 6—Perform surveillance and long-term monitoring after closure of the receiving and inspection system. UOM=M²/YR

.12.04.02 Assay

Phase 4—Construct storage facilities to assay high hazard/remote-handled waste. UOM=M²

Phase 5—Operate and maintain the waste-assay system. UOM=M³/YR

Phase 6—Perform long-term surveillance and monitoring after closure of the waste assay system. UOM=M²/YR

.12.04.03 Waste Stream Sort/Separation—Remote Handled

Phase 4—Construct storage facilities to sort/separate high hazard/remote-handled waste. UOM=M²

Phase 5—Operate and maintain the remote-handled waste separation and sorting system. UOM=M³/YR

Phase 6—Perform long-term surveillance and monitoring after closure of the remote-handled waste separation and sorting system. UOM=M²/YR

.12.04.04 Remote—Container Handling

Phase 4—Construct storage facilities used to remotely handle containers. UOM=M²

Phase 5—Operate and maintain the remotely handled container system. UOM=M³/YR

Phase 6—Perform long-term surveillance and monitoring after closure of the remote container handling system. UOM=M²/YR

.12.04.05 Separation/Handling Special Materials/Wastes

Phase 4—Construct storage facilities to separate and handle special materials and wastes. UOM=M²

Phase 5—Operate and maintain the special materials/waste special handling system. UOM=M³/YR

Phase 6—Perform long-term surveillance and monitoring after closure of the special materials/waste special handling system. UOM=M²/YR

.12.04.9X Other

Phase 4—Other costs associated with environmental management high hazard/remote waste treatment. UOM=M²

Phase 5—Operate and maintain other environmental management high/remote hazard waste front-end storage systems. UOM=M³/YR

Phase 6—Perform long-term surveillance and monitoring after closure of other environmental management high hazardous/remote-handled waste front-end storage systems. UOM=M²/YR

.12.05 Contact Handled Storage

Phase 4—Construct permanent storage facilities for contact- handled hazardous waste streams (e.g., high hazardous wastes including hazardous/toxic waste and radioactive waste). UOM=M²

Phase 5—Process contact-handled waste streams and operation of permanent storage facilities for contact-handled hazardous waste streams (e.g., high hazardous wastes including hazardous/toxic waste and radioactive waste). The operations include receiving, loading, unloading and maintenance of these facilities for as long as they are required. UOM=M³/YR

Phase 6—Long-term surveillance, monitoring, and maintenance of the facility to ensure compliance with requirements after operations cease. UOM=M²/YR

.12.05.01 Low Hazardous Storage

Phase 4—Construct facility for low hazard storage. UOM=M²

Phase 5—Operate and maintain the facility for low hazard storage. UOM=M³/YR

Phase 6—Perform long-term surveillance and monitoring of facility for low hazard storage. UOM=M²/YR

.12.05.02 Vault Storage

Phase 4—Construction vaults to store contact-handled waste. UOM=M²

Phase 5—Operate and maintain vaults to store contact-handled waste. UOM=M³/YR

Phase 6—Perform long-term surveillance and monitoring of vaults to store contact-handled waste. UOM=M²/YR

.12.05.03 Silo Storage

Phase 4—Construct silos to store contact-handled waste. UOM=M²

Phase 5—Operate and maintain silos to store contact-handled waste. UOM=M³/YR

Phase 6—Perform long-term surveillance and monitoring of silos to store contact-handled waste. UOM=M²/YR

.12.05.04 Intermediate Fuel Storage

Phase 4—Construct facilities for intermediate fuel storage. UOM=M²

Phase 5—Operate and maintain facilities for intermediate fuel storage. UOM=M³/YR

Phase 6—Perform long-term surveillance and monitoring of facilities for intermediate fuel storage. UOM=M²/YR

.12.05.04.01 Wet Intermediate Storage

Phase 4—Construct facilities for wet intermediate fuel storage. UOM=M²

Phase 5—Operate and maintain facilities for wet intermediate fuel storage.
UOM=M³/YR

Phase 6—Perform long-term surveillance and monitoring of facilities for wet intermediate fuel storage. UOM=M²/YR

.12.05.04.02 Dry Intermediate Storage

Phase 4—Construct facilities for dry intermediate fuel storage. UOM=M²

Phase 5—Operate and maintain facilities for dry intermediate fuel storage.
UOM=M³/YR

Phase 6—Perform long-term surveillance and monitoring of facilities for dry intermediate fuel storage. UOM=M²/YR

.12.05.04.9X Other

Phase 4—Construct other intermediate fuel storage. UOM=M²

Phase 5—Operate and maintain other intermediate fuel storage. UOM=M³/YR

Phase 6—Perform long-term surveillance and monitoring of other intermediate fuel storage. UOM=M²/YR

.12.05.9X Other

Phase 4—Construct other contact-handled storage facilities. UOM=M²

Phase 5—Operate and maintain other contact-handled storage facilities.
UOM=M³/YR

Phase 6—Perform long-term surveillance and monitoring on other contact-handled storage facilities. UOM=M²/YR

.12.06 Remote Handled Storage

Phase 4—Construct permanent storage facilities for remote-handled hazardous waste streams (e.g., high hazardous wastes including high level radioactive waste and alpha contaminated waste requiring remote handling). UOM=M²

Phase 5—Process remote-handled hazardous waste streams (e.g., high-level hazardous wastes including high-level radioactive waste and alpha-contaminated waste requiring remote handling) and operations of permanent storage facilities for those waste streams (Operations includes receiving, loading, and unloading waste materials and maintaining the storage facility as long as necessary. UOM=M³/YR

Phase 6—Long-term surveillance and maintenance through facility closure or D&D.
UOM=M²/YR

.12.06.01 Vault Storage

Phase 4—Construct vaults for remote-handled waste storage. UOM=M²

Phase 5—Operate and maintain vaults for remote-handled waste storage.
UOM=M³/YR

Phase 6—Perform long-term surveillance and monitoring of vaults for remote-handled waste storage. UOM=M²/YR

.12.06.02 Silo Storage

Phase 4—Construct silos for remote-handled waste storage. UOM=M²

Phase 5—Operate and maintain silos for remote-handled waste storage. UOM=M³/YR

Phase 6—Perform long-term surveillance and monitoring of silos for remote-handled waste storage. UOM=M²/YR

.12.06.03 Pool Storage

Phase 4—Construct pools for remote-handled waste storage. UOM=M²

Phase 5—Operate and maintain pools for remote-handled waste storage. UOM=M³/YR

Phase 6—Perform long-term surveillance and monitoring of pools for remote-handled waste storage. UOM=M²/YR

.12.06.04 Single Shell Tank

Phase 4—Construct single shell tank for waste storage. UOM=M²

Phase 5—Operate and maintain single shell tank waste storage. UOM=M³/YR

Phase 6—Perform long-term surveillance and monitoring of single shell tank. UOM=M²/YR

.12.06.05 Double Shell Tank

Phase 4—Construct double shell tank for waste storage. UOM=M²

Phase 5—Operate and maintain double shell tank waste storage. UOM=M³/YR

Phase 6—Perform long-term surveillance and monitoring of double shell tank. UOM=M²/YR

.12.06.9X Other

Phase 4—Construct other storage for remote-handled waste. UOM=M²

Phase 5—Operate and maintain other storage for remote-handled waste. UOM=M³/YR

Phase 6—Perform long-term surveillance and monitoring of other storage for remote-handled waste. UOM=M²/YR

.12.07 Mixed Waste Storage

Phase 4—Construct permanent storage facilities for mixed waste streams. Mixed waste is waste with both hazardous and radiological constituents. UOM=M²

Phase 5—Process the mixed waste stream (i.e., waste with both hazardous and radiological constituents and operations of the permanent mixed waste storage. Operations include receiving, loading, and unloading mixed waste and maintaining the facilities for as long as necessary. UOM=M³/YR

Phase 6—Long-term surveillance and maintenance through facility closure or D&D. UOM=M²/YR

.12.08 Facilities and Sheds for Temporary Storage

Phase 4—Construct and installing facilities for short-term or temporary storage of low/moderate hazardous waste.

Note: Temporary facilities for all other purposes are included in element .05.01 Site Work—Mobilization. UOM=M²

Phase 5—Operate and maintain temporary facilities. Operations includes receiving, loading, and unloading low/moderate hazardous waste and maintaining facilities for as long as necessary. UOM=M²/YR

.12.09 Waste Storage Fees and Taxes

Phases 4-6—Cost of fees and taxes charged by one Government agency to another or by one organization to another for the storage of HTR waste. For some environmental restoration programs, refer to element .32.xx for disposal options. UOM=M³

12.10 Storage Facility Commissioning Activities

Phase 4—Activities associated with startup and testing or commissioning of the storage facility, systems, and equipment. Examples of activities included in this element are: testing using cold or simulated waste; testing using hot or actual waste; training O&M workers; establishing and refining operational parameters, safety, and accident procedures and protocol; performing optimization studies; selecting, establishing, and defining management and working teams. Testing and start up are considered complete when technology operations can be sustained at specified operational and quality standards. UOM=LS

.12.10.01 Pre-Operations

Phase 4—Perform activities such as testing the system, equipment, facility, and processes using cold or simulated waste to better refine parameters and maximize safety before testing with hot waste. UOM=LS

.12.10.02 Cold Commissioning

Phase 4—Perform activities such as testing of system, equipment, facility, and processes using cold or simulated waste prior to testing with actual waste prior to hot commissioning to better refine parameters, and to maximize safety. UOM=LS

.12.10.03 Hot Commissioning

Phase 4—Perform activities such as testing the system, equipment, facility, and processes using actual or hot waste to better refine parameters, and to maximize safety before O&M. UOM=LS

.12.10.9X Other

Phase 4—Other activities involved with facility commissioning. UOM=LS

.12.9X Other

Phase 4—Construct other storage facilities or processes or the costs of other activities associated with storage facilities or processes. UOM=M²

Phase 5—O&M of other storage facilities or processes or the costs of O&M of other activities associated with storage facilities or processes. UOM=M³/YR

Phase 6—Long-term surveillance and maintenance of other storage facilities or processes or the costs of long-term surveillance and maintenance other activities associated with storage facilities or processes. UOM=M²/YR

.13.00 Disposal Facility/Process

.13.01 Reserved for Future Use

.13.02 Disposal Facility Front-End—Low/Moderate Hazard

Phase 4—Construct permanent facilities for receiving and inspecting, container handling, open/dump/sort, and preparing low/moderate hazardous waste streams for disposal. Low/moderate hazardous waste streams are those waste streams exclusively regulated under 40 CFR Part 261 and that require minimal health and safety personnel protection (PPE Level C or lower). UOM=M²

Phase 5—O&M of the facilities including receiving and inspecting, container handling, open/dump/sort, and preparing low/moderate hazardous waste streams for disposal. This element also includes operation and maintenance of the facilities during the waste-disposal period. UOM=M³/YR

Phase 6—Long-term surveillance and maintenance for an indefinite period after facility closure. UOM=M²/YR

.13.02.01 Receiving and Inspection

Phase 4—Construct facility for receiving and inspecting incoming low/moderate waste streams for disposal. UOM=M²

Phase 5—Operate and maintain the facility for receiving and inspecting incoming low/moderate material and waste streams for disposal. UOM=M³/YR

Phase 6—Perform long-term surveillance and monitoring of facility for receiving and inspecting incoming low/moderate waste streams for disposal. UOM=M²/YR

.13.02.02 Assay

Phase 4—Construct facility for assaying incoming low/moderate waste streams for disposal. UOM=M²

Phase 5—Operate and maintain the facility for assaying incoming low/moderate material and waste streams for disposal. UOM=M³/YR

Phase 6—Perform long-term surveillance and monitoring of facility for assaying incoming low/moderate waste streams for disposal. UOM=M²/YR

.13.02.03 Container Handling

Phase 4—Construct container-handling facility for low/moderate waste streams for disposal. UOM=M²

Phase 5—Operate and maintain container-handling facility for low/moderate material and waste streams for disposal. UOM=M³/YR

Phase 6—Perform long-term surveillance and monitoring of container-handling facility for low/moderate waste streams for disposal. UOM=M²/YR

.13.02.04 Waste Stream Sort/Separation—Contact Handled

Phase 4—Construct sorting and separating facility for low/moderate, contact-handled waste streams for disposal. UOM=M²

Phase 5—Operate and maintain sorting and separating facility for low/moderate, contact-handled material and waste streams for disposal. UOM=M³/YR

Phase 6—Perform long-term surveillance and monitoring of sorting and separating facility for low/moderate, contact-handled waste streams for disposal. UOM=M²/YR

.13.02.05 Separation/Handling Special Materials/Wastes

Phase 4—Construct separation and special handling facility for low/moderate waste streams for disposal. UOM=M²

Phase 5—Operate and maintain separation and special handling facility for low/moderate material and waste streams for disposal. UOM=M³/YR

Phase 6—Perform long-term surveillance and monitoring of separation and special handling facility for low/moderate waste streams for disposal. UOM=M²/YR

.13.02.9X Other

Phase 4—Construct other disposal facility front-end areas for low/moderate hazard waste. UOM=M²

Phase 5—Operate and maintain other disposal facility front-end for low/moderate hazard waste. UOM=M³/YR

Phase 6—Perform long-term surveillance and monitoring of other disposal facility front-end for low/moderate hazard waste. . UOM=M²/YR

.13.03 Disposal Facility Front-End—High/Remote Hazard

Phase 4—Construct permanent facilities for receiving and inspecting, container handling, open/dump/sort, and preparing highly hazardous, radioactive, explosive, and remote-handled waste streams for disposal. Highly hazardous or remote-handled wastes are those waste streams that are not exclusively regulated under 40 CFR Part 261 or that require high levels of personnel protection (PPE Level B or higher), engineering controls, and personnel exposure monitoring. UOM=M²

Phase 5—Operate and maintain facilities for receiving and inspecting, container handling, open/dump/sort, and preparing highly hazardous, radioactive, explosive and remote-handled waste streams for disposal. It also includes operating and maintaining the facilities during the waste-disposal period. UOM=M³/YR

Phase 6—Long-term surveillance and maintenance for an indefinite period after facility closure. UOM=M²/YR

.13.03.01 Receiving and Inspection

Phase 4—Construct a facility for receiving and inspecting incoming high/remote waste streams for disposal. UOM=M²

Phase 5—Operate and maintain facility for receiving and inspecting incoming high/remote material and waste streams for disposal. UOM=M³/YR

Phase 6—Perform long-term surveillance and monitoring of facility for receiving and inspecting incoming high/remote waste streams for disposal. UOM=M²/YR

.13.03.02 Assay

Phase 4—Construct a facility for assaying incoming high/remote waste streams for disposal. UOM=M²

Phase 5—Operate and maintain facility for assaying incoming high/remote material and waste streams for disposal. UOM=M³/YR

Phase 6—Perform long-term surveillance and monitoring of facility for assaying incoming high/remote waste streams for disposal. UOM=M²/YR

.13.03.03 Waste Stream Sort/Separation—Remote Handled

Phase 4—Construct a sorting and separating facility for high/remote, waste streams for disposal. UOM=M²

Phase 5—Operate and maintain sorting and separating facility for high/remote material and waste streams for disposal. UOM=M³/YR

Phase 6—Perform long-term surveillance and monitoring of sorting and separating facility for high/remote waste streams for disposal. UOM=M²/YR

.13.03.04 Remote—Container Handling

Phase 4—Construct a facility for container-handling high/remote waste streams for disposal. UOM=M²

Phase 5—Operate and maintain facility for container-handling high/remote material and waste streams for disposal. UOM=M³/YR

Phase 6—Perform long-term surveillance and monitoring of facility for container-handling high/remote waste streams for disposal. UOM=M²/YR

.13.03.05 Separation/Handling Special Materials/Wastes

Phase 4—Construct a facility for separation and special handling of high/remote waste streams for disposal. UOM=M²

Phase 5—Operate and maintain facility for separation and special handling of high/remote material and waste streams for disposal. UOM=M³/YR

Phase 6—Perform long-term surveillance and monitoring of facility for separation and special handling of high/remote waste streams for disposal. UOM=M²/YR

.13.03.9X Other

Phase 4—Construct other disposal facility front-end for high/remote hazard waste. UOM=M²

Phase 5—Operate and maintain other disposal facility front-end for high/remote hazard material and waste. UOM=M³/YR

Phase 6—Perform long-term surveillance and monitoring of other disposal facility front-end for high/remote hazard waste. UOM=M²/YR

.13.04 Landfill

Phase 4—Construct a landfill. Landfills are engineered structures that have containment and leachate/runoff control features. See also Solids/Soils Containment (e.g., Capping/Barrier) Collection, or Control under .19.xx. UOM=M³

Phase 5—Operate and maintain a landfill, burial ground, burial trench, or burial pit. Operation and maintenance includes receiving, inspecting, handling, and monitoring of waste. It also includes O&M of the facility during the waste-disposal period. UOM=M³/YR

Phase 6—Perform long-term surveillance and maintenance for an indefinite period after facility closure. UOM=M²/YR

.13.05 Aboveground Vault

Phase 4—Construct an aboveground disposal vault. An aboveground vault is a structure composed of concrete or other building material with three walls, a floor, and a roof constructed above grade. The vault allows for entry of persons and machinery. UOM=M³

Phase 5—Operate and maintain an aboveground disposal vault including receiving, inspecting, handling, and monitoring. It also includes operation and maintenance of the facility during the waste-disposal period. UOM=M³/YR

Phase 6—Perform long-term surveillance and maintenance for an indefinite period after facility closure. UOM=M²/YR

.13.06 Underground Vault

Phase 4—Construct an underground disposal vault. An underground vault is a structure composed of concrete or other building material with three walls, a floor, and a roof constructed below grade. The vault allows for entry of persons and machinery. UOM=M³

Phase 5—Operate and maintain an underground disposal vault including receiving, inspecting, handling, and monitoring. It also includes operation and maintenance of the facility during the waste-disposal period. UOM=M³/YR

Phase 6—Perform long-term surveillance and maintenance for an indefinite period after facility closure. UOM=M²/YR

.13.07 Underground Mine/Shaft

Phase 4—Construct an underground disposal mine/shaft. A mine/shaft is an excavation with the floors, walls, and ceiling composed primarily of natural material. The ceiling, walls, and floor may have supports of wood, steel, or concrete as necessary. UOM=M³

Phase 5—Operate and maintain an underground disposal mine/shaft including receiving, inspecting, handling, and monitoring. It also includes operation and maintenance of the facility during the waste-disposal period. UOM=M³/YR

Phase 6—Perform long-term surveillance and maintenance for an indefinite period after facility closure. UOM=M²/YR

.13.08 Tanks

Phase 4—Construct tanks for use as disposal units. Tanks are those structures that are regulated under 40 CFR Part 280, underground storage tanks or 40 CFR Part 264 Subpart J, aboveground storage tanks. UOM=M³

Phase 5—Operate and maintain the disposal storage tanks including receiving, inspecting, handling, and monitoring. It also includes operation and maintenance of the facility during the waste-disposal period. UOM=M³/YR

Phase 6—Perform long-term surveillance and maintenance for an indefinite period after facility closure. UOM=EA/YR

.13.09 Pads (Tumulus/Retrievable Storage/Other)

Phase 4—Construct disposal pads (tumulus, retrievable storage, or other). These structures have a floor of concrete or other relatively impervious material, possibly with walls, but lack a roof or ceiling. Pads may be at or below grade. UOM=M²

Phase 5—Operate and maintain the facility including receiving, inspecting, handling, and monitoring of disposal pads (tumulus, retrievable storage, or other). UOM=M²/YR

Phase 6—Perform long-term surveillance and maintenance for an indefinite period after facility. UOM=M²/YR

.13.10 Confined Disposal Facilities (CDF)

Phase 4—Construct confined disposal facilities (CDFs), which are engineered structures enclosed by dikes and designed to retain dredged material. They may be located upland (above the water table), partially in the water near shore, or completely surrounded by water. A CDF may have a large cell for material disposal and adjoining cells for retention and decantation of turbid, supernatant water. A variety of linings have been used to prevent

seepage through the dike walls. The most effective are clay or bentonite-cement slurries, but sand, soil, and sediment linings have also been used. UOM=M³

Phase 5—Operate and maintain the CDF including receiving, inspecting, handling, and monitoring. It also includes operation and maintenance of the facilities during the waste-disposal period. UOM=M³/YR

Phase 6—Perform long-term surveillance and maintenance for an indefinite period after facility closure. UOM=M²/YR

.13.11 Engineered Disposal

Phase 4—Construct engineered disposal facilities not specifically addressed elsewhere in this ECES (e.g., Aboveground and Underground Vaults). These engineered disposal facilities are for disposal of radioactive (non-RCRA) low-level waste and mixed (RCRA) low-level waste. Typical construction includes the foundation, leachate collection (double leachate collection for RCRA waste), monitoring systems, concrete vaults, and earthen material covers. UOM=M³

Phase 5—Operate and maintain the engineered disposal facilities including receiving, inspecting, handling, and monitoring. Construction of the facility is often a continuous process concurrent with the placement of waste containers. This element also includes operation and maintenance of the facility during the waste-disposal period. UOM=M³/YR

Phase 6—Perform long-term surveillance and maintenance for an indefinite period after facility closure. UOM=M²/YR

.13.12 Intermediate Depth Disposal (Burial Ground/Trenches/Pits)

Phase 4—Construct intermediate-depth disposal facilities. These facilities are excavated below grade with no containment features (either geological or engineered). They may also include a surface cover of natural materials. UOM=M³

Phase 5—Operate and maintain the intermediate-depth facilities including receiving, inspecting, handling, and monitoring of intermediate-depth disposal facilities. UOM=M³/YR

Phase 6—Perform long-term surveillance and maintenance for an indefinite period after facility closure. UOM=M³/YR

.13.13 Geologic Disposal

Phase 4—Construct geologic disposal facilities such as the Waste Isolation Pilot Plant (WIPP). The WIPP is designed to contain transuranic waste for more than 10,000 years by taking advantage of the natural process of the encapsulation of the disposal unit buried 2,000 feet below the surface in a salt mine. UOM=M³

Phase 5—Operate and maintain the geologic disposal facility including receiving, inspecting, handling, and monitoring. In the case of WIPP this operation is an involved labor-intensive process ensuring the acceptance of waste and proper placement of it. Elements such as .32 Material Handling/Transportation should be used in conjunction with this element. It also includes operation and maintenance of the facilities during the waste-disposal period. UOM=M³/YR

Phase 6—Perform long-term surveillance and maintenance for an indefinite period after facility closure. UOM=M²/YR

.13.14 Shallow Land Disposal

Phase 4—Construct shallow land disposal facilities. Shallow land disposal facilities consist of a shallow (as compared to deep geologic disposal) trench system without engineered features such as those included in the Engineered Disposal Facilities. Drums or other containers are placed in the trench and covered with seven feet of soil, clay, and impervious materials similar to a RCRA Subtitle D cap included in .19.05. UOM=M³

Phase 5—Operate and maintain shallow land disposal facilities including receiving, inspecting, handling (placement of drums/containers), and monitoring. UOM=M³/YR

Phase 6—Perform long-term surveillance and maintenance for an indefinite period after facility closure. UOM=M²/YR

.13.15 Deep Well Injection

Phase 4—Construct deep well disposal facilities. Waste is injected into geologic formations under conditions defined in 40 CFR 148, which provides the parameters allowing injection of waste into geologic formations. UOM=EA

Phase 5—Operate and maintain deep well disposal facilities including receiving, inspecting, handling, and monitoring. UOM=EA/YR

Phase 6—Perform long-term surveillance and maintenance for an indefinite period after facility closure. UOM=EA/YR

.13.16 Silo Disposal

Phase 4—Construct a silo disposal system, a type of engineered disposal facility (see .13.11) designed for disposal of 30 to 5,000 M³ of radioactive (non-RCRA) low-level waste and mixed (RCRA) low-level waste. Silos are small, engineered, aboveground, cylindrical, reinforced concrete disposal units constructed in clusters. When a silo is filled with waste containers, it is back-filled with sand and cast in place with reinforced concrete. When all silos are filled, they are back-filled and covered with a multi-layer cap. UOM=M³

Phase 5—Operate and maintain silo disposal facilities including receiving, inspecting, handling (placement of waste containers), and monitoring. It also includes maintenance of these facilities during the waste-disposal period. UOM=EA/YR

Phase 6—Perform long-term surveillance and maintenance for an indefinite period after facility closure. UOM=EA/YR

.13.17 Borehole Disposal

Phase 4—Use borehole disposal technology, which is a stand-alone engineered disposal unit (see .13.11) designed for disposal of 1 cubic meter of radioactive (non-RCRA) low-level waste and mixed (RCRA) low-level waste. Each borehole is drilled into a suitable shallow geologic formation, backfilled with concrete, and completed with a multi-layer-engineered cap. UOM=EA

Phase 5—Operate and maintain borehole disposal facilities including receiving, inspecting, handling (placement of waste), and monitoring. UOM=EA/YR

Phase 6—Perform long-term surveillance and maintenance for an indefinite period after facility closure. UOM=EA/YR

.13.18 Disposal Fees and Taxes

Phases 4 to 6—Fees and tax charges levied on one Government agency or department/organization by another for waste disposal. For some environmental restoration programs, refer to element .32.xx for disposal options. UOM=M³

.13.19 Disposal Facility Commissioning Activities

Phase 4—Activities associated with startup and testing or commissioning of the disposal facility, systems, and equipment. Examples of activities included in this element are: testing using cold or simulated waste; testing using hot or actual waste; training O&M workers; establishing and refining operational parameters, safety, and accident procedures and protocol; performing optimization studies; selecting, establishing, and defining management and working teams. Testing and start up are considered complete when technology operations can be sustained at specified operational and quality standards
UOM=LS

.13.19.01 Pre-Operations

Phase 4—Perform activities such as testing the system, equipment, facility, and processes using cold or simulated waste to better refine parameters and maximize safety before testing with hot waste UOM=LS

.13.19.02 Cold Commissioning

Phase 4—Perform activities such as testing of system, equipment, facility, and processes using cold or simulated waste prior to testing with actual waste prior to hot commissioning to better refine parameters, and to maximize safety UOM=LS

.13.19.03 Hot Commissioning

Phase 4—Perform activities such as testing the system, equipment, facility, and processes using actual or hot waste to better refine parameters, and to maximize safety before O&M UOM=LS

.13.19.9X Other

Phase 4—Other activities involved with facility commissioning UOM=LS

.13.9X OTHER

Phase 4—Construction of other disposal facilities or processes or costs of other activities associated with storage facilities or processes. UOM=M³

Phase 5—O&M of other disposal facilities or processes or O&M costs of other activities associated with disposal facilities or processes. UOM=M³/YR

Phase 6—Long-term surveillance and maintenance of other disposal facilities or processes or other activities associated with disposal facilities or processes. UOM=M³

.14.00 Ordnance and Explosives (OE) Removal and Destruction (CWM is Included in Waste Management .11 and Technologies .21-.31 and .34)

.14.01 Demolition for OE Removal

Phase 4—Prepare an area for explosive demolition activities. Activities include the using sandbags, using heavy equipment, clearing brush, running electrical wire from a safe area to the point where explosives operations will be conducted. Building a fence, posting warning signs, or constructing a site to be used for destroying unexploded ordnance (UXO)/munitions found during OE activities. See also Demolition under Element.05.04. UOM=M²

.14.02 Brush Clearing with OE

Phase 4—Form work teams to remove brush for either surface or subsurface UXO activities. Members of the work teams will be exposed to UXO. Teams will have at least one UXO qualified person to act as a safety observer. Use of saws, axe, and other brush clearing equipment is required. UOM=M²

.14.03 Blast Mats

Phase 4—Use of blast mats to catch rocks and other fragments. Commercial mats made of rubber and other materials are used to cover explosives. UOM=EA

.14.04 Blast Shields

Phase 4—Use of blast shields. These shields are engineering controls designed to protect personnel and the public from accidental detonations of UXO. They are usually locally built from plans drawn up by the U. S. Army, Corps of Engineers, Huntsville, Alabama Civil Structures Branch. They are made of various materials (usually aluminum). UOM=EA

.14.05 Surface Sweep (Visual)

Phase 4—Use of UXO teams, up to seven people, that walk in a line formation and investigate all surface items that are potential UXO. Teams may be supplemented by non-UXO personnel who have UXO safety training. UOM=M²

.14.06 Surface Sweep (Magnetometer)

Phase 4—Use of UXO Teams, of up to seven people, that, with magnetometers to aid the search, walk in a line formation and investigate all surface items that are potential UXO. This activity usually occurs in forests where leaf and brush cover impedes visual sweeps. Magnetometers detect only ferrous metals. Non-UXO personnel who have UXO safety training can supplement teams. UOM=M²

.14.07 Surface Sweep (Mag and Flag)

Phase 4—Use of magnetometers to conduct a surface sweep and flags to mark anomalies detected during the sweep. Mag and Flag on an OE project includes dividing the site into grids, normally 200' x 200'. Teams of up to seven people mark off five-foot lanes and use magnetometers to locate all subsurface anomalies in a grid. Each anomaly is marked with a pin flag for future investigation. UOM=M²

.14.08 Excavate by Hand 0' - 2' Depth

Phase 4—Manually excavate to a depth not to exceed two feet. Teams of up to seven people use hand tools (i.e., shovels, trowels, picks) to investigate subsurface anomalies and determine if they are UXO. Surface Sweep (Mag and Flag) and Excavation by hand can be combined if all team members are UXO qualified. The effort is very tedious and dangerous since current detection and location equipment give inaccurate depth. UOM=M³

.14.09 Excavate with Heavy Equipment Greater Than 2' Depth

Phase 4—Excavate using heavy equipment in hard ground or at depths exceeding 2 feet. Heavy equipment is allowed to dig within 12 inches of an anomaly. Then hand tools are used. The object is to safely determine if the anomaly is a UXO. UOM=M³

.14.10 Sifting

Phase 4—Sift at sites where the area is saturated with small metal and the UXO items in the investigating area are safe to disturb. UXO teams may use a hand or mechanical sifter to separate the soil and debris from the UXO. UXO personnel stand at the sifter or at a conveyor and separate the UXO from the scrap and debris. The sifter is sometimes used to separate chunks of explosives from soil, and to separate smaller materials from larger materials by using a sieve. Smaller items will pass through the sieve and larger items will be retained on the sieve. UOM=M³

.14.11 Removal of Chemical Warfare Material (CWM)

