# HTRW
# Operation & Maintenance
# Work Breakdown Structure

# HTRW
# O&M WBS

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Developed By The
Hazardous, Toxic, Radioactive Waste
Interagency Cost Engineering Group

Army Corps of Engineers
Navy
Air Force
Environmental Protection Agency
Department of Energy

# DATA DICTIONARY
# STANDARD DESCRIPTIONS
# HTRW OPERATION AND MAINTENANCE
# WORK BREAKDOWN STRUCTURE

This document contains standard descriptions for the Hazardous, Toxic, and Radioactive Waste (HTRW) Operation and Maintenance (O&M) Work Breakdown Structure (WBS). A standard description is included for the second (System) and third (Subsystem) levels of the HTRW O&M WBS.

The HTRW O&M WBS consists of four hierarchical levels. This document describes Level 2 (System) and Level 3 (Subsystem) under Level 1 (Account 342XX "HTRW Operation and Maintenance (Post Construction)". Further Level 1 breakdown consists of 341XX "Fiscal/Financial Closeout Activities", which are not included in this document. There are fourteen (14) Level 2 Systems (342XX 02, 03, 05, 06, 07, 08, 09, 11, 12, 13, 14, 15, 18, and 22) described.

This document includes the unit of measure (UOM) in both English and Metric and a standard description for each O&M WBS item in Level 3 (Subsystem). Units of measure assigned to Level 3 characterize Subsystem costs. Standard definitions for Level 4 (Assembly Category) are not included in this document. Units of measure for the treatment categories (342XX 11 through 342XX 15) generally indicate the total quantity of material treated in CY (M3), MGA (KLI), etc.

The HTRW O&M WBS considers all possible operation and maintenance items by including the "Other" item at all levels. All items not directly described by the WBS titles are included in the "Other" items as selected by the user (Cost Engineer) for the project estimate. The "Other" items are designated by the number "9X." The user is to replace the "X" with a number, 0 through 9, and assign an appropriate item description and unit of measure. Minimize the use of the "Other" 9X items.

Operation and maintenance which is of long term, indefinite term, or caretaker

status and is not integral with remedial action or construction activities is to be included in Account 342XX at the appropriate items. For example, this includes long term operation and maintenance for wells, associated piping network, and treatment plant to be operated and maintained for a long term (following being constructed and operated for a short term during the remedial action phase). In such cases, the long term operation and maintenance of the well-piping-treatment system is not integral with remedial action construction activities, and thus is included in Operation and Maintenance (Post Construction) Account 342XX.

Please note the following for the Data Dictionary:

NOTE 1: For the five character Account Number (Level 1), the first three characters are from the Army Corps of Engineers Superfund accounting system. The last 2 characters are user defined for estimating flexibility.

NOTE 2: Account 32XXX (HTRW Pre Construction and Project Management Activities) includes Project Management, Investigations, and Remedial Design. Account 32XXX is not included in this document.

NOTE 3: Account 33XXX (HTRW Construction Activities) includes Remedial Action (including operation during construction), Engineering During Construction (EDC), and Supervision and Administration (S&A) (Construction Management). Account 33XXX is not included in this document.

NOTE 4: Account 34XXX (HTRW Post Construction and Financial Closeout Activities) includes Post Construction Operation and Maintenance (O&M) and Fiscal/Financial Closeout.

NOTE 5: The Superfund and Work for Others Programs use Account Numbers 32XXX, 33XXX, and 34XXX. The DERP (Defense Environmental Restoration Program) and BRAC ER (Base Realignment and Closure Environmental Restoration) Programs use corresponding Account Numbers 72XXX, 73XXX, and 74XXX, which are not included in this document.

NOTE 6: Unit of Measure (UOM) Definitions:

| English | Metric |
|---|---|
| EA - Each | EA - Each |
| SY - Square Yards | M2 - Square Meters |
| ACR - Acres | HEC - Hectars |
| CY - Cubic Yards | M3 - Cubic Meters |
| LF - Linear Feet | M - Meters |
| MGA - Thousand Gallons | KLI - Kilo Liters |
| TON - Tons | MT - Metric Tons |
| MO - Months | MO - Months |
| HR - Hours | HR - Hours |
| GAL - Gallons | LIT - Liters |
| CF - Cubic Feet | M3 - Cubic Meters |
| LB - Pounds | KG - Kilo Grams |
| SF - Square Feet | M2 - Square Meters |
| YR - Years | YR - Years |

Note 7: 342XX Account second (System) and third (Subsystem) numbers correspond to the 331XX Account System and Subsystem numbers.

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# HTRW OPERATION AND MAINTENANCE WORK BREAKDOWN STRUCTURE

| ACCOUNT (LEVEL 1) | SYSTEM (LEVEL 2) | SUBSYSTEM (LEVEL 3) | DESCRIPTION OF MEASUREMENT | UOM ENG(MET) | STANDARD DESCRIPTION |
|---|---|---|---|---|---|
| 342XX | | | | | **HTRW OPERATION AND MAINTENANCE**<br>Account 34XXX includes post construction Operation and Maintenance (O&M) which is long term, indefinite term, or caretaker status following remedial action or construction. Account 33XXX includes HTRW remedial action (construction) work for all programs and includes operation which occurs during construction (remedial action). Account 33XXX excludes project management at all phases and excludes pre construction investigations and remedial design which are all in Account 32XXX. Account 33XXX excludes post construction operation and maintenance which is in Account 34XXX. Account 34XXX post construction operation and maintenance includes such items as operation labor and equipment, maintenance and repair, fuel, utilities, bulk chemicals, raw materials, plant ownership/rental, plant upgrades and replacements, transport waste materials to the plant, preparation and handling of waste materials at the plant, training, regulatory approvals, etc. |
| 342XX | 02 | | | | **MONITORING, SAMPLING, TESTING, AND ANALYSIS**<br>Provides for all work during post construction O&M associated with air, water, sludge, solids and soil sampling, monitoring, testing, and analysis. Includes sample taking, shipping samples and sample analysis by on-site and off-site laboratory facilities. |
| 342XX | 03 | | | | **SITEWORK**<br>Post construction O&M. Sitework includes site improvements, and site utilities. Site improvements include roads, parking, curbs, gutters, walks and other hardscaping. Site utilities include water, sewer, gas, other utility distribution. Also includes fuel storage tanks. All work involving contaminated or hazardous material is excluded from this system. Storm drainage involving contaminated surface water is included under "Surface Water Collection and Control" (342XX.05). |
| 342XX | 05 | | | | **SURFACE WATER COLLECTION AND CONTROL**<br>Provides for post construction O&M of the system for the collection and control of contaminated surface water through storm drainage piping and structures, erosion control measures, and civil engineering structures such as berms, dikes and levees. Includes transport to treatment plant. |
| 342XX | 06 | | | | **GROUNDWATER COLLECTION AND CONTROL**<br>Provides for post construction O&M of the system for the collection and control of contaminated groundwater through piping, wells, trenches, slurry walls, sheet piling and other physical barriers. Includes transport to treatment plant. |
| 342XX | 07 | | | | **AIR POLLUTION/GAS COLLECTION AND CONTROL**<br>Includes the post construction O&M of the system for collection and control of |

# HTRW OPERATION AND MAINTENANCE WORK BREAKDOWN STRUCTURE

| ACCOUNT (LEVEL 1) | SYSTEM (LEVEL 2) | SUBSYSTEM (LEVEL 3) | DESCRIPTION OF MEASUREMENT | UOM ENG(MET) | STANDARD DESCRIPTION |
|---|---|---|---|---|---|
| | | | | | gas, vapor and dust. |
| 342XX | 08 | | | | **SOLIDS COLLECTION AND CONTAINMENT**<br>Provides for post construction O&M of the system for exhuming and handling of solid hazardous, toxic and radioactive waste (HTRW) through excavation, sorting, stockpiling, and filling containers. Provides for post construction O&M of multilayered caps. Includes transport to treatment plant. |
| 342XX | 09 | | | | **LIQUIDS/SEDIMENTS/SLUDGES COLLECTION AND CONTAINMENT**<br>Includes post construction O&M of the system for collection of HTRW-contaminated liquids and sludges through dredging and vacuuming, and the furnishing and filling of portable containers. Includes the post construction O&M of the system for containment of liquids and sludges through lagoons, basins, tanks, and dikes. Includes transport to treatment plant. |
| 342XX | 11 | | | | **BIOLOGICAL TREATMENT**<br>Includes post construction O&M (separate for each subsystem technology) of the plant facility, based on the volume of waste material treated, including portable treatment equipment which is charged on a time basis and can be used on more than one project (342XX.11.(01.-14.)). Includes a separate item for the yearly post construction O&M of a permanent plant facility (342XX.11.50.). Biological treatment is the microbial transformation of organic compounds. Biological treatment processes can alter inorganic compounds such as ammonia and nitrate, and can change the oxidation state of certain metal compounds. Includes in-situ biological treatment such as land farming as well as activated sludge, composting, trickling filters, anaerobic, and aerobic digestion. Includes process equipment and chemicals required for treatment. For transportation see "Transport to Treatment Plant" (342XX.05.11, 342XX.06.08, 342XX.08.03 or 342XX.09.04). |
| 342XX | 12 | | | | **CHEMICAL TREATMENT**<br>Includes post construction O&M (separate for each subsystem technology) of the plant facility, based on the volume of waste material treated, including portable treatment equipment which is charged on a time basis and can be used on more than one project (342XX.12.(01.-14.)). Includes a separate item for the yearly post construction O&M of a permanent plant facility (342XX.12.50.). Chemical treatment is the process in which hazardous wastes are chemically changed to remove toxic contaminants from the environment. Type of treatment included in this system are oxidation/reduction, solvent extraction, chlorination, ozonation, ion exchange, neutralization, hydrolysis, photolysis, dechlorination, and electrolysis reactions. Includes process equipment and chemicals required for treatment. For transportation see "Transport to Treatment Plant" (342XX.05.11, 342XX.06.08, 342XX.08.03 or 342XX.09.04). |
| 342XX | 13 | | | | **PHYSICAL TREATMENT** |

| ACCOUNT (LEVEL 1) | SYSTEM (LEVEL 2) | SUBSYSTEM (LEVEL 3) | DESCRIPTION OF MEASUREMENT | UOM ENG(MET) | STANDARD DESCRIPTION |
|---|---|---|---|---|---|
| | | | | | Includes post construction O&M (separate for each subsystem technology) of the plant facility, based on the volume of waste material treated, including portable treatment equipment which is charged on a time basis and can be used on more than one project (342XX.13.(01.-32.)). Includes a separate item for the yearly post construction O&M of a permanent plant facility (342XX.13.50.). These treatment processes are the physical separation of contaminants from solid, liquid or gaseous waste streams. The treatments are applicable to a broad range of contaminant concentrations. Physical treatments generally do not result in total destruction or separation of the contaminants in the waste stream, consequently post-treatment is often required. Type of physical treatment included in this system are filtration, sedimentation, flocculation, precipitation, equalization, evaporation, stripping, soil washing, and carbon adsorption. Includes process equipment and chemicals required for treatment. For transportation see "Transport to Treatment Plant" (342XX.05.11, 342XX.06.08, 342XX.08.03 or 342XX.09.04). |
| 342XX | 14 | | | | **THERMAL TREATMENT**<br>Includes post construction O&M (separate for each subsystem technology) of the plant facility, based on the volume of waste material treated, including portable treatment equipment which is charged on a time basis and can be used on more than one project (342XX.14.(01.-07.)). Includes a separate item for the yearly post construction O&M of a permanent plant facility (342XX.14.50.). Thermal treatment is the destruction of wastes through exposure to high temperature in combustion chambers and energy recovery devices. Several processes capable of incinerating a wide range of liquid and solid wastes include fluidizied bed, rotary kiln, multiple hearth, infrared, circulating bed, liquid injection, pyrolysis, plasma torch, wet air oxidation, supercritical water oxidation, molten salt destruction, and solar detoxification. Includes process equipment and chemicals required for treatment. For transportation see "Transport to Treatment Plant" (342XX.05.11, 342XX.06.08, 342XX.08.03 or 342XX.09.04). |
| 342XX | 15 | | | | **STABILIZATION/FIXATION/ENCAPSULATION**<br>Includes post construction O&M (separate for each subsystem technology) of the plant facility, based on the volume of waste material treated, including portable treatment equipment which is charged on a time basis and can be used on more than one project (342XX.15.(01.-07.)). Includes a separate item for the yearly post construction O&M of a permanent plant facility (342XX.15.50.). Stabilization/fixation/encapsulation processes attempt to improve the handling and physical characteristics of the wastes, decrease the surface area, limit the solubility of any pollutants and detoxify contained pollutants. For transportation see "Transport to Treatment Plant" (342XX.05.11, 342XX.06.08, 342XX.08.03 or 342XX.09.04). |
| 342XX | 18 | | | | **DISPOSAL (OTHER THAN COMMERCIAL)**<br>Includes post construction O&M (separate for each subsystem disposal |

