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COST PROJECTIONS FOR POST-CLOSURE CUSTODIAL CARE OF THE BARNWELL RADIOACTIVE WASTE DISPOSAL FACILITY

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Gary B. Merrell; URS Corporation; radiological and environmental risk assessment

Dr. Gary M. Sandquist; URS Corporation; nuclear engineering and quality assurance

Robert Sobocinski, URS Corporation; groundwater and geochemistry including uranium and other radioactive materials

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Their participation in that workshop was vital in identifying unplanned events and quantifying their consequences, responses, and effects.

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To all who have contributed, we convey our deep and inadequately expressed appreciation.

ACRONYMS AND ABBREVIATIONS

AIG	AIG Companies
AIS	American International Specialty Lines Insurance, a subsidiary of AIG
ANI	American Nuclear Insurers
Atlantic Compact	Atlantic Interstate Low-Level Radioactive Waste Management Compact
Atlantic Compact Act	Atlantic Interstate Low-Level Radioactive Waste Compact Implementation Act
Board	South Carolina Budget and Control Board
CFR	Code of Federal Regulations
CHP	Certified Health Physicist
CNS, CNSI	Chem-Nuclear Systems, LLC, presently a wholly-owned subsidiary of EnergySolutions LLC
Compact	Atlantic Interstate Low-Level Radioactive Waste Management Compact
DHEC	South Carolina Department of Health and Environmental Control
gpm	gallon per minute
facility	Barnwell Low-Level Radioactive Waste Disposal Facility
Extended Care Fund	Barnwell Extended Care Fund, also known as Atomic Waste Burial Fund, Barnwell Extended Care Maintenance Fund, and Barnwell LLRW Disposal Facility Extended Care Fund
in-region	Applicable to disposal operations for LLRW generated in the three Atlantic Compact member states, namely South Carolina, New Jersey, and Connecticut
interim care period	Time Phase I areas (portions of the facility stabilized and closed during Phase I closure) are monitored and maintained by CNS.
Institutional Control Period	Period of nominally 100 years that follows Phase II closure and post-closure observations activities; Responsibility for facility surveillance, environmental monitoring, and maintenance resides with the Board.
L	Liter
LLRW	Low-level radioactive waste
LLRWPA	Low-Level Radioactive Waste Policy Act, 1980

LLRWPAA	Low-Level Radioactive Waste Policy Amendments Act, 1985
Mid-range	Expected value; 50 percent probability that the value would be lower and 50 percent that it would be higher.
mrem	millirem; one thousandth of 1 rem
NRC	US Nuclear Regulatory Commission
pCi	picocuries, 1 picoCurie is 2.2 disintegrations per minute
Phase I closure	Closure of all inactive disposal areas not previously closed while in-region disposal operations continue.
Phase II closure	Closure of all areas that remained active during in-region disposal operations.
Post-closure observation period	Years 2010 through 2014 for Phase I areas and Years 2039 through 2044 for entire sire
site	The natural site at which the Barnwell facility is located and operates, corresponding to the parcel of property which is deeded to the State of South Carolina
SRS	Savannah River Site
URS	URS Corporation, contractor to the South Carolina Budget and Control Board that prepared this document
XL	XL Insurance Companies
Zone 1, Zone 2	Aquifers present beneath Barnwell LLRW disposal facility, Zone 2 being deeper and of greater concern for contaminant migration

ABSTRACT

This document evaluates the adequacy of the Barnwell Extended Care Fund in light of the risks identified and concludes that it is sufficiently funded to cover the costs and uncertainties associated with activities planned for post-closure care of the facility. The report concludes that the fund is currently sufficiently funded to cover some but not all of the costs that might be incurred in responding to unplanned events and consequences. The document reviews background information pertinent to the post-closure monitoring and maintenance of the Barnwell low-level radioactive waste disposal facility (the Barnwell facility) and describes financial responsibility for post-closure activities. It identifies and briefly characterizes the activities that will be conducted following facility closure and presents the mid-range estimate of post-closure costs. The report identifies and quantifies sources of uncertainty in activities and costs planned for post-closure care of the facility and presents 50, 80, and 95 confidence levels of planned projected costs. It identifies, characterizes, and quantifies unplanned events and consequences that might occur and costs that might be incurred in responding to the unplanned initiating events. It reviews and assesses options for managing the risks associated with the post-closure monitoring and maintenance of the Barnwell facility.