Phase 4—Removal of CMW material. CWM is military munitions or containers filled with chemical agents (e.g., Mustard Agent, methylphosphonothioate, Sarin, Lewisite,). UXO Teams are tasked to investigate anomalies at suspect CWM sites and determine if CWM items are present. If CWM items are found, the items are turned over to Technical Escort explosive-ordnance-disposal personnel and PMNSM for stabilization, transportation, storage and disposal. UOM=EA

.14.12 OE On-Site Destruction

Phase 4—Destroy OE on-site. When UXO items are found during OE investigations, the normal procedure is to destroy them in place. The second choice is to transport them to another location on that project site and destroy them. . UOM=EA

.14.13 Bunkers (Temporary)

Phase 4—Temporarily store explosives in bunkers. The correct term for an explosive storage facility is **magazine** rather than bunker. These bunkers are ATF approved containers for temporary storage of explosives and UXO that are awaiting destruction. UOM=EA

.14.9X Other

Phase 4—Costs for other activities associated with ordnance and explosives removal and destruction. UOM=EA

.15.00 Drums/Tanks/Structures/Miscellaneous Removal/Abatement

.15.01 Drum Removal

Phase 4—Drum removal activities such as locating buried or submerged drums, excavating buried drums by machine or hand, handling drums, cleaning and decontaminating drums, and crushing and shredding drums as necessary. This activity excludes removing drum contents; see .20.01 and .20.03 for content removal. UOM=EA

.15.02 Tank Removal

Phase 4—Tank removal activities such as locating buried or submerged tanks, excavating buried tanks by machine or hand, cleaning and decontaminating tanks, and cutting demolishing and crushing tanks. This activity excludes removing tank contents; see .20.01 and .20.03 for content removal. UOM=EA

.15.03 Structure Removal

Phase 4—Structure removal activities, such as removal of existing structures (e.g., buildings, pump stations, and out-fall structures) after decontamination and demolition. Use .05.04 or .14.01 for cost of demolition, and applicable technologies (.21.xx—.31.xx, and .34.xx) for cost of decontamination. UOM=M²

.15.03.01 Foundations

Phase 4—Remove building foundations after D&D. UOM=M²

.15.03.02 Columns

Phase 4—Remove structural columns after D&D. UOM=M²

.15.03.03 Beams and Supports

Phase 4—Remove beams and supports after D&D. UOM=M³

.15.03.9X Other

Phase 4—Remove other items that are from, or are part of, the structure. UOM=M³

.15.04 Asbestos Abatement

Phase 4—Asbestos abatement activities such as isolating work areas, removing or encapsulating asbestos, cleaning up, packaging waste for disposal, and conducting final inspections. Also included are HEPA filtration devices, vacuums, air-monitoring equipment, and amended water. UOM=M²

.15.04.01 Establishment of Containment Around Contaminated Material to be Removed

Phase 4—Establish an area around the contaminated area to ensure containment of material. UOM=M²

.15.04.01.01 Temporary Barrier

Phase 4—Establish a temporary barrier to ensure containment of material.
UOM=M²

.15 .04.01.02 Tenting

Phase 4—Establish and maintain a tent barrier to ensure containment of material.
UOM=M²

.15 .04.01.03 Glovebags

Phase 4—Use glovebags to ensure containment of material. UOM=EA

.15.04.02 *Air Cleaning Units*

Phase 4—Use HEPA filters and vacuums to stop airborne contamination. UOM=EA

.15.04.03 *Secondary Containment*

Phase 4—Establish secondary containment for the work area. UOM=M²

.15.04.04 *Wet Asbestos Containing Material with Amended Solutions*

Phase 4—Use solutions to wet the asbestos-contaminated material to prevent airborne contamination. UOM=M²

.15.04.05 *Cut and Remove Asbestos Containing Material*

Phase 4—Cut and remove asbestos-containing material. UOM=M²

.15.04.05.01 Reciprocating Saw

Phase 4—Use reciprocating saw to cut and remove asbestos. UOM=M²

.15.04.05.02 Portable Band Saw

Phase 4—Use portable band saw to cut and remove asbestos. UOM=M²

.15.04.05.03 Mechanical Shears

Phase 4—Use mechanical shears to cut and remove asbestos. UOM=M²

.15.04.06 *Prepare, Package and Remove ACM*

Phase 4—Prepare, package, and remove asbestos-containing material. UOM=M³

.15.04.07 *Wet Brush or Clean Work Area and Surfaces*

Phase 4—Remove all loose material and clean work area surfaces. UOM=M²

.15.04.08 *Apply Encapsulant to All Surfaces in Work Area*

Phase 4—Apply substance used to ensure no waste will escape the surfaces of the work area. UOM=M²

.15.04.09 *Provisions for Changing, Washing, and Waste Handling*

Phase 4—Provide areas for workers to wash, change, and effectively handle waste.
UOM=M²

.15.04.9X *Other*

Phase 4—Perform other work associated with asbestos abatement. UOM=M²

.15.05 Piping and Pipeline Removal

Phase 4—Piping/pipeline removal activities such as locating buried or aboveground piping; excavating buried piping by machine or hand; cutting, demolishing, and handling pipe; and removing concrete pipe pits. UOM=M

.15.06 Well Abandonment

Phase 4—Well abandonment activities such as properly sealing and abandoning wells to eliminate physical hazards of the well and contaminant migration pathway and to prevent hydraulic head changes and the mixing of water between aquifers. Boreholes must be clear of obstruction prior to abandonment, obstacles must be removed from the well, and the well must be grouted prior to pulling the casing. Sealants, used to provide a watertight barrier to contaminant migration, consist of cement-based grout, bentonite clay, or a combination of these substances. In some cases, re-drilling may be necessary to properly abandon the well. UOM=EA

Phase 6—Perform surveillance and inspection of the abandoned well to ensure that the seals, grouts, and other measures continue to perform their intended purpose of preventing contaminant migration. UOM=EA/YR

.15.06.01 Remove Obstacles Out of Borehole

Phase 4—Remove obstacles from the well shaft to be abandoned. UOM=LS

.15.06.02 Pull Casing

Phase 4—Remove the well casing. UOM=M

.15.06.03 Well Grouting/Sealing of Annular Space

Phase 4—Fill the well shaft and annulus space with grout to provide a barrier to contaminant migration. UOM=M³

.15.06.04 Aggregates

Phase 4—Place aggregates in well during abandonment. UOM=M³

.15.06.05 Sealants- Bentonite Clay, Portland Cement, Concrete, Other

Phase 4—Fill the well shaft and annulus space with bentonite clay, Portland cement, concrete, or other materials. UOM=M³

.15.06.06 Grout Pumps and Tremmie Pipe

Phase 4—Utilize grout pumps and tremmie pipes for well abandonment. UOM=M³

.15.06.07 Storage Tanks

Phase 4—All costs associated with using storage tanks during well abandonment. UOM=EA

.15.06.08 Transportation of Technology Components

Phase 4—All costs associated with transporting or freight on board cost for those components and materials needed for well abandonment. UOM=KM

.15.06.09 Set up and Startup

Phase 4—Perform set up and startup activities associated with well abandonment. UOM=LS

.15.06.9X Other

Phase 4—Other costs associated with well abandonment. UOM=LS

.15.9X Other

Phase 4—Costs for performing other activities associated with drums, tanks, structures, miscellaneous removal or abatement. UOM=LS

.16.00 Air Pollution/Gas Collection and Control

.16.01 Gas/Vapor Collection Trench System

Phase 4—Construct gas/vapor collection trench systems, which are deep narrow trenches backfilled with gravel, to form a path of least resistance through which gases move upward to a collection apparatus. Assemblies include excavation, backfill, geotextile liners, well point dewatering, and a ventilation system for the site. UOM=M

Phase 5—O&M activities such as replacing parts and consumable materials, cleaning components, making repairs, and performing other activities for proper and optimal operation of the gas/vapor collection trench system. UOM=M/YR

Phase 6—Perform long-term surveillance, maintenance, and monitoring activities needed to ensure compliance with requirements. UOM=M/YR

.16.02 Gas/Vapor Collection Well System

Phase 4—Construct gas/vapor collection wells to permit the venting of underground gases to a collection well system in order to prevent migration or buildup. Collection and monitoring activities include drilling rig setup, well drilling, handling of cuttings/water, casing, casing removal, placing gravel pack material, grouting, wet well and well development/testing, well screening, capping, well house installation, well pump and instrumentation installation, well piping, installing valves and fittings, and electrical connections. Also included are blowers and/or compressors, piping, meters, and control systems. Gas treatment is not included in the costs of this element. Gas/vapor collection should not be confused with the soil vapor extraction process listed under Soil Vapor Extraction (.25.17). UOM=EA

Phase 5—O&M activities such as replacing parts and consumable materials, cleaning components, making repairs, and performing other activities for proper and optimal operation of gas/vapor collection well system. UOM=EA/YR

Phase 6—Perform long-term surveillance, maintenance, and monitoring activities needed to ensure compliance with requirements. UOM=EA/YR

.16.03 Gas/Vapor Collection at Lagoon Cover

Phase 4—Construct the subsystem for venting gases and vapors at lagoon covers to prevent migration or buildup. Assemblies include collection hose, tank, vacuum blower/compressor, valves, boxes, and manholes. UOM=M²

Phase 5—O&M activities such as replacing parts and consumable materials, cleaning components, making repairs, and performing other activities for proper and optimal operation of gas/vapor collection at lagoon covers. UOM=M²/YR

Phase 6—Perform long-term surveillance, maintenance, and monitoring activities needed to ensure compliance with requirements. UOM=M²/YR

.16.04 Fugitive Dust/Vapor/Gas Emissions Control

Phase 4—Install fugitive dust/vapor/gas emissions control systems to prevent the spread of airborne contaminants. Assemblies include sprayed chemical dust suppressants, wind fences/screens, synthetic covers over waste piles, and water spraying. See also specific gas technologies under elements .21.xx—.31.xx and .34.xx. UOM=M²

Phase 5—O&M activities such as replacing parts and consumable materials, cleaning components, making repairs, and performing other activities for proper and optimal operation of fugitive/vapor/gas emission control system. UOM=M²/YR

Phase 6—Perform long-term surveillance, maintenance, and monitoring activities needed to ensure compliance with various requirements. UOM=M²/YR

.16.9X Other

Phase 4—Construct or install other devices or elements associated with air pollution or gas collection and control. UOM=M²

Phase 5—O&M of other devices or elements associated with air pollution or gas collection and control. UOM=M²/YR

Phase 6—Long-term surveillance, maintenance, and monitoring of other devices or elements associated with air pollution or gas collection and control. UOM=M²/YR

.17.00 Surface Water/Sediments Containment, Collection, and Control

.17.01 Dredging/Excavating

Phase 4—Dredge and excavate. Dredging is the removal of sediment and sludge with overlying water. Dredging may be used to remove sediments in contaminated settling basins, lagoons, and retention ponds. Dredging includes hydraulic, mechanical, and pneumatic dredges using cutterheads, bucket dredges, wheel dredges, and suction dredging. Excavating is the removal of soils, solids, or contaminated materials from the ground. Dredging/excavating during Phase 4 is for purposes of first-time construction or action. Maintenance and operation of the dredging or excavating equipment is considered part of the dredging or excavating cost. This cost will be included in the price a contractor bids. See also Excavation and Earthwork under .05.05. UOM=M³

Phases 5 and 6—Dredge and excavate to maintain the system for ongoing operations. For example, this includes dredging or excavating sediments or deposits in a weir, plume, or channel. . UOM=M³

.17.01.01 Hydraulic

Phases 4-6—Use of hydraulic-powered equipment for dredging and excavating.
UOM=M³

.17.01.02 Mechanical

Phases 4-6—Use of mechanical equipment for dredging and excavating. UOM=M³

.17.01.03 Pneumatic

Phases 4-6—Use of pneumatic-powered equipment for dredging and excavating.
UOM=M³

.17.01.9X Other

Phases 4-6—Use of other methods for dredging and excavating. UOM=M³

.17.02 Berms

Phase 4—Constructing berms, which are earthen structures to control contaminated surface water by diverting its flow. The primary purpose of berms is to divert surface runoff that has entered a contaminated area and must be collected. Activities include excavating and backfilling, hauling, pumping to dry the site, and placing drainage facing materials.
UOM=M³

Phases 5 and 6—Maintain the berm performing activities such as inspection, replacement of materials, clearing of area, making repairs, and other activities to ensure structural stability of the berm. UOM=M/YR

.17.02.01 Rock Excavation

Phase 4—Perform rock excavation during the construction of the berm. UOM=M³

.17.02.02 Excavation/Fill

Phase 4—Perform excavation and fill activities during the construction of the berm.
UOM=M³

.17.02.03 Backfill

Phase 4—Backfill of areas during the construction of the berm. UOM=M³

.17.02.04 Borrow

Phase 4—Perform borrow operations during the construction of the berm. UOM=M³

.17.02.05 Hauling

Phase 4—Haul earthen material during the construction of the berm. UOM=M³

.17.02.06 Spread

Phase 4—Spread earthen material during the construction of the berm. UOM=M³

.17.02.07 Grading

Phase 4—Grade earthen material during the construction of the berm. UOM=M³

.17.02.08 Compaction

Phase 4—Compact earthen material during the construction of the berm. UOM=M³

.17.02.09 Scarification

Phase 4—Scarify earthen material during the construction of the berm. UOM=M³

.17.02.10 Harrowing

Phase 4—Harrow earthen material during the construction of the berm. UOM=M³

.17.02.11 Tracking

Phase 4—Track earthen material during the construction of the berm. UOM=M³

.17.02.12 Contour Furrowing

Phase 4—Perform contour furrowing during the construction of the berm. UOM=M³

.17.02.13 Stockpiling

Phase 4—Stockpile earthen material during the construction of the berm. UOM=M³

.17.02.14 Topsoil

Phase 4—Apply topsoil during the construction of the berm. UOM=M³

.17.02.15 Settlement Markers

Phase 4—Place settlement markers during the construction of the berm. UOM=EA

.17.02.16 Stripping

Phase 4—Strip earthen material during the construction of the berm. UOM=M³

.17.02.17 Riprap

Phase 4—Place riprap during the construction of the berm. UOM=M³

.17.02.9X Other

Phase 4—Other costs associated with construction of berms. UOM=M³

.17.03 Floodwalls

Phase 4—Construct floodwalls. Floodwalls are structures used to protect land from flooding and inundation. Activities include excavation and backfill, hauling, pumping to dry the site, concrete placement or construction of other structures, etc. UOM=M²

Phases 5 and 6—Maintain the flood walls with activities such as inspecting the area, replacing materials, clearing the area, making repairs, and performing other activities to ensure structural stability of the berm.. UOM=M²/YR

.17.03.01 Excavation

Phase 4—Excavate during the construction of floodwalls. UOM=M³

.17.03.02 Backfill

Phase 4—Backfill areas during the construction of the floodwall. UOM=M³

.17.03.03 Concrete

Phase 4—Pour and place concrete during construction of floodwall. UOM=M³

.17.03.9X Others (Use Numbers 90-99)

Phases 4-6—Other costs associated with construction of floodwalls. UOM=M³

.17.04 Levees/Dams/Dike

Phase 4—Construct levees, dams, and dikes used to prevent a body of contaminated water from overflowing. Activities include excavation and backfill, hauling, drainage facing materials, pumping to dry the site and other activities required for constructing the structures. UOM=M³

Phases 5 and 6—Maintain the levees, dams, and dikes with activities such as inspection, replacement of materials, clearing of area, making repairs, and other activities to ensure structural stability of the levees/dams/dike. UOM=M³/YR

.17.04.01 Rock Excavation

Phase 4—Perform rock excavation during the construction of the levees/dams/dike. UOM=M³

.17.04.02 Excavation/Fill

Phase 4—Perform excavation and fill activities during the construction of the levees/dams/dike. UOM=M³

.17.04.03 Backfill

Phase 4—Backfill areas during the construction of the levees/dams/dike. UOM=M³

.17.04.04 Borrow

Phase 4—Borrow during the construction of the levees/dams/dike. UOM=M³

.17.04.05 Hauling

Phase 4—Haul earthen material during the construction of the levees/dams/dike.

UOM=M³

.17.04.06 Spreading

Phase 4—Spread earthen material during the construction of the levees/dams/dike.

UOM=M³

.17.04.07 Grading

Phase 4—Grade earthen material during the construction of the levees/dams/dike.

UOM=M³

.17.04.08 Compaction

Phase 4—Compact earthen material during the construction of the levees/dams/dike.

UOM=M³

.17.04.09 Scarification

Phase 4—Scarify earthen material during the construction of the levees/dams/dike.

UOM=M³

.17.04.10 Harrowing

Phase 4—Harrow of earthen material during the construction of the levees/dams/dike.

UOM=M³

.17.04.11 Tracking

Phase 4—Track earthen material during the construction of the levees/dams/dike.

UOM=M³

.17.04.12 Contour Furrowing

Phase 4—Perform contour furrowing during the construction of the levees/dams/dike.

UOM=M³

.17.04.13 Stockpiling

Phase 4—Stockpile earthen material during the construction of the levees/dams/dike.

UOM=M³

.17.04.14 Topsoil

Phase 4—Apply topsoil during the construction of the levees/dams/dike. UOM=M³

.17.04.15 Settlement Markers

Phase 4—Place settlement markers during the construction of the levees/dams/dike.

UOM=EA

.17.04.16 Stripping

Phase 4—Strip earthen material during the construction of the levees/dams/dike.

UOM=M³

.17.04.17 Riprap

Phase 4—Place riprap during the construction of the levees/dams/dike. UOM=M³

.17.04.9X Other

Phase 4—Other costs associated with construction of levees/dams/dikes. UOM=M³

.17.05 Terraces and Benches

Phase 4—Construct terraces and benches for controlling contaminated surface water runoff by intercepting the flow of water before it causes erosion. Activities include site preparation, excavation and backfill, hauling, soil stabilization, pumping to dry the site, geotechnical testing, and placing drainage facing materials. UOM=M

Phases 5 and 6—Maintain terraces and benches with activities such as inspecting the area, replacing materials, clearing the area, making repairs, and performing other activities to ensure structural stability of the terraces and benches. UOM=M/YR

.17.06 Channels/Waterways/Ditches

Phase 4—Construct a pathway for moving and directing water, liquids, or other contaminated fluids. Construction activities include excavating, pumping to dry the site, pouring concrete, filling, doing form work, and laying ripraps. UOM=M³

Phases 5 and 6—Maintain channels, waterways, ditches with activities such as inspecting the area, replacing materials, clearing the area, making repairs, and performing other activities to maintain the channels/waterways/ditches. UOM=M/YR

.17.07 Chutes or Flumes

Phase 4—Construct chutes and flumes. Chutes and flumes are natural or man-made channels that divert contaminated water away from a given area. Activities include grading, building earthwork, pouring concrete, doing formwork, reinforcing steel, and laying riprap. UOM=M

Phases 5 and 6—Maintain chutes and plumes with activities such as inspecting the area, replacing materials, clearing the area, making repairs, and performing other activities to maintain the chutes and flumes. UOM=M/YR

.17.08 Sediment Barriers

Phase 4—Construct sediment barriers to control the amount of sediments that are suspended and transported by the flow of contaminated surface water. Activities include silt fencing, installing straw bales, pumping, and excavating/grading temporary sediment basins. UOM=M

Phases 5 and 6—Maintain sediment barriers with activities such as inspecting the area, replacing materials, clearing areas, making repairs, and performing other activities to maintain the sediments barriers. UOM=M/YR

.17.09 Storm Drainage (See X.05.28 for Storm Sewer)

Phase 4—Construct and/or install piping, junction boxes, manholes, inlets, invert construction, grates, covers, headwalls, riprap, excavation, and backfill for storm water drainage in contaminated areas. UOM=M

Phases 5 and 6—Maintain storm drainage with activities such as inspecting areas, replacing materials, clearing the area, making repairs, and performing other activities to maintain the storm drains. UOM=M/YR

.17.10 Lagoons/Basins/Tanks

Phase 4—Construct lagoons/basins/tanks (Also see Element .13.08) for storing liquid wastes. Activities include constructing earth structures, liners, spillways, intake/outlet structures, underground tanks, aboveground tanks, concrete retention basins, and overtopping alarm systems. The element also includes excavation and earthwork, ripraps, construction of pumping stations and controls, lift stations and controls, manholes, piping and fittings, hosing, and holding tanks. UOM=M³

Phases 5 and 6—Maintain lagoons/basins/tanks with activities such as inspecting the area, replacing materials, clearing the area, making repairs, and performing other activities to maintain the lagoons/basins/tanks. UOM=M²/YR

.17.11 Pumping/Draining/Collection

Phase 4—Pump or drain aboveground or underground tanks and basins and collect other liquids. This element also includes inspection, replacement of materials, clearing of area, making repairs, and other activities to maintain the pumps, drains, and collection system during the removal process. UOM=M³

Phases 5 and 6—Remove liquid and sludge as part of O&M activities. Such activities will occur as there are leaks and infiltration into structures that requires the removal of the waste. The element also includes inspecting of area, replacing materials, clearing of area, making repairs, and other activities to maintain the pumps, drains and collection system during the removal process. UOM=M³

.17.12 Erosion Control

Phase 4—Establish turf and plant trees, shrubs, and ground covers for erosion control. UOM=M²

Phases 5 and 6—Maintain erosion control with activities such as inspection, replacement of materials, clearing of area, making repairs, and performing other activities to ensure proper erosion control. This element also includes mowing of established turf. UOM=M²/YR

.17.13 Aquatic Barrier

Phase 4—Construct or install an aquatic barrier system, an impassable barrier and/or fish guidance system within a stream channel or waterway to restrict fish from entering and/or exiting the system or to guide fish to more appropriate areas within the aquatic system. The system may be a physical structure; a mechanical, sonic, or electrical field, or a strobe-stimulated or pressure-induced system that may be permanently deployed within the stream system or activated to correspond to critical fish movements or migrations. UOM=M²

Phases 5 and 6—Maintain aquatic barriers with activities such as inspecting the area, replacing materials, clearing the area, making repairs, and performing other activities that ensure proper functioning of the aquatic barrier system. UOM=M²/YR

.17.14 Sediment Capping

Phase 4—Construct a sediment cap to contain contaminated soil and solids. UOM=M²

Phases 5 and 6—Maintain sediment capping with activities such as inspecting the area, replacing materials, clearing the area, making repairs, and performing other activities to ensure proper functioning of the sediment cap. UOM=M²/YR

.17.9X Other

Phase 4—Construct or install other devices or elements associated with surface water, sediments containment, collection and control. UOM=M²

Phases 5 and 6—Perform maintenance activities such as area inspection, replacing materials, clearing of area, and making repairs on other surface water, sediments containment, collection and control devices or elements. UOM=M²/YR

.18.00 Groundwater Containment, Collection, or Control

.18.01 Extraction Wells

Phase 4—Construct extraction wells, typically used for pumping groundwater. Extraction well construction activities include: set up the drill, drill the well, handle cuttings/water, install casing, remove casing, install gravel pack material, grout, install wet well, develop/test the well, install well screens, cap, construct the well house, and install the well pump and instrumentation, well piping, valves, fittings, electrical and other components. UOM=EA

Phase 5—Operate and maintain extraction wells with activities such as inspect the site, replace components, clear the area, make repairs, and perform other activities to ensure proper functioning of injection wells. UOM=EA/YR

Phase 6—Perform long-term surveillance, maintenance, and monitoring activities associated with abandoned wells to ensure there are no contaminant pathways or leakage of contaminants. UOM=EA/YR

.18.02 Injection Wells

Phase 4—Construct injection wells for injecting liquid wastes deep underground between geologically impermeable layers, usually of clay or shale, to contain or remove the contaminant plume, to direct contaminants to the extraction wells, or to lower the water table to prevent it from intercepting buried hazardous, toxic, and radioactive contaminants. Injection well installation activities include drilling rig set up, well drilling, well construction, handling of cuttings/water, casing, casing removal, gravel pack material, grout, wet well, well developing/testing, well screen, capping, well house, well pump and instrumentation, well piping, valves, fittings, electrical, and other components. UOM=EA

Phase 5—Operate and maintain injection wells with activities such as inspection, replacement of components, clearing of area, making repairs, and other activities ensure proper functioning of injection wells.. UOM=EA/YR

Phase 6—Long-term surveillance, maintenance, and monitoring activities associated with injection wells to ensure there are no contaminant pathways or leakage of contaminants. UOM=EA/YR

.18.03 Subsurface Drainage/Collection/French Drain

Phase 4—Construct subsurface drainage collection systems. Drainage/collection items associated with constructing a site subsurface gravity drainage and collection system. Assemblies include trench excavation and shoring, geotextile fabrics, liners, manholes, pumping, piping and fittings, hosing, and holding tanks. UOM=M

Phases 5 and 6—Maintain subsurface drainage/collection/French drains with activities such as inspecting the area, replacing components, clearing the area, making repairs, and performing other activities to ensure proper functioning of subsurface drainage and collection system. UOM=M/YR

.18.04 Slurry Walls

Phase 4—Construct slurry walls, trenches, typically 24-36 inches thick, excavated through pervious materials to a relatively impervious underlying stratum and backfilled with a soil/bentonite or cement/bentonite slurry mixture. Slurry walls provide a vertical barrier to reduce the horizontal permeability of soil. Slurry wall construction includes excavation, bentonite slurry makeup, and backfill/slurry displacement. The operation of batch plant equipment such as storage tanks, ponds, grout plants, circulation pumps and batch mixers are also included. . UOM=M²

Phases 5 and 6—Maintain slurry wells with activities such as inspecting areas, replacing materials, making repairs, and performing other activities to ensure stability of the slurry wall. UOM=M²/YR

.18.05 Grout Curtain

Phase 4—Construct grout curtains, an impenetrable barrier placed to prevent further contaminant migration by drilling into pervious rock formations at spaced intervals and injecting cement-based grouts under pressure. Grout curtain items include drilling rig, grout materials, on-site batch plants, grout pumps, and grout injection monitors. UOM=M²

Phases 5 and 6—Maintain grout curtains with activities such as inspecting the area, replacing materials, clearing the area, making repairs, and performing other activities to ensure the stability of the grout curtain. UOM=M²/YR

.18.06 Sheet Piling

Phase 4—Install sheet piling as an impervious barrier to contaminant migration once it is driven to an impervious underlying stratum. This element includes all materials, labor, and equipment to drive sheet piling and pull/salvage, if required. UOM=M²

Phases 5 and 6—Maintain sheet piling with activities such as inspecting the area, replacing components, clearing the area, making repairs, and performing other activities to ensure the proper functioning of the sheet piling. UOM=M²/YR

.18.9X Other

Phase 4—Construct or install other devices or elements associated with ground water containment, collection, and control. UOM=M²

Phases 5 and 6—Perform maintenance activities such as inspecting the area, replacing materials, clearing the area, and making repairs on other ground water containment, collection and control devices or elements. UOM=M²/YR

.19.00 Solids/Soils Containment (e.g., Capping/Barrier) Collection or Control

.19.01 Contaminated Soil Collection (Excavation)

Phase 4—Remove soil contaminated by hazardous, toxic, or radioactive contaminants. The cost of purchasing, hauling, loading, placing, and compacting clean fill also is captured with this element. Collection equipment includes excavator, front-end loader, backhoe, gradall, clamshell, dragline, and other mechanical means. Cost of revegetation is captured under .05 Site Work and is not included in this element. UOM=M³

Phase 5—Inspect contaminated soil to ensure it complies with Federal, state, and local rules and regulations. UOM=M³/YR

.19.02 Waste Containment, Portable (Furnish/Fill)

Phase 4—Perform waste containment activities such as procuring containers and the labor to fill them with liquid, sludges, or solid hazardous, toxic, and radioactive contaminants. Examples of containers are open-top sludge containers, closed-top sludge containers, roll-off containers, open head drums, spill containment vessels, spill containment pallets, storage tanks, drum liners, over packs, and lab packs. UOM=M³

Phase 5—Maintain integrity of waste containment with activities such as inspecting the area, clearing the area, and performing other activities to ensure wastes are not exposed to the environment and that the integrity of containers is maintained. UOM=M³/YR

.19.03 Upper Vegetative (Topsoil) Layer

Phase 4—Install an upper vegetative layer at the top of a cap. This element includes soil cover or topsoil placed to support vegetation and plant life. Upper vegetative layers are usually placed to reduce erosion and to protect the bottom layers. See also .05.02, Cleanup/Landscaping/Revegetation. UOM=M²

Phases 5 and 6—Maintain upper vegetative layers with activities such as inspecting the area, replacing components, clearing the area, mowing, reseeding, making repairs, and performing other activities to ensure the integrity of the upper vegetative layer is maintained. UOM=M²/YR

.19.04 RCRA C Cap

Phase 4—Install a RCRA Subtitle C cap for use in RCRA hazardous waste applications. These caps generally consist of a 2-foot thick upper vegetative layer, a 12-inch drainage layer of sand, and a low-permeability layer comprising a synthetic liner over 2 feet of compacted clay. Gas vent layers allow trapped gas to be collected and treated. A 12-inch thick layer of native soil or sand acts as a foundation for the cap. The compacted clay liners are effective if they retain a certain moisture content but are susceptible to cracking if the

clay material is desiccated. As a result, alternate cap designs are usually considered for arid environments. UOM=M²

Phases 5 and 6—Maintain a RCRA C Cap with activities such as inspecting the cap, replacing components, clearing the area, making repairs, and performing other activities to ensure the integrity of the cap is maintained. UOM=M²/YR

.19.05 RCRA D Cap

Phase 4—Install a RCRA Subtitle D cap consisting of a 6-inch upper vegetative layer, and an 18-inch thick layer of earthen material with permeability coefficient of 1x 10⁻⁵ cm/sec or lower. RCRA D landfills are for non-hazardous solid waste. UOM=M²

Phases 5 and 6—Maintain a RCRA D Cap with activities such as inspecting the cap, replacing components, clearing the area, mowing, reseeding, making repairs, and performing other activities to ensure the integrity of the cap is maintained. UOM=M²/YR

.19.06 Asphalt/Concrete Layer

Phase 4—Construct an asphalt or concrete barrier to provide a contact and infiltration barrier between the landfill and the aboveground environment. UOM=M²

Phases 5 and 6—Maintain an asphalt/concrete layer with activities such as inspecting the barrier, replacing materials, repairing caps, clearing the area, and performing other activities to ensure the integrity of the barrier. UOM=M²/YR

