



Individual Aquifer Protection Permit Closure and Post-Closure Plan/Strategy and Cost Estimate Checklist

Permittee:	Inventory No.:
Reviewer:	LTF:
Today's Date	Checked By

Checklist Instructions

This checklist is provided as a guideline for ADEQ staff in performing their substantive review and as guidance to the applicant on what information ADEQ will need to review for a Closure and Post-Closure Strategy and Cost Estimates for Aquifer Protection Permit applications. The strategy should be reviewed first to make sure there is a complete facility list and acceptable strategy that meets regulatory requirements. Once this is accomplished, the cost estimates associated with each task should be reviewed¹.

This checklist is intended to address three types of discharging facilities commonly permitted at mines, industrial facilities and wastewater treatment plants: surface impoundments (including mine tailings ponds, evaporation/infiltration ponds, process ponds, etc.), heap leach pads, and piles (including solid waste/landfill, waste rock piles and non-inert overburden). Many of the applications submitted to ADEQ will have one of these types of facilities, but not every type of discharging facility is listed. Point of compliance (POC) wells are included as well for evaluation of the costs for installation, monitoring and abandonment, as applicable. Please visit the www.azdeq.gov to find program specific information including applications, rules, statutes, the Arizona Mining BADCT Guidance Manual, and other guidance information. This checklist does not supplant or supersede statutory or rule requirements and is not intended to be binding on the applicant or ADEQ staff.

¹ ADEQ recommends the State of Nevada’s Standardized Reclamation Cost Estimator (SRCE) Excel workbook as a tool to evaluate cost estimates. Although applicants are not required to use SRCE, its use may expedite ADEQ’s review.



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Section 1: Closure and Post-Closure Strategy

Y: yes, meets the requirement; N: no, does not meet the requirement (see comment below); NA: does not apply

The closure strategy must address each discharging facility listed in the permit. Similar facilities may be addressed collectively in the narrative descriptions listed below.

The requirements for closure and post-closure are listed in A.A.C. R18-9-A209 and definitions for “closed facility” and “clean closure” are included in A.R.S. § 49-201. A closure strategy may achieve clean closure for one or more discharging facilities listed in the permit, in which case post-closure maintenance and monitoring are not required for those facilities. If you have questions regarding clean closure requirements, please contact the ADEQ Groundwater Section. The APP application for Clean Closure form is available on the ADEQ website.

The information needed in a strategy to evaluate costs includes the narrative descriptions below.

All assumptions made in the strategy should be fully explained.

After each of these narrative descriptions for each discharging facility is reviewed, the more detailed information for the cost estimates should be evaluated. The cost estimates items in Section 3, should match the activities described in the strategy.

	Narrative description of each facility and the pollutants discharged
comment	
	Narrative description of the site investigation plan for each facility for the purpose of closure
comment	
	Narrative description of the closure design for each facility (e.g. removal, treatment/disposal, discharge control features)
comment	
	Narrative description of each activity to be conducted for closure for each facility and the timing of each activity
comment	
	Narrative description of any post-closure maintenance, monitoring, inspections and reporting for each facility and the duration ²
comment	
	Narrative description of the documentation such as test results, drawings and reports on the closure and post-closure activities to be provided
comment	
	Narrative description of limitations on future land or water uses, or both, at the facility as a result of facility operations
comment	
	Narrative description of the location of borrow/cover source, the road/routes from borrow/cover source to locations where the borrow/cover will be placed, and a description of the areas where a financial demonstration for closure and post-closure has been made to another governmental agency.
comment	

² Duration of post-closure maintenance and monitoring will vary. The strategy should provide the rationale for the proposed post-closure duration.



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Section 2: Cost Estimate Description

Y: yes, meets the requirement; N: no, does not meet the requirement (see comment below); NA: does not apply

Cost estimates for closure and post-closure based on a strategy must be derived by an engineer, controller, or accountant using competitive bids, construction plan take-off's, specifications, operating history for similar facilities, or other appropriate sources. The cost estimates must be representative of regional fair market costs.