EXECUTIVE SUMMARY

This report estimates the future costs to the State of South Carolina of monitoring and maintaining the Barnwell facility. Money to pay for these activities has been deposited into an account called the Barnwell Extended Care Fund, which is maintained by the Office of State Treasure. At the end of 2007, the balance of the account, derived from a surcharge of $2.80 per cubic foot on waste disposed at the Barnwell site and accumulated interest earnings, was $123 million.

The South Carolina Budget and Control Board is responsible under state law for ensuring that adequate funds are on hand to cover all costs of custodial care, so that the site does not become a burden on future generations. The purpose of this report is to project the costs of custodial care and to assess the adequacy of the fund balance to cover these costs.

The report (1) provides a "mid-range" estimate of costs that the State of South Carolina can expect to pay for all activities necessary to monitor and maintain the disposal facility grounds, (2) identifies contingencies and events that may result in costs beyond those identified in the mid-range cost analysis, and (3) discusses options for managing the Fund in view of the wide range of uncertainties inherent in any long-range cost estimate of this type.

Cost Estimate for Planned Post-Closure Activities

The mid-range annual costs to the Barnwell Extended Care Fund of planned monitoring and maintenance activities for the Barnwell facility (below) are estimated to vary with time as follows:

Program Phase	Years	Estimated Mid-Range Costs per Year	Present Value of Mid-Range Costs
To Beginning of Phase II of Closure	2010 through 2038	$2.0 million/yr	$41 million
Phase II Post-Closure Observation	2039 through 2043	$4.0 million/yr	$10 million
Stage I Institutional Control	2044 through 2068	$2.3 million/yr	$22 million
Stage II Institutional Control	2069 through 2093	$1.7 million/yr	$9.6 million
Stage III & IV Institutional Control	2094 through 2143	$1.3 million/yr	$7.5 million
		Total	**$90 million**

As shown above, the total present value of mid-range costs for planned post-closure care activities for the Barnwell facility is $90 million. The mid-range estimated costs and present values of custodial care costs are as likely to be exceeded as not. The Barnwell Extended Care Fund appears to be sufficiently funded to cover the estimated mid-range costs of planned and expected activities for monitoring and maintaining the closed disposal facility. After covering the costs of planned and expected activities, some $33 million is expected, with 50 percent confidence, to be available to address the costs of contingencies and unplanned events and responses.

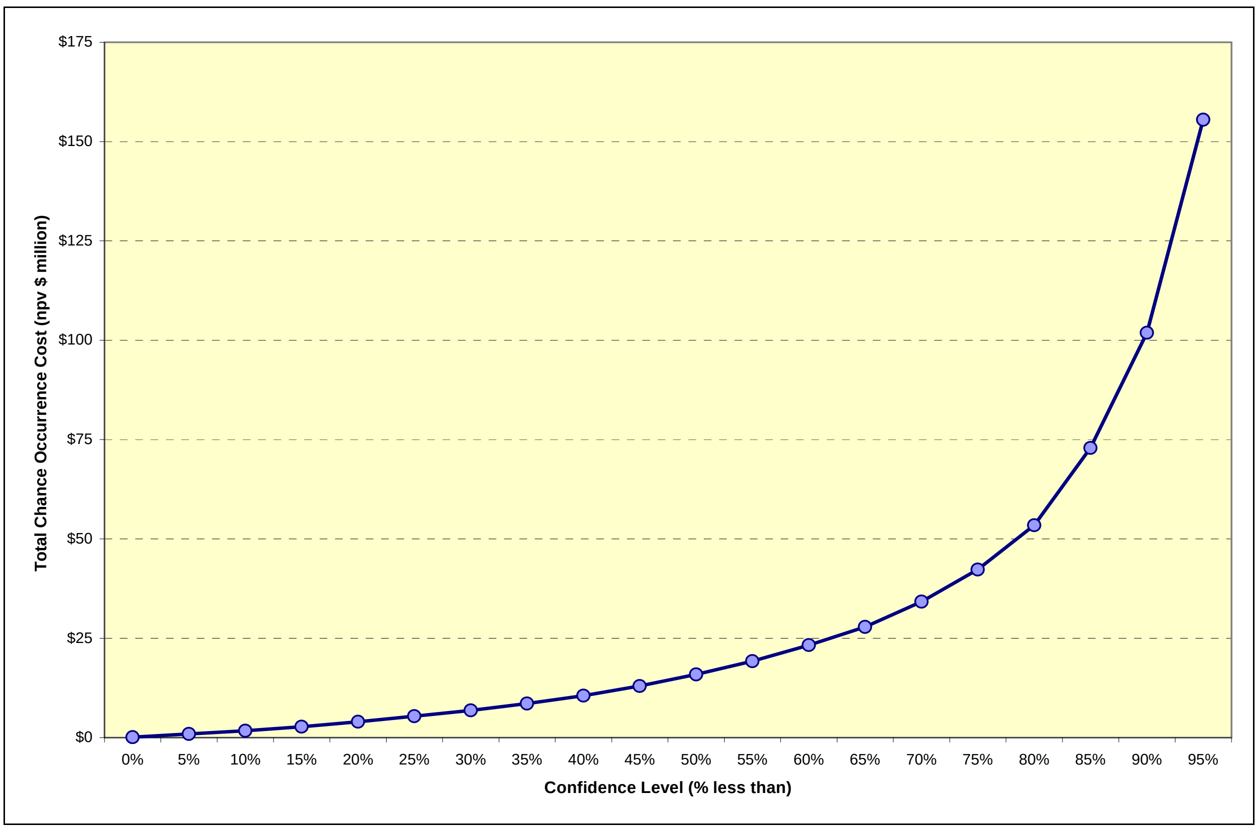
Cost Estimate for Contingencies Associated with Planned Activities