.19.07 Landfill Cap Enhancements

Phase 4—Make enhancements to the landfill cap to reduce or eliminate contaminant migration. Water harvesting and vegetative covers (.19.03) are two types of landfill cover enhancements. Water harvesting uses runoff enhancement to manage landfill site water balance. This can be achieved with metal rain gutter placed parallel to the slope. The percentage of runoff increases when gutter coverage increases. However, too much coverage (40%) has little effect on runoff enhancement. UOM=M²

Phases 5 and 6—Maintain landfill cap enhancements with activities such as inspecting the enhancements, replacing, repairing enhancements, clearing the area, and performing other activities to ensure the integrity of the enhancements. UOM=M²/YR

.19.08 Engineered Barrier

Phase 4—Construct a single or a multilayer barrier to prevent infiltration of water into a contaminated area or a landfill. Barrier materials, placed beneath the contaminated material can consist of geomembranes, geotextiles, soil, clay, or rocks. Critical components include barrier layers and drainage layers to collect the leachate in case of a barrier leakage. UOM=M²

Phases 5 and 6—Maintain engineered barriers with activities such as inspecting the barrier, replacing components, clearing the area, making repairs, and performing other activities to ensure the integrity of the barrier. UOM=M²/YR

.19.9X Other

Phase 4—Construct or install other devices or elements associated with solid/soils containment, collection, and control. UOM=M²

Phases 5 and 6—Perform maintenance activities such as inspecting the devices or elements, replacing components, clearing the area, and making repairs on other solids/soil containment, collection, and control devices or elements. UOM= M²/YR

.20.00 Liquid Waste/Sludge (e.g., UST/AST) Containment, Collection, or Control

.20.01 Industrial Vacuuming

Phase 4—Construct/install industrial vacuuming units for removing wastes contained in tanks, containers, surface impoundment, or process vessels by pumping or pneumatic conveyance. Also see .17.11 and .20.03. UOM=M³

Phase 5—Remove industrial waste resulting from ongoing activities, leaks, or infiltration; operate the industrial vacuum unit; repairing the unit; and replace components. UOM=M³

.20.02 Radioactive Specific Waste Containment

Phase 4—Contain radioactive specific waste by procuring fill containers and the labor to fill them with low-level and high-level radioactive liquid waste. Examples of containers are Low Specific Activity (LSA) waste containers, LSA drum over packs, LSA laundry containers, strong-tight containers, Type A containers, Type B shipping containers, lead-shielded containers, reusable containers, and special use containers. UOM=M³

Phase 5—Maintain radioactive specific waste containment with activities such as inspecting the containers, clearing the area, and performing other activities to ensure wastes are not exposed to the environment and that the integrity of the containers is maintained. UOM=M³

.20.03 Pumping/Draining/Collection

Phase 4—Construct/install pumping/drainage/collection systemswork associated with removing liquid wastes from drums, tanks, and basins. UOM=M³

Phase 5—Pump/drainage/collection of liquid as part of O&M activities, e.g., such as when leaks occur or liquids infiltrate. Activities such as inspecting the area, replacing components, clearing areas, making repairs, and performing other activities to maintain the pumps, drains, and collection system are also included. UOM=M³

.20.9X Other

Phase 4—Construct or install other devices or elements associated with liquid waste/sludge collection and containment. UOM=M³

Phase 5—Perform maintenance activities such as inspecting the devices or elements, replacing components, clearing the area, and making repairs on other liquid waste/sludge collection and containment devices or elements. UOM=M³

.21.00 In-situ Biological Treatment

.21.01 Biological Barriers

Phase 4—Install a biological barrier across the flow path of a contaminant plume, allowing the water portion of the plume to move through the barrier and contaminants to be captured on sorbent material. The sorbent barrier consists of materials that retard the movement of organic materials and microbes that biodegrade the sorbed organic while prohibiting the

movement of biologically degradable contaminants. The barrier volume provides localized control of in-situ environment, such as nutrients, co-substrates, or electron donors or acceptors, to optimize biodegradation. UOM=M²

Phase 5—Maintain biological barriers with activities such as inspecting the barrier, replacing nutrients or chemical, clearing the area, and performing other activities to maintain the biological barrier system. UOM=M²/YR

.21.02 Reserved for Future Use

.21.03 Bioventing

Phase 4—Aerate subsurface soils, using injected air as the oxygen source, to stimulate in-situ biological activity and promote biodegradation of compounds amenable to biodegradation under aerobic conditions. In contrast to soil vapor extraction, bioventing is designed to maximize in-site biodegradation, rather than volatilization of amenable compounds. Thus, bioventing systems usually operate at much lower per-well airflow rates than soil vapor extraction systems. This element includes the cost of drilling wells and the equipment required for bioventing including well casing, manifold piping, and blower(s). These activities can also use Extraction Wells (.18.01) and Injection Wells (.18.02.) for drilling and well development costs. UOM=M³

Phase 5—O&M activities such as inspecting the bioventing system, replacing materials and parts, clearing the area, making repairs, and performing other activities to maintain the pumps and system. UOM=M³/YR

.21.04 Cometabolic Treatment

Phase 4—Construction associated with using cometabolic treatment, an emerging application involving the injection of water containing dissolved primary substrate (e.g., methane, toluene) and oxygen into groundwater to support the cometabolic breakdown of targeted organic contaminants. Co-metabolism is one form of secondary substrate transformation in which enzymes produced for primary substrate oxidation are capable of fortuitously degrading the secondary substrate even though the secondary substrates do not afford sufficient energy to sustain the microbial population. The addition of methane or methanol supports methanotrophic activity, which has been demonstrated effective to degrade chlorinated solvents, such as vinyl chloride and TCE, by cometabolism. Although toluene, propane and butane are used to stimulate a different class of microorganisms, not methanotrophs, they have been used successfully for supporting cometabolism of TCE. This element does not include drilling cost or well-development costs. If necessary, use Extraction Wells (.18.01) and Injection Wells (.18.02.) for drilling and well development costs. UOM=M³

Phase 5—O&M activities such as inspecting the area, replacing nutrients, replacing components, clearing the area, making repairs, and performing other activities to maintain the system. UOM=M³/YR

.21.05 Constructed Wetlands

Phase 4—Construction associated with using natural geochemical and biological processes inherent in an artificial wetland ecosystem to accumulate and remove metals, explosives, and other contaminants from influent waters. The process can be a filtration or degradation. Although this technology incorporates principal components of wetland ecosystems, including organic soils, microbial fauna, algae, and vascular plants, microbial activity is responsible for most of the remediation. This element includes excavating to construct the wetland, planting wetland flora, incorporating organic soil and microbial fauna, and performing other activities essential for wetland construction. UOM=M²

Phase 5—Inspect and maintain the site. UOM=M²/YR

.21.06 Enhanced Bioremediation

Phase 4—Construction associated with using indigenous or inoculated microorganisms (i.e., fungi, bacteria, and other microbes) to degrade (metabolize) organic contaminants found in soil and/or groundwater. Enhanced bioremediation accelerates the rate of bioremediation by increasing the concentrations of electron acceptors, nutrients, or limiting inorganic in groundwater, surface water, leachate, soil, and other media. If necessary, use Extraction Wells (.18.01) and Injection Wells (.18.02.) for drilling and well-development costs. UOM=M³

Phase 5—O&M activities such as inspecting the area, replacing nutrients and chemicals, clearing the area, making repairs, and performing other activities to maintain the pumps to enhance bioremediation. UOM=M³/YR

.21.07 Land Treatment

Phase 4—Systematically treat land involving the dynamic interaction of waste, soil, and biological activity to degrade, transform, and immobilize waste constituents. Land treatment is a bioremediation technology in which contaminated soils, sediments, or sludge are turned over (i.e., tilled) to aerate, and allowed to interact with the soil and climate at the site. Tilling also allows for mixing of nutrients, waste, and microorganisms, which enhance the biological activity. UOM=M²

Phase 5—Inspect and maintain the area under land treatment. UOM=M²/YR

.21.08 Natural Attenuation

Phases 4 and 6—Employ natural processes such as dilution, dispersion, volatilization, biodegradation, adsorption, and chemical reactions with soil materials, that allow for reduction of contaminant concentrations to acceptable levels. Consideration of this option requires modeling and evaluation of contaminant degradation rates and pathways. The primary objective of site modeling is to demonstrate that natural processes of contaminant degradation will reduce contaminant concentrations below regulatory standards before potential exposure pathways are completed. In addition, Sampling and sample analysis must be conducted throughout the process to confirm that degradation is proceeding at rates consistent with meeting cleanup objectives. Note: Natural attenuation is not the same as "no action." In all cases, extensive site characterization is required. Use .07, .08, and .09 for characterization and sampling efforts. UOM=M²

.21.09 Phytoremediation

Phase 4—Employ phytoremediation, a process that uses plants to remove, transfer, stabilize, and destroy organic/inorganic contamination in soil, sediments, groundwater, surface water, and leachate. There are several ways plants can be used for the phytoremediation. These mechanisms include enhanced rhizosphere biodegradation, hydraulic control, phyto-degradation and phyto-volatilization. This element includes the cost of purchasing plants, planting, adding nutrients or chemicals, and other essential costs.

UOM=M²

Phase 5—Inspect and maintain the site and provide moisture and food to plants.

UOM=M²/YR

.21.10 Baroball

Phase 4—Install a Baroball to enhance barometric pumping to remove volatile organic compounds from the soil by taking advantage of changes in barometric pressure above and below ground. When the subsurface pressure is higher, contaminants naturally move upward where they can be treated/released. The Baroball significantly increases the effectiveness of barometric pumping by preventing the inflow of air into a venting well when atmospheric pressures reverse, a condition that can reduce contaminant removal by diluting and discharging the pollutant. Its design consists of a simple plastic sphere that seals the well from incoming surface air. Baroballs utilize a CPT truck for well installation. UOM=EA

Phase 5—Inspect the Baroball system and maintain the system to ensure proper operation.

UOM=EA/YR

.21.9X Other

Phase 4—Construct or install other in-situ biological treatment systems. UOM=M²

Phases 5 and 6—Perform O&M activities such as inspecting the system, replacing materials, clearing the area, and making repairs on other in-situ biological treatment.

UOM=M²/YR

.22.00 Ex-situ Biological Treatment

.22.01 Activated Sludge

Phase 4— Construction associated with using activated sludges—sludges that contain living organisms that are agitated and aerated to promote biological growth—to treat wastewater containing biodegradable organic compounds. Note: All activated sludge systems are not sequencing batch reactors. Sequencing batch reactors are one of about a dozen variations of activated sludge treatment and do not necessarily have to be aerated. Activated sludge assemblies include reactors, aerators, aerobic bacteria (maintained in suspension), settling tanks, and recycling lines for the settled biomass. Costs do not include pumping contaminated water to the treatment plant. UOM=M³

Phase 5—O&M activities such as inspecting activated sludge reactors, replacing components, cleaning areas making repairs, and performing other activities to maintain the reactor. UOM=M³/YR

.22.02 Reserved for Future Use

.22.03 Biopile (Bioheap, Biomound)

Phase 4— Construction associated with using biopile processes. Biopile treatment/composting is a controlled biological process for converting contaminants to low toxicity byproducts. In most cases, indigenous microorganisms achieve degradation. The composting system is designed to provide optimum temperature, moisture, content, aeration, and nutrient conditions to promote rapid biodegradation. The compost system is typically operated so that material temperature rises to 40 °C-55 °C (105 °F-130 °F.) due to heat released by biodegradation. Bulking agents may be required. If the soil porosity is low or recalcitrant contaminants are being treated. Composting can be performed using windrows, aerated static piles (biopiles), or specially designed machines. This element includes aerator or mixers, conveyer or transport equipment, chemicals, leachate collection and control, reactor, and other items needed to use biopile treatment/composting to convert contaminants to low-toxicity byproducts. If housing is necessary, use .11.xx. UOM=M³

Phase 5—O&M activities such as inspecting the biopile, replacing materials or nutrients, clearing the area, and performing other activities to maintain the biopile. UOM=M³/YR

.22.04 Comatabolic Treatment

Phase 4—Employ cometabolism, a form of secondary substrate transformation in which enzymes produced for primary substrate oxidation are capable of fortuitously degrading the secondary substrate even though the secondary substrates do not afford sufficient energy to sustain the microbial population. UOM=M³

Phase 5—O&M activities such as inspecting the area, replacing nutrients, clearing the area, and performing other activities to enhance cometabolic treatment. UOM=M³/YR

.22.05 Genetically Engineered Organism

Phase 4— Construction associated with treating contaminants with microorganisms that have undergone external processes by which its basic set of genes has been altered. The utilization of genetically engineered organisms involves the controlled use of these specially cultivated organisms to treat contaminants. UOM=M³

Phase 5—O&M activities such as inspecting the treatment facility, replacing organisms, clearing the area, and performing other activities to enhance microbiological activities. UOM=M³/YR

.22.06 Land Farming

Phase 4—Construction associated with using land farming, an ex-situ soil treatment technology that uses agricultural practices to promote biodegradation of organic contaminants. Waste containing low concentrations of organic contaminants is spread over a large area and allowed to interact with the soil and climate at the site. The waste, soil, climate, and biological agents interact dynamically as a system to degrade, transform, and immobilize waste constituents. UOM=M³

Phase 5—O&M activities such as inspecting land farms, clearing areas, making repairs, and performing other activities to maintain the land farm. UOM=M³/YR

.22.07 Rotating Biological Contactors

Phase 4— Construction associated with using rotating biological contactors (RBCs), slowly rotating circular disks covered with microorganisms and made of polystyrene, polyvinyl chloride, or other stable material, that are partly exposed to the air and partly submerged in troughs containing wastewater to degrade dissolved organic compounds. UOM=M³

Phase 5—O&M activities such as inspecting the RBC, replacing parts, clearing the area, making repairs, and performing other activities to maintain the RBC. UOM=M³/YR

.22.08 Slurry Phase Biological Treatment

Phase 4— Construction associated with using slurry phase biological treatment, also known as Slurry Biodegradation. This treatment involves the use of microbial action to break down sludge or soils in a water suspension into simple, stable compounds. Slurry biodegradation activities include excavation, material segregation, scrubbing, aeration, bioreactor mixing, dewatering, and placement of additional nutrients. UOM=M³

Phase 5—O&M activities such as inspecting the area, replacing nutrients and components, clearing the area, and performing other activities to maintain and enhance biodegradation. UOM=M³/YR

.22.09 Trickling Filters

Phase 4— Construction associated with using a trickling filtration system, which uses a rotary sprinkler to evenly distribute a waste liquid across a bed of filtration media into which microorganisms are attached. As the waste stream trickles through the filter media, the organic contaminants are biodegraded. Trickling filters consist of a highly permeable bed of media, rotary sprinklers, porous underdrain systems, and settling tanks. UOM=M³

Phase 5—O&M activities such as inspecting the trickling filter system, cleaning filters, clearing the area, making repairs, and performing other activities to maintain the filters. UOM=M³/YR

.22.10 Biological Lagoons

Phase 4— Construction associated with using biological lagoons as facilitative lagoons to treat low- to medium-strength organic wastes. Biological lagoons use a lined earthen basin and sometimes aerated to promote optimal growth of microorganisms for effective treatment of contaminated liquids and sludge. This method of treatment relies on rate of algae photosynthesis, adequacy of mixing, good inlet-outlet design, and adequate air temperatures to operate efficiently. Anaerobic lagoons or aerated lagoons are modified processes that treat wastes at higher rates. UOM=M³

Phase 5—O&M activities such as inspecting the biological lagoon, clearing the area, making repairs, and performing other activities to maintain the biological lagoons. UOM=M³/YR

.22.11 Anaerobic Sludge Digestion

Phase 4— Construction associated with using an anaerobic sludge digestion treatment process, which stabilizes sludge, by using microorganisms in the absence of oxygen. This element includes reactor, piping, instrumentation and controls, pumps, and other items necessary for anaerobic sludge digestion. UOM=M³

Phase 5—Operation and maintenance activities such as inspecting the digester, replacing consumables, replacing parts, making repairs, cleaning areas, operating technology, and performing other activities to maintain the digester. UOM=M³/YR

.22.12 Composting

Phase 4— Construction associated with using composting to biologically degrade soil contaminants, sludge, or municipal solid organic wastes. The contaminated media is mixed with organic nutrients. A bulking agent, such as wood chip, and inorganic nutrients are also mixed in. The mixture is then placed in (compost) piles to promote heat generation and, thus, faster and more efficient biodegradation. Composting systems can be simple windrows mixed, turned periodically, or have complete mechanical mixing and aerating systems.

UOM=M³

Phase 5—O&M activities such as inspecting the composting system, clearing the area, making repairs, and performing other activities to maintain the composting system.

UOM=M³/YR

.22.13 Fungal Biodegradation (White Rot Fungus)

Phase 4— Construction associated with using White Rot Fungus, also known as *Phanerochaete chrysosporium* in a bioreactor, to degrade organopollutants. White Rot Fungus, containing lignin-degrading or wood-rotting enzymes, has the ability to degrade and mineralize a number of organopollutants including the predominant conventional explosives TNT, hexogen, and high-melting-explosives. In addition, White Rot Fungus has the potential to degrade and mineralize other recalcitrant materials, such as DDT, PAH, PCB, and PCP. Two different treatment configurations have been tested for White Rot Fungus, in-situ and bioreactor. An aerobic system using moisturized air on wood chips is used in a reactor for biodegradation. Although White Rot Fungus degradation of TNT has been reported in laboratory-scale settings using pure cultures, several factors increase the difficulty of using this technology for full-scale treatment. These factors include competition from native bacterial populations, toxicity inhibition, chemical sorption, and the inability to meet risk-based cleanup levels. White rot works best in nitrogen-limited environments. High TNT or PCP concentrations in soil also can inhibit growth of white rot fungus. White Rot Fungus is not native to soil. UOM=M³

Phase 5—O&M activities such as inspecting the area, clearing the area, making repairs, and performing other activities to maintain the fungal biodegradation system. UOM=M³/YR

.22.9X Other

Phase 4—Construct or install other ex-situ biological treatment. UOM=M².

Phase 5—Perform O&M activities such as inspecting the treatment system, replacing materials, clearing the area, and making repairs on other ex-situ biological treatment.

UOM=M³/YR

.23.00 In-situ Chemical Treatment

.23.01 Reserved for Future Use

.23.02 Oxygen Release Compounds

Phase 4— Construction associated with using oxygen release compounds to treat VOCs, SVOCs, and fuels. Compounds such as hydrogen peroxide or liquid or gaseous oxygen may be passively introduced in wells, trenches, or pumped into the contaminated area to enhance biotreatment. UOM=M³

Phase 5—O&M activities such as inspecting the area, regularly introducing materials, and performing other activities to maintain the oxygen release system. UOM=M³/YR

.23.03 Neutralization

Phase 4— Construction associated with using acids and caustics to adjust the pH of a wastewater stream. Costs of neutralization include acids, caustics, chemical storage, mixing basins, pH probes and controls. Acids or chemicals can also be directly applied to soil or spill sites. UOM=M³

Phase 5—O&M activities such as inspecting the site, preparing and feeding chemicals into the waste stream, clearing the area, making repairs, and performing other activities to maintain the neutralization system. UOM=M³/YR

.23.04 Oxidation/Reduction

Phase 4— Construction associated with using in-situ oxidation/reduction treatments of hydrocarbon, halocarbon, radionuclides, and metal ions that contaminate groundwater and the unsaturated zone. Application of oxidants such as ozone, hydrogen peroxide, or potassium permanganate directly to the contaminant change them to more benign chemicals such as carbon dioxide and water or precipitate metal ions to a more insoluble/immobile form. Oxidants can be combined with in-situ reduction, such as the use of zero valence iron. Oxidation/reduction equipment includes air compressors, oxygen generators, ozone generators, mixing tanks, injection wells, and piping. UOM=M³

Phase 5—O&M activities such as inspecting the site, preparing and feeding chemicals into the contaminated site, clearing the area, making repairs, and performing other activities to maintain the oxidation/reduction system. UOM=M³/YR

.23.05 Soil Flushing (Surfactant/Solvent)

Phase 4— Construction associated with using in-situ soil flushing to extract contaminants from the soil with water or other suitable aqueous solutions. Soil flushing is accomplished by passing the extraction fluid through in-place soils using an injection or infiltration process. Extraction fluids must be recovered from the underlying aquifer and, when possible, recycled. Use Extraction Wells (.18.01) and Injection Wells (.18.02.) for drilling and well development costs. UOM=M³

Phase 5—O&M activities such as inspecting the site, preparing chemicals, clearing the area, repairing components, and performing other activities to maintain the soil flushing system. UOM=M³/YR

.23.9X Other

Phase 4—Construct or install other in-situ chemical treatment. UOM=M³

Phase 5—Perform O&M activities such as inspection, replacement of materials, clearing of area, and making repairs on other in-situ chemical treatment. UOM=M³/YR

.24.00 Ex-situ Chemical Treatment

.24.01 Glycolate/Alkali Metal/Polyethylene Glycol (A/PEG)

Phase 4— Construction associated with using A/PEG and potassium polyethylene glycol to detoxify halogenated aromatic and other organic compounds, such as PCBs and pentachlorophenols by heating them with PEG and sodium hydroxide or potassium hydroxide for several hours at 150°C (300°F). The APEG process decomposes PCBs and representative halogens in an exothermic and self-sustaining manner. A dechlorination reagent is formed by reacting alkali metals (such as sodium) with PEG in the presence of heat and oxygen. The reaction mechanism involves nucleophilic substitution or elimination and the oxidative degradation of chlorine through the generation of numerous free radicals. The process reactivity can be "tuned" or directed at various aliphatic or aromatic systems by varying the molecular weight of PEG. Typical by-products of the reaction are salts, such as sodium chloride, hydrogen, and hydroxylated organic derivatives. The primary advantage of the system is that the reagent is not based on a dispersed metallic sodium reaction, can tolerate low levels of water content, and is stable in air. Therefore, the process may be applicable to soils and sediments dredging and to low-moisture sludge. UOM=M³

Phase 5—O&M activities such as inspecting and clearing the area, preparing chemicals, and repairing components. UOM=M³/YR

.24.02 Base—Catalyzed Decomposition Process

Phase 4— Construction associated with using a base-catalyzed decomposition process to remediate soils and sediments contaminated with chlorinated organic compounds, especially PCBs, dioxins, and furans. Contaminated soil is screened, processed with a crusher and pug mill. The soil is then mixed with sodium bicarbonate and heated at about 350°C (660°F) for one hour, which dehalogenates 25%-75% of the halogenated aromatics. The remainder is volatilized and passed on to the second reactor, a slurry or liquid phase reactor that uses a high boiling-point hydrocarbon oil, catalyst, sodium hydroxide, and heat (350°C) to dehalogenate or decompose the contaminants. Contaminated oily liquids (such as pesticides and PCB transformer oil) are treated in the slurry/liquid phase reactor only. UOM=M³

Phase 5—O&M activities such as inspecting the facility, preparing chemicals, cleaning the area, and repairing components. UOM=M³/YR

.24.03 Chemical Hydrolysis

Phase 4— Construction associated with using hydrolysis, the chemical reaction of water with another substance, where hydrogen and hydroxyl are added to the other substance, usually forming two or more new compounds. Assemblies include feed systems, storage tanks, piping, and diaphragm metering pumps. UOM=M³

Phase 5—O&M activities such as inspecting the facility, preparing chemicals, cleaning the area, and repairing components. UOM=M³/YR

.24.04 Chlorination

Phase 4—Construct a facility for applying chlorine to drinking water, sewage, or industrial wastes to disinfect or to oxidize undesirable compounds. Assemblies include feed systems, storage tanks, chemicals, piping, and diaphragm metering pumps. UOM=M³

Phase 5—O&M activities such as inspecting the facility, preparing chemical feed, and repairing components. UOM=M³/YR

.24.05 Dehalogenation

Phase 4— Construction associated with using a dehalogenation treatment, a chemical process in which halogenated (usually chlorinated) organic compounds in an aqueous or soil medium are mixed and heated with basic reagent to remove the halogens (usually chlorine). This element includes all dehalogenation processes that are not based on alkali metals or based catalyzed decomposition process. See Glycolate Alkali Metal/Polyethylene Glycol (.24.01) and Base-Catalyzed Decomposition Process (.24.02.). UOM=M³

Phase 5—O&M activities such as inspecting the facility, preparing chemicals, cleaning the area, and repairing components. UOM=M³/YR

.24.06 Hydrogen Reduction

Phase 4— Construction associated with using reducing chemicals using hydrogen as reducing agent. UOM=M³

Phase 5—O&M activities such as inspecting the facility, purchasing and preparing chemicals, cleaning the area, and repairing components. UOM=M³/YR

.24.07 Ion Exchange

Phase 4—Construct a facility for using the ion exchange process to remove inorganic compounds by capturing ions on a resinous material known as ion exchange resins. Wastewater is continuously passed through a column containing the ion exchange resin until the resin becomes exhausted, at which point the resin is regenerated. Ion exchange is not a destructive technology; therefore the contaminated regenerants will need disposal. Exchangers include cation exchangers, anion exchangers, and mixed-bed exchangers. Assemblies include ion exchange columns, chemical feed pumps, and storage tanks. UOM=M³

Phase 5—O&M activities such as inspecting the facility, preparing chemicals, cleaning resins, and repairing components. UOM=M³/YR

.24.08 Chemical Oxidation/Reduction

Phase 4—Construct a facility for using oxidation/reduction (redox) reactions, in which an atom or group of atoms lose or gain electrons, to transfer electrons. In oxidation/reduction reactions the contaminants become more stable or more mobile. The addition of oxygen breaks down organic waste or chemicals such as cyanides, phenols, and organic sulfur compounds. Peroxide and ozone are the oxidizing agents usually used in conjunction with UV. Heavy metals are usually reduced to less mobile forms of chemicals. UOM=M³

Phase 5—O&M activities such as inspecting the facility, preparing chemicals, cleaning the area, and repairing components. UOM=M³/YR

.24.09 Oxygen Release Compounds

Phase 4—Construct a facility for using compounds such as hydrogen peroxide or liquid or gaseous oxygen to enhance biotreatment, through passive introduction into wells and trenches, or pumping into the contaminated area. Oxygen release compounds are primarily designed to treat VOCs, SVOCs, and fuels. UOM=M³

Phase 5—O&M activities such as inspecting the facility preparing chemicals, cleaning the area, and repairing components. UOM=M³/YR

.24.10 Ozonation

Phase 4—Construct a facility for using ozone as an oxidizing agent in a water or wastewater treatment process. Ozone is produced with corona discharge technology and must be produced on-site due to the hazards of transporting and storing ozone. Ozone-induced oxidation can be conducted in a batch or continuous process. Batch production uses a single reaction tank; continuous operation uses two tanks, one of which serves as an overflow tank for excess ozone. Assemblies include equipment to remove any residual ozone and monitoring units. UOM=M³

Phase 5—O&M activities such as inspecting the facility, preparing chemicals, cleaning the area, and repairing components. Note that the high amounts of electricity required is an operations cost. UOM=M³/YR

.24.11 Solvent Extraction

Phase 4—Construct a facility for using separation processes in which two immiscible or partially soluble liquid phases are brought into contact for the transfer of one or more compounds. This process is commonly referred to as liquid-liquid extraction or, more loosely, as solvent extraction. This is the separation of constituents from a liquid solution by contact with another, immiscible liquid in which the constituents are more soluble. Liquid-liquid extraction is applicable for removal of organic components from aqueous solutions into immiscible solvents. The processes are primarily physical as the solutes being transferred are ordinarily recovered without chemical change. On the other hand, the physical equilibrium relationships on which such operations are based depend mainly on the chemical characteristics of the solutes and solvents. Thus, use of a solvent that chemically resembles one component of a mixture more than the other components will lead to concentration of that component in the solvent phase, with the exclusion from the phase of the dissimilar components. The contaminant is not altered by extraction but is transferred to a different phase. The most common systems include 1) mixer-settler, consisting of a mixing chamber and a settling chamber for phase dispersion and separation; 2) extraction columns, consisting of either packed extractors or sieve-tray extractors for mixing of the solute and solvent; and 3) centrifugal contactors, which rely on centrifugal force to mix the solute and solvent. Refer to Soil Washing (.26.35) for ex-situ extraction of contaminants from soils or Soil Flushing (.25.11) for in-situ extraction of contaminants from soils. UOM=M³

Phase 5—O&M activities such as inspecting the facility, preparing chemicals, cleaning the area, and repairing components. UOM=M³/YR

.24.12 Neutralization

Phase 4—Employ neutralization, the use of acids and caustics to adjust the pH of wastewater or waste streams. Neutralization costs include initial acids or caustics, chemical storage, mixing basins, pH probes, and controls. UOM=M³

Phase 5—O&M activities such as inspecting the facility, preparing, cleaning the area, and repairing components. UOM=M³/YR

.24.13 Ultraviolet (UV) Photolysis

Phase 4— Construction associated with using ultraviolet photolysis, the process by which chemical bonds are broken by ultraviolet light. Products of photo-degradation vary according to the matrix in which the process occurs, but the complete conversion of an organic contaminant, to CO₂ or H₂O for example, is not probable. Equipment for ultraviolet photolysis includes UV lamps, process pumps, and monitors. Note that this element does not include UV oxidation. See Ultraviolet Oxidation (.24.14). UOM=M³

Phase 5—O&M activities such as inspecting the facility preparing chemicals, replacing parts, cleaning the area, and repairing components. UOM=M³/YR

.24.14 Ultraviolet (UV) Oxidation

Phase 4— Construct a facility for using UV oxidation, which uses UV radiation plus an oxidizing agent such as ozone or hydrogen peroxide to destroy organic and explosive components in low turbidity water and wastewater. If complete mineralization is achieved, the final products of oxidation are carbon dioxide, water, and salts. Equipment for UV oxidation includes UV lamps, storage for oxidants, piping, process pumps, and instrumentation and monitors. If ozone is used, equipment for off-gas treatment will be required. UOM=M³

Phase 5—O&M activities such as inspecting the facility, preparing chemicals, replacing parts, cleaning the area, and repairing components. UOM=M³/YR

.24.15 Coagulation/Flocculation/Precipitation

Phase 4— Construct a facility for using coagulation to increase clumping of particles in wastewater by biological or chemical means allowing for the separation of the particles from the water by sedimentation or filtration. Chemicals such as lime, alum, and iron salts often induce precipitation. Cost elements include the reactors or mixing tanks, mixing devices, water or storage tanks, pumping equipment, piping, and other instrumentation and controls. UOM=M³