The cost estimate should consider and specify unit rates³ including equipment production rates, rental costs, standard labor costs⁴, analytical costs⁵, and geotechnical testing costs⁶, as applicable. The cost estimates are to be provided for each discharging facility and contain details to demonstrate the estimates are sufficient to verify total costs. The most common deficiency associated with closure and post-closure cost estimates is the lack of detail for line item costs. Line item details should include quantities (volumes, etc.), units, unit costs, itemized costs, and total cost.

³ Unit Rate Sources: The applicant should develop and implement a comprehensive unit rate breakdown for all closure and post-closure cost estimates. Line items in the unit rate cost breakdown should include detailed explanations for all components. This should include any assumptions, lengths, dimensions, unit rate conversions, and any other data necessary to justify unit rate costing. For the creation of a comprehensive unit rate breakdown, ADEQ recommends using the most current year costs referenced to a verifiable source such as RS Means. RS Means is a division of Reed Business Information that provides cost (materials, equipment, etc.) information to the construction industry so contractors in the industry can provide accurate estimates and projections for their project costs. It has become a data standard for government work in terms of pricing (unit rates), and is widely used by the industry as a whole. RS Means is accessible online and it also integrated in a variety of cost estimating software packages (databases, etc.) to allow for fast and reliable estimating. Cost information is updated annually and is available online, via CD-ROM, or in book form. The RS Means website, for unit rate information, is located at <http://www.rsmeansonline.com>. ADEQ also recommends the use of the most recent edition of the Caterpillar Performance Handbook (CPH) for determining machinery performance in relation to unit rates applied for earth-material moved. A large percentage of closure costs are applicable to equipment costs. The unit rate used for equipment should accurately reflect all costs such as fuel price, fuel consumption, lubricants, tire life/replacement, and repair costs. The CPH also provides hourly production figures for various types of machines under various conditions (slopes, power-rating/speeds, blade-types, etc.). Production rates are also provided in the CPH, which is most important when determining estimated total closure and post-closure costs. An on-line edition of the CPH can be located by searching the Caterpillar website at <http://westernstatescat.com>. The applicant may be well informed to review the available files found under the State of Nevada's Standardized Reclamation Cost Estimator (SRCE). The SRCE is an Excel workbook file that contains a data model to calculate reclamation costs. The cost-data file contains region specific SRCE model inputs such as DBA labor rates, applicable fuel and rental equipment rates, and mobilization/demobilization (RS Means) costs. One important note is that the SRCE also uses local vendor cost quotes as an additional unit rate source. The most recent version of the SRCE can be located at <http://www.nvbond.org>.

⁴ Hourly Labor Rates for Closure Post-Closure Costs using the Davis-Bacon Act (DBA): The State of Arizona does not have its own Arizona prevailing wage law. As a consequence, the use of federal wage rates governed under the Davis-Bacon Act (DBA) should be utilized for all appropriate mine closure and post-closure costs (heavy equipment operator, laborer, etc.). The DBA is governed under the United States Department of Labor. Several websites provide current labor rates based on the State selected; county where construction will take place; and construction activity type. Using the search feature will provide all the details necessary to determine labor costs, such as the various skill-levels for power operators or whether union or non-union rates apply for the location. ADEQ highly recommends that the applicant review the website <https://beta.sam.gov/> for assistance in developing labor rates for closure and post-closure costs.

⁵ Analytical Costs: The applicant should provide current analytical laboratory costs for all sample analysis required under the closure and post-closure strategy/plan. The cost for each analytical method should be derived from an Arizona Certified (licensed) Laboratory. A list of Arizona Certified Laboratories can be obtained from the Arizona Department of Health Services (ADHS) which is located at <http://www.azdhs.gov/lab/license>.