| ACCOUNT (LEVEL 1) | SYSTEM (LEVEL 2) | SUBSYSTEM (LEVEL 3) | DESCRIPTION OF MEASUREMENT | UOM ENG(MET) | STANDARD DESCRIPTION |
|---|---|---|---|---|---|
| | | | | | method) of the plant facility, based on the volume of waste material disposed, including portable treatment equipment which is charged on a time basis and can be used on more than one project (331XX.18.(01.-10.)). Includes a separate item for the yearly post construction O&M of a permanent disposal facility (342XX.18.15.). Disposal (Other than Commercial) provides for the final placement of HTRW or ordnance at facilities owned or controlled by the Government. An example would be the disposal of wastes through burial at a DOE nuclear facility or ordnance disposal at DOD facilities. Includes handling, disposal fees, and transportation to the final Destruction/Disposal/Storage facility. Excluded is the transportation to a facility for treatment prior to final disposal. For transportation prior to final disposal see "Transport to Treatment Plant" (342XX.05.11, 342XX.06.08, 342XX.08.03 or 342XX.09.04). Disposal may be accomplished through the use of secure landfills, burial grounds, trench, pits, above ground vault, underground vault, underground mine/shaft, tanks, pads (tumulus / retrievable storage, other), storage buildings or protective cover structures, cribs, deep well injection, incinerator, or other. |
| 342XX | 22 | | | | **GENERAL REQUIREMENTS (Optional Breakout)**<br>Consists of general requirements during post construction O&M which are not specifically identifiable in the other systems such as indirect, overhead, profit, and other general requirements. This system is OPTIONAL. It may be used to separately show general requirements; however, if it is not used, general requirements must be distributed throughout in the other systems. |
| 342XX | 9x | | | | **OTHER (Use Numbers 90-99)**<br>Includes all Hazardous, Toxic, Radioactive Waste post construction O&M work not described by the above listed systems. |
| 342XX | 02 | | | | **MONITORING, SAMPLING, TESTING, AND ANALYSIS**<br>Provides for all work during post construction O&M associated with air, water, sludge, solids and soil sampling, monitoring, testing, and analysis. Includes sample taking, shipping samples and sample analysis by on-site and off-site laboratory facilities. |
| 342XX | 02 | 01 | Each monitoring station | EA (EA) | **METEOROLOGICAL MONITORING**<br>Meteorological monitoring during post construction O&M includes measurement of wind, precipitation, and barometric pressure as well as other parameters. Includes the operation of meteorological stations and instrument shelters. |
| 342XX | 02 | 02 | Each monitoring event | EA (EA) | **RADIATION MONITORING**<br>Radiation monitoring during post construction O&M includes the measuring of radiation of personal body count levels and at specified site areas. Body count monitoring includes personal dosimetry systems, hand and/or foot counters and whole body counters. Area monitoring includes remote monitoring, alarm systems, survey monitoring and special case area monitoring. |

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| ACCOUNT (LEVEL 1) | SYSTEM (LEVEL 2) | SUBSYSTEM (LEVEL 3) | DESCRIPTION OF MEASUREMENT | UOM ENG(MET) | STANDARD DESCRIPTION |
|---|---|---|---|---|---|
| 342XX | 02 | 03 | Each monitoring event | EA (EA) | **AIR MONITORING AND SAMPLING**<br>Air monitoring and sampling during post construction O&M is the monitoring for detection of HTRW to ensure compliance with clean air regulations. Includes monitoring of asbestos, HTRW, contaminated dust gases and vapors. |
| 342XX | 02 | 04 | Each monitoring well | EA (EA) | **MONITORING WELLS**<br>Provides for all work during post construction O&M associated with the operation and maintenance of monitoring wells. |
| 342XX | 02 | 05 | Each sample | EA (EA) | **SAMPLING SURFACE WATER/GROUNDWATER/LIQUID WASTE**<br>Sampling surface water/groundwater/liquid waste during post construction O&M includes the work associated with the retrieval of liquid waste samples. This also includes sampling of leachate and treatment process effluents, and sample shipping. |
| 342XX | 02 | 06 | Each sample | EA (EA) | **SAMPLING SOIL AND SEDIMENT**<br>Sampling soil and sediment during post construction O&M includes all work associated with the retrieval of surface and subsurface soil and sediment/sludge samples. This includes any subsurface exploration, split spoon sampling, auger boring samples, the digging of sampling test pits and shipping to testing lab. |
| 342XX | 02 | 07 | Each sample | EA (EA) | **SAMPLING ASBESTOS**<br>Sampling asbestos during post construction O&M includes all activities associated with the retrieval of asbestos samples, excluding air sampling, which is covered under "Air Monitoring and Sampling" (342XX.02.03). Includes shipping to testing labs. |
| 342XX | 02 | 08 | Each sample | EA (EA) | **SAMPLING RADIOACTIVE CONTAMINATED MEDIA**<br>Sampling radioactive contaminated media during post construction O&M includes all activities associated with the gathering of contaminated radioactive media samples. This includes materials, labor and equipment for taking samples, plus packaging and shipping to testing lab. |
| 342XX | 02 | 09 | Each analysis | EA (EA) | **LABORATORY CHEMICAL ANALYSIS**<br>Laboratory chemical analysis during post construction O&M consists of work by an independent laboratory for analysis of contaminated samples. This includes air/industrial hygiene analysis, general water and wastewater quality analysis, priority pollutant analysis (all media), biomonitoring and bioassay analysis, Resource Conservation and Recovery Act (RCRA) analysis, miscellaneous waste analysis, and soil and sediment analysis. Does not include storage and disposal of lab samples. See "Off-Site Laboratory Facilities" (342XX.02.14). |
| 342XX | 02 | 10 | Each analysis | EA (EA) | **RADIOACTIVE WASTE ANALYSIS**<br>Radioactive waste analysis consists of work during post construction O&M by |

| ACCOUNT (LEVEL 1) | SYSTEM (LEVEL 2) | SUBSYSTEM (LEVEL 3) | DESCRIPTION OF MEASUREMENT | UOM ENG(MET) | STANDARD DESCRIPTION |
|---|---|---|---|---|---|
| | | | | | an independent laboratory for the analysis of radioactive contaminated waste samples. This includes analysis of radioactive animal tissue/bone, air, liquid, urine/feces and vegetation/sediment/soil. Does not include storage and disposal of lab samples. See “Off-Site Laboratory Facilities” (342XX.02.14). |
| 342XX | 02 | 11 | Each test | EA (EA) | **GEOTECHNICAL TESTING**<br>Geotechnical testing during post construction O&M consists of work by an independent laboratory for the analysis of soil properties. Included are analysis of shear strength, permeability, consolidation and soil classification. |
| 342XX | 02 | 12 | Each Instrument | EA (EA) | **GEOTECHNICAL INSTRUMENTATION**<br>Geotechnical instrumentation during post construction O&M is used to record measurable changes in soil, surface water and groundwater. Geotechnical instrumentation includes peizometers, inclinometers, settlement gauges, and vadose zone monitors. |
| 342XX | 02 | 13 | Each laboratory | EA (EA) | **ON-SITE LABORATORY FACILITIES**<br>Provides for the rental/ownership, setup, certification/approval/evaluation, equipment, and operation during post construction O&M of an on-site laboratory service. |
| 342XX | 02 | 14 | Each laboratory | EA (EA) | **OFF-SITE LABORATORY FACILITIES**<br>Provides for the storage and/or disposal of contaminated samples at an off-site laboratory during post construction O&M. Commercial laboratory analysis fees are included in "Laboratory Chemical Analysis" (342XX.02.09) and "Radioactive Waste Analysis" (342XX.02.10). |
| 342XX | 02 | 9x | | | **OTHER (Use Numbers 90-99)**<br>Includes all monitoring, sampling, testing, and analysis during post construction O&M not described by the above listed subsystems. |
| 342XX | 03 | | | | **SITEWORK**<br>Post construction O&M. Sitework includes site improvements, and site utilities. Site improvements include roads, parking, curbs, gutters, walks and other hardscaping. Site utilities include water, sewer, gas, other utility distribution. Also includes fuel storage tanks. All work involving contaminated or hazardous material is excluded from this system. Storm drainage involving contaminated surface water is included under "Surface Water Collection and Control" (342XX.05). |
| 342XX | 03 | 04 | Area of surfacing per duration of O&M | SY/YR (M2/YR) | **ROADS/PARKING/CURBS/WALKS**<br>Post construction O&M. Roads/parking/curbs/walks include bituminous, aggregate, and concrete surfacing as well as costs for base courses, geotextile fabrics, curbs and gutters, striping, guard rails and barricades. |
| 342XX | 03 | 05 | Total length of fence per duration of O&M | LF/YR (M/YR) | **FENCING**<br>Post construction O&M. Includes gate posts, line posts, top rail, fabric, apron |

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| ACCOUNT (LEVEL 1) | SYSTEM (LEVEL 2) | SUBSYSTEM (LEVEL 3) | DESCRIPTION OF MEASUREMENT | UOM ENG(MET) | STANDARD DESCRIPTION |
|---|---|---|---|---|---|
| | | | | | and gates. |
| 342XX | 03 | 06 | Total length of distribution per duration of O&M | LF/YR (M/YR) | **ELECTRICAL DISTRIBUTION**<br>Post construction O&M. Includes wire, conduit, fittings, manholes, site lighting fixtures, transformer, switchgear, aerial distribution, and underground distribution. Includes distribution up to the point of connection to the treatment equipment's main power or control panel. Excludes temporary connections. |
| 342XX | 03 | 07 | Total length of distribution per duration of O&M | LF/YR (M/YR) | **TELEPHONE/COMMUNICATION DISTRIBUTION**<br>Post construction O&M. Includes wire, conduit, fittings, and manholes. Includes distribution up to the point of connection to the treatment equipment's main power or control device (panel, valve, etc.). Excludes temporary connections. |
| 342XX | 03 | 08 | Total length of distribution per duration of O&M | LF/YR (M/YR) | **WATER/SEWER/GAS DISTRIBUTION**<br>Post construction O&M. Includes piping, fittings, valves, and manholes. Includes distribution up to the point of connection to the treatment equipment's main control device ( valve, etc.). Excludes temporary connections. |
| 342XX | 03 | 09 | Total length of distribution per duration of O&M | LF/YR (M/YR) | **STEAM AND CONDENSATE DISTRIBUTION**<br>Post construction O&M. Includes piping, fittings, insulation, valves, testing, pipe supports, and steam tunnel. Includes distribution up to the point of connection to the treatment equipment's main control device ( valve, etc.). Excludes temporary connections. |
| 342XX | 03 | 10 | Total length of distribution per duration of O&M | LF/YR (M/YR) | **FUEL LINE DISTRIBUTION**<br>Post construction O&M. Includes piping, fittings, valves, and manhole/valve box. Includes distribution up to the point of connection to the treatment equipment's main control device ( valve, etc.). Excludes temporary connections. |
| 342XX | 03 | 11 | Total length of drainage/subdrainage channels per duration of O&M | LF/YR (M/YR) | **STORM DRAINAGE/SUBDRAINAGE**<br>Post construction O&M. Includes piping, manholes, junction boxes, invert, grates, covers, headwalls, flumes, and rip rap. |
| 342XX | 03 | 12 | Area of structure per duration of O&M | SF/YR (M2/YR) | **PERMANENT COVER STRUCTURE OVER CONTAINMENT AREA**<br>Post construction O&M. Includes a permanent structure over a solid waste containment area. Examples are an asphalt parking lot over a RCRA cap or an air-supported structure over a contaminated excavation. |
| 342XX | 03 | 14 | Each tank per duration of O&M | EA/YR (EA/YR) | **FUEL STORAGE TANKS**<br>Post construction O&M. Includes fuel storage tanks and associated fill/vent piping, overflow protection valves, spill protection systems, alarms, manways, concrete pad and anchors, and miscellaneous straps and fasteners. |
| 342XX | 03 | 9x | | | **OTHER (Use Numbers 90-99)** |