Phase 5—O&M activities such as inspecting the treatment unit, preparing chemicals, cleaning the area, and repairing components. UOM=M³/YR

.24.16 Activated Alumina (Adsorption/Absorption)

Phase 4— Construction associated with using activated alumina as an adsorptive media. Activated alumina removes a variety of contaminants, including excessive fluoride, arsenic, and selenium from contaminated liquids. The medium requires periodic cleaning with an appropriate regenerant such as alum, acid, or bases to remain effective. Assemblies include ion exchange columns, chemical feed pumps, and storage tanks. UOM=M³

Phase 5— O&M activities such as inspecting the facility, preparing chemicals, cleaning the sorbent materials, and repairing components. UOM=M³/YR

.24.17 Forage® Sponge (Adsorption/Absorption)

Phase 4—Construct a facility for using open-celled cellulose Forage® sponges incorporating an amine-containing chelating polymer that selectively absorbs dissolved heavy metals. The polymer is intimately bonded to the cellulose, minimizing physical separation from the supporting matrix. The functional groups in the polymer (i.e., amine and carboxyl groups) provide selective affinity for heavy metals in both cationic and anionic

states, preferentially forming complexes with transition-group heavy metals. Assemblies include ion exchange columns, chemical feed pumps, and storage tanks. UOM=M³

Phase 5—O&M activities such as inspecting the facility, preparing chemicals, cleaning or backwashing adsorptive materials, and repairing components. UOM=M³/YR

.24.18 Chemical Extraction (Solvent/Acid/Alkaline Extraction)

Phase 4—Construct a facility for using chemical extraction using aqueous chemicals to separate contaminants from soil and solids. Contaminated soil and solids are mixed in a mixing tank or a reactor, and the contaminants are separated from the solids and released into the liquid. The solids are then separated from the extracted solution and further treatment is applied if necessary. Chemical extractants include a variety of acidic and basic solutions. Assemblies include mixing tanks or reactors, mixers, chemical feed pumps, and storage tanks. UOM=M³

Phase 5—O&M activities such as inspecting the facility, preparing chemicals, cleaning or backwashing adsorptive materials, and repairing components. UOM=M³/YR

.24.9X Other

Phase 4—Construct or install other ex-situ chemical treatment. UOM=M³

Phase 5—Perform O&M activities such as inspecting the site, replacing materials, cleaning the area, and repairing other ex-situ chemical treatment. UOM=M³/YR

.25.00 In-situ Physical Treatment

.25.01 In—Well Air Stripping/Circulating Wells

Phase 4—Construct a facility for using the circulating well (CW) technique for subsurface groundwater stripping by creating a three-dimensional circulating pattern of groundwater. Groundwater is drawn into a well through one screened section and is pumped through the well to a second screened section where it is reintroduced to the aquifer. The upward and downward flow can be redirected depending on site-specific conditions. Because groundwater is not pumped above the ground, the cost of operations is reduced. In addition, simultaneous treatment of the vadose zone is achieved in the form of bioventing and vapor extraction from the circulating well. CW systems can provide treatment inside the well, in the aquifer, or both. For in-well treatment, the contaminant must be adequately soluble and mobile so it can be recirculated. In-well treatment includes air stripping, activated carbon adsorption, and biodegradation. In-situ treatment is achieved by enhancing aerobic biodegradation. Use Extraction Wells (.18.01) and Injection Well (.18.02.) for drilling and well development costs. UOM=M³

Phase 5—O&M activities such as inspecting on the facility, clearing the area, and repairing components. UOM=M³/YR

.25.02 Air Sparging

Phase 4—Construction associated with using groundwater sparging treatment technologies to remove organic contaminants by injecting air into the aquifer and allowing the air to pass upward into the unsaturated soil. Contaminants are removed either by partitioning into the moving air or through biodegradation enhanced by the introduction of dissolved oxygen from the injected air. The injected air to be captured by an SVE system. Air sparging equipment consists of an air compressor (usually an oil-less compressor), piping, and

injection wells. Associated equipment includes instrumentation and controls and occasionally involves air filters and a heat exchanger. UOM=M³

Phase 5—O&M activities such as inspecting treatment units, cleaning the area, and repairing components. UOM=M³/YR

.25.03 Crushing

Phase 4—Construct a facility for using a process that crushes or reduces sizes of rocks, concrete, asphalt, or bricks by applying pressure in place. UOM=M³

Phase 5—Operations and maintenance activities such as inspecting the treatment unit, cleaning the area, and repairing components. UOM=M³/YR

.25.04 Cryogenics (Frozen Soil Barrier)

Phase 4—Construction associated with using a frozen soil barrier as a temporary in-situ containment technology to isolate or prohibit migration of the contaminants by freezing the ground, thereby limiting contaminant movement in or out of the frozen area. Circulating refrigerant through dual-tube boreholes spaced around the area to be contained forms a 4-to 6-footthick barrier, which freezes the soil moisture and reduces permeability. UOM=M²

Phase 5—O&M activities such as inspecting the treatment unit, preparing chemicals, cleaning the area, and repairing components. UOM=M³/YR

.25.05 Fracturing (Hydrofracturing)

Phase 4—Construct a facility for using high-pressure injection of a water/sand mixture to create open fractures in low-permeability soils. Injected sand keeps fractures open, enabling contaminant removal and reagent addition. This will increase contaminant removal rates by creating a more permeable pathway for fluid and vapor. Applicable for removal of chlorinated organic and petroleum contamination from fine-textured soils, hydraulic fracturing can be coupled with thermally enhanced soil vapor extraction. UOM=M

Phase 5—O&M activities such as inspecting equipment, preparing materials, cleaning the area, and repairing components. UOM=M/YR

.25.06 Lasagna Process

Phase 4—Install the Lasagna process to remediate contaminated soils with very low permeability. The Lasagna process is a combination of process that includes electrokinetics to move the water and soluble contaminants in soil pores; chemical or biological treatment zones in which contaminants can be decomposed or adsorbed; and drilling or fracturing processes that allow the development of the treatment zones. UOM=M²

Phase 5—O&M activities such as inspecting the facility, preparing chemicals, cleaning the area, and repairing components. UOM=M³/YR

.25.07 Laser (Cutting)

Phase 4—Acquire and install lasers to cut equipment, structures, and other items for removal and demolition. Operation of the laser is included in this activity. UOM=M

Phase 5—O&M activities include cutting items. UOM=M

.25.08 Laser (Surface Decontamination)

Phase 4—Acquire and install lasers to remove contaminated layers of paint or coating without having to decontaminate the entire item. This element also includes the operation of the laser. UOM=M²

Phase 5—O&M activities include using lasers during facility operation and maintenance to remove contaminated layers of paint or coating without having to decontaminate the entire item. Also includes the operation of the laser. UOM=M²

.25.09 Passive/Reactive Treatment Wall

Phase 4—Construct a passive/reactive treatment wall as a barrier to a contaminated plume. These walls usually consist of a trench filled with reactive materials or electrochemical barrier constructed down gradient, in the path of a contaminated plume. As the trench intercepts the plume, the contaminated water passively travels through the reactive media that degrade the contaminants. A variety of reactive media (chemical or physical) can be used to treat or capture the contaminants. See .21.01 for Biological Barrier. A common reactive barrier configuration is a funnel and gate that direct large volume of contaminated water through the reactive wall without the need for pumping. This element includes trenching or excavation activities. UOM=M²

Phase 5—O&M activities such as inspecting the treatment site, preparing chemicals or materials, cleaning the area, and repairing the barrier. UOM=M²/YR

.25.10 Skimming

Phase 4—Acquire and install skimming devices to collect or remove material floating on contaminated liquids. Skimming devices include rotating arms, vacuuming devices, scrapers, special absorptive cloths, and other processes. UOM=M³

Phase 5—O&M activities such as inspecting the treatment unit, preparing equipment, cleaning the area, and repairing or replacing components. UOM=M³/YR

.25.11 Soil Flushing (Surfactant/Solvent)

Phase 4—Construction associated with using in-situ soil flushing to extract contaminants from the soil with water or other suitable aqueous solutions. Soil flushing is accomplished by passing the extraction fluid through in-place soils using an injection or infiltration process. Extraction fluids must be recovered from the underlying aquifer and, when possible, recycled. Use Extraction Wells (.18.01) and Injection Wells (.18.02.) for drilling and well development costs. UOM=M³

Phase 5—O&M activities such as inspecting the site, preparing chemicals, clearing the area, and repairing components. UOM=M³/YR

.25.12 Solids Dewatering/Drying

Phase 4—Construction associated with using solids dewatering, any of a number of processes to remove water, moisture, or liquids. These processes include open-air drying, enhanced evaporation through venting or heating in place, placing heavy loads on contaminated waste and collecting the leachate, and installing materials that enhance water movement in one direction. This element may also include drilling, piping, fans or air pumps, liquid pumps, electrodes for heating, vents for collecting off-gas, and related equipment. UOM=M³

Phase 5—O&M activities such as inspecting treatment unit, cleaning the area, and repairing components. UOM=M³/YR

.25.13 Reserved for Future Use

.25.14 Vacuum/Blasting

Phase 4—Acquire and install equipment for removing surface contaminants using high-pressure blasting with scouring materials such as ice pellets, carbon dioxide pellets, sand, water or other hard, abrasive, or corrosive materials. The contaminated materials are then collected using a vacuuming device. UOM=M²

Phase 5—O&M activities such as operation and maintenance of the vacuuming and blasting equipment and systems, and including replacing parts and consumables, inspecting and cleaning equipment, repairing components, and other similar tasks. UOM=M²/YR

.25.15 Coating

Phase 4—Acquire and install equipment for applying paints, adhesive substances, or bonding substances on structures or equipment to contain contaminants or to reduce exposure to contaminants. UOM=M²

Phases 5 and 6—O&M activities include the regular application of paints, adhesive substances, or bonding substances on structures or equipment to contain contaminants or to reduce exposure to contaminants during operation and maintenance or long-term monitoring activity. UOM=M²/YR

.25.16 Electrokinetics

Phase 4—Construct a facility for using the electrokinetics process to remove metals and organic contaminants from low-permeability soil, mud, sludge, and marine dredging. When direct current is passed through low permeable soil, it mobilizes charged species, causing ions and water to move toward the electrodes. Positively charged ions and compounds move toward the cathode. Negatively charged ions and compounds move toward the anode. The current creates an acid front at the anode and a base front at the cathode. This generation of acidic condition in-situ may help mobilize sorbed metal contaminants for transport to the collection system at the cathode. Two primary mechanisms transport contaminants through the soil towards one or the other electrodes: electromigration and electroosmosis. In electromigration, charged particles are transported through the substrate. In contrast, electroosmosis is the movement of a liquid containing ions relative to a stationary charged surface. Of the two, electromigration is the main mechanism for the electrokinetic treatment process. The direction and rate of movement of an ionic species will depend on the magnitude and polarity of its charge and the magnitude of the electroosmosis-induced flow velocity. Non-ionic species, both inorganic and organic, will be transported with the electroosmosis-induced water flow. This element includes electrodes, storage tanks, instrumentation and controls, and other miscellaneous items. See other technologies for processing the waste. UOM=M³

Phase 5—O&M activities such as utility cost, treatment unit inspection, cleaning electrodes, and repairing components. UOM=M³/YR

.25.17 Soil Vapor Extraction

Phase 4—Construction associated with using soil vapor extraction (SVE) to remove volatile organic compounds from vadose zone soil by pulling air through the soil. The air is

moved by means of a blower or vacuum placed in the soil through extraction wells. Associated equipment includes condensate handling devices, instrumentation and controls, and, in most cases, off-gas treatment geomembranes to prevent short-circuiting. The SVE process is distinct from vapor/gas venting and collection listed under Gas/Vapor Collection Trench System (.16.01). Activities associated with SVE may include surface covering (placement of geomembranes) and Air Sparging (.25.02). UOM=M³

Phase 5—O&M activities such as inspecting treatment unit, cleaning components, and repairing components. UOM=M³/YR

.25.18 Fracturing (Pneumatic)

Phase 4— Construction associated with using the pneumatic fracturing process to remove chlorinated organic and petroleum contamination from fine-textured soils. Fracture wells are drilled in the contaminated vadose zone and left open (uncased) for most of their depth. A packer system is used to isolate small (0.6-meter or 2-foot) intervals so that short bursts (~20 seconds) of compressed air (less than 10,300 mm of Hg or 200 pounds per square inch) can be injected into the interval to fracture the formation. The process is repeated for each interval in the contaminated depth. Pneumatic fracturing can be coupled with thermally enhanced soil vapor extraction technologies to enhance performance. UOM=M

Phase 5—O&M activities such as inspecting equipment, preparing materials, cleaning the area, and repairing components. UOM=M/YR

.25.19 Blast Enhanced Fracturing

Phase 4— Construct a facility for using blast-enhanced fracturing at sites with fractured bedrock formations. The increased well yields, hydraulic conductivity values, and capture zones occur as a result of the highly fractured area created by detonation of explosives in boreholes. UOM=M

Phase 5—O&M activities such as inspecting equipment, preparing materials, cleaning the area, and repairing components. UOM=M/YR

.25.20 Directional Wells (Enhancement)

Phase 4—Drill directional wells, also known as horizontal wells, that position wells horizontally, or at an angle, to reach contaminants not accessible by direct vertical drilling. Directional drilling may be used to enhance other in-situ or in-well technologies such as groundwater pumping, bioventing, SVE, soil flushing, and in-well air stripping. Hardware used for directional boring includes wireline coring rigs, hydraulic thrust systems, electric cone penetrometers, steering tracking hardware, sonic drilling equipment, and push coring systems. Hydraulically activated thrust equipment capable of exerting more than 40 tons of thrust is used to push the directional boring heads into the earth. Directional control is obtained by proper positioning of the face of the non-symmetric boring head. Slow rotation of the boring head will cut and compact the geologic material into the borehole wall. Thrusting a non-rotating boring head will cause a directional change. The machinery is capable of initiating a borehole, steering down to a desired horizontal depth, continuing at that depth, and then steering back to the surface at a downrange location. UOM=EA

Phase 5—O&M activities such as inspecting equipment, preparing materials, cleaning the area, and repairing components. UOM=EA/YR

.25.21 Bioslurping

Phase 4— Construct a facility for using the bioslurping process for recovering free-phase, light, non-aqueous-phase liquids, or contaminated groundwater from near the vadose zone/water table interface via vacuum enhanced pumping. This activity is often accomplished with a variable length suction pipe (for extracting liquids) inside a soil vapor extraction well. The screened interval of the soil vapor extraction well usually spans the vadose zone/water table interface. Soil vapor extraction and free product/groundwater extraction occur simultaneously; resulting in aeration of surrounding soil, which enhances biodegradation compounds amenable to biodegradation under aerobic conditions. This element includes drilling the well and equipment required for bioslurping, such as well casing, manifold piping, suction piping (or drop tubes), vacuum pump(s) (often liquid-ring pumps), air/water separator(s), and oil/water separator(s). Extracted liquids and air may also require treatment. UOM=M²

Phase 5—O&M activities such as inspecting equipment, replacing materials or components, clearing the area, making repairs, and performing other activities to maintain the pumps and collect the contaminants. UOM=M²/YR

.25.22 Dual Phase Extraction (Multi-Phase)

Phase 4—Construct and/or install a high-vacuum system to simultaneously remove various combinations of contaminated liquids and gases from above and below the water table. This technology is known as multi-phase extraction or vacuum-enhanced extraction. Once above ground, the extracted vapors or liquid-phase organic and groundwater are separated and treated. UOM=M³

Phase 5—O&M activities such as inspecting equipment, replacing materials or components, clearing the area, making repairs, and performing other activities to maintain the pumps and collect the contaminants. UOM=M²/YR

.25.23 Draw-Down Pumping

Phase 4— Construct a facility for using draw-down pumping to pump light, non-aqueous-phase liquid (LNAPL) and groundwater from recovery wells or trenches. Pumping removes water and lowers the water table near the extraction area to create a cone of depression. The cone of depression in the vicinity of the extraction well produces a gravity head that pushes flow of LNAPL toward the well and increases the thickness of the LNAPL layer in the well. Each foot of groundwater depression provides a driving head equivalent to a pressure difference of 0.45 psi. In most cases, the production of a cone of depression will increase LNAPL recovery rates. Pumping may be accomplished with one or two pumps. In the single-pump configuration, one pump withdraws both water and LNAPL. The two-pump configuration uses one pump located below the water table to remove water and a second pump located in the LNAPL layer to recover LNAPL. A single pump system reduces capital and operating costs and allows simpler control systems and operation but produces a stream of mixed water and LNAPL that must be separated. UOM=M³

Phase 5—O&M activities such as inspecting equipment, replacing materials or components, clearing the area, making repairs, and performing other activities to maintain the pumps and collect the contaminants. UOM=M³/YR

.25.9X Other

Phase 4—Construct or install other in-situ physical treatment facilities. UOM=M³

Phases 5 and 6—Perform O&M activities such as inspecting equipment, replacing materials, clearing the area, and repairing in-situ physical treatment equipment.
UOM=M²/YR

.26.00 Ex-situ Physical Treatment

.26.01 Aeration

Phase 4—Construction associated with using aeration to bring air and water, soil, sludge, or other contaminated media into contact to promote biological degradation or oxidation.

Aeration can be accomplished by a variety of methods including tilling the land, air compressors, blowers, and sprinkler systems. UOM=M³

Phase 5—O&M activities such as inspecting the treatment unit, preparing feed materials, cleaning the area and repairing components. UOM=M³/YR

.26.02 Advanced Electrical Reactor

Phase 4—Construction associated with using an advanced electrical reactor to incinerate wastes within a reactor core heated by electrically heated carbon electrodes (which are insulated by nitrogen gas). This element includes reactor ownership/rental, feeders for solids and nozzles for liquids, and post-reactor treatment. UOM=M³

Phase 5—O&M activities such as inspecting the treatment unit, replacing equipment, cleaning the area, and repairing components. UOM=M³/YR

.26.03 Agglomeration

Phase 4—Construction associated with using agglomeration to transform sludge into dry, dense pellets by batch mixing sludge with an agglomeration agent. UOM=M³

Phase 5—O&M activities such as inspecting the treatment unit, preparing chemicals, cleaning the area, and repairing components. UOM=M³/YR

.26.04 Air Stripping

Phase 4—Construct a facility for using air stripping to physically transfer dissolved molecules from a liquid waste stream to a flowing gas. Air stripping is normally carried out as a continuous operation that employs a packed tower, where liquid waste is pumped near the top of a stripping column and flows down through an upward airflow. As the airflow contacts the liquid wastes, the volatile organic are stripped from the liquid waste. This element does not include extracting or pumping contaminated groundwater. UOM=M³

Phase 5—O&M activities such as utility costs, treatment unit inspection, cleaning the area, and repairing components. UOM=M³/YR

.26.05 Chelation

Phase 4—Construct a facility for using chelation to remove toxic metals from soil, sludge, or liquids. Metals contained in the soil, sludge, or liquids are contacted with an aqueous solution containing a chelating agent. The resulting slurry is dewatered, or the chelating agent combined with the toxic metal is sent to a storage or treatment plant. Assemblies include conveyors, water or storage tanks, mixing devices, dewatering devices, and pumps and associated piping and valves. UOM=M³

Phase 5—O&M activities such as inspecting the treatment unit or reactor, preparing chemicals, cleaning the area, and repairing components. UOM=M³/YR

.26.06 Crushing

Phase 4—Install equipment used to crush or reduce the sizes of rocks, concrete, asphalt, or bricks by applying pressure. The crushing is completed ex-situ. UOM=M³

Phase 5—Operations and maintenance activities such as inspecting the crushing unit, cleaning the area, and repairing components. UOM=M³/YR

.26.07 Compaction/Volume Reduction

Phase 4—Install a compaction unit that uses physical force to reduce the volume of solids, thereby easing handling, transportation, storage, and disposal of the waste. UOM=M³

Phase 5—O&M activities such as inspecting the compactor unit, cleaning the area, and repairing components. UOM=M³/YR

.26.08 Spray Dryer

Phase 4—Construct a facility for using a process that accepts feed in fluid state and converts it into a dried particulate form by spraying the fluid into a hot drying medium. Feed is sprayed using high pressure nozzles, high pressure air, or fluid nozzles. The heating method of drying air can be steam coils or thermic fluid or other air heater, according to the conditions available. The fines produced are taken out and the final powder gets collected at the bottom. UOM=M³

Phase 5—Operate the equipment and perform maintenance activities such as inspecting the dryer unit, cleaning the area, and repairing components. UOM=M³/YR

.26.09 Decant/Phase Separation

Phase 4—Construct a facility for using decant separation to separate liquids from the sediment that has settled to the bottom of the tank or basin. This element includes the cost of decant equipment, tanks (water, chemical, waste storage), instrumentation and controls, pumping or liquid transfer, and associated piping. UOM=M³

Phase 5—O&M activities such as inspecting the decant unit, cleaning the area, and repairing components. UOM=M³/YR

.26.10 Dissolved Air Floatation

Phase 4—Construct a facility for using dissolved air floatation as a pretreatment to separate suspended solids, oil, and grease from wastewater without using chemicals. Gas bubbles are brought out of solution and into contact with contaminants in the waste stream. These gas bubbles attach to the contaminants and lift them to the surface. Assemblies include pressurization units, discharge heads, associated piping, transfer pumps, and tanks. UOM=M³

Phase 5—O&M activities such as inspecting the treatment unit, cleaning the area, and repairing components. UOM=M³/YR

.26.11 Distillation

Phase 4—Construct a facility for using distillation to purify liquids through boiling so that the steam condenses to a pure liquid and the pollutants remain in a concentrated residue. The process involves two basic phases, the liquid phase and the vapor phase. The components to be separated by distillation are present in both phases but in different concentrations. If there are only two components in the liquid, one concentrates in the

condensed vapor (condensate) and the other in the residual liquid. If there are more than two components, the less volatile components concentrate in the residual liquid and the more volatile in the vapor condensate. This element includes the cost of the distillation unit, cooling systems, piping, pumps, instrumentation and control, and other miscellaneous items. UOM=M³

Phase 5—O&M activities such as inspecting the treatment unit, cleaning the area, and repairing components. UOM=M³/YR

.26.12 E-Beam

Phase 4—Acquire and install electron beam treatment technology to destroy organic-contaminated wastewater, soil, sediments, or sludge suspended in an aqueous matrix. The high-energy electron beam generates strongly reducing reactive species and strongly oxidizing reactive species at the same time and in almost the same concentration in the solution. The reactive transient initiates the chemical reactions that are capable of destroying hazardous compounds in aqueous solution, in most cases transforming them into carbon dioxide, water, and salt. UOM=M³

Phase 5—O&M activities such as inspecting the treatment unit, cleaning the area, and repairing components. UOM=M³/YR

.26.13 Electrochemical Oxidation

Phase 4—Construct a facility for using electrochemical oxidation to create ions for electrochemically oxidizing aqueous organic liquid, organic liquid, and some organic solids into carbon dioxide and water. The process requires an electrochemical cell in which the anode and cathodes are present; electric current flows through the cell, causing chemical reaction in the electrolyte. UOM=M³

Phase 5—O&M activities such as inspecting the treatment unit, preparing chemicals, cleaning the area, and repairing components. UOM=M³/YR

.26.14 Reserved for Future Use

.26.15 Electrolysis

Phase 4—Construct a facility for using electrolysis to oxidize substances at the anode and reduce substances at the cathode. Electrolysis is the process in which reduction and oxidation reactions take place at the surface of conductive electrodes immersed in an electrolyte under the influence of an applied potential. Assemblies include trough-shaped elongated cells, monitoring equipment, and anode and cathode material. UOM=M³

Phase 5—O&M activities such as inspecting the treatment unit, cleaning the electrolytes, and repairing components. UOM=M³/YR

.26.16 Equalization

Phase 4—Construct a facility for using the equalization process in which collected wastewater is mixed to produce a homogenous solution that is discharged to a treatment plant. Blending is used to even out variations in contaminated soils and sludge, similar to equalization. Equalization is used to maintain stability and to reduce disruptions in a treatment system. Assemblies include mixers, aerators, discharging pumps, and equalization tank. UOM=M³

Phase 5—O&M activities such as inspection, cleaning, and repairing components. UOM=M³/YR

.26.17 Evaporation

Phase 4—Construct a facility for using evaporation to treat organic material that can be removed by heat or to reduce the volume of liquids or the high moisture content in wastes. Evaporation increases the concentration of contaminants in the waste media. Evaporation is usually conducted under vacuum conditions to reduce atmospheric pressure promotes evaporation. Or the surface area of the tank is increased to further promote evaporation. Assemblies include simple stills, flash and circulation evaporators, rotors, and heaters.

UOM=M³/YR

Phase 5—O&M activities such as inspection, cleaning, and repairing components. UOM=M³/YR

.26.18 Soil Vapor Extraction

Phase 4—Construct a facility for using soil vapor extraction (SVE) to remove VOCs from soil by pulling air through the soil. The air/vapor is moved by means of a blower or vacuum pump connected to reactors or cells via piping. Or the excavated soil can be placed in a network of aboveground pippins to which a vacuum is applied to encourage volatilization of organics. Soil piles are generally covered with a geomembrane to prevent volatile emissions and to prevent the soil from becoming saturated by precipitation. Associated equipment includes condensate-handling devices, instrumentation and controls, and in most cases, off-gas treatment equipment. SVE differs from vapor/gas venting and collection listed under Gas/Vapor Collection Trench System (.16.01). Activities associated with SVE may include Air Sparging (.25.02). UOM=M³

Phase 5—O&M activities such as inspecting the treatment unit, cleaning the components, and repairing components. UOM=M³/YR

.26.19 Filter Presses

Phase 4—Construction associated with using filter presses for sludge dewatering. Filter presses consist of chamber filter plates between which sludge is pumped. Under high pressure, the plates are forced together, which effectively dewater the sludge. The resulting sludge cake is discharged from the filter press. Assemblies include filter press ownership/rental costs, sludge transfer and feed pumps, chemical feed and storage equipment, sludge storage and conditioning tanks, mixers, belt filter, vacuum filter, drying beds, and necessary pipe work. UOM=M³

Phase 5—O&M activities such as inspecting the filter press unit, cleaning the area, and repairing components. UOM=M³/YR

.26.20 Media Filtration

Phase 4—Construct a facility for using media filtration to separate microparticles suspended in a liquid or gaseous fluid by forcing the fluid through a porous medium. As the fluid passes through the medium, the suspended particles are trapped on the surface of the medium or within the body of the medium. The pressure differential to move the fluid through the medium can be induced by gravity, positive pressure, or vacuum application. The most common system for media filtration is through a layered bed of granular media, usually a coarse anthracite coal and sand. UOM=M³

Phase 5—O&M activities such as inspecting the filtration unit, cleaning or backwashing, and repairing components. UOM=M³/YR

.26.21 Freeze Crystallization

Phase 4—Construct a facility for using freeze crystallization to remove purified solvent from solution as frozen crystals. When a solution containing dissolved contaminants is slowly frozen, water ice crystals form on the surface, and the contaminants are concentrated in the remaining solution (called "mother liquor"). The ice crystals can be separated from the mother liquor, washed, and melted to yield a nearly pure water stream. The contaminated waste stream, mother liquor, and any precipitated solids, are generally more amenable to subsequent treatment by conventional destruction and stabilization technologies due to the higher concentrations. UOM=M³

Phase 5—O&M activities such as inspecting the crystallization unit, cleaning the area, and repairing components. UOM=M³/YR

.26.22 Reserved for Future Use

.26.23 Granular Activated Carbon Adsorption—Liquid

Phase 4—Construct a facility for using activated carbon adsorption to remove organic contaminants from liquid waste streams. Granular activated carbon is applied in a stationary column or filter bed where organic contaminants are adsorbed. Items associated with carbon adsorption are isotherm tests, granular activated carbon columns, pre-filters, and items associated with regenerating the spent carbon. UOM=M³

Phase 5—O&M activities such as inspecting the carbon unit, cleaning or regenerating the carbon, and repairing components. UOM=M³/YR

.26.24 Heavy Media Separation

Phase 4—Construct a facility for using heavy media separation to separate materials of differing density by float/sink in a colloidal suspension of a finely ground dense mineral. This suspension, or media, usually consists of a water-suspension of magnetite, galena, or ferrosilicon. UOM=M³

Phase 5—O&M activities such as inspecting the separation unit, cleaning the area, and repairing components. UOM=M³/YR

.26.25 High Pressure Aqueous Destruction

Phase 4—Construct a facility for using surface cleaning technologies that use water under high-pressure to remove contaminants from soils, solids, and structures. This process may be used in conjunction with surfactants and solvents for cleaning and decontamination. Ultrahigh-pressure water jet equipment can also be used as a cutting tool. UOM=M³

Phase 5—O&M activities such as inspecting the treatment unit, cleaning the unit, and repairing components. UOM=M³/YR

.26.26 Lignin Adsorption/Sorptive Clays

Phase 4—Construction associated with using lignin adsorption/sorptive clays to treat aqueous waste streams with organic, inorganic, and heavy metals contamination. The waste stream is treated by the molecular adhesion of the contaminants to an adsorptive surface. UOM=M³

Phase 5—O&M activities such as inspecting the treatment unit, preparing chemicals, and repairing components. UOM=M³/YR

.26.27 Magnetic Separation

Phase 4—Construct a facility for using magnetic separation to extract slightly magnetic radioactive particles from host media such as water, soil, or air. All uranium and plutonium compounds are slightly magnetic while most host media are nonmagnetic. The process operates by passing contaminated fluid or slurry through a magnetized volume. The magnetized volume contains a magnetic matrix material such as steel wool or spherical steel balls that extract the slightly magnetic contamination particles from the slurry. UOM=M³
Phase 5—O&M activities such as inspecting the treatment unit, cleaning the components, and repairing components. UOM=M³/YR

.26.28 Membrane Separation-Electrodialysis

Phase 4—Construct a facility for using electrodialysis to remove dissolved salts, soluble silica, and organic materials from waste streams and to concentrate the dissolved heavy metal. Assemblies include water storage tanks, associated pumps, piping, and valves, and backwashing of contaminated membranes. UOM=M³

Phase 5—O&M activities such as inspecting the treatment unit, replacing components, and repairing equipment. UOM=M³/YR