⁶ Geotechnical Testing Costs: The applicant should provide current costs for all geotechnical and materials sample analysis required under the closure and post-closure strategy/plan. The cost for each analysis method should reflect costs for standard American Society for Testing and Materials (ASTM) procedures or other standard test methods. Note that some labs may be accredited by the American Association of Highway and Transportation Officials (AASHTO) or other organizations and/or operate under the technical supervision of a registered professional engineer.



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Cost Estimate	
<p style="text-align: center; color: blue; font-size: small;">Y: yes, meets the requirement; N: no, does not meet the requirement (see comment below); NA: does not apply</p>	
<p>A summary of the cost estimate should be prepared and submitted for review. Similar facilities may be addressed collectively in the narrative descriptions requested below.</p>	
<p>If costs are covered within a financial demonstration already made to another governmental agency, the specific line items covered by the other financial demonstration should be noted in the cost estimate. Documentation should be provided that demonstrates the other financial demonstration is viable (e.g. fully funded) and that it clearly covers the line items noted in the cost estimate. Submittal of this information will allow ADEQ to review the costs, determine whether they are already covered by a demonstration already made to another governmental agency, and deduct these costs from the amount required in the Financial Assurance Demonstration required by A.A.C. R18-9-A203.B.3.</p>	
comment	Narrative description of the method used to develop the cost estimate (e.g. spreadsheet, SRCE, other tool)
comment	If applicable, narrative of any previous cost estimate (amount, date, facilities covered), change(s) to previous cost estimate amount with reason for increase/decrease, previous financial assurance mechanism used
comment	Narrative description of the assumptions used for unit rates, equipment production rates, rental costs, labor costs, analytical costs, geotechnical testing costs, as applicable
comment	Summary of each discharging facility's closure and post-closure costs and proposed financial assurance mechanism
comment	If applicable, summary of costs and financial assurance mechanism already made to another governmental agency for specific discharging facilities
comment	Summary of contingency amount included in the cost estimate including a discussion of the rationale.

Facility Specific Checklists (Surface Impoundment, Heap Leach, Piles, Groundwater Monitoring and POC Wells)

For each facility, use the applicable checklist to provide/review itemized costs. If any of the individual items under each major heading below are not applicable to one or more facilities, indicate why the cost is not applicable in the comments section. A spreadsheet summarizing the costs for each facility, with the facility description information included on the spreadsheet or referenced to the application so that it is easily accessible, is highly recommended. All assumptions used to develop itemized costs should be fully explained and noted on the spreadsheet.



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Section 3: Cost Estimate Details
Surface Impoundment (e.g. tailings, evaporation/infiltration, process) Cost Estimate

Y: yes, meets the requirement; N: no, does not meet the requirement (see comment below); NA: does not apply	
	Facility Description ⁷ : - impoundment and berm dimensions/design, lining/drain system design - history and characterization of use/leaks/overlapping that may need to be investigated - structures to be disconnected: ancillary concrete structures, pipelines, and tanks - closure design configuration
comment	
	Site Investigation Plan: - plan development, - soil/waste residue (liquids and sediment above the liner) characterization and confirmation sampling below the liner (number of samples per pond or number of samples per acre of pond, parameters/analysis, lateral and vertical extent of sampling) - groundwater sampling at POC locations (number of samples, parameters/analysis) - method of sampling (type of drill rig, grab samples, discrete, hand auger) - characterization of borrow source for backfill (sampling, analysis)
comment	
	Closure Activities: costs associated with closure in-place or closure by removal Engineering costs for: - slope stability analysis - closure configuration design (e.g. erosion control, surface water/storm water control, drawings, specifications) - construction QA/QC plan development Materials, equipment, labor, fuel and mobilization/demobilization costs for: - earth moving/re-grading - backfill/cap construction - surface water /storm water control construction - re-vegetation for evapotranspiration cover or erosion control - construction QA/QC testing, surveying - waste residue/liner disposal
comment	
	Post-closure inspection, maintenance/repair and monitoring (applies for cases other than clean closure, or cases where closure strategy warrants post-closure activities): - inspections - surface water/storm water control maintenance - groundwater monitoring at POC (use Groundwater Monitoring and POC Well Cost Estimate portion of this checklist) - duration and frequency
comment	
	Closure and Post-closure documentation: - Report results for characterization/confirmation samples for soil, waste residue (liquids and sediment), and groundwater - As-Built documentation report (drawings, specifications), materials removed/imported - inspection, maintenance/repair and monitoring reporting
comment	
	Contingency costs - provide a contingency multiplier
comment	