Since the estimate is only a "mid-range" projection, a 50 percent chance exists that these costs will be exceeded, and a 50 percent chance that they overstate the actual costs. Uncertainty exists because the cost model cannot always accurately forecast the unit costs for components that make up the total costs, and the model may overestimate or underestimate quantities of labor and materials that will be needed.

Further analysis of these uncertainties concludes, with 80 percent confidence, that the costs of planned and expected activities will not exceed $95 million. Thus, with 80 percent confidence, a total of about $28 million are available in the Barnwell Extended Care Fund to address the costs of *unplanned* events that are not part of the normal and planned monitoring and maintenance program. Such unplanned events include the potential remediation of a tritium plume known to exist in groundwater under and downgradient from the Barnwell facility.

Cost Estimate for Unplanned Events

Risks were analyzed to determine the total "chance occurrence costs" of responding to unplanned events and outcomes, not including tritium plume remediation. The analysis considers a collection of unplanned events that might occur, the judged probability of each, the year in which it might happen, and the judged cost of responding to the occurrence. The chance occurrence cost of an event was estimated using this information in 5,000 Monte Carlo simulations with the Crystal Ball software and is summarized in the figure below.



The dependence of projected total chance occurrence costs on the level of confidence of the projection is depicted in the figure above. The analysis concluded with 65 percent confidence that the total chance occurrence cost of unplanned events, consequences, and responses (not including tritium plume remediation) would not exceed the $28 million available after meeting the costs of planned activities. With 80 percent confidence, these unplanned costs are estimated not to exceed about $53 million, and with 95 percent confidence, they are estimated not to exceed about $155 million.

It is important to consider the limits of the analysis. The estimated costs of responding to unplanned events are, in most cases, qualitative projections of the expert panel and were not based on researched analogs. Moreover, some unlikely events such as intentional attacks on the disposal facility, the Barnwell Extended Care Fund was judged not be the primary or even a secondary source of funds to address the consequences, especially where emergency responses are involved.

Groundwater Contamination on Adjacent Property

Excluding the cost impacts that involve emergency responses due to intentional attacks or the consequences of wars, the wide range of contingency costs identified in the risk analysis is dominated by the cost uncertainties related to radioactive contamination in groundwater under and downgradient from the state-owned property on which the Barnwell facility is located. Tritium contamination in groundwater outside the property was first discovered in 1978, and releases have continued since that time. According to published accounts, the tritium plume extends approximately 3,300 feet south of the site where it discharges into a small creek (Mary’s Branch of the Lower Three Runs Creek), well upstream from the point where it joins with the Savannah River.

In the late 1990s, Chem-Nuclear (CNS) purchased the land on which the tritium plume had encroached. In 2002, CNS placed a restrictive covenant on the land to prevent the extraction of groundwater or surface water without approval by DHEC. This tract is securely fenced to prevent trespassing and provide additional assurance that no drinking water wells will be drilled on the adjacent land.