.26.29 Reverse Osmosis

Phase 4—Construct a facility for using reverse osmosis to remove dissolved salts, soluble silica, colloids, and organic molecules from waste streams. Wastewater is collected and sent through a reverse osmosis system under pressure (200-1200 psig). The reverse osmosis system first filters, then concentrates, waste materials while water easily passes through. The secondary waste (brine) needs to be treated further or disposed of. The membrane can be made of cellulose acetate, thin film composites, or various polymers. There are also several membrane configurations with varying membrane areas within the modules. Equipment includes reverse osmosis membranes, containment modules, chemical feed (usually acid), high-pressure pumps, storage tanks, piping, and instrumentation and controls. UOM=M³

Phase 5—O&M activities such as inspecting the treatment unit, preparing chemicals, replacing components, and repairing equipment. UOM=M³/YR

.26.30 Oil/Water Separation

Phase 4—Construct an oil-water separator to separate oil and water using the differences in their densities and gravitational pull. UOM=M³

Phase 5—O&M activities such as inspecting the treatment unit, replacing components, and repairing equipment. UOM=M³/YR

.26.31 Sedimentation

Phase 4—Construct a facility for using sedimentation, a physical process by which particles suspended in a liquid are made to settle by means of gravitational and inertial forces acting on both the particles suspended in the liquid and the liquid itself. UOM=M³

Phase 5—O&M activities such as inspecting the treatment unit, replacing components, and repairing equipment. UOM=M³/YR

.26.32 Shredding

Phase 4—Construct a facility for shredding large solid wastes and process drums and their contents. Necessary equipment includes conveyors and rotary shear shredders. UOM=M³

Phase 5—O&M activities such as inspecting the treatment unit, replacing components, and repairing equipment. UOM=M³/YR

.26.33 Sieving (Size Separation, Screening, Physical Separation)

Phase 4—Construct a facility for using sieves to separate smaller materials from larger materials. Physical separation is based on the fact that most organic and inorganic contaminants tend to bind, either chemically or physically, to the fine (i.e., clay and silt) fraction of a soil. The clay and silt soil particles are, in turn, physically bound to the coarser sand and gravel particles by compaction and adhesion. Thus, separating the fine clay and silt particles from the coarser sand and gravel soil particles effectively concentrates the contaminants into a smaller volume of soil that could then be further treated or disposed. Equipment includes conveyers, storage tanks, sieves or screens, and other equipment. This element also includes straining contaminated water or wastewater to remove sludge and coarse solid materials. Items included in this element are pumps, piping, storage tanks, valves, and other equipment. UOM=M³

Phase 5—O&M activities such as inspecting the treatment unit, replacing components, and repairing equipment. UOM=M³/YR

.26.34 Skimming

Phase 4—Acquire and install skimming devices to remove or collect floating material at the top of contaminated media. Skimming can be used to separate oil from water, liquid of different densities, solids from liquids, etc. Skimming devices include rotating arms, vacuuming devices, scrappers, belt skimmers or rope wicks made of oleophilic or hydrophobic material, a floating filter mesh with high affinity for non-polar hydrocarbons, and other devices. UOM=M³

Phase 5—O&M activities such as inspecting the treatment unit, replacing components, and repairing equipment. UOM=M³/YR

.26.35 Soil Washing (Surfactant/Solvent)

Phase 4—Construction associated with using soil washing as an ex-situ separation technology that uses a fluid (usually water or water with wash-improving additives) to remove hazardous, toxic, or radioactive contaminants from excavated soils, sludge, and sediments. The soil is rinsed to remove any excess surfactants, while the liquids are treated as contaminated liquids. Assemblies include conveyors, screens, tanks, dewatering devices, associated piping and valves, and liquid waste treatment units. Refer to Soil Flushing (Surfactant/Solvent) (.23.05), Glycolate Alkali Metal/Polyethylene Glycol (A/PEG) (.24.01), Dehalogenation (Catalytic Dechlorination) (.24.05), and Solvent Extraction (.24.11) (which uses an organic chemical to dissolve, separate and concentrate organic contaminants) for in-situ treatment. UOM=M³

Phase 5—O&M activities such as inspecting the treatment unit, preparing chemicals, replacing components, and repairing equipment. UOM=M³/YR

.26.36 Solids Dewatering/Drying

Phase 4—Construct a facility for using solids dewatering to remove water, moisture, liquids, or fluids by filtration, centrifugation, open air drying, vacuum suction, or other mechanical or evaporative method. Dewatering or drying also reduces volume and, thereby, increases the ease of handling waste. Dewatered sludge is disposed of by burning or being sent to a landfill. This element does not include dewatering through the use of a filter press, see Filter Presses (.26.19). UOM=M³

Phase 5—O&M activities such as inspecting the treatment unit, replacing components, and repairing equipment. UOM=M³/YR

.26.37 Sprinkler Irrigation

Phase 4—Construct a sprinkler irrigation system to volatilize VOCs from contaminated wastewater. The process involves the pressurized distribution of VOC-laden water through a standard sprinkler irrigation system. Sprinkler irrigation transfers VOCs from the dissolved aqueous phase to the vapor phase, whereby the VOCs are released directly to the atmosphere. UOM=M³

Phase 5—O&M activities such as inspecting the treatment unit, replacing components, and repairing equipment. UOM=M³/YR

.26.38 Supercritical Extraction

Phase 4—Construction associated with using supercritical extraction to dissolve organic constituents of a waste stream after mixing the waste with a gas (such as carbon dioxide, propane, or butane) pressurized to the supercritical state. The enhanced solubility of the fluid, due to the high pressures and temperatures, aid in the removal of the wastes. UOM=M³

Phase 5—O&M activities such as inspecting the treatment unit, replacing components, and repairing equipment. UOM=M³/YR

.26.39 Surfactant Enhanced Recovery

Phase 4—Construct a facility for applying surfactant micelles or steam to the groundwater to facilitate groundwater pumping by increasing the mobility and solubility of the contaminants sorbed to the soil matrix. Surfactant micelles can also facilitate the entrainment of hydrophobic contaminants to allow removal and assures that multiphase contaminants can be effectively removed. Thus the process can increase the contaminant mass removal per pore volume of groundwater flushing through the contaminated zone. The implementation of surfactant-enhanced recovery requires the injection of surfactants into a contaminated aquifer. Typical systems use a pump to extract groundwater some distance from the injection point. The extracted groundwater is treated ex-situ to separate the injected surfactants from the contaminants and groundwater. To be cost-effective, the design of the surfactant-enhanced recovery system is critical. When the surfactants have been separated from the groundwater, they can be re-injected into the subsurface. Contaminants must be separated from the groundwater and treated prior to discharge of the extracted groundwater. UOM=M³

Phase 5—O&M activities such as inspecting the treatment unit, replacing components, and repairing equipment. UOM=M³/YR

.26.40 Synthetic Resin Adsorption

Phase 4—Construction associated with using synthetic resin absorption to absorb and capture contaminants onto a resin in a liquid or gaseous stream. Synthetic resins are more durable than natural adsorbents and provide large surface area and higher adsorption capacity for organic molecules. UOM=M³

Phase 5—O&M activities such as inspecting the treatment unit, regenerating resin, replacing components, and repairing equipment. UOM=M³/YR

.26.41 Gravity Separation

Phase 4—Construct a facility for using gravity separation which relies on a density difference between phases, as a solid/liquid separation process. Equipment size and effectiveness of gravity separation depends on the settling velocity of the solid, which is a function of particle size, density difference, fluid viscosity, and particle concentration (hindered settling). Gravity separation is also used for removing immiscible oil phases and for classification where particles of different sizes are separated. It is often preceded by coagulation and flocculation to increase particle size, thereby allowing removal of fine particles. UOM=M³

Phase 5—O&M activities such as inspecting the treatment unit, replacing components, and repairing equipment. UOM=M³/YR

.26.42 Cryogenics

Phase 4—Construct a facility for using cryogenics to defuse unexploded munitions by freezing the munitions and destroying them by smashing the device and breaking them apart. This element includes equipment for freezing the munitions, facility for destroying the frozen munitions, and other auxiliary equipment. UOM=EA

Phase 5—O&M activities such as inspecting equipment, operating equipment, replacing components, and repairing equipment. UOM=EA/YR

.26.43 Nanofiltration

Phase 4—Construct a facility for using nanofiltration, a process similar to reverse osmosis, to remove certain dissolved salts, soluble silica, colloids, and organic molecules from liquid waste streams. Wastewater is collected and sent through a nanofiltration system under pressure, usually less than that of the reverse osmosis system (75-250 psi.). The nanofiltration system first filters, then concentrates, waste materials while water easily passes through. Equipment includes membranes, containment modules, chemical feed (usually acid), pressure pumps, instrumentation and control, and storage tanks. Treatment or disposal of the concentrate or brine is not included in this element. UOM=M³

Phase 5—O&M activities such as inspecting the treatment unit, preparing chemicals, replacing components, and repairing equipment. UOM=M³/YR

.26.44 Ultrafiltration/Microfiltration

Phase 4—Construct a facility for using ultrafiltration and microfiltration, low-pressure membranes (10-75 psi) to treat contaminated water and other liquids. This is the physical process whereby microparticles suspended in a liquid or gaseous fluid are separated by forcing the fluid through a porous membrane. As the fluid passes through the membrane, the larger suspended particles are trapped on the surface of the membrane. The size of the membrane pores varies and there are numerous membrane materials and configurations. Equipment includes membranes, containment modules, chemical feed (usually acid), pressure pumps, instrumentation and control, and storage tanks. UOM=M³

Phase 5—O&M activities such as inspecting the filtration unit, cleaning the area, and repairing components. UOM=M³/YR

.26.45 Membrane Pervaporation

Phase 4—Construct a facility for using membrane pervaporation, a process that uses permeable membranes that preferentially adsorb VOCs from contaminated water. Contaminated water first passes through a heat exchanger, raising the water temperature. The heated water then enters the pervaporation module, containing membranes composed of a nonporous organophilic polymer, similar to silicone rubber, formed into capillary fibers. VOCs diffuse by vacuum from the membrane-water interface through the membrane wall. Treated water exits the pervaporation module while the organic vapors travel from the module to a condenser where they return to the liquid phase. The condensed organic materials represent only a fraction of the initial wastewater volume and may be subsequently disposed of at a cost saving. UOM=M³

Phase 5—O&M activities such as inspecting the treatment unit, operating the unit, replacing components, and repairing equipment. UOM=M³/YR

.26.9X Other

Phase 4—Construct or install other ex-situ physical treatment. UOM=M³

Phase 5—Perform O&M activities such as inspecting the facility, replacing materials, clearing the area, and repairing other ex-situ physical treatment. UOM=M³/YR

.27.00 In-situ Thermal Treatment

.27.01 Thermal Blanket (with Vacuum Extraction)

Phase 4—Construct a thermal blanket to vaporize contaminants by heating soils to the boiling point of the contaminant. Contaminated vapors are then drawn out of the soil by a vacuum unit and treated in an off-gas unit. A thermal blanket comprises a steel box with a layer of steel webbing at the bottom. Heating elements, through which heat is transferred to the soil below, are woven. The blanket is placed above the contaminated soil, and a layer of vermiculite insulation is placed 12-18 inches above the blanket. This ensures a complete seal between the blanket and the contaminated soil. Thermal blankets are effective on contaminants located to a depth of approximately 3 feet. UOM=M²

Phase 5—O&M of the treatment unit. Activities include monitoring the equipment and processes, replacing consumable materials, and replacing parts. UOM=M²/YR

.27.02 Six-Phase Heating and Extraction

Phase 4—Construct a treatment unit that combines six-phase soil heating with soil vapor extraction. Six-phase electrical heating splits conventional three-phase electricity into six electrical phases, producing an improved subsurface heat distribution. Heating raises the vapor pressure of volatile and semi-volatile contaminants, increasing the removal capabilities of the soil vapor extraction system. Heating also dries the soil and creates steam, which increases permeability and strips contaminants that may not be removed by the conventional soil vapor extraction system. UOM=M³

Phase 5—O&M of the treatment unit. Activities include monitoring the equipment and processes, replacing consumable materials, and replacing parts. UOM=M³/YR

.27.03 Reserved for Future Use

.27.04 Steam/Hot Water Injection Vacuum Extraction

Phase 4—Construct a facility for using in-situ steam extraction to remove hydrocarbons from contaminated soils by the continuous pumping of steam and heated compressed air and the recovery of the subsequently contaminated water and off-gas. The resultant air-stream is treated (by carbon adsorption, catalytic oxidation, or other means), compressed, and returned to the soil being treated. The condensed water is removed from the liquid stream with a gravity separator followed by treatment to remove dissolved organics. The condensed organics are collected and held for recycling or disposal. Assemblies include drilling injection and extraction wells and vacuum pumps. UOM=M³

Phase 5—O&M activities such as inspecting the treatment unit, replacing components, and repairing equipment. The cost of energy also is included. UOM=M³/YR

.27.05 High Temperature Thermal Desorption

Phase 4—Construct a facility for using high-temperature thermal desorption to heat (directly or indirectly) contaminated media such as soil, sediments, sludge, and filter cakes to 315°C-537°C (600°F-1,000°F), driving off water and volatile contaminants. The volatile contaminants may be burned in an afterburner, condensed to reduce the volume to be disposed of, oxidized through catalytic oxidation, or captured by carbon adsorption beds. Auxiliary equipment includes shredders, conveyors, blowers, fuel system instrumentation and controls, bag houses, scrubbers, and treated-material handling systems. At high temperatures, decontaminated soil may not retain its physical properties and components in the soil may be damaged, which usually prevents treated soil from supporting future biological activity. UOM=M³

Phase 5—O&M activities such as inspecting the treatment unit, replacing components, and repairing equipment. The cost of energy also is included. UOM=M³/YR

.27.06 Reserved for Future Use

.27.07 Low Temperature Thermal Desorption

Phase 4—Construct a facility for using low-temperature thermal desorption to heat (directly or indirectly) contaminated media such as soil, sediments, sludge and filter cakes to 93°C to 315°C (200 °F-600 °F), driving off water and volatile contaminants. The volatile contaminants may be burned in an afterburner, condensed to reduce the volume to be disposed of, oxidized through catalytic oxidation, or captured by carbon adsorption beds. Auxiliary equipment includes shredders, conveyors, blowers, fuel system instrumentation and controls, bag houses, scrubbers, and treated-material handling systems. At low temperatures, decontaminated soil retains its physical properties and components in the soil are not damaged, which enables treated soil to retain the ability to support future biological activity. UOM=M³

Phase 5—O&M activities such as inspecting the treatment unit, replacing components, and repairing equipment. The cost of energy is included. UOM=M³/YR

.27.08 Radiofrequency/Electromagnetic Heating

Phase 4—Construct a facility for using radio frequency/magnetic heating to remove contaminants such as oil, gasoline, diesel fuel, carbon tetrachloride, hexane, chloroform, and other constituents from liquid containing soils and solids at elevated temperatures (100°C-400°C). To implement the radiofrequency heating technology, electrodes must be placed in a borehole in the ground. Components also include vapor extraction tubes or piping, vapor barrier, condenser/ coolers, gas/liquid separator, storage tanks, off-gas treatment unit, pumps and blowers, and instrumentation and controls. UOM=M³

Phase 5—O&M activities such inspecting the equipment, and replacing consumables and components. The cost of energy and other utilities is included. UOM=M³/YR

.27.9X Other

Phase 4—Construct or install other in-situ thermal treatment units. UOM=M³

Phase 5—Perform O&M activities such as inspecting the unit, replacing materials, clearing the area, and repairing other in-situ thermal treatment units. UOM=M³/YR

.28.00 Ex-situ Thermal Treatment

.28.01 High Temperature Thermal Desorption

Phase 4—Construct a facility for using high-temperature thermal desorption to heat (directly or indirectly) contaminated media such as soil, sediments, sludge, and filter cakes to 315°C-538°C (600°F-1000°F), driving off water and volatile contaminants. The volatile contaminants may be burned in an afterburner, condensed to reduce the volume to be disposed of, oxidized through catalytic oxidation, or captured by carbon adsorption beds. Auxiliary equipment includes shredders, conveyors, blowers, fuel system instrumentation and controls, bag houses, scrubbers, and treated-material handling systems. At high temperatures, decontaminated soil may not retain its physical properties and components in the soil may be damaged, which usually prevents treated soil from supporting future biological activity. UOM=M³

Phase 5—O&M activities such as inspecting the treatment unit, replacing components, and repairing equipment. The cost of energy is included. UOM=M³/YR

.28.02 Incineration

Phase 4—Install incineration technologies to destroy wastes by burning them in combustion chambers and using energy recovery devices. Incineration technologies include fluidized bed, rotary kiln, multiple hearth, infrared, circulating bed, liquid injection, pyrolysis, plasma torch, and wet air oxidation. Incineration is accomplished by oxidative or pyrolytic methods in the combustion chamber. Auxiliary equipment includes shredders, conveyors, blowers, fuel system, instrumentation and controls, bag houses, scrubbers, and treated-material handling systems. UOM=M³

Phase 5—O&M activities such as inspecting the treatment unit, replacing components, and repairing equipment. The cost of energy is included with this element. UOM=M³/YR

.28.03 Low Temperature Thermal Desorption

Phase 4—Construct a facility for using low-temperature thermal desorption to heat (directly or indirectly) contaminated media such as soil, sediments, sludge and filter cakes to 93°C-315°C (200°F-600°F), driving off water and volatile contaminants. The volatile

contaminants may be burned in an afterburner, condensed to reduce the volume to be disposed of, oxidized through catalytic oxidation, or captured by carbon adsorption beds. Auxiliary equipment includes shredders, conveyors, blowers, fuel system instrumentation and controls, bag houses, scrubbers, and treated-material handling systems. At low temperatures, decontaminated soil retains its physical properties and components in the soil are not damaged, which enables treated soil to retain the ability to support future biological activity. UOM=M³

Phase 5—O&M activities such as inspecting the treatment unit, replacing components, and repairing equipment. The cost of energy is included. UOM=M³/YR

.28.04 Molten Salt Oxidation

Phase 4—Construct a facility for using molten salt destruction, which combusts waste materials in a bed of molten salt. Wastes are fed into a vessel containing molten salt and air; the high rate of heat transfer to the wastes causes destruction. Melt removal can be continuous or in batch mode. A variety of salts are used; the most common are sodium carbonate and potassium carbonate. Assemblies for molten salt destruction include salts, incinerators, storage systems, filtration systems, dewatering pretreatment systems, and a secondary reactor and cleanup system for off-gases. UOM=M³

Phase 5—O&M activities such as inspecting the treatment unit, replacing components, and repairing equipment. The cost of energy is included. UOM=M³/YR

.28.05 Open Burn and Open Detonation

Phase 4—Construction associated with using open burn (OB) and open detonation (OD) operations to destroy excess, obsolete, or unserviceable (EOU) munitions and energetic materials. In OB operations, energetics or munitions are destroyed by self-sustained combustion, which is ignited by an external source such as flame, heat, or a detonation wave. An auxiliary fuel may be added to initiate and sustain the combustion of materials. In OD operations, detonatable explosives and munitions are destroyed by a detonation, which is generally initiated by the detonation of an energetic charge. UOM=M³

Phase 5—O&M activities such as inspecting the site. The cost of energy is included. UOM=M³/YR

.28.06 Plasma

Phase 4—Construct a facility for using incinerating or vitrifying processes that use plasma or an electrically neutral, highly ionized gas composed of ions, electrons, and neutral particles to generate the heat to destroy organic and inorganic material. Plasma torches use electricity to create and maintain enough heat (in excess of 5000°C) to vaporize and destroy organic materials and inorganic materials are retained in a molten bath. Plasma processes usually cannot treat solids. This element includes reactor and auxiliary equipment such as shredders, conveyors, blowers, fuel system, instrumentation and controls, bag houses, scrubbers, and treated-material handling systems. An off-gas system removes particulates, organic vapors, and volatilizes metals. UOM=M³

Phase 5—O&M activities such as inspecting the treatment unit, replacing components, and repairing equipment. This element also includes the cost of energy. UOM=M³/YR

.28.07 Pyrolysis

Phase 4—Construct a facility for using pyrolysis to transform hazardous organic materials into gaseous components, small quantities of liquid, and a solid residue (coke) containing fixed carbon and ash. Pyrolysis is the chemical decomposition induced in organic materials by heat in the absence of oxygen. In practice, it is not possible to achieve a completely oxygen-free atmosphere; actual pyrolytic systems are operated with less than stoichiometric quantities of oxygen. Because some oxygen will be present in any pyrolytic system, nominal oxidation will occur. If volatile or semi-volatile materials are present in the waste, thermal desorption will occur. Pyrolysis typically occurs under pressure and at operating temperatures above 430 °C (800 °F). Pyrolysis of organic materials produces combustible gases, including carbon monoxide, hydrogen, methane, and other hydrocarbons. The off-gases may be treated in a secondary combustion chamber, flared, and partially condensed. Particulate removal equipment such as fabric filters or wet scrubbers are also required. Pyrolysis minimizes the production of flue gases as compared to oxidation. Conventional thermal treatment methods, such as rotary kiln, rotary hearth furnace, or fluidized bed furnace, are used for waste pyrolysis. Kilns or furnaces used for pyrolysis are physically similar to incinerator equipment but would operate at lower temperature and with less air supply than would be required for combustion. Molten salt processes may also be used for waste pyrolysis. UOM=M³

Phase 5—O&M activities such as inspecting the treatment unit, replacing components, and repairing equipment. This element also includes the cost of energy. UOM=M³/YR

.28.08 Reserved for Future Use

.28.09 Retort/Amalgamation

Phase 4—Construction associated with using retort/amalgamation for the removal and recovery of mercury. The contaminated medium is heated to volatilize the contaminants. The contaminants are captured or recovered by reacting with another metal, such as gold, or chemicals that can stabilize or convert the contaminants to highly insoluble forms. UOM=M³

Phase 5—O&M activities such as inspecting the treatment unit, replacing components, and repairing equipment. This element also includes the cost of energy. UOM=M³/YR

.28.10 Solar Detoxification/Evaporation

Phase 4—Construct a facility for using solar detoxification to photolytically degrade vaporized soil contaminants in a solar reactor into which sunlight is focused by a parabolic mirror array. The vaporized contaminants flow into the reactor after being desorbed from the soil when the latter is heated to about 400°C (750°F). UOM. UOM=M³

Phase 5—O&M activities such as inspecting the treatment unit, replacing components, and repairing equipment. UOM=M³/YR

.28.11 Steam Stripping/Flushing/Reforming

Phase 4—Construct a facility for using steam stripping to physically transfer dissolved molecules from a liquid waste stream to a vapor stream. Steam stripping is normally carried out as a continuous operation that employs a conventional fractional distillation column where preheated wastewater is pumped near the top of the distillation column and flows downward through a flow of steam rising from the column bottom. As the steam contacts

the liquid wastes, the volatile organics are stripped from the liquid waste and carried to a condenser in a water-cooled heat exchanger and collected in an accumulator tank. Secondary waste treatments (e.g., off-gas), if not part of the unit, but are costed using other treatment technologies. UOM=M³

Phase 5—O&M activities such as inspecting the treatment unit, replacing components, and repairing equipment. This element also includes the cost of energy. UOM=M³/YR

.28.12 Supercritical Water Oxidation

Phase 4—Construct a facility for using supercritical water oxidation to improve the solubility of organic substances and salts. This process is also referred to as Supercritical Wet Oxidation and Supercritical Wet-Air Oxidation. This technology oxidizes organics at various concentrations with air, oxygen, or other oxidants, in the presence of high concentrations of water at temperatures and pressures above the critical point water. The critical point is where vapor and liquid occur. Oxidation is usually conducted at 400°C-650°C under 253x10⁵ psi. Above the critical temperature and pressure, the properties of water are quite different from those of normal liquid or atmospheric steam. Under these conditions chemicals such as organic substances are completely soluble in water under some supercritical conditions and salts are almost insoluble under other supercritical conditions. Reactors that can withstand the temperature, pressure, corrosive aspects of the system, heat exchanger, and air compressor are key components. UOM=M³

Phase 5—O&M activities such as inspecting the treatment unit, replacing components, and repairing equipment. This element also includes the cost of energy. UOM=M³/YR

.28.13 Thermally Enhanced Vapor Extraction

Phase 4—Construction associated with using steam/hot-air injection or electrical resistance, electromagnetic, fiber-optic, or radio-frequency heating to increase the volatilization rate of semi-volatiles and facilitate their extraction. The process is similar to Soil Vapor Extraction but requires heat resistant components. Key components include reactor, coolers/condensers, off-gas treatment equipment, pumps and air blowers, particulate filters, instrumentation and controls, and piping. UOM=M³

Phase 5—O&M activities such as inspecting the treatment unit, replacing components, and repairing equipment. This element also includes the cost of energy. UOM=M³/YR

.28.14 Molten Metal

Phase 4— Construct a facility for using a bath of molten metal as a solvent to reduce hazardous, toxic, and radioactive liquid, slurries, and solid waste to their basic elements. This process is also known as the Catalytic Extraction Process (CEP). With the addition of select reactants, these elements can be recombined to form valuable gases, ceramics, and metals that can be used by industry. CEP differs from incineration or other thermal treatment technologies because it does not rely on flame combustion to alter the character and composition of waste. Instead, CEP relies on the catalytic properties of the molten metal to dissolve waste compounds. The equipment includes waste preparation facility to store, sort, and reduce size of waste; sealed environment processing tank; instrumentation and controls to monitor the process; and off-gas collection and treatment unit. UOM=M³

Phase 5—O&M activities such as inspecting the treatment unit, replacing components, repairing equipment, and cleaning the area. This element also includes the cost of energy. UOM=M³/YR

.28.15 Hot Gas Decontamination

Phase 4— Construct a facility for raising the temperature of the contaminated equipment or material to 260°C (500°F) for a specified period of time to decontaminate materials. The gas effluent from the material is treated in an afterburner system to destroy all volatilized contaminants. The method eliminates a waste that is stockpiled and requires disposal as a hazardous material and permits reuse or disposal of scrap as non-hazardous material. Hot-gas decontamination can also be used for decontaminating explosives, masonry, or metallic structures. The method involves sealing and insulating the structures, heating them with a hot-gas stream to 260°C (500°F) for a prescribed period of time, volatilizing the explosive contaminants, and destroying them in an afterburner. Operating conditions are site-specific. Contaminants are completely destroyed. UOM=M³

Phase 5—O&M activities such as inspecting the treatment unit, replacing components, and repairing equipment. UOM=M³/YR

.28.9X Other

Phase 4—Construct or install other ex-situ thermal treatment units. UOM=M²

Phase 5—Perform O&M activities such as inspecting the unit, replacing materials, clearing the area, and repairing equipment. UOM=M³/YR

.29.00 In-situ Stabilization/Fixation/Encapsulation

.29.01 Asphalt-Based Encapsulation

Phase 4—Construct a facility for using asphalt-based encapsulation to form a matrix encapsulating contaminated liquid or solid wastes. The process entails mixing waste and asphalt and heating them until they fuse in a stable matrix. UOM=M³

Phase 5—O&M activities such as monitoring the process, preparing chemicals, and repairing components. UOM=M²/YR

.29.02 Grout Injection

Phase 4—Acquire and install a facility for injecting grout directly into contaminated soil to prevent migration of the contaminants. Grouting will fill pores or seal voids that allow for infiltration of fluid and reduce pathways for contaminant transport. Grouting also encapsulates the contaminated soil. In most applications, cement is used for grouting applications. Assemblies include pumps for liquids or slurries, storage silos, weigh feeders, piping, and mixers. UOM=M³

Phase 5—O&M activities such as monitoring the process, preparing chemicals, and repairing components. UOM=M²/YR

.29.03 Pozzolan Process

Phase 4—Construct a facility for using an in-situ pozzolan process for in-place encapsulation of waste material by combining pozzolanic (siliceous) material, lime, or Portland cement with water to form a concrete-like solid. Pozzolanic material includes fly ash, blast-furnace slag, and cement kiln dust. UOM=M³

Phase 5—O&M activities such as monitoring the process, preparing chemicals, and repairing components. UOM=M²/YR

.29.04 In-situ Vitrification

Phase 4—Construction associated with using in-situ vitrification for in-place encapsulation of contaminated soils and sludge into a solid, glassy matrix by using large amounts of electrical current to melt the soil. The heat destroys most organics and captures inorganics in glass. Assemblies include electrical generators, electrical power distribution, electrodes, graphite placed over the soil to establish a conductive path, and an exhaust hood system to capture gaseous wastes. UOM=M³

Phase 5—O&M activities such as monitoring the process, preparing additives, and repairing components. UOM=M²/YR

.29.05 In-situ Pipe Grouting

Phase 4—Acquire and install equipment for pumping grout into existing pipes, including manholes, to prevent access, introduction, or entrance of contaminants. UOM=M³

Phase 5—O&M activities such as monitoring the process, preparing grout, and repairing components. UOM=M³

.29.9X Other

Phase 4—Construct or install other in-situ stabilization/fixation/encapsulation treatment facility. UOM=M³

Phase 5—Perform O&M activities such as inspecting the facility, replacing materials, clearing the area, and repairing the stabilization/fixation/encapsulation treatment facility. UOM=M²/YR

.30.00 Ex-situ Stabilization/Fixation/Encapsulation

.30.01 Asphalt-Base Encapsulation

Phase 4—Construct a facility for using asphalt-based encapsulation to form a matrix encapsulating contaminated liquid or solid wastes. The process entails mixing waste and asphalt, placing the mixture in a mold, and heating it until the waste and asphalt fuse in a stable matrix. Asphalt-based encapsulation includes dewatering, organic polymers, lime, kiln dust, or Portland cement. UOM=M³

Phase 5—O&M activities such as monitoring the process, preparing chemicals, and repairing components. UOM=M³/YR

.30.02 Calcination

Phase 4—Construct a facility for using calcination to vaporize water in the waste and transform chemicals in the waste to calcine particles. Calcination is a solidification technology in which liquid waste is placed in a calcinator cell heated to 500°C (932°F) by the combustion of oxygen and kerosene. The off-gas from the calcinator is passed through a combination of dry and wet clean-up systems before being released into the atmosphere. UOM=M³

Phase 5—O&M activities such as monitoring the process, preparing additives, and repairing components. This element also includes the cost of energy. UOM=M³/YR

.30.03 Polymer Based Encapsulation

Phase 4—Construct a facility for using polymer encapsulation systems to incorporate waste residues in polyethylene jackets (thermoplastic polymers). Systems also consist of monomers or prepolymers that are polymerized or crosslinked by the use of catalysts or accelerators after being mixed with liquid wastes (polymerization systems). UOM=M³