⁷ The purpose of the facility description section is to provide convenient reference to the applicant and reviewer of closure design information needed when considering closure costs. There won't be closure costs/line items associated with the facility description items.



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Heap Leach Pad Cost Estimate	
Y: yes, meets the requirement; N: no, does not meet the requirement (see comment below); NA: does not apply	
	Facility Description: - dimensions, lining and collection system design - history and characterization of use (chemical and physical) - structures to be removed (piping, etc.) - closure design configuration
comment	
	Physical Stability: The closed facility must have a configuration that assures physical stability Engineering costs (modeling, drawings, specifications, etc.) for: - slope stability analysis - cover material source characterization - erosion and surface water/storm water control analysis and design - construction QA/QC plan development Materials, equipment, labor, fuel, and mobilization/demobilization costs for: - reconfiguration/benching/re-grading - erosion and surface water/storm water control structures - re-vegetation - construction QA/QC testing
comment	
	Chemical Stability: A solutions management plan should be developed that addresses each of the following: Water Balance Analysis to evaluate leachate generation potential Leachate Characterization: - sampling of materials remaining in pad (ore and lixiviant) - analysis to determine neutralization solution (if specified in closure strategy) Leachate source control, migration control and/or treatment (e.g. isolation/removal, cap/cover, trenches, cutoff walls, neutralization/rinsing/detoxification (typically precious metals), wetlands treatment, etc.) will require materials, equipment, labor, fuel, and mobilization/demobilization costs for: - construction - operation and duration - confirmation sampling and analysis - disposal - H ₂ O and neutralizing/detoxification agents (if specified in closure strategy)
comment	
	Post-closure inspection, maintenance/repair and monitoring: - inspections - surface water/storm water control maintenance - groundwater monitoring at POC (use Groundwater Monitoring and POC Well Cost Estimate portion of this checklist) - treatment confirmation monitoring (if specified in the post-closure strategy) - duration and frequency
comment	
	Closure and post-closure documentation - As-Built Configuration (surveying, drawings, specifications, construction report) - Treatment Documentation (if specified in the closure and/or post-closure strategy) - Report results for characterization/confirmation samples for soil, waste residue (liquids and sediment), and groundwater - inspection, maintenance/repair and monitoring reporting
comment	
	Contingency costs - provide a contingency multiplier
comment	

§ The Closure Strategy for chemical stability should specify how leachate from the heap leach pad will be managed. Precious metal heap leach facilities may use cyanide compounds whereas copper (base-metal) heap leach facilities which are typically much larger do not use cyanide compounds. Consequently, the applicability of cost items listed in this checklist will vary with the type of heap leach. Refer to the Mining BADCT Guidance Manual for guidance.



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Pile (e.g. solid waste/landfill, waste rock, non-inert overburden) Cost Estimate

Y: yes, meets the requirement; N: no, does not meet the requirement (see comment below); NA: does not apply