With drinking water wells on the adjacent property prohibited, DHEC approved a CNS proposal to designate the Barnwell disposal facility’s point of compliance with the Environmental Protection Agency’s drinking water standard at the southernmost boundary of this privately-owned property, some 3,300 feet south of the boundaries of the disposal facility property. This compliance point is slightly downstream from the location where groundwater discharges into Mary’s Branch of the Lower Three Runs Creek.

Based on an assessment of publicly available information about the groundwater system in the vicinity of the facility, including environmental monitoring data and discussions with DHEC officials, authors of this report concluded that it is likely that surface water concentrations at this remote compliance point will exceed additional regulatory “trigger levels” within 10 to 20 years. Should these regulatory threshold levels be exceeded, it may be necessary to implement additional remedial measures at the Barnwell disposal site or on the adjacent property in order to reduce the level of tritium in groundwater and surface water.

The estimated costs of a program to reduce the levels of tritium contamination in groundwater vary widely, according to a report on the subject published by the Savannah River Site (SRS).

Based on information presented in that report, we conclude, with 80 percent confidence, that a program to address the contamination in the vicinity of the Barnwell facility to comply with applicable and relevant regulatory requirements could cost between $23 and $140 million, depending on the rate at which contaminated groundwater is required to be pumped and treated.

It is not clear whether a statutory basis exists that would permit using the fund to clean up this adjacent privately-owned land. Section 13-7-30, South Carolina Code of Laws, appears to dedicate the money in the fund to the State's future costs of performing monitoring and maintenance of the disposal site property itself, and certain other unrelated activities. If, however, the law and public policy supports using money from the Fund to address the contamination, such use would likely deplete Fund balances well before the end of the extended care period using a treatment technology that is likely to be acceptable to regulators and the public. If, for example, $23 million were reserved in year 2008 for the tritium plume remediation, and $28 million were also set aside in 2008 to address the cost of other unplanned events and contingencies, the balance of the Fund remaining to pay for all planned activities at the 80 percent confidence level would be exhausted in year 2059, which is 84 years prior to the end of institutional control period.

Basis for a Risk Management Plan

The basis for developing a risk management plan for the Barnwell Extended Care Fund is the total present value of estimated costs at the 80 percent confidence level. This would include the estimated costs of planned post-closure care activities with 80 percent confidence ($95 million) and the total chance occurrence cost of unplanned events (not including tritium plume remediation) with 80 percent confidence ($53 million). Thus, to have 80 percent confidence in the projection, a present fund balance of $148 million would be needed to cover all planned activities as well as responses to unplanned events, excluding the costs of tritium plume remediation.

At its current balance of about $123 million, the Barnwell Extended Care Fund is judged, with 65 percent confidence, to be adequate to cover all planned costs plus the costs of responding to unplanned events and consequences, excluding the costs of tritium plume remediation. Moreover, at its current balance, the Fund could cover costs of about $28 million beyond the costs of planned activities without impacting the Fund's ability to cover those costs. This amount available for unplanned costs is about $5 million greater than the cost of the least costly but acceptable tritium plume remediation program, but short of the upper tritium plume remediation estimate by over $100 million.

Present Value Analysis

The dollars reported in this study are converted to present values. This is a standard method where price inflation and interest earnings on deposits are considered for expenditures that are made in the future. Present value analyses convert the future costs of materials and services into the amount of money that would need to be on deposit today in order to make the purchase. Present value analyses take credit for the fact that the deposited money will earn interest that exceeds the effects of inflation. For example, if the deposited funds earn 5.0 percent interest and inflation is 3.0 percent, then the "real interest" rate is the difference between the interest rate and the inflation rate, or 2.0 percent in this example.

Based on results of a previous related report, Board staff requested that work documented in this report assume an annual "real interest" rate of 2.0 percent on the balance of invested funds. For the past 30 years, the real rate of return on secure financial instruments (such as long-term government debt) has generally exceeded 2 percent per year. Because the results of present value analyses can vary significantly depending on the real interest rate assumed, using a rate of 2.0 percent per year may conservatively understate the balance of the fund at any point in time.

Protecting the State against Risk

Factors that should be considered in developing an approach for managing Barnwell facility financial risks include the following:

- The State is capable of covering most losses, if necessary.
- Losses of a catastrophic nature would most likely invoke sources of funding associated with federal national security, disaster, or CERCLA actions.
- The most likely unplanned cost would result from contamination of nearby properties. But since off-site groundwater contamination is already known and occurring, it is doubtful that any insurance company would offer to cover such a claim at a reasonable price.
- Premium pricing will likely decline over time as the waste becomes less hazardous because of radioactive decay.
- Past disposal site operators should be considered to remain responsible for claims arising from their operations.