Phase 5—O&M activities such as monitoring the process, preparing additives, and repairing components. UOM=M³/YR

.30.04 Pozzolan Process (Lime/Portland Cement)

Phase 4—Construct a facility for using pozzolanic (siliceous) material mixing lime, or Portland cement, and water to form a concrete-like solid matrix in which the waste is encapsulated. Batch mixers or pugmills are routinely used for the mixing waste material, pozzolanic material, and water. Pozzolanic material includes fly ash, ground blast-furnace slag, and cement kiln dust. This element does not include excavating and transporting contaminated material; see Solids/Soils Containment, Collection, or Control (.19.xx) and Liquid Waste /Sludges Containment, Collection, or Control (.20.xx). UOM=M³

Phase 5—O&M activities such as monitoring the process, preparing additives, and repairing components. UOM=M³/YR

.30.05 Reserved for Future Use

.30.06 Sludge Stabilization (Aggregate/Rock/Slag)

Phase 4—Construct a facility for using sludge stabilization for the solidification of contaminated wastes using aggregate and rock and slag additives to form a uniform, stable matrix to encapsulate waste materials. Sludge stabilization includes pumps for liquids or slurries, conveyors for sludge or solids, storage silos, weigh feeders, piping, mixers, and disposal or storage. UOM=M³

Phase 5—O&M activities such as monitoring the process, preparing additives, and repairing components. UOM=M³/YR

.30.07 Vitrification/Molten Glass

Phase 4—Construct a facility for using vitrification to destroy combustible, hazardous, organic and inorganic wastes and/or melting the contaminants, capturing them in the molten glass. During the process, a pool of molten glass is developed and maintained by a passing a high-voltage electrical current between submerged electrodes. Combustible gases, mixed with air, ignite and react above the molten glass. Solids and noncombustible materials are incorporated into the glass bed, while gases are pulled out of the chamber through a series of filters. Assemblies include pretreatment systems (evaporation and sedimentation), conveyors, sumps to collect settling particles, and heat recovery and air pollution control systems. This element does not include excavating and transporting contaminated material; see Solids/Soils Containment, Collection or Control (.19.xx) and Liquid Waste /Sludges Containment, Collection, or Control (.20.xx). UOM=M³

Phase 5—O&M activities such as monitoring the process, preparing additives, and repairing components. This element also includes the cost of energy. UOM=M³/YR

.30.08 Modified Sulfur Cement

Phase 4—Construct a facility for using modified sulfur cement, commercially available thermoplastic material, to solidify contaminated materials. Cement is melted (at 127°C-149°C [260 °F-300°F]) then mixed with the waste to form a homogenous molten slurry that is discharged into suitable containers for cooling, storage, and disposal. Sulfur dioxide and hydrogen sulfide emissions are limited to allowable threshold values by the relatively low temperatures. A variety of common mixing devices, such as, paddle mixers and pug mills, can be used. UOM=M³

Phase 5—O&M activities such as monitoring the process, preparing additives, and repairing components. This element also includes the cost of energy. UOM=M³/YR

.30.09 Polyethylene Extrusion

Phase 4—Construct a facility for using the polyethylene extrusion process to mix polyethylene binders and dry waste materials using a heated cylinder containing a mixing/transport screw. The heated, homogenous mixture exits the cylinder through an output die into a mold, where it cools and solidifies. Polyethylene's properties produce a very stable, solidified product. The process has been tested on nitrate salt wastes at plant-scale, establishing its viability, and on various other wastes at the bench and pilot scale. Equipment needed includes waste-drying or -heating unit, conveyers and feeders, mixing tank and mixer, extruder, storage tanks, and off-gas treatment unit. UOM=M³

Phase 5—O&M activities such as monitoring the process, preparing additives, and repairing components. This element also includes energy cost. UOM=M³/YR

.30.10 Emulsified Asphalt

Phase 4—Construction associated with using asphalt emulsification to transfer waste in water to an asphalt solid that is impermeable to water. Asphalt emulsions are very fine droplets of asphalt, dispersed in water, that are stabilized by chemical emulsifying agents. The emulsions are available as either cationic or anionic emulsions. The emulsified asphalt process involves adding emulsified asphalt having the appropriate charge to hydrophilic liquid or semi-liquid wastes at ambient temperature. After mixing, the emulsion breaks, the water in the waste is released, and the organic phase forms a continuous matrix of hydrophobic asphalt around the waste solids. In some cases, neutralizing agents, such as lime or gypsum, may be required. After setting and curing, the waste is uniformly distributed throughout the resulting solid asphalt, which is impermeable to water. UOM=M³

Phase 5—O&M activities such as process monitoring the process, preparing additives, and repairing components. UOM=M³/YR

.30.9X Other

Phase 4—Construct or install other ex-situ stabilization/fixation/encapsulation treatment facility. UOM=M³

Phase 5—Perform O&M activities such as inspecting the facility, replacing materials, clearing the area, and repairing the treatment facility. UOM=M³/YR

.31.00 Facility Decommissioning and Dismantlement

.31.01 Nuclear Facility Shutdown and Inspection

Phases 1-4—This element includes activities such as plant shutdown and inspection, shutdown of unnecessary equipment, compilation and verification of as-built drawings, and other general housekeeping activities. UOM=M³

Phase 5—This element includes costs for operating and maintaining the equipment for facility shutdown and inspection. UOM=M³/YR

.31.01.01 Plant Shutdown and Inspection

Phase 4—Perform nuclear facility shutdown activities and inspection of the plant. UOM=M²/YR

Phase 5—Operate and maintain equipment used during plant shutdown and inspection. UOM=M²/YR

.31.01.02 Shutdown of Unnecessary Equipment

Phase 4—Shut down or turn off unnecessary equipment, systems, and processes. UOM=EA

Phase 5—Operate and maintain equipment used during shutdown of unnecessary equipment activities. UOM=EA

.31.01.03 Compilation/Verification of As-Built Drawings

Phase 4—Compile and verify as-built drawings for nuclear facility shutdown and inspection. UOM=EA

Phase 5—Operate and maintain equipment used during compilation/verification of as-built drawings. UOM=EA

.31.01.04 General Housekeeping

Phase 4—Perform general housekeeping activities such as cleaning the area, removing debris, and removing small equipment and furniture during and after nuclear facility shutdown and inspection. UOM=M²

Phase 5—Operate and maintain equipment used during general housekeeping activities. UOM=M²/YR

.31.01.05 Identification, Maintenance, and Refurbishment of Systems and Equipment for Reuse

Phases 1-4—Identify, maintain, and refurbish systems and equipment from the nuclear facility for reuse. UOM=EA

Phase 5—Operate and maintain equipment used to identify, maintain, and refurbish systems and equipment for reuse. UOM=EA

.31.01.06 Isolation of Power Equipment

Phases 1-4—Isolate and disconnect power equipment and systems after nuclear facility shutdown. UOM=EA

.31.01.06.01 Isolation of Power Generating Equipment

Phases 1-4—Isolate power-generating equipment and systems after nuclear facility shutdown. UOM=EA

.31.01.06.02 Disconnection of Power Generating Equipment From Grid

Phases 1-4—Disconnect power-generating equipment and systems after nuclear facility shutdown. UOM=EA

.31.01.06.9X Other

Phases 1-4—Other costs associated with isolation of power equipment. UOM=EA

.31.01.07 De-energization and Isolation of Non-Essential Equipment

Phases 1-4—De-energize and isolate nonessential equipment and systems after nuclear facility shutdown. UOM=EA

.31.01.08 De-energization and Isolation of Primary and Auxiliary Equipment in Reactor

Phases 1-4—De-energize and isolate primary and auxiliary equipment and systems in reactor after nuclear facility shutdown. UOM=EA

.31.01.9X Other

Phases 4 and 6—Perform other activities associated with isolating power equipment. UOM=EA

.31.02 Deactivation

Phase 4—Prepare to place a facility in a safe and stable condition to minimize the long-term cost of a surveillance and maintenance program, and to protect workers, the public, and the environment until decommissioning is complete. This process includes removing fuel, draining and/or de-energizing nonessential systems, removing stored radioactive and hazardous materials, and related actions. UOM=M²

Phase 5—This element includes costs for operating and maintaining the equipment for the activities described in Phase 4. UOM=M²/YR

.31.02.01 Defueling and Transfer of Fuel

Phase 4—Perform defueling activities and transfer fuel from the reactor. UOM=KG

Phase 5—Operate and maintain equipment used during defueling and transfer of fuel. UOM=KG/YR

.31 .02.01.01 Unloading of Fuel

Phase 4—Unload or load fuel. UOM=KG/YR

Phase 5—Operate and maintain equipment used to load/unload fuel. UOM=KG/YR

.31 .02.01.02 Transfer of Fuel

Phase 4—Transfer and transport fuel. UOM=KG/YR

Phase 5—Operate and maintain equipment used to transfer fuel. UOM=KG/YR

.31 .02.01.9X Other

Phase 4—Other costs associated with defueling and transferring fuel. UOM=KG

Phase 5—Operate and maintain equipment used during other defueling/transferring tasks. UOM=KG/YR

.31.02.02 Draining and Drying or Blowdown of All Systems Not in Operation

Phase 4—Drain and dry or blowdown all systems not in operation. UOM=M³

Phase 5—Operate and maintain equipment used during draining and drying or blowdown of systems not in operation. UOM=M³/YR

.31.02.03 Removal of System Fluids

Phase 4—Remove or transfer system fluids during deactivation. UOM=M³

Phase 5—Operate and maintain equipment used during removal of system fluids. UOM=M³/YR

.31.02.03.01 Water

Phase 4—Remove or transfer water during deactivation. UOM=M³

Phase 5—Operate and maintain equipment used during water removal. UOM=M³/YR

.31.02.03.02 Oil

Phase 4—Remove or transfer oil during deactivation. UOM=M³

Phase 5—Operate and maintain equipment used during oil removal and transfer. UOM=M³/YR

.31.02.03.03 Heavy water (D₂O—Deuterium Oxide)

Phase 4—Remove or transfer heavy water during deactivation. UOM=M³

Phase 5—Operate and maintain equipment used during removal or transfer of heavy water. UOM=M³/YR

.31.02.03.04 Sodium

Phase 4—Remove or transfer liquid sodium during deactivation. UOM=M³/YR

Phase 5—Operate and maintain equipment used during sodium removal. UOM=M³/YR

.31.02.03.9X Other

Phase 4—Remove or transfer other system fluids during deactivation.

UOM=M³/YR

Phase 5—Operate and maintain equipment used during removal or transfer of other fluids. UOM=M³/YR

.31.02.04 Removal of Spent Resins

Phase 4—Remove or transfer spent resin during deactivation. UOM=M³

Phase 5—Operate and maintain equipment used during removal or transfer of spent resins. UOM=M³/YR

.31.02.05 Modification of Access and Changing Facilities

Phase 4—Modify access and changing facilities during deactivation. UOM=M²

Phase 5—Operate and maintain equipment used to modify access and changing facilities. UOM=M²/YR

.31.02.06 Disconnection of Power Supplies/Perform Zero Energy Checks

Phase 4—Disconnect power supplies and performing of zero-energy checks. UOM=M²

Phase 5—Operate and maintain equipment used to disconnect power supplies/perform zero-energy checks. UOM=M²/YR

.31.02.07 Installation of Viewing Devices

Phase 4—Construct or install viewing devices. UOM=EA

Phase 5—Operate and maintain viewing devices. UOM=EA/YR

.31.02.08 Reduction or Elimination of Electrical and Water Supply Systems

Phase 4—Reduce or eliminate electrical and water supply systems. UOM=M

Phase 5—Operate and maintain equipment used to reduce or eliminate electrical and water supply systems. UOM=M/YR

.31.02.09 Installation of Continuous Air Monitoring System

Phase 4—Construct or install continuous air-monitoring systems. UOM=EA

Phase 5—Operate and maintain equipment used to install continuous air-monitoring system. UOM=EA/YR

.31.02.10 Removal of Nuclear Materials

Phase 4—Remove nuclear materials. UOM=M³/YR

Phase 5—Operate and maintain equipment used to remove nuclear materials. UOM=M³/YR

.31.02.11 Removal of Emergency Response Equipment, Tools, and Supplies

Phase 4—Remove emergency response equipment, tools, and supplies. UOM=EA

Phase 5—Operate and maintain equipment used to remove emergency response equipment, tools, and supplies. UOM=EA/YR

.31.02.12 Reserved for Future Use

.31.02.13 Removal of All Unattached Hazardous Material

Phase 4—Remove all unattached hazardous material. UOM=M³

Phase 5—Operate and maintain equipment used to remove unattached hazardous material. UOM=M³/YR

.31.02.14 Removal of All Unattached Ordnance

Phase 4—Remove all unattached ordnance. UOM=M³

Phase 5—Operate and maintain equipment used to remove unattached ordnance. UOM=M³/YR

.31.02.15 Removal of All Unattached Radiological Materials

Phase 4—Remove all unattached radiological materials. UOM=M³

Phase 5—Operate and maintain equipment used to remove unattached radiological materials. UOM=M³/YR

.31.02.16 Nuclear Fuel Material Inventory Recovery

Phase 4—Recover nuclear fuel material inventory. UOM=M³

Phase 5—Operate and maintain equipment used to recover nuclear fuel material inventory. UOM=M³/YR

.31.02.17 Isolation of Unused-Resin Purification Stations Pending Subsequent Decommissioning

Phase 4—Isolate unused-resin purification stations pending decommissioning. UOM=M²

Phase 5—Operate and maintain equipment used to isolate unused-resin purification stations pending decommissioning. UOM=M²/YR

.31.02.9X Other

Phases 4—Costs associated with other deactivation activities. UOM=M²

Phase 5—Operation and maintenance costs of other deactivation equipment. UOM=M²/YR

.31.03 Preparation for Dormancy

Phase 4—Prepare the nuclear facility for dormancy after it has been stabilized, shut down, and deactivated. Activities include ensuring that equipment/components/systems are turned off and isolated and that tanks and drains are emptied, cleaned, and isolated; locking and tagging out equipment and components; monitoring and setting up alarm systems; and securing the area and equipment. UOM=M²

Phase 5—Monitoring, surveillance, and inspection activities to ensure that the nuclear facility is safe, is not releasing contaminants, and is in a non-nuclear critical state. UOM=M²/YR

.31.03.01 Layout of Dormancy Period Control Area

Phase 4—Lay out the dormancy period control area. UOM=M²

Phase 5—Operate and maintain equipment to layout the dormancy period control area. UOM=M²/YR

.31.03.02 Zoning for Long-Term Storage

Phase 4—Zone the facility for long-term storage. UOM=M²

Phase 5—Operate and maintain equipment used to zone the facility for long-term storage. UOM=M²/YR

.31.03.03 Removal of Inventory Not Suitable for Long-Term Storage

Phase 4—Remove inventory not suitable for long-term storage. UOM=M³

Phase 5—Operate and maintain equipment used to remove inventory not suitable for long-term storage. UOM=M³/YR

.31.03.04 Replacement or Enhancement of Equipment and Systems with More Efficient Components (Also X.06.03.05)

Phase 4—Replace or enhance equipment systems with more efficient components.

UOM=EA

Phase 5—Operate and maintain equipment used to replace or enhance equipment and systems with more efficient components (Also .06.03.05). UOM=EA/YR

.31.03.9X Other

Phase 4—Other costs associated with preparation for dormancy. UOM=M³/YR

Phase 5—Costs to operate and maintain equipment used during other activities to prepare the facility for dormancy. UOM=M³/YR

.31.04 Hot Cell Equipment Modification

Phase 4—Seal and isolate equipment in the hot cell, such as gloveports, bagout ports, bulkhead electrical fittings, inlet filters, and other penetrations into the glovebox, to prevent contamination spread. UOM=M²

Phase 5—This element includes maintaining sealed equipment. UOM=M²/YR

.31.04.01 Isolation of Process, Utility, and Instrument Air Line Penetrations

Phase 4—Modify hot cell equipment to isolate process, utility, and instrument air-line penetrations to prevent contamination. UOM=EA

Phase 5—Operate and maintain equipment used to isolate process, utility, and instrument air-line penetrations. UOM=EA/YR

.31.04.02 Isolation of Electrical Power

Phase 4—Modify hot cell equipment to isolate electrical power. UOM=EA

Phase 5—Operate and maintain equipment used to isolate electrical power. UOM=EA/YR

.31.04.03 Isolation of Fire Suppression Nozzles and Temperature Detectors

Phase 4—Modify hot cell equipment to isolate fire suppression nozzles and temperature detectors. UOM=EA

Phase 5—Operate and maintain equipment used to isolate fire suppression nozzles and temperature detectors. UOM=EA/YR

.31.04.04 Isolation of Exhaust Ventilation System

Phase 4—Modify hot cell equipment to isolate exhaust ventilation system. UOM=EA

Phase 5—Operate and maintain equipment used to isolate exhaust ventilation system.
UOM=EA/YR

.31.04.05 Isolation of Gloveports and Bagports

Phase 4—Modify hot cell equipment to isolate gloveports and bagports. UOM=EA

Phase 5—Operate and maintain equipment used to isolate gloveports and bagports.
UOM=EA/YR

.31.04.06 Isolation of Criticality Drains

Phase 4—Modify hot cell equipment to isolate criticality drains. UOM=EA

Phase 5—Operate and maintain equipment used to isolate criticality drains.
UOM=EA/YR

.31.04.07 Isolation of All Other Seals and Lines

Phase 4—Modify hot cell equipment to isolate all other seals and lines. UOM=EA

Phase 5—Operate and maintain equipment used to isolate all other seals and lines.
UOM=EA/YR

.31.04.9X Other

Phase 4—Other costs associated with modifying hot cell equipment. UOM=EA

Phase 5—Costs to operate and maintain other equipment used to modify hot cells.
UOM=EA/YR

.31.05 Site Reconfiguration, Isolating and Securing Structure

Phases 4 and 5—Remove obstacles to dismantlement such as other projects or facilities/structures; creating barriers to intrusion; and ensuring structural integrity of foundations, walls, framing, ceilings, decking, roofs, cover blocks, platforms, and other items. UOM=M²

.31.05.01 Isolation of Tanks

Phases 4 and 5—Costs to isolate tanks and to operate and maintain equipment used to isolate tanks. UOM=EA

.31.05.02 Isolation of Lines Entering and Exiting the Building

Phases 4 and 5—Costs to isolate lines entering and exiting the building and to operate and maintain equipment used to isolate lines. UOM=M²

.31.05.03 Isolation of Utilities to the Building

Phases 4 and 5—Costs to isolate utilities to the building and to operate and maintain equipment used to isolate utilities. UOM=M²

.31.05.04 Sealing/Securing of Potential Pathways to the Environment

Phases 4 and 5—Costs to seal and secure the pathways to the environment to mitigate contamination and the costs to operate and maintain equipment used to seal and secure pathways to the environment. UOM=M²

.31.05.05 Securing/Isolation of Building From Both Personnel and Animals/Insects
Phases 4 and 5—Costs to secure and isolate buildings from people, animal, and insects and to operate and maintain equipment used to isolate buildings. UOM=M²

.31.05.06 Securing of Windows and Doors
Phases 4 and 5—Costs to secure windows and doors and to operate and maintain equipment used to secure windows and doors. UOM=M²

.31.05.07 Repairing of Roof
Phases 4 and 5—Costs to repair roofs and overhead coverings and to operate and maintain equipment used to cover roofs and overhead coverings. UOM=M²

.31.05.08 Isolation of Containment Structure
Phases 4 and 5—Costs to isolate containment structures and to operate and maintain equipment used to isolate containment structures. UOM=M²

.31.05.09 Removal of Obstacles to Dismantlement and Decommissioning
Phases 4 and 5—Costs to remove and transfer of obstacles to dismantlement and decommissioning and costs to operate and maintain equipment used to remove and transfer such obstacles. UOM=M²

.31.05.10 Site Boundary Reconfiguration
Phases 4 and 5—Perform indoor and outdoor site boundary reconfiguration and rezoning and operate and maintain boundary configuration equipment. UOM=M²

.31.05.10.01 Physical Reconfiguration of Boundary
Phases 4 and 5—Physically reconfigure the boundary and operate and maintain boundary-reconfiguration equipment. UOM=M²

.31.05.10.02 Modification of Access Ways
Phases 4 and 5—Modify access ways, entrances, and exits and operate and maintain equipment used to modify access way, entrances, and exits. UOM=M²

.31.05.10.03 Reconfiguration, Reconstruction, Security Fence O&M, Access, Barriers, Facilities and Others
Phases 4 and 5—Reconfigure or reconstruct security fences, including providing access and barriers and constructing and maintaining other facilities (see also .05.14 and .01.03.11). This element also includes the costs to operate and maintain the equipment used for reconfiguring or reconstructing security fences. UOM=M²

.31.05.10.9X Other

Phases 4 and 5—Costs to perform other site boundary-reconfiguration activities and to operate and maintain equipment used for those activities. UOM=M²

.31.05.11 Reconfiguration, Rerouting, and O&M of Utilities and Support Services (Also x.06.03.04)

Phases 4 and 5—Costs to reconfigure and reroute utilities and for support services to remove obstacles to dismantlement and operate and maintain equipment during these activities (also see .06.03.04). UOM=M

.31.05.11.01 Electrical

Phases 4 and 5—Costs to reconfigure and reroute electrical systems and operate and maintain equipment used to reconfigure and reroute electrical systems. UOM=M

.31.05.11.02 HVAC

Phases 4 and 5—Costs to reconfigure and reroute HVAC systems and to operate and maintain equipment used to reconfigure and reroute HVAC systems. UOM=M

.31.05.11.03 Fire Protection

Phases 4 and 5—Costs to reconfigure and reroute fire protection systems and to operate and maintain equipment used to reconfigure and reroute those systems. UOM=M²

.31.05.11.04 Lifting Devices

Phases 4 and 5—Costs to reconfigure and reroute lifting devices and to operate and maintain equipment to reconfigure and reroute those devices. UOM=EA

.31.05.11.05 Alarms and Monitors

Phases 4 and 5—Costs to reconfigure and reroute alarms and monitors and to operate and maintain equipment used to reconfigure and reroute alarms and monitors. UOM=EA

.31.05.11.9X Other

Phases 4 and 5—Costs to reconfigure and reroute other systems and to operate and maintain equipment used to reconfigure and reroute those systems. UOM=M

.31.05.12 Reconfiguration or Modification of Containment Structure

Phases 4 and 5—Costs to reconfigure or modify the containment structure and operate and maintain equipment used to reconfigure or modify the structure. UOM=M²

.31.05.9X Other

Phases 4 and 5—Other costs associated with reconfiguring and rerouting utilities and support services to remove obstacle to dismantlement and to operate and maintain equipment used during these activities. UOM=M².

.31.06 Removal of Fuel Handling Equipment

Phase 4—Dismantle and remove fuel-handling equipment including fuel positioning systems, cranes, and rigs. UOM=LS

Phase 5—O&M costs of fuel-handling removal equipment. UOM=LS/YR

.31.06.01 Removal of Cranes

Phase 4—Remove cranes used for fuel-handling. UOM=EA

Phase 5—Operate and maintain equipment used to remove cranes. UOM=EA/YR

.31.06.02 Removal of Fuel Handling and Positioning Systems and Equipment

Phase 4—Remove fuel-handling equipment, fuel-positioning system, and related equipment. UOM=EA

Phase 5—Operate and maintain equipment used to remove fuel-handling equipment, fuel-positioning systems, and related equipment. UOM=EA/YR

.31.06.02.01 Hoists

Phase 4—Remove hoists used in fuel-handling and -positioning systems.

UOM=EA

Phase 5—Operate and maintain equipment used to remove hoists. UOM=EA/YR

.31.06.02.02 Bridges

Phase 4—Remove bridges used in fuel-handling and -positioning systems.

UOM=EA

Phase 5—Operate and maintain equipment used to remove bridges.

UOM=EA/YR

.31.06.02.03 Tooling

Phase 4—Remove tooling used in fuel-handling and -positioning systems.

UOM=EA

Phase 5—Operate and maintain equipment used to remove tooling.

UOM=EA/YR

.31.06.02.04 Transfer Containers

Phase 4—Remove transfer containers used in fuel-handling and -positioning systems. UOM=EA

Phase 5—Operate and maintain equipment used to remove transfer containers.

UOM=EA/YR

.31.06.02.05 Storage Racks

Phase 4—Remove storage racks used in fuel-handling and -positioning systems.

UOM=EA

Phase 5—Operate and maintain equipment used to remove storage racks.

UOM=EA/YR

.31.06.02.06 Conveyors

Phase 4—Remove conveyors used in fuel-handling and -positioning systems.

UOM=EA

Phase 5—Operate and maintain equipment used to remove conveyors.
UOM=EA/YR

.31.06.02.07 Upenders

Phase 4—Removal of upenders used in fuel-handling and -positioning systems.
UOM=EA

Phase 5—Operate and maintain equipment used to remove upenders.
UOM=EA/YR

.31.06.02.08 Carriages

Phase 4—Remove carriages used in fuel-handling and -positioning systems.
UOM=EA

Phase 5—Operate and maintain equipment used to remove carriages.
UOM=EA/YR

.31.06.02.09 Inspection Devices

Phase 4—Remove inspection devices used in fuel-handling and -positioning systems. UOM=EA

Phase 5—Operate and maintain equipment used to remove inspection devices.
UOM=EA/YR

.31.06.02.10 Cameras

Phase 4—Remove cameras used in fuel-handling and -positioning systems.
UOM=EA/YR

Phase 5—Operate and maintain equipment used to remove cameras.
UOM=EA/YR

.31.06.02.11 Manipulators

Phase 4—Remove manipulators used in fuel-handling and -positioning systems.
UOM=EA

Phase 5—Operate and maintain equipment used to remove manipulators.
UOM=EA/YR

.31.06.02.12 Saws

Phase 4—Remove saws used in fuel-handling and -positioning systems.
UOM=EA

Phase 5—Operate and maintain equipment used to remove saws. UOM=EA/YR

.31.06.02.9X Other

Phase 4—Remove other fuel-handling and -positioning equipment. UOM=EA

Phase 5—Operate and maintain equipment used to remove other fuel-handling and -positioning equipment. UOM=EA/YR

.31.06.9X Other

Phase 4—Remove other fuel handling equipment. UOM=EA

Phase 5—Operate and maintain equipment used during other tasks associated with removing fuel-handling equipment. UOM=EA/YR

.31.07 Radiological Inventory Categorization for D&D

Phases 4 and 5—Develop an estimate of radionuclide quantities presents in the facility and the nature of their principal physical and chemical forms. Apart from spent fuel, the radiological inventory can be divided into two categories: (1) activation of structural materials and (2) surface contamination. This contamination may consist of activated corrosion products, fuel fragments, and/or fission products. UOM=LS

.31.07.01 Reserved for Future Use

.31.07.02 Calculations to Evaluate Inventory

Phases 4 and 5—Costs to perform calculations to evaluate radiological inventory and to operate and maintain equipment used during those calculations. UOM=LS

.31.07.9X Other

Phases 4 and 5—Costs of performing other tasks associated with categorizing the radiological inventory for D&D tasks and to operate and maintain equipment used during those tasks. UOM=LS

.31.08 Preparation and Decontamination of Area and Equipment

Phase 4—Locate all surface contamination on walls, floors, and equipment; construct equipment; and treat, stabilize, or remove all contamination using techniques such as chemical extraction, coatings, lasers, physical methods, thermal methods, vacuuming/blasting, and washing. UOM=M²

Phase 5—Operate and maintain the equipment used to treat, stabilize, or remove all contamination on walls, floors, and equipment. UOM=M²/YR

31.08.01 Decontamination of Systems for Dose Reduction of Controlled Area

Phase 4—Prepare and decontaminate systems for dose reduction of controlled areas and for other purposes. UOM=M²

Phase 5—Operate and maintain equipment used to decontaminate systems for dose reduction of controlled area. UOM=M²/YR

.31.08.02 Washing of Sump Areas to Remove Excess Residual Chemicals

Phase 4—Wash sump areas to remove excess residual chemicals or for other purposes. UOM=M²

Phase 5—Operate and maintain equipment used to wash sump areas to remove excess residual chemicals. UOM=M²/YR

.31.08.03 Protective Clothing/Breathing Apparatuses

Phase 4—Use of protective equipment and breathing apparatus for decontamination. UOM=EA

Phase 5—Operate and maintain protective clothing/breathing apparatuses. UOM=EA/YR

.31.08.04 Decontamination and Release of Rad Zones

Phase 4—Decontaminate and release rad zones. UOM=M²

Phase 5—Operate and maintain equipment used to decontaminate and release rad zones. UOM=M²/YR

.31.08.05 Reserved for future use

.31.08.06 Surface Decontamination of Floors

Phase 4—Conduct surface decontamination of floors. UOM=M²

Phase 5—Operate and maintain equipment to decontaminate floor surfaces.
UOM=M²/YR

.31.08.07 Surface Decontamination of Walls

Phase 4—Conduct surface decontamination of walls. UOM=M²

Phase 5—Operate and maintain equipment used to decontaminate wall surfaces.
UOM=M²/YR

.31.08.08 Surface Decontamination of Equipment/Dismantled Piping

Phase 4—Conduct surface decontamination of equipment and dismantled piping.
UOM=M²

Phase 5—Operate and maintain equipment used to decontaminate the surfaces of
equipment/dismantled piping. UOM=M²/YR

.31.08.09 Surface Decontamination of Piping and Tank Internals

Phase 4—Conduct surface decontamination of piping and tank internals. UOM=M²

Phase 5—Operate and maintain equipment used to decontaminate the surfaces of
piping and tank internals. UOM=M²/YR

.31.08.10 Decontamination of Reactor Vessel and Internals

Phase 4—Conduct decontamination of reactor vessels and internals. UOM=M²

Phase 5—Operate and maintain equipment used to decontaminate reactor vessel and
internals. UOM=M²/YR

.31.08.11 Decontamination of Primary and Auxiliary Systems

Phase 4—Decontaminate primary and auxiliary systems. UOM=M²

Phase 5—Operate and maintain equipment used to decontaminate primary and
auxiliary systems. UOM=M²/YR

.31.08.12 Decontamination of Biological Shield

Phase 4—Decontaminate the biological shield. UOM=M²

Phase 5—Operate and maintain equipment used to decontaminate the biological shield.
UOM=M²/YR

.31.08.13 Decontamination of Spent Fuel Pool Linings (Also X.31.13)