	<p>Facility Description:</p> <ul style="list-style-type: none"> - dimensions, lining system design, drainage system design - history and characterization of materials (physical and chemical) - closure design configuration
comment	
	<p>Workplan:</p> <p>Engineering costs (modeling, drawings, specifications, etc.) for:</p> <ul style="list-style-type: none"> - slope stability analysis - erosion and surface water/storm water control analysis and design - construction QA/QC plan development - groundwater sampling at POC (number of samples, parameters/analysis) - characterization of borrow source for cover and/or backfill (sampling, analysis) - landfill leachate management plan
comment	
	<p>Closure Activities: costs associated with closure in-place or closure by removal</p> <p>Materials, equipment, labor, fuel and mobilization/demobilization costs for:</p> <ul style="list-style-type: none"> - earth moving/re-grading (contouring) - backfill/cap construction - surface water/storm water control construction (diversion/detention structures, etc.) - re-vegetation - construction QA/QC testing, surveying - material and/or liner disposal - monitoring/management system installation (groundwater; leachate collection)
comment	
	<p>Post-closure inspections, maintenance/repair and/or monitoring:</p> <ul style="list-style-type: none"> - inspections - surface water/storm water control maintenance - groundwater monitoring at POC (use Groundwater Monitoring and POC Well Cost Estimate portion of this checklist) - landfill leachate management - duration and frequency
comment	
	<p>Closure and Post-closure documentation:</p> <ul style="list-style-type: none"> - Results for characterization/confirmation samples for soil, waste residue, and groundwater - As-Built documentation report (drawings, specifications), materials removed/imported - inspection, maintenance/repair and monitoring reporting
comment	
	<p>Contingency costs</p> <ul style="list-style-type: none"> - provide a contingency multiplier
comment	



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Groundwater Monitoring and Point of Compliance (POC) Well Cost Estimates ⁹	
Y: yes, meets the requirement; N: no, does not meet the requirement (see comment below); NA: does not apply	
	Workplan: should include information on the proposed well and include the following: <ul style="list-style-type: none"> - well location, design, drilling and construction methods - geophysics - well development - aquifer testing - decontamination - sampling methodology and techniques (soil, groundwater, geotechnical, etc.) - Notice of Intent (NOI) - mobilization/demobilization/standby
comment	
	Well Installation Report: <ul style="list-style-type: none"> - as-builts (drawings, location, screened interval, depth to water, drilling log, NOI #) - survey information - well development description (pumping, decontamination, etc.) - aquifer test results - analytical results (soils, groundwater during drilling and development) - ambient groundwater monitoring results
comment	
	Hydrogeologic Study <ul style="list-style-type: none"> - groundwater monitoring data - groundwater and contaminant transport modeling - passive containment capture zone (PCCZ) monitoring/modeling
comment	
	Closure and Post-Closure monitoring and reporting <ul style="list-style-type: none"> - quarterly/semi-annual/annual/biennial monitoring and reporting - water quality sampling and analysis - water levels - groundwater contour maps - passive containment capture zone (PCCZ) analysis - well maintenance and inspections - duration
comment	
	Well Abandonment ¹⁰ <ul style="list-style-type: none"> - abandonment technique and report - pump removal - well permit (Arizona Department of Water Resources) - amendment to Aquifer Protection Permit (to remove well and monitoring requirements)
comment	

⁹ POC Wells are not discharging facilities, however, POC wells are included in this checklist because there will be a cost associated with post-closure maintenance and monitoring of POC wells for most closures. There may be a need to install new wells for closure. If POC wells are not part of the closure or post-closure strategy, this section is not applicable.

¹⁰ Well Abandonment: The applicant should provide detailed well closure costs that include contractor mobilization/demobilization, permits, well pump removal, drill-out of top 20-feet of well, grouting, pad/casing removal, labor including per-diem, etc. A well unit cost should be developed based on these line items, site conditions (well depth, well diameter, etc.), along with the application of current industry standards and regulation requirements governing well abandonment. An excellent reference that describes the well abandonment process, abandonment methods, and Arizona governing rules can be found in the Well Abandonment Handbook, prepared by the Arizona Department of Water Resources (ADWR) and dated 2008. The ADWR website provides a list of Arizona licensed well drillers, most also do well abandonment, and is available at www.azwater.gov under permits/reporting/well information/well driller list. Current values for most line items can be obtained from any Arizona licensed well driller.