Several risk management options have been identified and evaluated. It appears that the current American Nuclear Insurers (ANI) insurance policy will continue to be available to the state at the $100-million limit in place today. Historically, ANI has allowed the transfer of a policy from a site operator to another party at the time of the decommissioning of a facility. Clearly, the existence of the tritium contamination in groundwater under and adjacent to the Barnwell facility raises questions about whether insurance coverage would be "grandfathered" for the facility, or whether this significant source of risk, and any others related to off-site contamination, might be excluded from the policy. The disadvantage of insurance is the insurer's control over the price of the premium and associated coverage, based on their own assessment of risk.

While a commercial insurance policy appears preferable, self-insurance might be considered as a substitute or a supplement to insurance. The Barnwell Extended Care Fund itself could be viewed as a self-insurance mechanism, since it provides a potential source of funds in case actual losses exceed protection ultimately provided by the State. To the extent that the funds available exceed the anticipated needs for planned custodial care activities, the fund should be viewed as a vehicle for accomplishing self insurance. Aside from this, however, beginning a formal self-insurance mechanism for the Barnwell facility would be impractical at this time, since disposal operations have already been curtailed and insurance appears to be available. However,

As shown throughout this report, the balance of the Barnwell Extended Care Fund exceeds the projected "mid-range" costs for planned custodial care activities by about $33 million, and exceeds the more conservative estimate at the 80-percent confidence level by $28 million.

A reasonable chance exists, however, that unplanned events will occur and that some of the available $28 million will be needed to pay for such unplanned costs. This report also shows that some unplanned events are not likely to be covered by commercial insurance. Because of these uncertainties, we recommend that the Barnwell Extended Care Fund be maintained and allowed to grow as a defense for the uncertainty of unplanned future hazards and risks.

The State might consider transferring or partitioning $28 million from the Barnwell Extended Care Fund into a separate fund designated as a "Barnwell Contingency Fund". The purpose of such an action would be to provide a separate fund to address the potential costs of unplanned events, consequences, and responses. Segmenting the Barnwell Extended Care Fund in this manner into two separate funds with different purposes might help clarify for policy makers and the public the scope and purpose of the accumulated money.

As observations, experience, and additional data of the Barnwell facility provide a better basis for assessing the risks of monitoring and maintaining the closed disposal facility, the State would be well served to reassess its risk management strategy, and the performance of the extended care program itself. While such reassessment might be done on an ongoing basis, we recommend that the State conduct a comprehensive assessment of the adequacy of the Extended Care Fund and the assessment of risk at least every 20 years.

PART I BACKGROUND INFORMATION

This document consists of three parts that have different purposes:

- Part I, Background Information, provides background and descriptive information about the Barnwell facility and the legal and financial constraints within which the facility must operate and be maintained.
- Part, II, Mid-Range Cost Estimates, describes planned post-closure custodial care activities for the Barnwell LLRW disposal facility and presents the expected cost of conducting those activities. This part does not address uncertainties, contingencies, or the complications and additional costs associated with unplanned events.
- Part III, Financial Risks, addresses the possibility that post-closure custodial care costs at the Barnwell facility might differ from expected costs for two reasons: uncertainties in the costs of planned activities, and costs associated with unplanned (but nevertheless possible) future events.

Background information about the Barnwell facility, the site at which it is located, waste disposed of at the facility, and other matters related to the post-closure care of the facility are presented in this part of the document.

PART II presents the results of an independent estimate of all planned and expected post-closure monitoring and maintenance costs associated with post-closure observations and long-term custodial care of the Barnwell facility.

Actual costs can differ from the mid-range costs because of uncertainties in the quantities and unit costs used to prepare the cost estimate and because costly events may occur that have not been planned or expected. These “contingent costs” are discussed in PART III of this document.

I.1 OVERVIEW

The South Carolina Budget and Control Board (the Board) owns and administers the land on which the Barnwell low-level radioactive waste (LLRW) disposal facility presently operates. The Board also administers the Atomic Waste Burial Fund (also known as the Barnwell Extended Care Maintenance Fund and referred to in this report as the Extended Care Fund). The Extended Care Fund was established pursuant to Section 13-7-30 of the South Carolina Code of Laws (SCCL 13:7) to cover the costs of monitoring and maintaining the disposal site following its final closure and termination of the license granted by the South Carolina Department of Health and Environmental Control (DHEC). The Extended Care Fund has been funded since 1972 and continues to grow through a surcharge on waste disposed of at the Barnwell facility and reinvested interest earnings.