# HTRW OPERATION AND MAINTENANCE WORK BREAKDOWN STRUCTURE

| ACCOUNT (LEVEL 1) | SYSTEM (LEVEL 2) | SUBSYSTEM (LEVEL 3) | DESCRIPTION OF MEASUREMENT | UOM ENG(MET) | STANDARD DESCRIPTION |
|---|---|---|---|---|---|
| | | | | | Includes post construction O&M of sitework not described by the above listed subsystems. |
| 342XX | 05 | | | | **SURFACE WATER COLLECTION AND CONTROL**<br>Provides for post construction operation and maintenance of the system for the collection and control of contaminated surface water through storm drainage piping and structures, erosion control measures, and civil engineering structures such as berms, dikes, and levees. Includes transport to treatment plant. |
| 342XX | 05 | 01 | Length of berm/dike per duration of O&M | LF/YR (M/YR) | **BERMS/DIKES**<br>Consists of post construction operation and maintenance. Berms and dikes are used to control contaminated surface water by diverting its flow. Its primary purpose in an environmental project is the diversion of surface runoff that has entered a contaminated area and must be collected. Includes earth or other structure, drainage facing materials, etc. |
| 342XX | 05 | 02 | Area of one side of the wall per duration of O&M | SF/YR (M2/YR) | **FLOODWALLS**<br>Consists of post construction operation and maintenance. Floodwalls are structures used to protect land from flooding and inundation., Includes concrete or other structures, etc. |
| 342XX | 05 | 03 | Length of levee per duration of O&M | LF/YR (M/YR) | **LEVEES**<br>Post construction O&M. Levees are used to prevent a body of contaminated water from overflowing. Includes earth structure, drainage facing materials, etc. |
| 342XX | 05 | 04 | Length of terraces/benches per duration of O&M | LF/YR (M/YR) | **TERRACES AND BENCHES**<br>Post construction O&M. Terraces and benches are used for the control of contaminated surface water runoff by intercepting the flow of water before it causes erosion. Includes earth or other structures, drainage facing materials, etc. |
| 342XX | 05 | 05 | Length of channel/waterways per duration of O&M | LF/YR (M/YR) | **CHANNELS/WATERWAYS (SOIL/ROCK)**<br>Post construction O&M. Includes channel or waterway earth cut. |
| 342XX | 05 | 06 | Length of chutes and flumes per duration of O&M | LF/YR (M/YR) | **CHUTES OR FLUMES**<br>Post construction O&M. Chutes and flumes are structures that divert contaminated water away from an area. Includes earth or other structure, concrete, formwork, reinforcing steel, and rip rap. |
| 342XX | 05 | 07 | Length of barriers per duration of O&M | LF/YR (M/YR) | **SEDIMENT BARRIERS**<br>Post construction O&M. Sediment barriers control the amount of sediments that are suspended and transported by the flow of contaminated surface water. Includes silt fencing, straw bales, and sediment basins. |
| 342XX | 05 | 08 | Length of drainage per duration | LF/YR (M/YR) | **STORM DRAINAGE** |

# HTRW OPERATION AND MAINTENANCE WORK BREAKDOWN STRUCTURE

| ACCOUNT (LEVEL 1) | SYSTEM (LEVEL 2) | SUBSYSTEM (LEVEL 3) | DESCRIPTION OF MEASUREMENT | UOM ENG(MET) | STANDARD DESCRIPTION |
|---|---|---|---|---|---|
| | | | of O&M | | Post construction O&M. Includes piping, junction boxes, manholes, inlets, invert, grates, covers, headwalls, and rip rap. |
| 342XX | 05 | 09 | Area of facility per duration of O&M | ACR/YR (HEC/YR) | **LAGOONS/BASINS/TANKS/DIKES/PUMP SYSTEM** Post construction O&M. Lagoons/basins/tanks/dikes are used for the storage of liquid wastes. Includes post construction operation and maintenance of earth structures, liners, spillways, intake/outlet structures, underground tanks, aboveground tanks, concrete retention basins, and overtopping alarm systems. Also includes post construction operation and maintenance of pumping stations and controls, lift stations and controls, manholes, piping and fittings, hosing, and holding tanks. |
| 342XX | 05 | 10 | Volume of waste material | MGA (KLI) | **PUMPING/DRAINING/COLLECTION** Includes work during post construction operation associated with pumping or draining aboveground or underground tanks and basins. |
| 342XX | 05 | 11 | Volume of waste material | MGA (KLI) | **TRANSPORT TO TREATMENT PLANT** Transport to treatment plant during post construction operation includes equipment, materials, and labor for hauling, loading, and unloading of liquid waste. |
| 342XX | 05 | 13 | Total area per duration of O&M | ACR/YR (HEC/YR) | **EROSION CONTROL** Post construction O&M. Includes turf and installation trees, shrubs, and ground covers. Also includes mowing of established turf. |
| 342XX | 05 | 9x | | | **OTHER (Use Numbers 90-99)** Includes all post construction O&M for surface water collection and control not described by the above listed subsystems. |
| 342XX | 06 | | | | **GROUNDWATER COLLECTION AND CONTROL** Provides for post construction O&M of the system for the collection and control of contaminated groundwater through piping, wells, trenches, slurry walls, sheet piling and other physical barriers. Includes transport to treatment plant. |
| 342XX | 06 | 01 | Each well per duration of O&M | EA/YR (EA/YR) | **EXTRACTION AND INJECTION WELLS** Post construction O&M. Injection wells are 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 HTRW. Extraction wells are utilized for pump and treat operations. Extraction and injection wells include casing, gravel pack material, grout, wet well, well screen, capping, well house, well pump and instrumentation, well piping, valves and fittings, and electrical. |
| 342XX | 06 | 02 | Length of drainage/collection system per duration of O&M | LF/YR (M/YR) | **SUBSURFACE DRAINAGE/COLLECTION** Post construction O&M. Drainage/collection includes items associated with a site subsurface gravity drainage and collection system. Assemblies include |

# HTRW OPERATION AND MAINTENANCE WORK BREAKDOWN STRUCTURE

| ACCOUNT (LEVEL 1) | SYSTEM (LEVEL 2) | SUBSYSTEM (LEVEL 3) | DESCRIPTION OF MEASUREMENT | UOM ENG(MET) | STANDARD DESCRIPTION |
|---|---|---|---|---|---|
| | | | | | trench, geotextile fabrics, liners, manholes, piping and fittings, hosing, and holding tanks. |
| 342XX | 06 | 03 | Surface area of slurry wall one side per duration of O&M | SF/YR (M2/YR) | **SLURRY WALLS** Post construction O&M. Slurry walls are narrow vertical trenches, typically 24-36 inches wide, excavated through pervious materials to a relatively impervious underlaying strata and backfilled with a soil/bentonite or cement/bentonite slurry mixture. This provides a vertical barrier to reduce the horizontal permeability of soil. Slurry walls include trench, and backfill/bentonite slurry. |
| 342XX | 06 | 04 | Surface area of grout curtain one side per duration of O&M | SF/YR (M2/YR) | **GROUT CURTAIN** Post construction O&M. A grout curtain is 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. |
| 342XX | 06 | 05 | Surface area of sheet piling one side per duration of O&M | SF/YR (M2/YR) | **SHEET PILING** Post construction O&M. Sheet piling serves as an impervious barrier for contaminant migration once it is driven to an impervious underlaying strata. |
| 342XX | 06 | 06 | Area of facility per duration of O&M | ACR/YR (HEC/YR) | **LAGOONS/BASINS/TANKS/DIKES/PUMP SYSTEM** Post construction O&M. Lagoons/basins/tanks/dikes are used for the storage of liquid phase groundwater wastes. Also includes post construction operation and maintenance of earth structures, liners, spillways, intake/outlet structures, overtopping alarm systems, underground tanks, aboveground tanks, and concrete retention basins. Also includes post construction operation and maintenance of pumping stations and controls, lift stations and controls, manholes, piping and fittings, hosing, and holding tanks. |
| 342XX | 06 | 07 | Volume of waste material | MGA (KLI) | **PUMPING/COLLECTION** Pumping/collection during post construction operation includes work associated with a site pumping and collection system. |
| 342XX | 06 | 08 | Volume of waste material | MGA (KLI) | **TRANSPORT TO TREATMENT PLANT** Transport to treatment plant during post construction operation includes equipment, materials, and labor for hauling, loading and unloading of wastes. |
| 342XX | 06 | 9x | | | **OTHER (Use Numbers 90-99)** Includes all post construction O&M for groundwater collection and control not described by the above listed subsystems. |
| 342XX | 07 | | | | **AIR POLLUTION/GAS COLLECTION AND CONTROL** Includes the post construction O&M of the system for collection and control of gas, vapor and dust. |
| 342XX | 07 | 01 | Length of trench per duration of O&M | LF/YR (M/YR) | **GAS/VAPOR COLLECTION TRENCH SYSTEM** Post construction O&M. Gas/Vapor collection trench systems consist of deep narrow trenches backfilled with gravel, to form a path of least resistance |

| ACCOUNT (LEVEL 1) | SYSTEM (LEVEL 2) | SUBSYSTEM (LEVEL 3) | DESCRIPTION OF MEASUREMENT | UOM ENG(MET) | STANDARD DESCRIPTION |
|---|---|---|---|---|---|
| | | | | | through which gases move upward to a collection apparatus. Assemblies include a trench, backfill, geotextile linings, well point dewatering and a ventilation system for the site. |
| 342XX | 07 | 02 | Number of wells per duration of O&M | EA/YR (EA/YR) | **GAS/VAPOR COLLECTION WELL SYSTEM** Post construction O&M. Gas/Vapor collection well systems permit the venting of underground gases to a collection well system in order to prevent migration or buildup. Collection and monitoring wells include casing, gravel pack material, grout, wet well, well screen, capping, well house, well pump and instrumentation, well piping, valves and fittings and electrical. Also included are blowers and/or compressors, piping, metering, and control systems. This should not be confused with the soil vapor extraction process listed under "Vapor Extraction" (342XX.13.23). |
| 342XX | 07 | 03 | Area of collection system coverage per duration of O&M | SY/YR (M2/YR) | **GAS/VAPOR COLLECTION AT LAGOON COVER** Post construction O&M. Provides for the venting of gases and vapors at lagoon covers to prevent migration or buildup. Assemblies include collection hose, tank, vacuum blower/compressor, valves, boxes, and manholes. |
| 342XX | 07 | 04 | Area of emissions control system coverage per duration of O&M | ACR/YR (HEC/YR) | **FUGITIVE DUST/VAPOR/GAS EMISSIONS CONTROL** Post construction O&M. Fugitive dust/vapor/gas emissions control prevent the spread of airborne contaminants. Assemblies include sprayed chemical dust suppressants, wind fences/screens, synthetic covers over waste piles, and water spraying. |
| 342XX | 07 | 9x | | | **OTHER (Use Numbers 90-99)** Includes all post construction O&M for air pollution and gas collection and control not described by the above listed subsystems. |
| 342XX | 08 | | | | **SOLIDS COLLECTION AND CONTAINMENT** Provides for post construction O&M of the system for exhuming and handling of solid hazardous, toxic and radioactive waste (HTRW) through excavation, sorting, stockpiling, and filling containers. Provides for post construction O&M of multilayered caps. Includes transport to treatment plant. |
| 342XX | 08 | 01 | Volume of waste material | CY (M3) | **CONTAMINATED SOIL COLLECTION** Post construction operation. Includes the removal of solid contaminated soil HTRW waste by front end loader, backhoe, gradall, clamshell, dragline or other mechanical means. |
| 342XX | 08 | 02 | Volume of waste material | CY (M3) | **WASTE CONTAINMENT, PORTABLE (FURNISH/FILL)** Post construction operation. Waste containment includes the procurement of and labor to fill containers with solid HTRW wastes. 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. |
| | | | | | |