Phase 4—Decontaminate spent fuel pool linings. UOM=M²

Phase 5—Operate and maintain equipment used to decontaminate spent fuel pool
linings (Also .31.13). UOM=M²/YR

.31.08.14 Decontamination of Areas and Equipment in Hot Cells

Phase 4—Decontaminate area and equipment in hot cells. UOM=M²

Phase 5—Operate and maintain equipment used to decontaminate areas and equipment
in hot cells. UOM=M²/YR

.31.08.15 Decontamination for Recycling and Reuse

Phase 4—Decontaminate materials for recycling and reuse. UOM=M²

Phase 5—Operate and maintain equipment used to decontaminate materials for recycling and reuse. UOM=M²/YR

.31.08.16 Locating Areas to Be Decontaminated

Phase 4—Define and locate areas to be decontaminated. UOM=LS

Phase 5—Operate and maintain equipment used to locate areas to be decontaminated. UOM=LS

.31.08.17 Reconfiguration of Area and Locations

Phase 4—Reconfigure and modify area and locations for, and resulting from, D&D activities. UOM=M²

Phase 5—Operate and maintain equipment used to reconfigure area and locations. UOM=M²/YR

.31.08.18 Area Layout and Control/Containment Area Setup

Phase 4—Layout and establish area for decontamination and control and contain the set-up area. UOM=M²

Phase 5—Operate and maintain equipment used to layout area and control/containment area setup. UOM=M²/YR

.31.08.19 Decontamination Area/Facility for Equipment and Vehicles

Phase 4—Construct decontamination area/facility for equipment and vehicles such as washing facilities, waste collection and handling, and environmental monitoring. UOM=M²

Phase 5—Operate and maintain equipment used during decontamination area/facility for equipment and vehicles. UOM=M²/YR

.31.08.20 Decontamination Area/Facility for Personnel (i.e., Showers, Changing Rooms, Monitors, Waste Handling)

Phase 4—Construct decontamination area for personnel with facilities for activities such as showering, changing clothes, hand washing, environmental monitoring, and waste collection and handling. UOM=M²

Phase 5—Operate and maintain equipment used during decontamination area/facility for personnel. UOM=M²/YR

.31.08.21 Decontamination of Buildings and Stacks

Phase 4—Decontaminate buildings, stacks, and other structures. UOM=M²

Phase 5—Operate and maintain equipment used to decontaminate buildings, stacks, and other structures. UOM=M²/YR

.31.08.9X Other

Phase 4—Perform other activities required to prepare for and decontaminate areas and equipment. UOM=M²

Phase 5—Operate and maintain equipment used to prepare for and decontaminate other areas and equipment. UOM=M²/YR

.31.09 Dismantling and Removal of Contaminated Equipment/Material

Phases 4 and 5—This element includes cutting, sizing, and removing contaminated equipment, instrument tubing, piping, tanks, structures, stacks, and other components. UOM=M²

.31.09.01 Cutting, Sizing, and Removal of Equipment

Phases 4 and 5—Cut, size, and remove contaminated equipment and material. Operate and maintain equipment used to cut, size, and remove equipment. UOM=KG

.31.09.02 Cutting, Sizing, and Removal of Instrument Tubing

Phases 4 and 5—Cut, size, and remove contaminated instrument tubing. Operate and maintain equipment used to cut, size, and remove instrument tubing. UOM=M

.31.09.03 Cutting, Sizing, and Removal of Piping

Phases 4 and 5—Cut, size, and remove contaminated piping. Operate and maintain equipment used to cut, size, and remove piping. UOM=M

.31.09.03.01 Establishment of Containment, Whether by Temporary Barriers or by Tenting

Phases 4 and 5—Establish containment such as temporary barriers or tents. Operate and maintain equipment used to establish containment. UOM=M²

.31.09.03.02 Removal of Concrete Structures Around Embedded Piping

Phases 4 and 5—Remove contaminated structure around embedded piping. Operate and maintain equipment used to remove concrete structures around embedded piping. UOM=M²

.31.09.03.03 Removal of the Embedded Piping

Phases 4 and 5—Remove contaminated embedded piping. Operate and maintain equipment used to removal embedded piping. UOM=M

.31.09.03.9X Other

Phases 4 and 5—Cut, size, and removal other contaminated piping. Operate and maintain equipment used to cut, size, and remove other piping activities. UOM=M²

.31.09.04 Cutting, Sizing, and Removal of Tanks

Phases 4 and 5—Cut, size, and remove contaminated tanks. Operate and maintain equipment used to cut, size, and remove tanks. UOM=M³

.31.09.05 Cutting, Sizing, and Removal of Structures/Stacks

Phases 4 and 5—Cut, size, and remove contaminated structures, columns, and stacks. Operate and maintain equipment used to cut, size, and remove structures, columns, and stacks. UOM=M³

.31.09.06 Sorting and Segregation of Materials and Components

Phases 4 and 5—Sort and segregate materials and components. Operate and maintain equipment used to sort and segregate materials and components. UOM=M³

.31.09.9X Other

Phases 4 and 5—Perform other activities to dismantle and remove contaminated equipment and material. Operate and maintain equipment used during other activities related to dismantling and removing contaminated equipment/material. UOM=M³

.31.10 Dismantling Operations on Reactor Vessel and Internals

Phase 4—Remove the reactor pressure vessel, internal and attached piping, control rods, assemblies, instrumentation, and other internal components. UOM=EA

Phase 5—O&M of dismantling equipment. UOM=EA/YR

.31.10.01 Cutting, Sizing, and Removal of Flat Stock and Pressure Vessels

Phase 4—Cut, size, and remove contaminated flat stock and pressure vessels.

UOM=KG

Phase 5—Operate and maintain equipment used to cut, size, and remove flat stock and pressure vessels. UOM=KG/YR

.31.10.02 Cutting, Sizing, and Removal of Internal and Attached Piping

Phase 4—Cut, size, and remove contaminated internal and attached piping. UOM=M

Phase 5—Operate and maintain equipment used to cut, size, and remove internal and attached piping. UOM=M/YR

.31.10.03 Cutting, Sizing, and Removal of Control Rods

Phase 4—Cut, size, and remove reactor control rods. UOM=M

Phase 5—Operate and maintain equipment used to cut, size, and remove control rods. UOM=M/YR

.31.10.04 Cutting, Sizing, and Removal of Assemblies

Phase 4—Cut, size, and remove contaminated assemblies. UOM=KG

Phase 5—Operate and maintain equipment used to cut, size, and remove assemblies. UOM=KG/YR

.31.10.05 Cutting, Sizing, and Removal of Instrumentation

Phase 4—Cut, size, and remove other contaminated instrumentation and controls.

UOM=KG

Phase 5—Operate and maintain equipment used to cut, size, and remove other instrumentation and controls. UOM=KG/YR

.31.10.06 Cutting, Sizing, and Removal of Other Internals

Phase 4—Cut, size, and remove other contaminated internals. UOM=KG

Phase 5—Operate and maintain equipment used to cut, size, and remove other internals. UOM=KG/YR

.31.10.07 Disconnecting of Reactor Vessels and Internals

Phase 4—Disconnect reactor vessels and internals. UOM=M³

Phase 5—Operate and maintain equipment used to disconnect reactor vessels and internals. UOM=M³/YR

.31.10.07.01 Control-rod Blades and Motors, Rod Guide Tubes, Reactor Scram Assembly (RSA)-Guide Tubes

Phase 4—Disconnect the control-rod blades and motors, rod guide tubes, and RSA guide tubes. UOM=KG

Phase 5—Operate and maintain equipment used to disconnect control-rod blades and motors, rod guide tubes, RSA guide tubes. UOM=KG/YR

.31.10.07.02 Reactor Pressure Vessel Top Head

Phase 4—Disconnect the reactor pressure vessel top head.. UOM=KG

Phase 5—Operate and maintain equipment used to disconnect the reactor pressure vessel top head. UOM=KG/YR

.31.10.07.03 Reactor Core Top Head

Phase 4—Disconnect the reactor core top head. UOM=KG

Phase 5—Operate and maintain equipment used to disconnect the reactor core top head. UOM=KG/YR

.31.10.07.04 Steam Dryer

Phase 4—Disconnecting the steam dryer. UOM=KG

Phase 5—Operate and maintain equipment used to disconnect the steam dryer. UOM=KG/YR

.31.10.07.05 Feedwater Sparger Ring

Phase 4—Disconnect the feedwater sparging ring. UOM=KG

Phase 5—Operate and maintain equipment used to disconnect the feedwater sparger ring. UOM=KG/YR

.31.10.07.06 Core Shroud, Including Fixing

Phase 4—Disconnect the core shroud, including fixing.. UOM=KG

Phase 5—Operate and maintain equipment used to disconnect the core shroud, including fixing. UOM=KG/YR

.31.10.07.07 Reactor pressure vessel including support skirt and insulation

Phase 4—Disconnect the reactor pressure vessel, including the support skirt and insulation. UOM=KG

Phase 5—Operate and maintain equipment used to disconnect the reactor pressure vessel, including the support skirt and insulation. UOM=KG/YR

.31.10.07.9X Other

Phase 4—Perform other activities associated with disconnecting reactor vessels and internals. UOM=KG

Phase 5—Operate and maintain equipment used to perform other activities associated with disconnecting reactor vessels and internals. UOM=KG/YR

.31.10.08 Preparation of Work Area

Phase 4—Prepare the work area. UOM=M²

Phase 5—Operate and maintain equipment used to prepare the work area. UOM=M²/YR

.31.10.09 Handling Devices and Protection Systems

Phase 4—Dismantle handling devices and protection systems. UOM=EA

Phase 5—Operate and maintain equipment used to dismantle handling devices and protection systems. UOM=EA/YR

.31.10.10 Removal of Handling Devices and Protection Systems

Phase 4—Remove handling devices and protection systems. UOM=EA

Phase 5—Operate and maintain equipment used to remove handling devices and protection systems. UOM=EA/YR

.31.10.11 Sorting and Segregation of Materials and Components

Phase 4—Sort and segregate materials and components. UOM=M³

Phase 5—Operate and maintain equipment used to sort and segregate materials and components. UOM=M³/YR

.31.10.12 Dams on Vessel Nozzles or Gates to Isolate and Contain Pool Being Used for Disassembly (If Performed Underwater)

Phase 4—Dismantle dams on vessel nozzles or gates to isolate and contain the pool used for disassembly. UOM=EA

Phase 5—Operate and maintain equipment used to dismantle dams on vessel nozzles or gates. UOM=EA/YR

.31.10.9X Other

Phase 4—Dismantle other reactor vessel and internal components. UOM=EA

Phase 5—Operate and maintain equipment used to dismantle other reactor vessels and internals. UOM=EA/YR

.31.11 Dismantling and Removal of Primary and Auxiliary Systems

Phase 4—Remove the primary and auxiliary systems that include components such as piping, pumps, instrumentation, moisture separators, condensers, and shielding. UOM=M²

Phase 5—O&M of removal equipment. UOM=M²/YR

.31.11.01 Disconnecting, Unbolting, Disassembly/Cutting, Sizing, and Removal of Piping

Phase 4—Disconnect, unbolt, disassemble, cut, size, and remove piping. UOM=M

Phase 5—Operate and maintain equipment used to disconnect, unbolt, disassemble, cut, size, and remove piping. UOM=M/YR

.31.11.02 Disconnecting, Unbolting, Disassembly/Cutting, Sizing, and Removal of Pumps

Phase 4—Disconnect, unbolt, disassemble, cut, size, and remove pumps. UOM=KG

Phase 5—Operate and maintain equipment used to disconnect, unbolt, disassemble, cut, size, and remove pumps. UOM=KG/YR

.31.11.03 Unbolting, Disassembly/Cutting, Sizing, and Removal of Containment Other Than Biological Shields

Phase 4—Disconnect, unbolt, disassemble, cut, size, and remove containments other than biological shields. UOM=KG

Phase 5—Operate and maintain equipment used to disconnect, unbolt, cut, size, and remove containment other than biological shields. UOM=KG/YR

.31.11.04 Disconnecting, Unbolting, Cutting, Sizing, and Removal of Primary Cooling Circuits

Phase 4—Disconnect, unbolt, disassemble, cut, size, and remove primary cooling circuits. UOM=M

Phase 5—Operate and maintain equipment used to disconnect, unbolt, disassemble, cut, size, and remove primary cooling circuits. UOM=M/YR

.31.11.05 Removal of Subsurface Materials

Phase 4—Remove subsurface materials. UOM=M³

Phase 5—Operate and maintain equipment used to remove subsurface materials. UOM=M³/YR

.31.11.06 Disconnecting, Unbolting, Cutting, Sizing, and Removal of Secondary Cooling Circuits

Phase 4—Disconnect, unbolt, disassemble, cut, size, and remove secondary cooling circuits. UOM=M

Phase 5—Operate and maintain equipment to disconnect, unbolt, disassemble, cut, size, and remove secondary cooling circuits. UOM=M/YR

.31.11.07 Disconnecting, Unbolting, Disassembly/Cutting, Sizing, and Removal of Other Primary or Auxiliary Systems

Phase 4—Disconnect, unbolt, disassemble, cut, size, and remove other primary or auxiliary systems. UOM=KG

Phase 5—Operate and maintain equipment used to disconnect, unbolt, disassemble, cut, size, and remove other primary or auxiliary systems. UOM=KG/YR

.31.11.08 Preparation of Work Area

Phase 4—Prepare the work area. UOM=M²

Phase 5—Operate and maintain equipment to prepare the work area. UOM=M²/YR

.31.11.09 Removal, Dismantling or Demolition of Spent Fuel Pool and Foundation

Phase 4—Remove, dismantle, or demolish spent fuel pool and foundation. UOM=M³

Phase 5—Operate and maintain equipment used to remove, dismantle or demolish spent fuel pool and foundation. UOM=M³/YR

.31.11.10 Removal, Dismantling or Demolition of Hot Cells

Phase 4—Remove, dismantle or demolish hot cells. UOM=M³

Phase 5—Operate and maintain equipment used to remove, dismantle, or demolish hot cells. UOM=M³/YR

.31.11.11 Removal, Dismantling or Demolition of Footing Drain Removal

Phase 4—Remove, dismantle or demolish the footing drain removal. UOM=M³

Phase 5—Operate and maintain equipment used to remove, dismantle, or demolish the footing drain removal. UOM=M³/YR

.31.11.12 Sorting and Segregation of Materials and Components

Phase 4—Sort and segregate materials and components. UOM=M³

Phase 5—Operate and maintain equipment used to sort and segregate materials and components. UOM=M³/YR

.31.11.13 Disconnecting, Unbolting, Disassembly/Cutting, Sizing, and Removal of Heat Exchangers

Phase 4—Disconnect, unbolt, disassemble, cut, size, and remove heat exchangers. UOM=KG

Phase 5—Operate and maintain equipment used to disconnect, unbolt, disassemble, cut, size, and remove heat exchangers. UOM=KG/YR

.31.11.9X Other

Phase 4—Perform other activities required to dismantle and remove primary and auxiliary systems. UOM=LS

Phase 5—Operate and maintain equipment used to perform other activities required to dismantle and remove primary and auxiliary systems. UOM=LS/YR

.31.12 Dismantling and Removal of Biological and Thermal Shields/Concrete

Phase 4—Remove the absorbing material placed around a reactor or radioactive source that is intended to reduce radiation levels. UOM=M²

Phase 5—O&M of removal equipment. UOM=M²/YR

.31.12.01 Cutting, Sizing, and Removal of Reinforcement Materials

Phase 4—Cut, size, and remove reinforcement materials around the biological and thermal shield. UOM=M²

Phase 5—Operate and maintain the equipment used to cut, size, and remove the reinforcing material. UOM=M²/YR

.31.12.02 Cutting, Sizing, and Removal of Biological and Thermal Shield/Concrete

Phase 4—Cut, size, and remove biological and thermal shield/concrete around the reactor or radiation source intended to reduce radiation levels. UOM=M²

Phase 5—Operate and maintain the equipment used to cut, size, and remove the biological and thermal shield/concrete. UOM=M²/YR

.31.12.9X Other

Phase 4—Perform other activities to dismantle and remove the biological shield. UOM=M²

Phase 5—Operate and maintain equipment used to perform other activities required to dismantle and remove the biological shield. UOM=M²/YR

.31.13 Removal of Pool Linings

Phase 4—Remove linings from spent fuel pools, which includes remote dismantlement of the steel lining. UOM=M²

Phase 5—O&M of removal equipment. UOM=M²/YR

.31.13.01 Drainage of Spent Fuel Pool

Phase 4—Drain the spent nuclear fuel pools before removing the linings. UOM=M³

Phase 5—Operate and maintain equipment used to drain the spent fuel pools. UOM=M³/YR

.31.13.02 Removal of Pool Linings

Phase 4—Remove spent fuel linings. UOM=M²

Phase 5—Operate and maintain equipment used to remove the linings. UOM=M²/YR

.31.13.03 Removal of Contaminants in Pool

Phase 4—Remove contaminants after removing spent fuel pool linings. UOM=M³

Phase 5—Operate and maintain equipment used to remove contaminants. UOM=M³/YR

.31.13.04 Cleaning of Surface to Limit Migration of Contaminants

Phase 4—Clean the surfaces to limit the migration of contaminants while removing spent fuel pool linings. UOM=M²

Phase 5—Operate and maintain equipment used to clean the surfaces. UOM=M²/YR

.31.13.9X Other

Phase 4—Perform other activities required to remove the pool lining. UOM=M²

Phase 5—Operate and maintain equipment used to perform other activities required to remove the pool lining. UOM=M²/YR

.31.14 Dismantling of In-Cell Equipment

Phase 4—Dismantle hot cells including removing lead glass windows, internal remote-operated cranes and hoists, manipulators, tongs, glove ports, liquid and gas piping, electrical outlets, pass-through, fire suppression equipment, lighting, ventilation, and other equipment. UOM=EA

Phase 5—O&M of removal equipment. UOM=EA/YR

.31.14.01 Cutting, Sizing, and Removal of Lead Glass Windows

Phase 4—Cut, size, and remove the hot cell lead-glass windows. UOM= M²

Phase 5—Operate and maintain equipment used to cut, size, and remove hot cell lead-glass windows. UOM= M²/YR

.31.14.02 Cutting, Sizing, and Removal of Internal Remote Operated Cranes

Phase 4—Cut, size, and remove the hot cell internal remote-operated cranes and hoists. UOM=EA

Phase 5—Operate and maintain equipment used to cut, size, and remove hot cell internal remote-operated cranes and hoists. UOM=EA/YR

.31.14.03 Cutting, Sizing, and Removal of Manipulators

Phase 4—Cut, size, and remove the hot cell manipulators. UOM=EA

Phase 5—Operate and maintain equipment used to cut, size, and remove hot cell manipulators. UOM=EA/YR

.31.14.04 Cutting, Sizing, and Removal of Gloveports and Bagports

Phase 4—Cut, size, and remove the hot cell gloveports and bagports. UOM=EA

Phase 5—Operate and maintain equipment used to cut, size, and remove hot cell gloveports and bagports. UOM=EA/YR

.31.14.05 Cutting, Sizing, and Removal of Liquid and Gas Piping

Phase 4—Cut, size, and remove the hot cell liquid and gas piping. UOM=M

Phase 5—Operate and maintain equipment used to cut, size, and remove hot cell liquid and gas piping. UOM=M/YR

.31.14.06 Cutting, Sizing, and Removal of Ventilation Systems

Phase 4—Cut, size, and remove the hot cell ventilation system. UOM=M

Phase 5—Operate and maintain equipment used to cut, size, and remove hot cell ventilation system. UOM=M/YR

.31.14.07 Cutting, Sizing, and Removal of Lighting and Electrical Systems

Phase 4—Cut, size, and remove the hot cell lighting and electrical system. UOM=M
Phase 5—Operate and maintain equipment to cut, size, and remove hot cell lighting and electrical system. UOM=M/YR

.31.14.08 Cutting, Sizing, and Removal of Fire Suppression Systems

Phase 4—Cut, size, and remove the hot cell fire-suppression system. UOM=M

Phase 5—Operate and maintain equipment used to cut, size, and remove hot cell fire-suppression system. UOM=M/YR

.31.14.9X Other

Phase 4—Perform other activities required to dismantle hot cell equipment. UOM=M

Phase 5—Operate and maintain equipment used to perform other activities required to dismantle hot cell equipment. UOM=M/YR

.31.15 Removal of Other Material and Equipment from Containment Structure

Phase 4—This element includes removing all material and equipment not specified previously. UOM=M³

Phase 5—Operate and maintain equipment used to remove all material and equipment not specified previously. UOM=M³/YR

.31.16 Facility (Controlled Area) Hardening, Isolation, or Entombment

Phase 4—Construction associated with encasing radioactive materials in concrete or other structural material sufficiently strong and structurally long-lived to ensure retention of the radioactivity until it has decayed to levels that permit restricted release of the site.

UOM=M³

Phase 5—O&M of equipment to perform hardening, isolation, or entombment.

UOM=M²/YR

.31.16.01 Zoning for long-term Storage

Phase 4—Identify and zone areas and items for long-term storage. UOM=M²

Phase 5—Operate and maintain equipment used to zone areas for long-term storage.

UOM=M²/YR

.31.16.02 Mothballing

Phase 4—Personnel, material, and equipment costs associated with mothballing.

UOM=M²

Phase 5—Operate and maintain equipment used for mothballing. UOM=M²/YR

.31.16.03 Entombment

Phase 4—Entomb radioactive materials. UOM=M³

Phase 5—Operate and maintain equipment used to entomb radioactive materials.

UOM=M²/YR

.31.16.9X Other

Phase 4—Perform Other activities required for facility (controlled area) hardening, isolation, or entombment. UOM=M³

Phase 5—Operate and maintain equipment used to perform other activities required for facility (controlled area) hardening, isolation, or entombment. UOM=M³/YR

.31.17 Removal of All Other Facilities, or Entire Contaminated Facility

Phase 4—Final takedown of the facility using shears, wrecking balls, rams, bulldozers, implosion, or other technique/equipment. UOM=M²

Phase 5—Operate and maintain removal equipment, inspect and clean the area, and replace consumables. UOM=M²/YR

.31.17.01 Removal of Activated Material and Equipment Exceeding Release Levels

Phase 4—Remove activated material and equipment exceeding release levels. UOM=M³

Phase 5—Operate and maintain removal equipment, inspect and clean the area, and replace consumables. UOM=M²/YR

.31.17.02 Removal of Contaminated Components That Can Only Be Dismantled at the End of the Removal Process

Phase 4—Remove contaminated components that can be removed only at the end of the removal process. UOM=M³

Phase 5—Operate and maintain removal equipment, inspect and clean the area, and replace consumables. UOM=M²/YR

.31.17.03 Removal of Non-Contaminated or Decontaminated Ancillary Equipment

Phase 4—Remove non-contaminated or decontaminated ancillary equipment. UOM=M³/YR

Phase 5—Operate and maintain removal equipment, inspect and clean the area, and replace consumables. UOM=M²/YR

.31.17.9X Other

Phase 4—Perform other activities required for to remove all other facilities or the entire contaminated facility. UOM=M²

Phase 5—Operate and maintain equipment required to perform other activities to remove all other facilities or the entire contaminated facility, inspect and clean the area, and replace consumables. UOM=M²/YR

.31.18 Dismantling of Temporary Fuel Storage Facility

Phase 4—Final takedown of the temporary fuel-storage facility using shears, wrecking balls, rams, bulldozers, or other technique/equipment. UOM=M²

Phase 5—Operate and maintain removal equipment. UOM=M²/YR

.31.19 Dismantling of Intermediate Fuel Storage Facility

Phase 4—Final takedown of the intermediate fuel-storage facility using shears, wrecking balls, rams, bulldozers, or other technique/equipment. UOM=M²

Phase 5—Operate and maintain removal equipment. UOM=M²/YR

.31.20 Reprocessing Costs Reprocess the equipment, components, and other materials for reuse.
UOM=M³

.31.21 Dismantling or Demolition of Other Facilities

Phase 4—Dismantle and demolish contaminated treatment, storage, or disposal facilities using shears, wrecking balls, rams, bulldozers, or other technique/equipment. UOM=M²

Phase 5—Operate and maintain removal equipment. UOM=M²/YR

.31.21.01 Dismantling or Demolition of Environmental Treatment Unit or Facility

Phase 4—Dismantle and demolish environmental treatment units or facilities.

UOM=M²

Phase 5—Operate and maintain equipment used to dismantle and demolish the environmental treatment unit or facility. UOM=M²/YR

.31.21.02 Dismantling or Demolition of Waste Storage Facilities

Phase 4—Dismantle and demolish waste storage facilities. UOM=M²

Phase 5—Operate and maintain equipment used to dismantle and demolish the waste storage facility. UOM=M²/YR

.31.21.03 Dismantling or Demolition of Waste Disposal Facilities

Phase 4—Dismantle and demolish waste disposal facilities. UOM=M²

Phase 5—Operate and maintain equipment used to dismantle and demolish the waste disposal facility. UOM=M²/YR

.31.21.9X Other

Phase 4—Perform other activities to dismantle and demolish an environmental treatment facility or unit. UOM=M²

Phase 5—Operate and maintain equipment used to perform other activities required to dismantle and demolish an environmental treatment facility or unit. UOM=M²/YR

.31.9x Other

Phases 4 and 5—This element includes all other activities involved in decommissioning and dismantlement not described by the above-listed categories.

UOM=LS

.32.00 Material Handling/Transportation

.32.01 Waste Stream Handling/Packaging

Phases 1-4—Construct a facility for lifting, packaging, and removing materials generated or removed from the environment. Systems that can aid in handling operations include automatic guided vehicles, palletizing robots, cranes, hoists, elevators, and conveyors. Waste is packaged in storage containers, receptacles, transportation packages, a major part of the transportation vehicle, or some other waste package. UOM=M³

Phase 5—Operate and maintain handling equipment. UOM=M³/YR

.32.01.01 Receiving, Unloading and Inspection

Phases 1-4—Purchase and install equipment and systems to receive, unload, and inspect waste material. UOM=M³

Phase 5—Operate and maintain equipment used in these processes. UOM=M³/YR

.32.01.02 Stage and Store

Phases 1-4—Purchase and install equipment and systems to stage and store waste material generated or removed from the environment. UOM=M³

Phase 5—Operate and maintain equipment and systems used to stage and store waste material generated or removed from the environment. UOM=M³/YR

.32.01.03 Waste Conditioning

Phases 1-4—Purchase and install equipment and systems to condition waste material generated or removed from the environment. UOM=M³

Phase 5—Operate and maintain equipment and systems used to condition waste material generated or removed from the environment. UOM=M³/YR

.32.01.04 Contact Handled Packaging/Overpacking/Labeling

Phases 1-4—Purchase and install equipment and systems for contact-handled packaging, overpacking, and labeling of waste material generated or removed from the environment. UOM=M³

Phase 5—Operate and maintain equipment and systems for contact-handled packaging, overpacking, and labeling of waste material generated or removed from the environment. UOM=M³/YR

.32.01.05 Remote Handled Packaging/Overpacking/Labeling

Phases 1-4—Purchase and install equipment and systems for remote-handled packaging, overpacking, and labeling of waste material generated or removed from the environment. UOM=M³

Phase 5—Operate and maintain equipment and systems for the remote-handled packaging, overpacking, and labeling of waste material generated or removed from the environment. UOM=M³/YR

.32.01.06 Washing

Phases 1-4—Purchase and install equipment and systems to wash waste material (e.g., equipment, furniture, large blocks) generated or removed from the environment. UOM=M³

Phase 5—Operate and maintain equipment and systems to wash waste material generated or removed from the environment. UOM=M³/YR

.32.01.07 Waste Sorting and Segregation

Phases 1-4—Purchase and install equipment and systems to sort and segregate waste material generated or removed from the environment. UOM=M³

Phase 5—Operate and maintain equipment and systems to sort and segregate waste material generated or removed from the environment. UOM=M³/YR

.32.01.9X Other

Phases 1-4—Other activities required for waste stream handling and packaging. UOM=M³

Phase 5—Other O&M activities for waste stream handling and packaging. UOM=M³/YR

.32.02 Transportation Device/Equipment

Phases 1-4—Construct and procure transportation devices/equipment such as railroads, trucks, and barges. UOM=EA

Phase 5—Operate and maintain transportation devices/equipment. UOM=EA/YR

.32.02.01 Transportation Device/Equipment for On-Site Transfers

Phases 1-4—Purchase and install transportation devices/equipment for on-site waste transfers. UOM=EA

Phase 5—Operate and maintain transportation devices/equipment for on-site waste transfers. UOM=EA/YR

.32.02.02 Transportation Device/Equipment for Off-Site Transportation

Phases 1-4—Purchase and install transportation devices/to ship waste offsite. UOM=EA

Phase 5—Operate and maintain transportation devices/equipment to ship waste offsite. UOM=EA/YR

.32.02.9X Other

Phases 1-4—Purchase and install other transportation devices/equipment. UOM=EA

Phase 5—Operate and maintain other transportation devices/ equipment. UOM=EA/YR

.32.03 OE Off-Site Destruction Transportation to DoD Facility

Phases 1-4—Destroy OE at an off-site location or DoD facility. UOM=M³

Phase 5—Operate and maintain transportation devices/equipment and OE destruction. UOM=LS/YR

.32.04 Reserved for Future Use

.32.05 Reserved for Future Use

.32.06 Reserved for Future Use

.32.07 Reserved for Future Use

.32.08 Reserved for Future Use

.32.09 Reserved for Future Use

.32.10 Certification and Shipping

Phases 1-5—Prepare, obtain, and maintain certifications and permits (including driver license) needed to ship and transport equipment/material to storage/treatment/disposal locations. This element also includes packaging, loading, unloading, and hauling waste short distances. UOM=EA

.32.10.01 Special Permits, Packaging and Transport Requirements

Phases 1-5—Prepare and obtain special permits and meet packaging and transportation requirements for loading and hauling materials. UOM=EA

.32.10.02 Load and Haul Prepared Waste

Phases 1-5—Load and haul prepared waste to storage/disposal locations that are a short distance away. Costs for waste disposal containers are included with this element. UOM=M³

.32.10.03 Load and Haul Prepared Special Materials

Phases 1-5—Load and haul prepared special material to storage/disposal locations that are a short distance away. Costs for waste disposal containers are included with this element. UOM=M³

.32.10.9X Other

Phases 1-5—Perform other activities associated with certification and shipping. UOM=EA