According to present plans, CNS, the Barnwell facility operator, will monitor and maintain the closed portions of the disposal facility property as long as it conducts disposal operations at the facility. Once Barnwell disposal operations cease and the DHEC license is terminated, the Board will assume the responsibility to monitor and maintain the site and facility.

Beginning July 1, 2008, CNS will undertake a substantial stabilization and final closure project of major portions of the Barnwell facility. Over the following 15 to 24 months, all previously used disposal areas will be closed and provided with final engineered cover systems. In addition, numerous fixed buildings and facilities that have supported disposal operations will be decommissioned. At the conclusion of these so-called “Phase I closure” activities, approximately 105 acres of disposal area will have been stabilized and closed.

Following Phase I closure activities and continuing through about 2037, only those areas associated with ongoing disposal operations will remain active at the Barnwell facility. Only LLRW generated within the three member states of the Atlantic Compact (South Carolina, New Jersey, and Connecticut) will be received for disposal. These “in-region” disposal operations will involve approximately 10 acres of the Barnwell facility.

At the conclusion of in-region disposal operations in about 2038, a one-year stabilization and closure project will be undertaken and completed. This is referred to as “Phase II closure.” During Phase II closure activities, the Barnwell facility will be finally and completely closed, in compliance with all applicable regulations and license conditions, and as acceptable to DHEC. Following closure, a five-year period of post-closure observations will ensue to ensure that the closed facility is performing as planned, required, and expected and that no ongoing active maintenance will be required once responsibility for the facility’s post-closure care is transferred to the custodial agency (the Board).

Should post-closure observations reveal that the facility fails to meet any aspect of regulatory requirements or license conditions, the facility will remain under license and the facility operator (CNS) will remain responsible for any remedial actions deemed necessary and for monitoring and maintaining the facility.

Once all post-closure observations demonstrate that the Barnwell facility is performing as planned, required, and expected, the operating license will be terminated and responsibility for monitoring and maintaining the closed facility and site will be transferred to the Board. The Board is expected to monitor and maintain the closed Barnwell facility and site for nominally 100 years following conclusion of Phase II post-closure observations. This period of long-term custodial care is called the “institutional control” period.

Closure activities have been and will continue to be paid from the Decommissioning Trust Fund. The facility operator is responsible to conduct closure and post-closure observation activities. The Board will reimburse CNS from the fund for associated closure costs, as appropriate.

The objective of this part of the report is to present the results of an independent estimate of planned and expected costs that will be paid from the Extended Care Fund. These costs consist of certain institutional costs associated with monitoring and maintenance of closed portions of the facility starting with Phase I of closure and continuing through Phase II, and all costs of custodial care following final closure of the site. The estimated costs presented in this part are mid-range costs, for which an equal chance exists that actual costs will be less than the estimated costs presented in this part and that they will exceed the costs presented in this part.

Costs can differ from the mid-range costs because of uncertainties in the cost estimate and because costly events may occur that have neither been planned for nor expected. These “contingent costs” are discussed in Part II of this report.

This document does not address costs associated with facility stabilization and closure because these costs are paid from the Decommissioning Trust Fund and not from the Barnwell Extended Care Fund.

I.2 SITE AND FACILITY INFORMATION

The Barnwell facility is a 235-acre tract of land owned by the state of South Carolina and leased to CNS. The facility is located near the eastern boundary of the US Department of Energy's Savannah River Site, about 5 miles west of the town of Barnwell, South Carolina, adjacent to the hamlet of Snelling, as shown in Figure I-1

CNS is licensed by DHEC to dispose of LLRW at the Barnwell facility. CNS has operated the Barnwell facility since operations began in 1971, beginning as a stand-alone company and later as a subsidiary to other companies. At present, a total of 115 acres are available for disposal, of which 105 acres have been used. As of June 2005, 10 acres remained available for disposal of LLRW yet to be received. The layout of the Barnwell facility is shown in Figure I-2. A satellite photograph of the site is presented in Figure I-3 (Google 2008).