# HTRW OPERATION AND MAINTENANCE WORK BREAKDOWN STRUCTURE

| ACCOUNT (LEVEL 1) | SYSTEM (LEVEL 2) | SUBSYSTEM (LEVEL 3) | DESCRIPTION OF MEASUREMENT | UOM ENG(MET) | STANDARD DESCRIPTION |
|---|---|---|---|---|---|
| 342XX | 08 | 03 | Volume of waste material | CY (M3) | **TRANSPORT TO TREATMENT PLANT**<br>Transport to treatment plant during post construction operation includes equipment, materials and labor for hauling, loading and unloading of solid waste. |
| 342XX | 08 | 04 | Volume of waste material | CY (M3) | **RADIOACTIVE SPECIFIC WASTE CONTAINMENT (FURNISH/FILL)**<br>Post construction operation. Radioactive specific waste containment includes the procurement of and labor to fill containers with low level and high level radioactive solid 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. |
| 342XX | 08 | 05 | Area of cap or liner per duration of O&M | ACR/YR (HEC/YR) | **CAPPING OF CONTAMINATED AREA/WASTE PILE (SOIL/ASPHALT CAP)**<br>Post construction O&M. Includes multilayered caps and bottom liners designed to contain solid waste in place, to prevent the migration of precipitation, or entry of vegetation or animals into the waste cell, and to collect and distribute any leachate generated by the waste. Includes containment systems (liners) beneath waste piles or landfills. Cap layers and bottom liners include impervious clay layers, bentonite layer, granular drainage layers, geotextile membrane, flexible membrane liners, radon barrier, revegetation, erosion control, drainage and leachate collection system, manholes, sumps, lift stations, paving cover, blast protective cover and testing. |
| 342XX | 08 | 06 | Volume of waste material | CY (M3) | **NUCLEAR WASTE DENSIFICATION (DYNAMIC COMPACTION)**<br>Dynamic compaction during post construction operation is a technology that precedes the installation of a protective cap. Dynamic compaction is a method of densifying a waste disposal cell by means of dropping a large weight (several tons) a specified distance over the site area occupied by the disposal cell. The purpose of dynamic compaction is to densify the soil, HTRW, or other debris in order to prevent settlement of the disposal cell which could damage a protective cap and allow migration of contaminants over time. Includes all labor and equipment to accomplish dynamic compaction of a site. The technology can be applied to both nuclear and hazardous waste. |
| 342XX | 08 | 9x | | | **OTHER (Use Numbers 90-99)**<br>Includes all post construction O&M for solids collection and containment not described by the above listed subsystems. |
| 342XX | 09 | | | | **LIQUIDS/SEDIMENTS/SLUDGES COLLECTION AND CONTAINMENT**<br>Includes post construction O&M of the system for collection of HTRW-contaminated liquids and sludges through dredging and vacuuming, and the furnishing and filling of portable containers. Includes the post construction O&M of the system for containment of liquids and sludges through lagoons, |

# HTRW OPERATION AND MAINTENANCE WORK BREAKDOWN STRUCTURE

| ACCOUNT (LEVEL 1) | SYSTEM (LEVEL 2) | SUBSYSTEM (LEVEL 3) | DESCRIPTION OF MEASUREMENT | UOM ENG(MET) | STANDARD DESCRIPTION |
|---|---|---|---|---|---|
| | | | | | basins, tanks, and dikes. Includes transport to treatment plant. |
| 342XX | 09 | 01 | Volume of waste material | CY (M3) | **DREDGING/EXCAVATING**<br>Post construction O&M. Dredging is the removal of sediment and sludges with overlying water. Dredging may be used for the removal of sediments in contaminated settling basins, lagoons and retention ponds. Includes hydraulic, mechanical and pneumatic dredges using cutterheads, bucket dredges, wheel dredges and suction dredging. |
| 342XX | 09 | 02 | Volume of waste material | CY (M3) | **INDUSTRIAL VACUUMING**<br>Post construction O&M. Industrial vacuuming is the process of removal of industrial wastes contained in tanks, containers, surface impoundments or process vessels by pumping or pneumatic conveyance. |
| 342XX | 09 | 03 | Volume of waste material | MGA (KLI) | **WASTE CONTAINMENT, PORTABLE (FURNISH/FILL)**<br>Post construction O&M. Waste containment includes the procurement of and labor to fill containers with liquid waste, sediments and sludges. Types of waste containers include 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. |
| 342XX | 09 | 04 | Volume of waste material | MGA (KLI) | **TRANSPORT TO TREATMENT PLANT**<br>Transport to treatment plant during post construction O&M includes equipment, materials and labor for hauling, loading and unloading of liquid waste, sediments and sludges. |
| 342XX | 09 | 05 | Volume of waste material | MGA (KLI) | **RADIOACTIVE SPECIFIC WASTE CONTAINMENT (FURNISH/FILL)**<br>Post construction O&M. Radioactive specific waste containment includes the procurement of and labor to fill containers 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. |
| 342XX | 09 | 06 | Volume of waste material | MGA (KLI) | **PUMPING/DRAINING/COLLECTION**<br>Pumping/drainage/collection during post construction O&M includes work associated with removing liquid wastes from drums, tanks, and basins. |
| 342XX | 09 | 07 | Area of facility per duration of O&M | ACR/YR (HEC/YR) | **LAGOONS/BASINS/TANKS/DIKES/DRAIN SYSTEM**<br>Post construction O&M. Lagoons/basins/tanks/dikes are used for the storage of liquid wastes. Includes post construction operation and maintenance of earth structures, liners, spillways, intake/outlet structures, yard piping, pumping and lift stations, and overtopping alarm systems. Also includes the post construction operation and maintenance of a site drainage and collection system. Also includes post construction operation and maintenance of pumping stations and controls, lift stations and controls, manholes, piping and fittings, hosing, and holding tanks. |

# HTRW OPERATION AND MAINTENANCE WORK BREAKDOWN STRUCTURE

| ACCOUNT (LEVEL 1) | SYSTEM (LEVEL 2) | SUBSYSTEM (LEVEL 3) | DESCRIPTION OF MEASUREMENT | UOM ENG(MET) | STANDARD DESCRIPTION |
|---|---|---|---|---|---|
| 342XX | 09 | 9x | | | **OTHER (Use Numbers 90-99)**<br>Includes post construction O&M for liquids, sediments, and sludges collection and containment not described by the above listed subsystems. |
| 342XX | 11 | | | | **BIOLOGICAL TREATMENT**<br>Includes post construction O&M (separate for each subsystem technology) of the plant facility, based on the volume of waste material treated, including portable treatment equipment which is charged on a time basis and can be used on more than one project (342XX.11.(01.-14.)). Includes a separate item for the yearly post construction O&M of a permanent plant facility (342XX.11.50.). Biological treatment is the microbial transformation of organic compounds. Biological treatment processes can alter inorganic compounds such as ammonia and nitrate, and can change the oxidation state of certain metal compounds. Includes in-situ biological treatment such as land farming as well as activated sludge, composting, trickling filters, anaerobic, and aerobic digestion. Includes process equipment and chemicals required for treatment. For transportation see "Transport to Treatment Plant" (342XX.05.11, 342XX.06.08, 342XX.08.03 or 342XX.09.04). |
| 342XX | 11 | 01 | Volume of waste material | MGA (KLI) | **ACTIVATED SLUDGE (SEQUENCING BATCH REACTORS)**<br>Post construction O&M. Activated sludge is a sludge that contains living organisms that are agitated and aerated to promote biological growth. Activated sludge treats wastewater containing biodegradable organic compounds. Note that not all activated sludge systems are 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 a recycling line for the settled biomass. |
| 342XX | 11 | 02 | Volume of waste material | MGA (KLI) | **ROTATING BIOLOGICAL CONTACTORS**<br>Post construction O&M. Rotating biological contactors consist of slowly rotating circular disks of polystyrene, polyvinyl chloride or other stable material which are partly exposed to the air and partly submerged in troughs containing wastewater. The disks are covered with microorganisms that degrade dissolved organic compounds as they rotate in and out of the wastewater. |
| 342XX | 11 | 03 | Volume of waste material | CY (M3) | **LAND TREATMENT/FARMING (SOLID PHASE BIODEGRADATION)**<br>Post construction O&M. Land treatment/farming is the technology in which wastes are deposited on or in the soil and naturally degraded by microbes. Degradation can be accomplished by stimulating naturally occurring bacteria in the soil with the addition of nutrients (biostimulation). Another means of accomplishing degradation is by the addition of bacteria to the soil (bioaugmentation) as well as nutrients. The method employed depends on the waste and concentration of naturally occurring bacteria in the soil. After the contaminated soil is excavated and placed on bermed and lined prepared beds |

| ACCOUNT (LEVEL 1) | SYSTEM (LEVEL 2) | SUBSYSTEM (LEVEL 3) | DESCRIPTION OF MEASUREMENT | UOM ENG(MET) | STANDARD DESCRIPTION |
|---|---|---|---|---|---|
| | | | | | or treatment cells, land treatment employs conventional agriculture practices and consists of : 1) placement of soil 2) tillage 3) nutrient application 4) irrigation and 5) land reclamation. |
| 342XX | 11 | 04 | Volume of waste material | CY (M3) | **IN-SITU BIODEGRADATION/BIORECLAMATION** Post construction O&M. In-situ biodegradation/bioreclamation is the in-place bioremediation of contaminated media. In-situ implies that there is no excavation of soil or extraction of groundwater or surface water. |
| 342XX | 11 | 05 | Volume of waste material | MGA (KLI) | **TRICKLING FILTERS** Post construction O&M. A trickling filtration system 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 by the microorganisms. Trickling filters consist of a highly permeable bed of media, rotary sprinklers, porous underdrain systems, and settling tanks. |
| 342XX | 11 | 06 | Volume of waste material | MGA (KLI) | **BIOLOGICAL LAGOONS** Post construction O&M. Biological lagoons use a lined earthen basin and sometimes aeration to promote the optimal growth of microorganisms for the effective remediation of contaminated liquids and sludges. This method of treatment relies on algal photosynthesis, adequate mixing, good inlet-outlet design and adequate air temperatures to operate efficiently. Facultative lagoons typically are used to treat low to medium strength organic wastes. Anaerobic lagoons and/or aerated lagoons are modified processes that treat wastes at higher rates. |
| 342XX | 11 | 07 | Volume of waste material | CY (M3) | **COMPOSTING** Post construction O&M. Composting is a process which biologically degrades soil contaminants, sludge, or municipal solid organic wastes. The contaminated media is mixed with organic nutrients. A bulking agent, such as wood chips, 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 or turned periodically or have complete mechanical mixing and aerating systems. |
| 342XX | 11 | 08 | Volume of waste material | CY (M3) | **SLUDGE STABILIZATION - AEROBIC** Post construction O&M. Aerobic sludge stabilization is the bioremediation treatment process in which bioremedial microorganisms use oxygen to biologically oxidize compounds. Assemblies for aerobic sludge stabilization include tanks, lagoons, air diffusers, aeration equipment, and pure oxygen systems. |
| 342XX | 11 | 09 | Volume of waste material | CY (M3) | **SLUDGE STABILIZATION - ANAEROBIC** Post construction O&M. Anaerobic sludge stabilization is the bioremediation treatment process in which bioremedial microorganisms do not require oxygen and exist and react in a relatively oxygen-free environment. Assemblies for anaerobic sludge stabilization include air-tight containers, pH monitors, lime, |

| ACCOUNT (LEVEL 1) | SYSTEM (LEVEL 2) | SUBSYSTEM (LEVEL 3) | DESCRIPTION OF MEASUREMENT | UOM ENG(MET) | STANDARD DESCRIPTION |
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| | | | | | and methane recovery systems. |
| 342XX | 11 | 10 | Volume of waste material | CY (M3) | **GENETICALLY ENGINEERED ORGANISMS (WHITE ROT FUNGUS)** Post construction O&M. Genetically engineered organisms refers to 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. |
| 342XX | 11 | 11 | Volume of waste material | CY (M3) | **SLURRY BIODEGRADATION** Post construction O&M. Slurry biodegradation is the use of microbial action to break down sludges 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. |
| 342XX | 11 | 12 | Surface area of waste material | SF (M2) | **BIOVENTING** Post construction O&M. A process for aerating subsurface soils, using injected air as the oxygen source, to stimulate in-situ biological activity and promote biodegredation of compounds amenable to biodegredation under aerobic conditions. In contrast to soil vapor extraction, bioventing is designed to maximize in-site biodegredation, rather then volatilization of amenable compounds. Thus, bioventing systems usually operate at much lower per well air flow rates than soil vapor extraction systems. Equipment required for bioventing includes wells, manifold piping, and blower(s). |
| 342XX | 11 | 13 | Surface area of waste material | SF (M2) | **BIOSLURPING** Post construction O&M. A process for recovering free phase light non-aqueous phase liquids (LNAPL) and/or contaminated groundwater from near the vadose zone/watertable interface via vacuum enhanced pumping; often accomplished with a variable length suction pipe (for extracting liquids) inside of a soil vapor extraction well. The screened interval of the soil vapor extraction well usually spans the vadose zone/watertable interface. Soil vapor extraction and free product/groundwater extraction occur simultaneously; resulting in aeration of surrounding soil which enhances biodegredation compounds amenable to biodegredation under aerobic conditions. Equipment required for bioslurping includes wells, mainifold 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 require treatment. |
| 342XX | 11 | 14 | Volume of waste material | CY (M3) | **BIOPILE (HEAP PILE REMEDIATION)** Post construction O&M. Biopile is a process for degrading and/or detoxifying contaminants by use of an ex-situ version of soil bioventing in which air is pulled or blown through the soil pile to stimulate indigenous hydrocarbon-degrading microorganisms. Required equipment includes piping, blower(s), liner, and knockout tanks. |
| 342XX | 11 | 50 | Each facility per duration of | EA/YR | **POST CONSTRUCTION O&M OF PERMANENT PLANT FACILITY** |