.32.11 Transportation by Truck

Phases 1-5—Truck transport of soil, liquid, solids, equipment, drums, sediments, sludge, and other material contaminated with hazardous, toxic, or radioactive waste from one location to another. UOM=M³

.32.11.01 Removed Drums/Tanks and Misc. Transportation

Phases 1-5—Truck hazardous, toxic, or radioactive liquid drums/tanks, and miscellaneous items over longer distances such as interstate transportation. Costs for waste disposal containers are included in this element. UOM=M³

.32.11.02 Surface Water (Free Product) and Sediments Transportation

Phases 1-5—Truck hazardous, toxic, or radioactive surface water (free product) and sediments over longer distances (e.g., interstate). Costs for waste disposal containers are included in this element. UOM=M³

.32.11.03 Groundwater (Free Product) Transportation

Phases 1-5—Truck hazardous, toxic, or radioactive groundwater (free product) over longer distances (e.g., interstate). Costs for waste disposal containers are included in this element. UOM=M³

.32.11.04 Liquid Waste/Sludge (e.g., UST/AST) Transportation

Phases 1-5—Truck hazardous, toxic, or radioactive liquid wastes and sludges over longer distances (e.g., interstate). Costs for waste disposal containers are included in this element. UOM=M³

.32.11.05 Soil/Solid Waste Transportation

Phases 1-5—Truck hazardous, toxic, or radioactive soils and solids over longer distances (e.g., interstate). Costs for waste disposal containers are included in this element. UOM=M³

.32.11.06 D&D Facility Contaminated Equipment/Material Transportation

Phases 1-5—Truck hazardous, toxic, or radioactive equipment/material generated during facility D&D over longer distances (e.g., interstate). Costs for waste disposal containers are included in this element. UOM=M³

.32.11.9X Other

Phases 1-5—Perform other activities associated with trucking waste and other material. UOM=M³

.32.12 Transportation by Rail

Phases 1-5—Transport soil, liquid, solids, equipment, drums, sediments, sludge, and other material contaminated with hazardous, toxic, or radioactive waste by rail. UOM=M³

.32.12.01 Removed Drums/Tanks and Misc. Transportation

Phases 1-5—Transport hazardous, toxic, or radioactive drums/tanks and miscellaneous over longer distances (e.g., interstate) by rail. Costs for waste disposal containers are included in this element. UOM=M³

.32.12.02 Surface Water (Free Product) and Sediments Transportation

Phases 1-5—Transport hazardous, toxic, or radioactive surface water (free product) and sediments over longer distances (e.g., interstate) by rail. Costs for waste disposal containers are included in this element. UOM=M³

.32.12.03 Groundwater (Free Product) Transportation

Phases 1-5—Transport hazardous, toxic, or radioactive groundwater (free product) over longer distances (e.g., interstate) by rail. Costs for waste disposal containers are included in this element. UOM=M³

.32.12.04 Liquid Waste/Sludge (e.g., UST/AST) Transportation

Phases 1-5—Transport hazardous, toxic, or radioactive liquid wastes and sludges over longer distances (e.g., interstate) by rail. Costs for waste disposal containers are included with in element. UOM=M³

.32.12.05 Soil/Solid Waste Transportation

Phases 1-5—Transport hazardous, toxic, or radioactive soils and solids over longer distances (e.g., interstate) by rail. Costs for waste disposal containers are included in this element. UOM=M³

.32.12.06 D&D Facility Contaminated Equipment/Material Transportation

Phases 1-5—Transport hazardous, toxic, or radioactive equipment/material generated during facility D&D over longer distances (e.g., interstate) by rail. Costs for waste disposal containers are included in this element. UOM=M³

.32.12.9X Other

Phases 1-5—Perform other activities associated with transporting waste and material by rail. UOM=M³

.32.13 Transportation by Barge

Phases 1-5—Transport soil, liquid, solids, equipment, drums, sediments, sludge, and other material contaminated with hazardous, toxic, or radioactive waste by barge, ship, or other water transport vessel. UOM=M³

.32.13.01 Removed Drums/Tanks and Misc. Transportation

Phases 1-5—Transport hazardous, toxic, or radioactive drums/tanks and miscellaneous items by barge, ship, or other water transport vessel, usually for a longer distance (e.g., interstate). Costs for waste disposal containers are included in this element. UOM=M³

.32.13.02 Surface Water (Free Product) and Sediments Transportation

Phases 1-5—Transport hazardous, toxic, or radioactive surface water (free product) and sediments by barge, ship, or other water transport vessel, usually for longer distances (e.g., interstate). Costs for waste disposal containers are included in this element. UOM=M³

.32.13.03 Groundwater (Free Product) Transportation

Phases 1-5—Transport hazardous, toxic, or radioactive groundwater (free product) by barge, ship, or other water transport vessel, usually for longer distances (e.g., interstate). Costs of waste disposal containers are included in this element. UOM=M³

.32.13.04 Liquid Waste/Sludge (e.g., UST/AST) Transportation

Phases 1-5—Transport hazardous, toxic, or radioactive liquid wastes and sludges by barge, ship, or other water transport vessel, usually for longer distances (e.g., interstate). Costs for waste disposal containers are included in this element. UOM=M³

.32.13.05 Soil/Solid Waste Transportation

Phases 1-5—Transport hazardous, toxic, or radioactive soils and solids by barge, ship, or other water transport vessel, usually for longer distances (e.g., interstate). Costs for waste disposal containers are included in this element. UOM=M³

.32.13.06 D&D Facility Contaminated Equipment/Material Transportation

Phases 1-5—Transport hazardous, toxic, or radioactive equipment/material generated during facility D&D by barge, ship, or other water transport vessel, usually for longer distances (e.g., interstate). Costs for waste disposal containers are included in this element. UOM=M³

.32.13.9X Other

Phases 1-5—Perform other activities associated with transporting waste and material by barge, ship, or other water transport vessel. UOM=M³

.32.14 Transportation by Air

Phases 1-5—Transport soil, liquid, solids, equipment, drums, sediments, sludge, and other material contaminated with hazardous, toxic, or radioactive waste by airplanes. UOM=M³

.32.14.01 Removed Drums/Tanks and Misc. Transportation

Phases 1-5—Transport, hazardous, toxic, or radioactive drums/tanks and miscellaneous by airplane, usually longer distances (e.g., interstate). Costs for waste disposal containers are included in this element. UOM=M³

.32.14.02 Surface Water (Free Product) and Sediments Transportation

Phases 1-5—Transport hazardous, toxic, or radioactive surface water (free product) and by airplane, usually for longer distances (e.g., interstate). Costs for waste disposal containers are included in this element. UOM=M³

.32.14.03 Groundwater (Free Product) Transportation

Phases 1-5—Transport hazardous, toxic, or radioactive groundwater (free product) by airplane, usually for longer distances (e.g., interstate). Costs for waste disposal containers are included in this element. UOM=M³

.32.14.04 Liquid Waste/Sludge (e.g., UST/AST) Transportation

Phases 1-5—Transport hazardous, toxic, or radioactive liquid wastes and sludges by airplane, usually for longer distances (e.g., interstate). Costs for waste disposal containers are included in this element. UOM=M³

.32.14.05 Soil/Solid Waste Transportation

Phases 1-5—Transport hazardous, toxic, or radioactive soils and solids by airplane, usually for longer distances (e.g., interstate). Costs for waste disposal containers are included in this element. UOM=M³

.32.14.06 D&D Facility Contaminated Equipment/Material Transportation

Phases 1-5—Transport hazardous, toxic, or radioactive equipment/material generated during facility D&D by airplane, usually for longer distances (e.g., interstate). Costs for waste disposal containers are included in this element. UOM=M³

.32.14.9X Other

Phases 1-5—Perform other activities associated with transporting waste and material by airplane. UOM=M³

.32.15 Container Handling

Phases 1-4—Construction associated with systems for loading, unloading, and moving containers. Systems that can aid in handling operations include automatic guided vehicles, palletizing robots, cranes, hoists, elevators, and conveyors. UOM=M³

Phase 5—O&M of container-handling equipment. UOM=M³/YR

.32.9X

Phases 1-5—Costs associated with other material handling and transportation activities.

.33.00 Disposal

.33.01 Reserved for Future Use

.33.02 Reserved for Future Use

.33.03 Reserved for Future Use

.33.04 On-site Government Disposal Costs, Fees, and Taxes

All Phases—Costs, fees, or taxes paid by the generator to dispose of hazardous, toxic, or radioactive waste at an on-site facility owned and operated by same Government agency as the generator. UOM=M³

.33.04.01 Drums/Tanks and Miscellaneous Disposal

All Phases—Costs, fees, or taxes paid by the generator to dispose of hazardous, toxic, or radioactive drums/tanks and miscellaneous at an on-site facility owned and operated by the same Government agency as the generator agency. UOM=M³

.33.04.02 Surface Water (Free Product) and Sediments Disposal

All Phases—Costs, fees, or taxes paid by the generator to dispose of hazardous, toxic, and/or radioactive surface water (free product) and sediments at an on-site facility owned and operated by the same Government agency as the generator agency. UOM=M³

.33.04.03 Groundwater (Free Product) Disposal

All Phases—Costs, fees, or taxes paid by the generator to dispose of hazardous, toxic, and/or radioactive groundwater (free product) at an on-site facility owned and operated by the same Government agency as the generator agency. UOM=M³

.33.04.04 Liquid Waste/Sludge Disposal

All Phases—Costs, fees, or taxes paid by the generator to dispose of hazardous, toxic, or radioactive liquid wastes and sludges at an on-site facility owned and operated by the same Government agency as the generator agency. UOM=M³

.33.04.05 Soil/Solid Waste Disposal

All Phases—Costs, fees, or taxes paid by the generator to dispose of hazardous, toxic, or radioactive soils and solids at an on-site facility owned and operated by the same Government agency as the generator agency. UOM=M³

.33.04.06 D&D Facility Contaminated Equipment/Material Disposal

All Phases—Costs, fees, or taxes paid by the generator to dispose of hazardous, toxic, or radioactive equipment/material at an on-site facility owned and operated by the same Government agency as the generator agency. UOM=M³

.33.04.9X Other

All Phases—Costs, fees, and taxes paid by the generator to dispose of other hazardous, toxic, or radioactive materials and waste at an on-site facility owned and operated by the same Government agency as the generator agency. UOM=M³

.33.05 On-site Commercial Disposal Costs, Fees, and Taxes

All Phases—Costs, fees, or taxes paid by the generator to dispose of hazardous, toxic, or radioactive waste at an on-site commercial facility located on the waste generator's site but owned and operated by a private company. UOM=M³

.33.05.01 Drums/Tanks and Miscellaneous Disposal

All Phases—Costs, fees, or taxes paid by the generator to dispose of hazardous, toxic, and radioactive drums/tanks and miscellaneous items at a privately owned facility on the waste generator's property. UOM=M³

.33.05.02 Surface Water (Free Product) and Sediments Disposal

All Phases—Costs, fees, or taxes paid by the generator to dispose of hazardous, toxic, or radioactive surface water (free product) and sediment at a privately owned facility on the waste generator's property. UOM=M³

.33.05.03 Groundwater (Free Product) Disposal

All Phases—Costs, fees, or taxes paid by the generator to dispose of hazardous, toxic, or radioactive groundwater (free product) at a privately owned facility on the waste generator's property. UOM=M³

.33.05.04 Liquid Waste/Sludge Disposal

All Phases—Costs, fees, or taxes paid by the generator to dispose of hazardous, toxic, or radioactive liquid wastes and sludges at a privately owned facility on the waste generator's property. UOM=M³

.33.05.05 Soil/Solid Waste Disposal

All Phases—Costs, fees, or taxes paid by the generator to dispose of hazardous, toxic, or radioactive soils and solids at a privately owned facility on the waste generator's property. UOM=M³

.33.05.06 D&D Facility Contaminated Equipment/Material Disposal

All Phases—Costs, fees, or taxes paid by the generator to dispose of hazardous, toxic, or radioactive equipment/material at a privately owned facility on the waste generator's property during the D&D of facilities. UOM=M³

.33.05.9X Other

All Phases—Costs, fees, and taxes paid by the generator to dispose of other hazardous, toxic, or radioactive materials and waste at a privately owned facility on the waste generator's property. UOM=M³

.33.06 Off-site DOE Disposal Costs, Fees, and Taxes

All Phases—Costs, fees, or taxes paid by the generator to dispose of hazardous, toxic, and/or radioactive waste at an off-site facility owned and operated by DOE. UOM=M³

.33.06.01 Drums/Tanks and Miscellaneous Disposal

All Phases—Costs, fees, or taxes paid by the generator to dispose of hazardous, toxic, or radioactive drums/tanks and miscellaneous items at an off-site DOE facility. UOM=M³

.33.06.02 Surface Water (Free Product) and Sediments Disposal

All Phases—Costs, fees, or taxes paid by the generator to dispose of hazardous, toxic, or radioactive surface water (free product) and sediments at an off-site DOE facility. UOM=M³

.33.06.03 Groundwater (Free Product) Disposal

All Phases—Costs, fees, or taxes paid by the generator to dispose of hazardous, toxic, or radioactive groundwater (free product) at an off-site DOE facility. UOM=M³

.33.06.04 Liquid Waste/Sludge Disposal

All Phases—Costs, fees, or taxes paid by the generator to dispose of hazardous, toxic, or radioactive liquid wastes and at an off-site DOE facility. UOM=M³

.33.06.05 Soil/Solid Waste Disposal

All Phases—Costs, fees, or taxes paid by the generator to dispose of hazardous, toxic, or radioactive soils and solids at an off-site DOE facility. UOM=M³

.33.06.06 D&D Facility Contaminated Equipment/Material Disposal

All Phases—Costs, fees, or taxes paid by the generator to dispose of hazardous, toxic, or radioactive equipment/material during the D&D of facilities at an off-site DOE facility. UOM=M³

.33.06.9X Other

All Phases—Costs, fees, and taxes paid by the generator to dispose of other hazardous, toxic, or radioactive materials and waste at an off-site DOE facility. UOM=M³

.33.07 Off-site Other Government Disposal Costs, Fees, and Taxes

All Phases—Costs, fees, or taxes paid by the generator to dispose of hazardous, toxic, or radioactive waste at an off-site facility owned and operated by a Government agency other than the generator agency. UOM=M³

.33.07.01 Drums/Tanks and Miscellaneous Disposal

All Phases—Costs, fees, or taxes paid by the generator to dispose of hazardous, toxic, or radioactive drums/tanks and miscellaneous items at an off-site facility owned and operated by a Government agency other than the generator agency. UOM=M³

.33.07.02 Surface Water (Free Product) and Sediments Disposal

All Phases—Costs, fees, or taxes paid by the generator to dispose of hazardous, toxic, or radioactive surface water (free product) and sediments at an off-site facility owned and operated by a Government agency other than the generator agency. UOM=M³

.33.07.03 Groundwater (Free Product) Disposal

All Phases—Costs, fees, or taxes paid by the generator to dispose of hazardous, toxic, and/or radioactive groundwater (free product) at an off-site facility owned and operated by a Government agency other than the generator agency. UOM=M³

.33.07.04 Liquid Waste/Sludge Disposal

All Phases—Costs, fees, or taxes paid by the generator to dispose of hazardous, toxic, or radioactive liquid wastes and sludges at an off-site facility owned and operated by a Government agency other than the generator agency. UOM=M³

.33.07.05 Soil/Solid Waste Disposal

All Phases—Costs, fees, or taxes paid by the generator to dispose of hazardous, toxic, or radioactive soils and solids at an off-site facility owned and operated by a Government agency other than the generator agency. UOM=M³

.33.07.06 D&D Facility Contaminated Equipment/Material Disposal

All Phases—Costs, fees, or taxes paid by the generator to dispose of hazardous, toxic, and/or radioactive equipment/material at an off-site facility owned and operated by a Government agency other than the generator agency. UOM=M³

.33.07.9X Other

All Phases—Costs, fees, and taxes paid by the generator to dispose of other hazardous, toxic, or radioactive materials and waste at an off-site facility owned and operated by a Government agency other than the generator agency. UOM=M³

.33.08 Off-Site Commercial Disposal Costs, Fees, and Taxes

All Phases—Costs, fees, or taxes paid by the generator to dispose of hazardous, toxic, or radioactive waste at an off-site commercial facility. The disposal facility is owned and operated by a private company, and the facility is located outside of waste generator property. UOM=M³

.33.08.01 Drums/Tanks and Miscellaneous Disposal

All Phases—Costs, fees, or taxes paid by the generator to dispose of hazardous, toxic, or radioactive drums/tanks and miscellaneous items at a private facility outside the waste generator property. UOM=M³

.33.08.02 Surface Water (Free Product) and Sediments Disposal

All Phases—Costs, fees, or taxes paid by the generator to dispose of hazardous, toxic, or radioactive surface water (free product) and sediments disposal at a private facility outside the waste generator property. UOM=M³

.33.08.03 Groundwater (Free Product) Disposal

All Phases—Costs, fees, or taxes paid by the generator to dispose of hazardous, toxic, or radioactive groundwater (free product) disposal at a private facility outside the waste generator property. UOM=M³

.33.08.04 Liquid Waste/Sludge Disposal

All Phases—Costs, fees, or taxes paid by the generator to dispose of hazardous, toxic, or radioactive liquid wastes and sludges at a private facility outside the waste generator property. UOM=M³

.33.08.05 Soil/Solid Waste Disposal

All Phases—Costs, fees, or taxes paid by the generator to dispose of hazardous, toxic, or radioactive soils and solids at a private facility outside the waste generator property. UOM=M³

.33.08.06 D&D Facility Contaminated Equipment/Material Disposal

All Phases—Costs, fees, or taxes paid by the generator to dispose of hazardous, toxic, or radioactive equipment/material during the D&D of facilities at a private facility outside the waste generator property during the D&D of facilities. UOM=M³

.33.08.9X Other

All Phases—Costs, fees, and taxes paid by the generator to dispose of other hazardous, toxic, or radioactive materials and waste at an off-site commercial facility. UOM=M³

.33.09 Discharge to POTW

Phases 4 and 5—Discharge contaminated wastewater to publicly owned treatments work for recycling, storage, treatment, or discharge. UOM=M³

.33.9X Other

All Phases—All other activities involved in disposal not described by the above-listed categories. UOM=M³

.34.00 Air Emission and Off-Gas Treatment

.34.01 Biofiltration

Phase 4—Construct a biofilter to remove vapor phase organic streams using a biomass or soil column where the streams are degraded by microorganisms in the soil. Specific strains of bacteria may be introduced into the filter and optimal conditions provided to preferentially degrade specific compounds. UOM=M³

Phase 5—O&M activities such as inspecting the unit, clearing the area, mixing and feeding chemicals, making repairs, and performing other activities to enhance microorganisms. UOM=M³/YR

.34.02 High Energy Corona

Phase 4—Employ a High Energy Corona (HEC) mobile unit, using high-voltage electricity to destroy gaseous VOCs at room temperature. The HEC reactor is a glass tube filled with glass beads through which the pretreated contaminated off-gas is passed. Each reactor is 2 inches in diameter, 4 feet long, and weighs less than 20 pounds. A high-voltage electrode is placed along the centerline of the reactor, and a grounded metal screen is attached to the outer glass surface of the reactor. A high-voltage power supply is connected across the electrodes to provide 0-50 mA of 60-Hz electricity at 30 kV. The electrode current and power depend upon the type and concentration of contaminant. HEC equipment consists of: HEC reactor in which the VOCs are destroyed; inlet and outlet piping containing process instrumentation to measure humidity, temperature, pressure, contaminant concentration, and mass flow rate; means for controlling inlet flow rates and inlet humidity; and a secondary scrubber. UOM=M³

Phase 5—O&M activities such as inspecting the unit, operation of equipment, replacing parts and making repairs. UOM=M³/YR

.34.03 Tunable Hybrid Plasma Reactor

Phase 4—Construction associated with using a reactor to destroy organics or oxidize them to non-toxic chemicals through their interaction with the electrons and plasma generated from the electron beam. The reactor uses a moderate energy electron beam (100-300 keV) injected into atmospheric air containing the organic contaminants. Because plasma is generated, use of either alternating current or direct current electric fields allows a further increase in the electron and gas temperatures to optimize the treatment process. The high degree of tunability of the reactor gave rise to the name tunable hybrid plasma reactor. UOM=M³

Phase 5—O&M activities such as operation of equipment, inspecting the unit, replacing parts, and making repairs. UOM=M³/YR

.34.04 Membrane Separation

Phase 4—Construct a facility for using membrane separation to treat feed streams that contain dilute concentrations of VOCs. The organic vapor/air separation technology involves the preferential transport of organic vapors through a nonporous gas separation membrane (a diffusion process analogous to pumping saline water through a reverse osmosis membrane). In this system, the feed stream is compressed and sent to a condenser where the liquid solvent is recovered. The condenser bleed stream, which contains

approximately 5,000 ppm of the VOC, is then sent to the membrane module. The membrane module comprises modules of thin film membranes separated by plastic mesh that are wound spirally around a central collection pipe. In the membrane module, the stream is further concentrated to 3% VOC. The concentrated stream is returned to the compressor for further recovery in the condenser. Equipment includes compressors, membranes, instrumentation and control, and piping. UOM=M³

Phase 5—O&M activities such as operation of equipment, inspecting the unit, replacing parts, and making repairs. UOM=M³/YR

.34.05 Catalytic Oxidation

Phase 4—Construct a facility for using catalytic oxidation to destroy contaminants in the exhaust gas from air strippers and SVE systems. The addition of a catalyst accelerates the rate of oxidation by adsorbing the oxygen and the contaminant on the catalyst surface where they react to form carbon dioxide, water, and hydrochloric gas. The catalyst enables the oxidation reaction to occur at much lower temperatures than required by a conventional thermal oxidation. VOCs are thermally destroyed at temperatures typically ranging from 320°C-540°C (600°F-1000°F) by using a solid catalyst. First, the contaminated air is directly preheated (electrically or, more frequently, using natural gas or propane) to reach a temperature necessary to initiate the catalytic oxidation (310°C-370°C [600°C-700°F]) of the VOCs. The preheated VOC-laden air is passed through a bed of solid catalysts where the VOCs are rapidly oxidized. Thermal oxidizers can often be converted to catalytic units after initially high influent contaminant concentrations decrease to less than 1,000-5,000 ppm. Catalyst systems used to oxidize VOCs typically use metal oxides such as nickel oxide, copper oxide, manganese dioxide, or chromium oxide. Noble metals such as platinum and palladium may also be used. Equipment includes blowers, heaters, heat exchangers, instrumentation and control, and catalyst bed. Some systems might need scrubbers. UOM=M³

Phase 5—O&M activities such as inspecting the unit, replacing parts, and making repairs. UOM=M³/YR

.34.06 Thermal/Oxidation

Phase 4—Construct a facility for using thermal oxidation to destroy contaminants in the exhaust gas from air strippers and SVE systems. Thermal oxidation units are typically single-chamber, refractory-lined oxidizers equipped with a propane or natural gas burner and a stack. Lightweight ceramic blanket refractory is used because many of these units are mounted on skids or trailers. If gasoline is the contaminant, heat exchanger efficiencies are limited to 25%-35%, and preheat temperatures are maintained below 180°C (530°F) to minimize the possibility of ignition occurring in the heat exchanger. Flame arrestors are always installed between the vapor source and the thermal oxidizer. Burner capacities in the combustion chamber range from 0.5-2 million BTUs per hour. Operating temperatures range from 400°C-870°C (760°F-1,600°F), and gas residence times are typically one second or less. UOM=M³

Phase 5—O&M activities such as operation of equipment, inspecting the unit, replacing parts, and making repairs. UOM=M³/YR

.34.07 Ultraviolet Oxidation

Phase 4—Construct a facility for using UV oxidation to break down the chemical bonds under the influence of UV light and oxidants. Products of photo-degradation vary according to the matrix in which the process occurs, but the complete conversion of an organic contaminant to CO₂, H₂O, etc. is not probable. Equipment includes UV lamps, storage for oxidants, piping, process pumps, instrumentation and monitors, and off-gas treatment if ozone is used. UOM=M³

Phase 5—O&M activities such as inspecting the facility, preparing chemicals, replacing parts, cleaning the area, and repairing components. UOM=M³/YR

.34.08 VOC Recovery and Recycle

Phase 4—Construct a facility for using VOC recovery to capture volatile organic compounds from air streams. This technology is related to vapor phase carbon adsorption. A Brayton-cycle heat pump (BCHP) is used to condense VOCs from an air stream, a process that offers the potential for both recovery and either on-site or off-site recycling of a wide range of VOCs. The VOC-laden air stream comes from either vapor vacuum extraction of soil or air stripping of contaminated groundwater. The technology consists of activated carbon adsorbers located at each extraction well, plus a truck-mounted BCHP to regenerate the adsorbers on a periodic basis. The VOC-laden air from the well is passed through the carbon bed, adsorbing the VOCs. When the bed becomes saturated, hot nitrogen from the regenerator is used to desorb the VOCs from the bed. The nitrogen passes through a chiller, is compressed and then cooled in a recuperation unit where 50%-80% of the organics are recovered. The partially depleted nitrogen stream is then expanded through a turbine, lowering the temperature to as low as -101°C (-150°F) and condensing the remaining organics. The now-clean nitrogen passes through the recuperation unit to cool the VOC-laden nitrogen before returning to the carbon bed. The only outputs will be the clean off-gas from the well and a small amount of recovered organic. UOM=M³

Phase 5—O&M activities such as operation of equipment, inspecting the facility, replacing parts, and making repairs. UOM=M³/YR

.34.09 Internal Combustion Engine

Phase 4—Construction associated with using an internal combustion engine to burn organic contaminants as fuel. When the concentration of organics is too low, auxiliary fuel is added to enhance the oxidation. UOM=M³

Phase 5—O&M activities such as operation of equipment, replacing parts, and making repairs. UOM=M³/YR

.34.10 Granular Activated Carbon Adsorption Gas/Vapor

Phase 4—Construct a facility for using vessels containing activated carbon to remove organic contaminants from gaseous waste streams. Organic molecules are adsorbed into the carbon, which is either replaced or regenerated. Items associated with carbon adsorption are granular activated carbon columns, pre-filters, and items associated with regenerating the spent carbon. Organic carbon analyzers are used for on-line control. Costs include the cost of a GAC column, and in most cases, pumps, piping, and regeneration equipment. UOM=M³

Phase 5—O&M activities such as inspecting the carbon unit, cleaning or regenerating the carbon, and repairing components. UOM=M³/YR

.34.11 Alkali Bed Reactor

Phase 4—Construct a facility for using a chemical treatment technique to rapidly degrade chlorinated organic compounds in strong alkali solutions at elevated temperatures. Soda lime, a highly alkaline solid composed of 95% CaO and 5% NaOH, is presented to a contaminated air stream in a packed bed. The destruction process is essentially one step for both destruction of SVOC and neutralization of any acid vapors. The reaction takes place at relatively low temperatures (350°C-400°C) as compared to thermal oxidation, which suggests some catalytic activity on the part of the soda lime. The end product is a mixture of benign, non-hazardous salts consisting of Ca and Na chlorides and carbonates. UOM=M³

Phase 5—O&M activities such cleaning the area, inspecting the facility, making repairs, replacing components, and removing and handling waste. UOM=M³/YR

.34.12 Flameless Thermal Oxidation

Phase 4—Construct a heated, packed bed reactor containing a porous inert matrix composed of spherical or saddle shaped ceramic beads. The contaminated off-gas stream is ducted into a gas distribution plenum. The stream is then introduced to the packed bed where the interstitial geometry enhances the mixing and combustion of contaminated air and fuel. The surface characteristics of the interstitial matrix promote heat transfer. Its thermal capacitance dampens temperature changes and promotes stability of the combustion process even when significant changes occur in the concentration or composition of the off-gas stream. As the stream proceeds through the packed bed, it is rapidly heated to oxidation temperatures of 870°C-980°C (1,600°F-1,800°F) and VOC/SVOCs are broken down into combustion products. The interstitial geometry of the packed bed promotes homogeneous oxidation of all reactants avoiding the possibility of contaminants bypassing the flame reaction zone as can occur in thermal oxidation units. As with thermal and catalytic oxidation, flameless thermal oxidation systems make use of thermal recapture techniques to recover heat from the exhaust stream. UOM=M³

Phase 5—O&M activities such as cleaning the area, inspecting the facility, making repairs, replacing components, and removing and handling waste. UOM=M³/YR

.34.13 Condensation

Phase 4—Construct a facility for using condensation to remove VOCs from a non-condensable gas stream. By varying the gas stream temperature and pressure, organic vapors condense and separate from the non-condensable gas stream. The condensed organics are collected and sometimes reused. Surface condensers are shell and tube heat exchangers where coolant flows inside the tube and the condensed VOC stream is collected outside the tube. Contact condensers operate by spraying a cool liquid directly into a gas stream to cool and condense the organic vapors. UOM=M³

Phase 5—O&M activities such as inspecting treatment units, operation of equipment, cleaning the area, and repairing components. UOM=M³/YR

.34.14 Flaring

Phase 4—Construction associated with using flares, open-flame systems for the thermal destruction of volatile organic compounds. A typical application in the remediation area is treating off-gases from landfills. These off-gases may contain high concentrations of methane. However, in most cases, heating value of these gases may not be recovered economically. In a typical flare system, a pilot burner ignites the off-gases at the flare tip. For smokeless operation, flares may need an air or steam supply to provide efficient gas/air mixing. UOM=M³

Phase 5—O&M activities such as inspecting the treatment unit, operation of equipment, cleaning the area, and repairing components. UOM=M³/YR

.34.15 Synthetic Resin Adsorption

Phase 4—Construct a facility for using synthetic resins to adsorb and remove contaminant from gaseous waste streams. The resins are regenerated by thermally desorbing the contaminants, which are transferred to a more concentrated off-gas stream for treatment. UOM=M³

Phases 5 and 6—Includes utilities and energy for operation and maintenance activities such as regenerating resins, inspecting the treatment unit, cleaning the area, and repairing components. Additional elements from .34, Air Emission and Off-Gas Treatment should be used for treatment of regenerant off-gas streams. UOM=M³/YR

.34.9X Other

Phase 4—Construct or install other air emission and off-gas treatment technologies. UOM=M³

Phase 5—Perform O&M activities such as inspecting facilities, replacing materials, clearing the area, and making repairs on other air emission and off-gas treatment technologies. UOM=M³/YR

.9X OTHER (Use Numbers 90-99)

All Phases—This element includes all second-level activities not included in second-level elements X.01.xx to X.34.xx.