# HTRW OPERATION AND MAINTENANCE WORK BREAKDOWN STRUCTURE

| ACCOUNT (LEVEL 1) | SYSTEM (LEVEL 2) | SUBSYSTEM (LEVEL 3) | DESCRIPTION OF MEASUREMENT | UOM ENG(MET) | STANDARD DESCRIPTION |
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| | | | O&M | (EA/YR) | Post construction O&M of a permanent plant facility to remediate wastes through any of the technology subsystems listed above (342XX.11). Add a note for this item to explain which of the above subsystem technologies are used in the plant and and note the rated capacity of the plant such as MGA/DAY (KLI/DAY), CY/DAY (M3/DAY), etc. |
| 342XX | 11 | 9x | | | **OTHER (Use Numbers 90-99)**<br>Includes all post construction O&M for biological treatments not described by the above listed subsystems. |
| 342XX | 12 | | | | **CHEMICAL TREATMENT**<br>Includes post construction O&M (separate for each subsystem technology) of the plant facility, based on the volume of waste material treated, including portable treatment equipment which is charged on a time basis and can be used on more than one project (342XX.12.(01.-14.)). Includes a separate item for the yearly post construction O&M of a permanent plant facility (342XX.12.50.). Chemical treatment is the process in which hazardous wastes are chemically changed to remove toxic contaminants from the environment. Type of treatment included in this system are oxidation/reduction, solvent extraction, chlorination, ozonation, ion exchange, neutralization, hydrolysis, photolysis, dechlorination, and electrolysis reactions. Includes process equipment and chemicals required for treatment. For transportation see "Transport to Treatment Plant" (342XX.05.11, 342XX.06.08, 342XX.08.03 or 342XX.09.04). |
| 342XX | 12 | 01 | Volume of waste material | MGA (KLI) | **OXIDATION/REDUCTION (CATALYTIC OXIDATION, UV OZONE, PEROXIDE, SOLAR DETOXIFICATION)**<br>Post construction O&M. Oxidation/reduction (redox) reactions are those in which an atom or group of atoms loses electrons, hence oxidation/reduction is the transfer of electrons. In oxidation/reduction reactions the contaminant is usually oxidized. 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. For ozonation use "Ozonation" (342XX.12.04). |
| 342XX | 12 | 02 | Volume of waste material | MGA (KLI) | **SOLVENT EXTRACTION**<br>Post construction O&M. Separation processes in which two immiscible or partially soluble liquid phases are brought into contact for the transfer of one or more compounds are referred to as liquid-liquid extraction or, more loosely, as solvent extraction. The processes taking place are primarily physical, since 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 |

| ACCOUNT (LEVEL 1) | SYSTEM (LEVEL 2) | SUBSYSTEM (LEVEL 3) | DESCRIPTION OF MEASUREMENT | UOM ENG(MET) | STANDARD DESCRIPTION |
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| | | | | | 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" (342XX.13.09) for ex-situ extraction of contaminants from soils or "Soil Flushing" (342XX.13.10) for in-situ extraction of contaminants from soils. |
| 342XX | 12 | 03 | Volume of waste material | MGA (KLI) | **CHLORINATION**<br>Post construction O&M. Chlorination is the application of 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. |
| 342XX | 12 | 04 | Volume of waste material | MGA (KLI) | **OZONATION**<br>Post construction O&M. Ozone induced oxidation is a water or wastewater treatment process involving the use of ozone as an oxidizing agent. 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, while continuous operation uses two separate tanks, one being an overflow tank for excess ozone. Note that electricity (high amounts are used) should be included. Assemblies include post treatment to remove any residual ozone, and monitoring units. Oxidation can be increased by supplying ultraviolet (UV) radiation during treatment. |
| 342XX | 12 | 05 | Volume of waste material | MGA (KLI) | **ION EXCHANGE**<br>Post construction O&M. Ion exchange is the process by which inorganic compounds are removed by the capture of ions on a resinous material known as ion exchange resins. The resin is contained in a column and the wastewater is continuously passed through the column until the resin becomes exhausted, and is then regenerated. Ion exchange is not a destructive technology and the contaminated regenerant will eventually need disposal. Exchangers include cation exchangers, anion exchangers, and mixed-bed exchangers. Assemblies include ion exchange columns, chemical feed pumps, and storage tanks. |
| 342XX | 12 | 06 | Volume of waste material | MGA (KLI) | **NEUTRALIZATION**<br>Post construction O&M. Neutralization is the adjustment of a wastewater stream pH by the use of acids and caustics. Neutralization includes acids, caustics, chemical storage, mixing basins, pH probes and controls. |
| 342XX | 12 | 07 | Volume of waste material | MGA (KLI) | **CHEMICAL HYDROLYSIS**<br>Post construction O&M. Hydrolysis is the chemical reaction of water with |

| ACCOUNT (LEVEL 1) | SYSTEM (LEVEL 2) | SUBSYSTEM (LEVEL 3) | DESCRIPTION OF MEASUREMENT | UOM ENG(MET) | STANDARD DESCRIPTION |
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| | | | | | another substance in which hydrogen (H) and hydroxyl (OH) are added to the other substance usually forming two or more new compounds. Assemblies include feed systems, storage tanks, piping, and diaphragm metering pumps. |
| 342XX | 12 | 08 | Volume of waste material | MGA (KLI) | **ULTRAVIOLET PHOTOLYSIS**<br>Post construction O&M. Ultraviolet photolysis is the process by which chemical bonds are broken under the influence of 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 $CO_2$, $H_2O$, etc., is not probable. Equipment includes UV lamps, process pumps and monitors. Note that this account does not include UV oxidation. See "Oxidation/Reduction (Catalytic Oxidation...)" (342XX.12.01). |
| 342XX | 12 | 09 | Volume of waste material | CY (M3) | **DEHALOGENATION (CATALYTIC DECHLORINATION)**<br>Post construction O&M. Dehalogenation is the chemical process in which halogenated (usually chlorinated) organic compounds in an aqueous or soil media are mixed and heated with basic reagent to remove the halogens (usually chlorine). Included in this subsystem are all dehalogenation processess that are not based on alkali metals. See "Alkali Metal Dehalogenation" (342XX.12.10). |
| 342XX | 12 | 10 | Volume of waste material | CY (M3) | **ALKALI METAL DECHLORINATION**<br>Post construction O&M. Alkali metal dechlorination is the reaction of an alkali metal with a glycol for the removal of the halogens from halogenated organics such as fluorine, chlorine, bromine, and iodine. The alkali metal dechlorination process treats contaminated soils and sludges by using an alkaline metal mixed with a reagent to form a slurry, which is transferred to a concentrator reactor where the filtered waste is dechlorinated. The excess reagent is decanted and the soil is washed with water. The process requires dewatering pretreatment. This subsystem includes all generic alkali metal dehalogenation processess not specifically identified in other subsystems. See "Alkali Metal /Polyethylene Glycol (A/PEG)" (342XX.12.11). |
| 342XX | 12 | 11 | Volume of waste material | CY (M3) | **ALKALI METAL/POLYETHYLENE GLYCOL (A/PEG)**<br>Post construction O&M. APEG (and KPEG) are batch processes which detoxify halogenated aromatic and other organic compounds such as PCBs or pentachlorophenols (PCPs) by heating them with polyethylene glycol (PEG) and sodium hydroxide (NaPEG) or potassium hydroxide (KPEG) for several hours at 300 degrees 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 the polyethylene glycol in the presence of heat and oxygen. The reaction mechanism involves nucleophilic substitution/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 the polyethylene glycol. Typical |

| ACCOUNT (LEVEL 1) | SYSTEM (LEVEL 2) | SUBSYSTEM (LEVEL 3) | DESCRIPTION OF MEASUREMENT | UOM ENG(MET) | STANDARD DESCRIPTION |
|---|---|---|---|---|---|
| | | | | | 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 maybe applicable to soils, dredgings, sediments and low moisture sludges. |
| 342XX | 12 | 12 | Volume of waste material | CY (M3) | **BASE-CATALYZED DECOMPOSITION PROCESS (BCDP)**<br>Post construction O&M. The base-catalyzed decomposition process (BCDP) is a chemical dehalogenation treatment which is designed to dehalogenate (usually chlorinated) aromatic contaminants such as PCBs in sediment, oil, soil and sludge. For soil and sediment, the process uses two reactors. In the first reactor, the soil is mixed with sodium bicarbonate and heated at about 350 degrees C for one hour. 25%-75% of the halogenated aromatics are dehalogenated in this step. The rest are volatilized and passed on to the second reactor, a slurry or liquid phase reactor which utilizes a high boiling-point hydrocarbon oil, catalyst, sodium hydroxide and heat (350 degrees C) to dehalogenate/decompose the contaminants. Contaminated oily liquids (such as pesticides and PCB transformer oil) are treated with the slurry/liquid phase reactor only. |
| 342XX | 12 | 13 | Volume of waste material | MGA (KLI) | **ELECTROLYSIS**<br>Post construction O&M. Electrolysis (in-situ or ex-situ) 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. Electrolysis oxidizes the substances at the anode and reduces the substances at the cathode. Assemblies include trough-shaped elongated cells, monitoring equipment, anode and cathode material. |
| 342XX | 12 | 14 | Volume of waste material | CF (M3) | **VAPOR RECOVERY/REUSE (Internal Combustion Engine)**<br>Post construction O&M. Organic vapors may be suitable as the primary fuel for operation of internal combustion engines. Supplemental fuels are generally used to blend or supplant the contaminated vapors during periods of low production. |
| 342XX | 12 | 50 | Each facility per duration of O&M | EA/YR (EA/YR) | **POST CONSTRUCTION O&M OF PERMANENT PLANT FACILITY**<br>Post construction O&M of a permanent plant facility to remediate wastes through any of the technology subsystems listed above (342XX.12). Add a note for this item to explain which of the above subsystem technologies are used in the plant and and note the rated capacity of the plant such as MGA/DAY (KLI/DAY), CY/DAY (M3/DAY), etc. |
| 342XX | 12 | 9x | | | **OTHER (Use Numbers 90-99)**<br>Includes all post construction O&M for chemical treatments not described by the above listed subsystems. |
| 342XX | 13 | | | | **PHYSICAL TREATMENT** |

| ACCOUNT (LEVEL 1) | SYSTEM (LEVEL 2) | SUBSYSTEM (LEVEL 3) | DESCRIPTION OF MEASUREMENT | UOM ENG(MET) | STANDARD DESCRIPTION |
|---|---|---|---|---|---|
| | | | | | Includes post construction O&M (separate for each subsystem technology) of the plant facility, based on the volume of waste material treated, including portable treatment equipment which is charged on a time basis and can be used on more than one project (342XX.13.(01.-32.)). Includes a separate item for the yearly post construction O&M of a permanent plant facility (342XX.13.50.). These treatment processes are the physical separation of contaminants from solid, liquid or gaseous waste streams. The treatments are applicable to a broad range of contaminant concentrations. Physical treatments generally do not result in total destruction or separation of the contaminants in the waste stream, consequently post-treatment is often required. Type of physical treatment included in this system are filtration, sedimentation, flocculation, precipitation, equalization, evaporation, stripping, soil washing, and carbon adsorption. Includes process equipment and chemicals required for treatment. For transportation see "Transport to Treatment Plant" (342XX.05.11, 342XX.06.08, 342XX.08.03 or 342XX.09.04). |
| 342XX | 13 | 01 | Volume of waste material | MGA (KLI) | **FILTRATION/ULTRAFILTRATION**<br>Post construction O&M. Filtration is the physical process whereby particles suspended in a fluid are separated 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 and/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. Ultrafiltration occurs when particles are separated by forcing the fluid through a semi-permeable membrane. |
| 342XX | 13 | 02 | Volume of waste material | MGA (KLI) | **SEDIMENTATION**<br>Post construction O&M. Sedimentation is the 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. |
| 342XX | 13 | 03 | Volume of waste material | MGA (KLI) | **STRAINING**<br>Post construction O&M. Straining is the process by which wastewater is sent through a strainer to remove sludge and coarse solid materials. Assemblies include associated pumps, piping, and valves, storage tanks, and backwashing contaminated membranes. |
| 342XX | 13 | 04 | Volume of waste material | MGA (KLI) | **COAGULATION/FLOCCULATION/PRECIPITATION**<br>Post construction O&M. Coagulation is the increased clumping of particles in wastewater by biological or chemical means allowing for the separation of the particles from the water by sedimentation or filtration. It is often induced by chemicals such as lime, alum and iron salts. |
| 342XX | 13 | 05 | Volume of waste material | MGA (KLI) | **EQUALIZATION**<br>Post construction O&M. Equalization is the process in which collected wastewater is mixed to produce a homogenous solution and is discharged to a |

| ACCOUNT (LEVEL 1) | SYSTEM (LEVEL 2) | SUBSYSTEM (LEVEL 3) | DESCRIPTION OF MEASUREMENT | UOM ENG(MET) | STANDARD DESCRIPTION |
|---|---|---|---|---|---|
| | | | | | treatment plant. Blending is used to even out variations in contaminated soils and sludges, similar to equalization. Assemblies include mixers, aerators, discharging pumps and equalization tank. |
| 342XX | 13 | 06 | Volume of waste material | MGA (KLI) | **EVAPORATION**<br>Post construction O&M. Evaporation treats organic material that can be removed by heat. This is usually conducted under vacuum conditions increasing surface area to further promote separation. Assemblies include simple stills, flash and circulation evaporators, rotors, and heating. |
| 342XX | 13 | 07 | Volume of waste material | MGA (KLI) | **AIR STRIPPING**<br>Post construction O&M. Air stripping is the physical transfer of dissolved molecules from a liquid waste stream to a flowing gas. It is normally carried out as a continuous operation that employs a packed tower. For air stripping, liquid waste is pumped near the top of stripping column and flows downward through the tower, concurrent to an upward air flow. As the air flow contacts the liquid wastes, the volatile organics are stripped from the liquid waste. |
| 342XX | 13 | 08 | Volume of waste material | MGA (KLI) | **STEAM STRIPPING**<br>Post construction O&M. Steam stripping is the physical transfer of dissolved molecules from a liquid waste stream to a vapor stream. It is normally carried out as a continuous operation that employs a conventional fractional distillation column. For steam stripping, preheated wastewater is pumped near the top of the distillation column and flows downward, concurrent to an upward 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. |
| 342XX | 13 | 09 | Volume of waste material | CY (M3) | **SOIL WASHING (SURFACTANT/SOLVENT)**<br>Post construction O&M. Soil washing is an ex-situ separation technology which uses a fluid (usually water or water with wash improving additives) to remove hazardous, toxic, or radioactive contaminants from excavated soils, sludges 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 "Dehalogenation (Catalytic Dechlorination)" (342XX.12.09), "Alkali Metal Dechlorination" (342XX.12.10), "Solvent Extraction" (342XX.12.02) (which uses an organic chemical to dissolve, separate and concentrate organic contaminants) and "Soil Flushing (Surfactant/Solvent)" (342XX.13.10) for in-situ treatment. |
| 342XX | 13 | 10 | Volume of waste material | CY (M3) | **SOIL FLUSHING (SURFACTANT/SOLVENT)**<br>Post construction O&M. Soil flushing is an in-situ treatment of soils, sludges and sediments with water (with or without additives) to remove hazardous, toxic or radioactive contaminants. The wastewater is then recovered and |

| ACCOUNT (LEVEL 1) | SYSTEM (LEVEL 2) | SUBSYSTEM (LEVEL 3) | DESCRIPTION OF MEASUREMENT | UOM ENG(MET) | STANDARD DESCRIPTION |
|---|---|---|---|---|---|
| | | | | | treated. Assemblies include infiltration basins, water storage tanks with associated pumps, valves, and piping, groundwater recovery wells, and treatment for the recovered water. See "Soil Washing (Surfactant/solvent)" (342XX.13.09) for ex-situ treatment. |
| 342XX | 13 | 11 | Volume of waste material | CY (M3) | **SOLIDS DEWATERING**<br>Post construction O&M. Solids dewatering is the process of the removal of water by filtration, centrifugation, open air drying, or other mechanical or evaporative methods. Dewatering sludge facilitates disposal by burning or landfilling. Does not include dewatering through the use of a filter press, see "Filter Presses" (342XX.13.30). |
| 342XX | 13 | 12 | Volume of waste material | MGA (KLI) | **OIL/WATER SEPARATION**<br>Post construction O&M. Oil/water separation is the process of separating oil and water due to density differences and gravational pull. |
| 342XX | 13 | 13 | Volume of waste material | MGA (KLI) | **DISSOLVED AIR FLOATATION**<br>Post construction O&M. Dissolved air floatation (DAF) is commonly used as a pretreatment process for the separation of suspended solids, oil, and grease from wastewater without the use of 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, and tanks. |
| 342XX | 13 | 14 | Volume of waste material | CY (M3) | **HEAVY MEDIA SEPARATION**<br>Post construction O&M. Heavy media separation is the physical process used to separate materials of differing density by float/sink in a collodal suspension of a finely ground dense mineral. This suspension, or media, usually consists of a water-suspension of magnetite, galena or ferrosilicon. |
| 342XX | 13 | 15 | Volume of waste material | MGA (KLI) | **DISTILLATION**<br>Post construction O&M. Distillation is the process of purifying liquids through boiling, so that the steam condenses to a pure liquid and the pollutants remain in a concentrated residue. It involves two basic phases, the liquid phase and the vapor phase. The components which are 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. |
| 342XX | 13 | 16 | Volume of waste material | MGA (KLI) | **CHELATION**<br>Post construction O&M. Chelation is the process in which toxic metals are removed from the soil. Metals contained in the soil are contacted with an aqueous solution containing a chelating agent. The resulting slurry is dewatered and the chelating agent combined with the toxic metal is sent to a |

| ACCOUNT (LEVEL 1) | SYSTEM (LEVEL 2) | SUBSYSTEM (LEVEL 3) | DESCRIPTION OF MEASUREMENT | UOM ENG(MET) | STANDARD DESCRIPTION |
|---|---|---|---|---|---|
| | | | | | storage or treatment plant. Assemblies include conveyors, water storage tanks, dewatering devices, and associated piping and valves. |
| 342XX | 13 | 17 | Volume of waste material | MGA (KLI) | **SOLVENT EXTRACTION**<br>Post construction O&M. Refer to "Solvent Extraction" (342XX.12.02) for liquid-liquid extraction. Refer to "Soil Washing (Surfactant/Solvent)" (342XX.13.09) for ex-situ extraction of contaminants from soils. Refer to "Soil Flushing (Surfactant/Solvent) (342XX.13.10) for in-situ extraction of contaminants from soils. Refer to "Dehalogenation (Catalytic Dechlorination)" (342XX.12.09) of contaminated soils and sludges, "Alkali Metal Dechlorination" (342XX.12.10) and "Alkali Metal/Polyethylene Glycol (A/PEG)" (342XX.12.11) for related processes. |
| 342XX | 13 | 18 | Volume of waste material | MGA (KLI) | **SUPERCRITICAL EXTRACTION**<br>Post construction O&M. Supercritical extraction is the process in which the organic constituents of a waste stream are dissolved after mixing with a gas (such as carbon dioxide, propane, or butane) pressurized to the supercritical state. The enhanced solubilities of the fluid, due to the high pressures and temperatures, aid in the removal of the wastes. |
| 342XX | 13 | 19 | Volume of waste material | CF (M3) | **CARBON ADSORPTION - GASES**<br>Post construction O&M. Vessels containing activated carbon are used 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, prefilters, and items associated with regenerating the spent carbon. Organic carbon analyzers are used for on-line control. |
| 342XX | 13 | 20 | Volume of waste material | MGA (KLI) | **CARBON ADSORPTION - LIQUIDS**<br>Post construction O&M. Carbon adsorption use activated carbon 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, prefilters, and items associated with regenerating the spent carbon. |
| 342XX | 13 | 21 | Volume of waste material | MGA (KLI) | **MEMBRANE SEPARATION - REVERSE OSMOSIS**<br>Post construction O&M. Membrane separation removes dissolved salts, soluble silica, colloids and organic molecules from waste streams. Wastewater is collected and sent through a reverse osmosis system under pressure. The reverse osmosis systems filters, then concentrates waste materials while water easily passes through. Equipment includes reverse osmosis modules, chemical feed (usually acid), high pressure pumps, and treatment and disposal of the concentrate. |
| 342XX | 13 | 22 | Volume of waste material | MGA (KLI) | **MEMBRANE SEPARATION - ELECTRODIALYSIS**<br>Post construction O&M. Electrodialysis is the process in which an electrically |

| ACCOUNT (LEVEL 1) | SYSTEM (LEVEL 2) | SUBSYSTEM (LEVEL 3) | DESCRIPTION OF MEASUREMENT | UOM ENG(MET) | STANDARD DESCRIPTION |
|---|---|---|---|---|---|
| | | | | | charged membrane is introduced into a waste stream where the voltage drives the charged ions towards the membrane. Electrodialysis removes dissolved salts, soluble silica and organic materials from waste streams and concentrates the dissolved heavy metals. Assemblies include water storage tanks, associated pumps, piping, and valves, and backwashing of contaminated membranes. |
| 342XX | 13 | 23 | Volume of waste material | CY (M3) | **SOIL VAPOR EXTRACTION**<br>Post construction O&M. Soil vapor extraction (SVE), also known as vapor extraction, is a remediation technology which removes volatile organic compounds from soil by pulling air through the soil. The air is moved by means of a blower or vacuum pump connected to wells or trenches via piping. Associated equipment includes condensate handling devices, instrumentation and controls, and, in most cases, offgas treatment. The SVE process is distinct from vapor/gas venting and collection listed under “Gas/Vapor Collection Trench System” (342XX.07.01). Activities associated with SVE may include surface covering (placement of geomembrances) and Air Sparging (342XX.13.32.). |
| 342XX | 13 | 24 | Volume of waste material | CY (M3) | **SHREDDING**<br>Post construction O&M. Shredding is used to break up large solid wastes and process drums and their contents. Necessary equipment includes conveyors and rotary shear shredders. |
| 342XX | 13 | 25 | Volume of waste material | CY (M3) | **AERATION**<br>Post construction O&M. Aeration is the process of bringing about contact between air and water for the purpose of promoting biological degradation. Aeration is employed in several biological technologies including activated sludge, rotating biological contactors, trickling filters and biological lagoons. Assemblies include tanks, air diffusers, and reactors. |
| 342XX | 13 | 26 | Volume of waste material | CY (M3) | **ADVANCED ELECTRICAL REACTOR**<br>Post construction O&M. The advanced electrical reactor employs a thermal destruction process in which wastes are incinerated within a reactor core that is heated by electrically heated carbon electrodes (which are insulated by nitrogen gas). Included are reactor ownership/rental, feeders for solids and nozzles for liquids, and post reactor treatment. |
| 342XX | 13 | 27 | Volume of waste material | CY (M3) | **LOW LEVEL WASTE (LLW) COMPACTION**<br>Post construction O&M. Compacting is used for densifying the volume of LLW (radioactive) waste prior to disposal. Necessary equipment includes compactors, conveyors and compactor/shredder units and applicable ventilation systems. Also included are ownership/rental, setup and testing. This does not include waste transportation or disposal. |
| | | | | | |

# HTRW OPERATION AND MAINTENANCE WORK BREAKDOWN STRUCTURE

| ACCOUNT (LEVEL 1) | SYSTEM (LEVEL 2) | SUBSYSTEM (LEVEL 3) | DESCRIPTION OF MEASUREMENT | UOM ENG(MET) | STANDARD DESCRIPTION |
|---|---|---|---|---|---|
| 342XX | 13 | 28 | Volume of waste material | CY (M3) | **AGGLOMERATION**<br>Post construction O&M. Agglomeration is the transformation of sludge into dry, dense pellets. Agglomeration is accomplished by batchmixing sludge with an agglomeration agent. |
| 342XX | 13 | 29 | Volume of waste material | MGA (KLI) | **IN-SITU STEAM EXTRACTION**<br>Post construction O&M. In-situ steam extraction is the removal of hydrocarbons from contaminated soils by the continuous pumping of steam and heated compressed air and recovery of the subsequent contaminated water and offgases which are cooled to condense water and organics. The resultant air-stream is then treated (by carbon adsorption, catalytic oxidation, etc.), 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. |
| 342XX | 13 | 30 | Volume of waste material | MGA (KLI) | **FILTER PRESSES**<br>Post construction O&M. Filter presses are used for sludge dewatering. Filter presses consist of a number of chamber filter plates which sludge is pumped between. Under high pressure, the plates are forced together which effectively dewaters the sludge. The resulting sludge cake is then discharged from the press. Assemblies include filter press ownership/rental costs, operating 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 pipework. |
| 342XX | 13 | 31 | Volume of waste material | CY (M3) | **LIGNIN ADSORPTION/SORPTIVE CLAYS**<br>Post construction O&M. Lignin adsorption/sorptive clays are used to treat aqueous waste streams with organic, inorganic and heavy metals contamination. The waste stream is treated due to the molecular adhesion of the contaminants to an adsorptive surface. |
| 342XX | 13 | 32 | Volume of waste material | MGA (KLI) | **AIR SPARGING**<br>Post construction O&M. Air sparging is a ground water remediation technology which removes organic contaminants by injecting air into the aquifer and allowing the air to pass upward into the unsaturated soil. Contaminants are removed either through partitioning into the moving air or through biodegradation enhanced by the introduction of dissolved oxygen from the injected air. The injected air is almost always meant 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. |
| 342XX | 13 | 50 | Each facility per duration of | EA/YR | **POST CONSTRUCTION O&M OF PERMANENT PLANT FACILITY** |

# HTRW OPERATION AND MAINTENANCE WORK BREAKDOWN STRUCTURE

| ACCOUNT (LEVEL 1) | SYSTEM (LEVEL 2) | SUBSYSTEM (LEVEL 3) | DESCRIPTION OF MEASUREMENT | UOM ENG(MET) | STANDARD DESCRIPTION |
|---|---|---|---|---|---|
| | | | O&M | (EA/YR) | Post construction O&M of a permanent plant facility to remediate wastes through any of the technology subsystems listed above (342XX.13). Add a note for this item to explain which of the above subsystem technologies are used in the plant and and note the rated capacity of the plant such as MGA/DAY (KLI/DAY), CY/DAY (M3/DAY), etc. |
| 342XX | 13 | 9x | | | **OTHER (Use Numbers 90-99)**<br>Includes all post construction O&M for physical treatments not described by the above listed subsystems. |
| 342XX | 14 | | | | **THERMAL TREATMENT**<br>Includes post construction O&M (separate for each subsystem technology) of the plant facility, based on the volume of waste material treated, including portable treatment equipment which is charged on a time basis and can be used on more than one project (342XX.14.(01.-07.)). Includes a separate item for the yearly post construction O&M of a permanent plant facility (342XX.14.50.). Thermal treatment is the destruction of wastes through exposure to high temperature in combustion chambers and energy recovery devices. Several processes capable of incinerating a wide range of liquid and solid wastes include fluidizied bed, rotary kiln, multiple hearth, infrared, circulating bed, liquid injection, pyrolysis, plasma torch, wet air oxidation, supercritical water oxidation, molten salt destruction, and solar detoxification. Includes process equipment and chemicals required for treatment. For transportation see "Transport to Treatment Plant" (342XX.05.11, 342XX.06.08, 342XX.08.03 or 342XX.09.04). |
| 342XX | 14 | 01 | Volume of waste material | CY (M3) | **INCINERATION**<br>Post construction O&M. Includes fluidized bed, rotary kiln, multiple hearth, infrared, circulating bed, liquid injection, pyrolysis, plasma torch, wet air oxidation, batch, etc. Incineration is the thermal destruction of wastes through burning in combustion chambers and energy recovery devices. Incineration is accomplished by oxidative or pyrolytic methods. Auxillary equipment includes shredders, conveyors, blowers, fuel system, instrumentation and controls, bag houses, scrubbers, and treated material handling systems. |
| 342XX | 14 | 02 | Volume of waste material | CY (M3) | **LOW TEMPERATURE THERMAL DESORPTION**<br>Post construction O&M. Includes fluidized bed, rotary kiln, multiple hearth, infrared, circulating bed, liquid injection, pyrolysis, plasma torch, wet air oxidation, batch, etc. Low temperature thermal desorption (also called Low Temperature Volatilization) heats (directly or indirectly) contaminated media such as soil, sediments, sludges and filter cakes between 200 - 1000 degrees 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. Auxillary equipment includes shredders, conveyors, blowers, fuel system, instrumentation and controls, bag houses, scrubbers, and treated material |

| ACCOUNT (LEVEL 1) | SYSTEM (LEVEL 2) | SUBSYSTEM (LEVEL 3) | DESCRIPTION OF MEASUREMENT | UOM ENG(MET) | STANDARD DESCRIPTION |
|---|---|---|---|---|---|
| | | | | | handling systems. |
| 342XX | 14 | 03 | Volume of waste material | MGA (KLI) | **SUPERCRITICAL WATER OXIDATION**<br>Post construction O&M. Supercritical water oxidation decontaminates wastewater by heating it above the critical point of water and adding an oxidant such as air, oxygen, or hydrogen peroxide to oxidize the organic contaminants to mainly carbon dioxide and water. Resultant gases such as $CO_2$, $N_2$, and $NO_x$ (from nitrogen compounds) are removed as the effluent is cooled and depressurized. Halogenated compounds produce the corresponding halogen acids and sulfur-containing compounds produce sulfuric acid. |
| 342XX | 14 | 04 | Volume of waste material | CY (M3) | **MOLTEN SALT DESTRUCTION**<br>Post construction O&M. Molten salt destruction is the combustion of waste materials in a bed of molten salt. Wastes are fed into a vessel containing the molten salt and air in which 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, with the most common being sodium carbonate and potassium carbonate. Assemblies for molten salt destruction include salts, incinerators, storage systems, filtration systems, dewatering pretreatment systems, plus a secondary reactor and cleanup system for offgases. |
| 342XX | 14 | 05 | Volume of waste material | CY (M3) | **RADIO FREQUENCY HEATING**<br>Post construction O&M. Radio frequency heating includes heating soil with radio frequency waves to thermally decompose, vaporize, and distill hazardous constituents. Vapors emitted from the soil are collected in a vapor barrier above the soil surface for treatment or incineration. |
| 342XX | 14 | 06 | Volume of waste material | CY (M3) | **SOLAR DETOXIFICATION**<br>Post construction O&M. Solar detoxification photolytically degrades vaporized soil contaminants in a solar reactor into which sunlight is focused from a parabolic mirror array. The vaporized contaminants flow into the reactor after being desorbed from the soil when the latter is heated to about 750 degrees F. |
| 342XX | 14 | 07 | Volume of waste material | CY (M3) | **HIGH TEMPERATURE THERMAL DESORPTION**<br>Post construction O&M. High temperature thermal desorption unit >340 deg C (>650 deg F) is suitable for treatment of material contaminated by organic compounds that are classified as semivolitile. Oxygen levels may be limited or reduced to prevent combustion in the primary chamber. |
| 342XX | 14 | 50 | Each facility per duration of O&M | EA/YR (EA/YR) | **POST CONSTRUCTION O&M OF PERMANENT PLANT FACILITY**<br>Post construction O&M of a permanent plant facility to remediate wastes through any of the technology subsystems listed above (342XX.14). Add a note for this item to explain which of the above subsystem technologies are |

| ACCOUNT (LEVEL 1) | SYSTEM (LEVEL 2) | SUBSYSTEM (LEVEL 3) | DESCRIPTION OF MEASUREMENT | UOM ENG(MET) | STANDARD DESCRIPTION |
|---|---|---|---|---|---|
| | | | | | used in the plant and and note the rated capacity of the plant such as MGA/DAY (KLI/DAY), CY/DAY (M3/DAY), etc. |
| 342XX | 14 | 9x | | | **OTHER (Use Numbers 90-99)**<br>Includes all post construction O&M for thermal treatment not described by the above listed subsystems. |
| 342XX | 15 | | | | **STABILIZATION/FIXATION/ENCAPSULATION**<br>Includes post construction O&M (separate for each subsystem technology) of the plant facility, based on the volume of waste material treated, including portable treatment equipment which is charged on a time basis and can be used on more than one project (342XX.15.(01.-07.)). Includes a separate item for the yearly post construction O&M of a permanent plant facility (342XX.15.50.). Stabilization/fixation/encapsulation processes attempt to improve the handling and physical characteristics of the wastes, decrease the surface area, limit the solubility of any pollutants and detoxify contained pollutants. For transportation see "Transport to Treatment Plant" (342XX.05.11, 342XX.06.08, 342XX.08.03 or 342XX.09.04). |
| 342XX | 15 | 01 | Volume of waste material | CY (M3) | **MOLTEN GLASS**<br>Post construction O&M. Molten glass is used in destroying combustible hazardous organic wastes and/or encapsulating the solid byproducts. During the process a pool of molten glass is developed and maintained by a high amount of electrical current passing between submerged electrodes. Combustible gases are mixed with air, ignite and react above the pool of 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 used to collect settling particles, heat recovery and air pollution control systems. Does not include the excavation and transport of contaminated material, see "Solids Collection and Containment" (342XX.08) and "Liquids/Sediments/Sludges Collection and Containment" (342XX.09). |
| 342XX | 15 | 02 | Volume of waste material | CY (M3) | **IN-SITU VITRIFICATION**<br>Post construction O&M. In-situ vitrification is the in-place encapsulation of contaminated soils and sludges into a solid glassy matrix by melting the soil using large amounts of electrical current. Assemblies include electrical generators, electrical power distribution, electrodes, graphite placed over the soil to establish a conductive path and exhaust hood system to capture gaseous wastes. |
| 342XX | 15 | 03 | Volume of waste material | CY (M3) | **IN-SITU POZZOLAN PROCESS (LIME/PORTLAND CEMENT)**<br>Post construction O&M. In-situ Pozzolan Process is the in-place encapsulation of waste material by combining pozzolanic (siliceous) material, lime, or portland cement with water to form a concrete-like solid and left in place, encapsulating the waste. Pozzolanic material includes fly ash, blast-furnace slag and cement |

| ACCOUNT (LEVEL 1) | SYSTEM (LEVEL 2) | SUBSYSTEM (LEVEL 3) | DESCRIPTION OF MEASUREMENT | UOM ENG(MET) | STANDARD DESCRIPTION |
|---|---|---|---|---|---|
| | | | | | kiln dust. |
| 342XX | 15 | 04 | Volume of waste material | CY (M3) | **POZZOLAN PROCESS (LIME/PORTLAND CEMENT)** Post construction O&M. Pozzolanic (siliceous) material, lime, or portland cement, and water are mixed to form a concrete-like solid matrix in which the waste is encapsulated. Batchmixers or pugmills are routinely used for the mixing of waste material, pozzolanic material and water. Pozzolanic material includes fly ash, ground blast-furnace slag, and cement kiln dust. Does not include the excavation and transport of contaminated material, see "Solids Collection and Containment" (342XX.08) and "Liquids/Sediments/Sludges Collection and Containment" (342XX.09). |
| 342XX | 15 | 05 | Volume of waste material | CY (M3) | **ASPHALT-BASED ENCAPSULATION** Post construction O&M. Asphalt-based encapsulation uses asphalt to form a matrix encapsulating contaminated liquid or solid wastes. The process entails mixing waste and asphalt together, placement in a mold, and heating until they fused together in a stable matrix. Asphalt-based encapsulation include dewatering, organic polymers, lime, kiln dust, or portland cement. |
| 342XX | 15 | 06 | Volume of waste material | CY (M3) | **RADIOACTIVE WASTE SOLIDIFICATION (GROUTING/OTHER)** Post construction O&M. Radioactive waste solidification additives are used to form a uniform and stable matrix to encapsulate radioactive waste materials. Assemblies include pumps for liquids or slurries, conveyors for sludges or solids, storage silos, weigh feeders, piping, mixers and disposal or storage. |
| 342XX | 15 | 07 | Volume of waste material | CY (M3) | **SLUDGE STABILIZATION (AGGREGATE/ROCK/SLAG)** Post construction O&M. Sludge stabilization is the solidification of contaminated wastes using aggregate, rock and slag additives to form a uniform and stable matrix to encapsulate waste materials. Sludge stabilization include pumps for liquids or slurries, conveyors for sludges or solids, storage silos, weigh feeders, piping, mixers and disposal or storage. |
| 342XX | 15 | 50 | Each facility per duration of O&M | EA/YR (EA/YR) | **POST CONSTRUCTION O&M OF PERMANENT PLANT FACILITY** Post construction O&M of a permanent plant facility to remediate wastes through any of the technology subsystems listed above (342XX.15). Add a note for this item to explain which of the above subsystem technologies are used in the plant and and note the rated capacity of the plant such as MGA/DAY (KLI/DAY), CY/DAY (M3/DAY), etc. |
| 342XX | 15 | 9x | | | **OTHER (Use Numbers 90-99)** Includes all post construction O&M for stabilization/fixation/encapsulation treatments not described by the above listed subsystems. |
| 342XX | 18 | | | | **DISPOSAL (OTHER THAN COMMERCIAL)** Includes post construction O&M (separate for each subsystem disposal method) of the plant facility, based on the volume of waste material disposed, including portable treatment equipment which is charged on a time basis and |

| ACCOUNT (LEVEL 1) | SYSTEM (LEVEL 2) | SUBSYSTEM (LEVEL 3) | DESCRIPTION OF MEASUREMENT | UOM ENG(MET) | STANDARD DESCRIPTION |
|---|---|---|---|---|---|
| | | | | | can be used on more than one project (331XX.18.(01.-10.)). Includes a separate item for the yearly post construction O&M of a permanent disposal facility (342XX.18.15.). Disposal (Other than Commercial) provides for the final placement of HTRW or ordnance at facilities owned or controlled by the Government. An example would be the disposal of wastes through burial at a DOE nuclear facility or ordnance disposal at DOD facilities. Includes handling, disposal fees, and transportation to the final Destruction/Disposal/Storage facility. Excluded is the transportation to a facility for treatment prior to final disposal. For transportation prior to final disposal see "Transport to Treatment Plant" (342XX.05.11, 342XX.06.08, 342XX.08.03 or 342XX.09.04). Disposal may be accomplished through the use of secure landfills, burial grounds, trench, pits, above ground vault, underground vault, underground mine/shaft, tanks, pads (tumulus / retrievable storage, other), storage buildings or protective cover structures, cribs, deep well injection, incinerator, or other. |
| 342XX | 18 | 01 | Volume of waste material | CY (M3) | **LANDFILL / BURIAL GROUND / TRENCH / PITS** Provides for post construction O&M of a landfill, burial ground, burial trench, or burial pits. For disposal taxes and fees charged between agencies or departments, see "Disposal Fees and Taxes" (342XX.18.22). |
| 342XX | 18 | 02 | Volume of waste material | CY (M3) | **ABOVE GROUND VAULT** Provides for post construction O&M of an above ground disposal vault. For disposal taxes and fees charged between agencies or departments, see "Disposal Fees and Taxes" (342XX.18.22). |
| 342XX | 18 | 03 | Volume of waste material | CY (M3) | **UNDERGROUND VAULT** Provides for post construction O&M of an underground disposal vault. For disposal taxes and fees charged between agencies or departments, see "Disposal Fees and Taxes" (342XX.18.22). |
| 342XX | 18 | 04 | Volume of waste material | CY (M3) | **UNDERGROUND MINE / SHAFT** Provides for post construction O&M of an underground disposal mine/shaft. For disposal taxes and fees charged between agencies or departments, see "Disposal Fees and Taxes" (342XX.18.22). |
| 342XX | 18 | 05 | Volume of waste material | MGA (KLI) | **TANKS** Provides for post construction O&M of disposal storage tanks. For disposal taxes and fees charged between agencies or departments, see "Disposal Fees and Taxes" (342XX.18.22). |
| 342XX | 18 | 06 | Volume of waste material | CY (M3) | **PADS (TUMULUS / RETRIEVABLE STORAGE / OTHER)** Provides for post construction O&M of a disposal pads (tumulus, retrievable storage, or other). For disposal taxes and fees charged between agencies or departments, see "Disposal Fees and Taxes" (342XX.18.22). |
| 342XX | 18 | 07 | Volume of waste material | CY (M3) | **STORAGE BLDGS / PROTECT CVR STRUCT / OTHER BLDGS & STRUCT** Provides for post construction O&M of disposal storage buildings, protective |

| ACCOUNT (LEVEL 1) | SYSTEM (LEVEL 2) | SUBSYSTEM (LEVEL 3) | DESCRIPTION OF MEASUREMENT | UOM ENG(MET) | STANDARD DESCRIPTION |
|---|---|---|---|---|---|
| | | | | | cover structures, or other disposal storage structures. For disposal taxes and fees charged between agencies or departments, see "Disposal Fees and Taxes" (342XX.18.22). |
| 342XX | 18 | 08 | Volume of waste material | CY (M3) | **CRIBS**<br>Provides for post construction O&M of disposal cribs. For disposal taxes and fees charged between agencies or departments, see "Disposal Fees and Taxes" (342XX.18.22). |
| 342XX | 18 | 09 | Volume of waste material | CY (M3) | **DEEP WELL INJECTION**<br>Provides for post construction O&M of a deep well injection facility. For disposal taxes and fees charged between agencies or departments, see "Disposal Fees and Taxes" (342XX.18.22). |
| 342XX | 18 | 10 | Volume of waste material | CY (M3) | **INCINERATOR**<br>Provides for post construction O&M of an incinerator. For disposal taxes and fees charged between agencies or departments, see "Disposal Fees and Taxes" (342XX.18.22). |
| 342XX | 18 | 15 | Each facility per duration of O&M | EA/YR (EA/YR) | **POST CONSTRUCTION O&M OF PERMANENT DISPOSAL FACILITY**<br>Post construction O&M of a permanent disposal facility to remediate wastes through any of the disposal methods listed above (342XX.18). Add a note for this item to explain which of the above subsystem disposal methods are used in the plant. |
| 342XX | 18 | 20 | Number of waste containers | EA (EA) | **CONTAINER HANDLING**<br>Provides for all post construction operation work associated with the handling of waste containers for periodic inventory or inspection. Does not include placement of waste into disposal units. |
| 342XX | 18 | 21 | Weight of waste material | TON (MT) | **TRANSPORTATION TO STORAGE/DISPOSAL FACILITY**<br>Transport to storage/disposal facility during post construction operation includes equipment, materials, and labor for hauling, loading and unloading of solid waste and liquid wastes. |
| 342XX | 18 | 22 | Weight of waste material | TON (MT) | **DISPOSAL FEES AND TAXES**<br>Provides for all fees and taxes charged during post construction operation for the disposal of wastes. These include fees and taxes charged between agencies, departments and activities at government facilities. |
| 342XX | 18 | 23 | Weight of waste material | TON (MT) | **MIXED WASTE STORAGE FEES AND TAXES**<br>Provides for all fees and taxes charged during post construction operation for the storage of mixed wastes at government facilities. |
| 342XX | 18 | 9x | | | **OTHER (Use Numbers 90-99)**<br>Includes all post construction O&M for disposal (other than commercial) not described by the above listed subsystems. |

# HTRW OPERATION AND MAINTENANCE WORK BREAKDOWN STRUCTURE

| ACCOUNT (LEVEL 1) | SYSTEM (LEVEL 2) | SUBSYSTEM (LEVEL 3) | DESCRIPTION OF MEASUREMENT | UOM ENG(MET) | STANDARD DESCRIPTION |
|---|---|---|---|---|---|
| 342XX | 22 | | | | **GENERAL REQUIREMENTS**<br>Consists of general requirements during post construction O&M which are not specifically identifiable in the other systems such as indirect, overhead, profit, and other general requirements. This system is OPTIONAL. It may be used to separately show general requirements; however, if it is not used, general requirements must be distributed throughout in the other systems. |
| 342XX | 22 | 01 | Duration on site | MO (MO) | **SUPERVISION AND MANAGEMENT**<br>Personnel, vehicles, and per diem required for field supervision and management during post construction O&M. Also includes personnel at the home office not captured under home office G&A (342XX.22.12.). |
| 342XX | 22 | 02 | Duration on site | MO (MO) | **ADMINISTRATION JOB OFFICE**<br>Personnel, vehicles, travel and per diem, and adminstrative supplies required for field administration during post construction O&M. Also includes personnel at the home office not captured under home office G&A (342XX.22.12.). |
| 342XX | 22 | 03 | Duration on site | MO (MO) | **WAREHOUSE, MATERIALS HANDLING, AND PURCHASING**<br>Personnel, vehicles, travel and per diem, supplies and equipment required for field warehouse, materials handling, and purchasing during post construction O&M. |
| 342XX | 22 | 04 | Duration on site | MO (MO) | **ENGINEERING, SURVEYING AND QUALITY CONTROL**<br>Personnel, vehicles, travel and per diem, supplies, equipment, and engineering services required for field engineering, surveying, and quality control/assurance during post construction O&M. Also includes personnel at the home office not captured under home office G&A (342XX.22.12.). |
| 342XX | 22 | 06 | Duration on site | MO (MO) | **FIRST AID, FIRE PROTECTION, TRAFFIC CONTROL AND SECURITY**<br>Personnel, vehicles, travel and per diem, equipment, and related items for field first aid, fire protection, traffic control and security during post construction O&M. |
| 342XX | 22 | 07 | Duration on site | MO (MO) | **HEALTH AND SAFETY**<br>Personnel, vehicles, travel and per diem, protective equipment, personnel protective equipment and clothing, monitoring, training, exams, and related items required for field health and safety during post construction O&M. |
| 342XX | 22 | 11 | Duration on site | MO (MO) | **MISCELLANEOUS PROJECT EXPENSES**<br>Photographs, videos, air freight, submittals and permits, signs, winterization, inventory, property protection, vehicles, travel and per diem, and other miscellaneous project expenses during post construction O&M. |
| 342XX | 22 | 12 | Duration on site | MO (MO) | **INSURANCE, INTEREST, AND FEES**<br>Insurance, interest, home office G&A, profit, and bond during post construction |

# HTRW OPERATION AND MAINTENANCE WORK BREAKDOWN STRUCTURE

| ACCOUNT (LEVEL 1) | SYSTEM (LEVEL 2) | SUBSYSTEM (LEVEL 3) | DESCRIPTION OF MEASUREMENT | UOM ENG(MET) | STANDARD DESCRIPTION |
|---|---|---|---|---|---|
| | | | | | O&M. |
| 342XX | 22 | 9x | | | **OTHER (Use Numbers 90-99)**<br>Includes all post construction O&M general requirements not described in the above listed subsystems. |