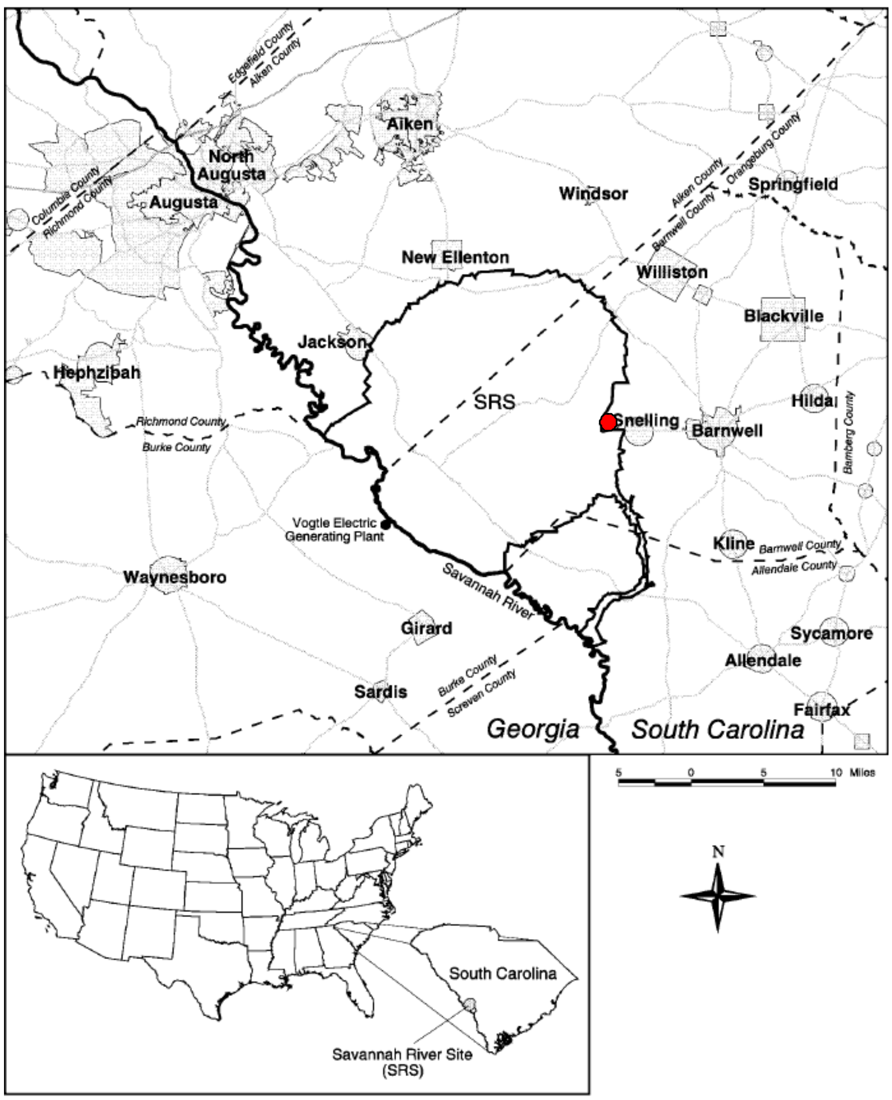


Figure I-1. Location of the Barnwell LLRW Disposal Facility

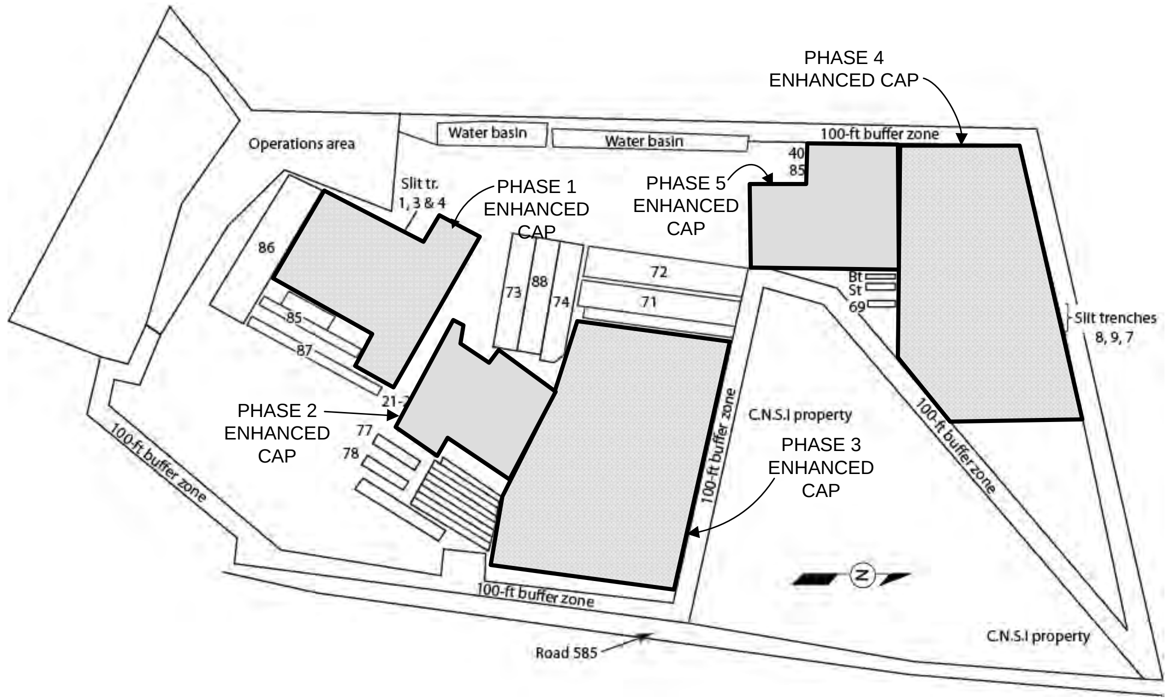


Figure I-2. Layout of Barnwell LLRW Disposal Facility

Figure I-3. Satellite Photograph of Barnwell LLRW Disposal Facility (Google 2008)

For purposes of cost estimating, the generalized timeline following final closure actions at the Barnwell facility is divided into five periods depending on the areas involved (depicted graphically in Figure I-4):

- To Beginning of Post-Closure Observation (years 2010 through 2038)
- Post-Closure Observation (years 2039 through 2043)
- Stage I: First 25 years of institutional control (years 2044 through 2068)
- Stage II: Second 25 years of institutional control (years 2069 through 2093)
- Stage III and IV: Last 50 years of institutional control (years 2094 through 2143)

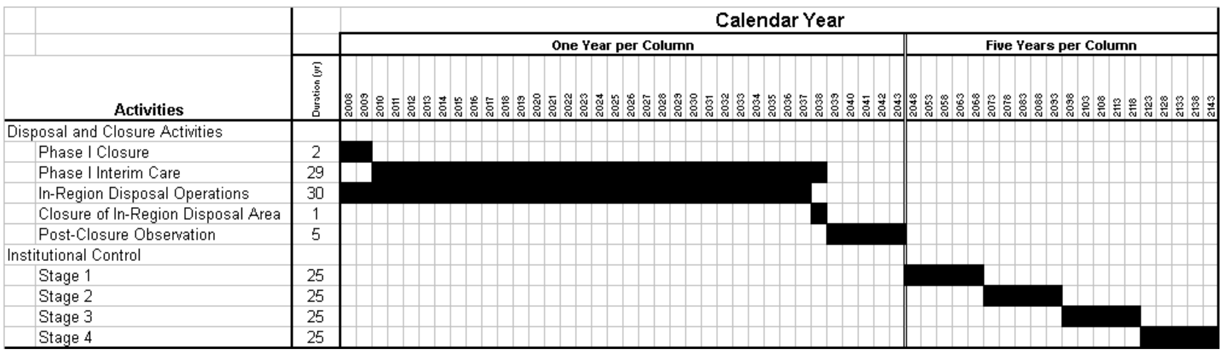


Figure I-4. Timeline for the Post-Closure Custodial Care of the Barnwell Facility

The five-year post-closure observation period is different from the institutional control period both in the kinds of activities that will be conducted and in the entity who will conduct them. During the post-closure observation period, CNS remains the facility licensee and continues to be responsible and accountable for conducting all required maintenance and monitoring activities throughout the facility and for monitoring of the environment in areas adjacent to the disposal site. In contrast, on successful completion of the Phase II post-closure observation period, the license will be terminated, CNS will cease all activity at the facility, and the facility will be transferred to the State's custodial care agency (the Board), which will assume responsibility for all subsequent monitoring and maintenance activity.

CNS is expected to conduct in-region disposal operations for 30 years commencing on July 1, 2008. Transfer of the facility for institutional control will not occur until all disposal operations at the facility are concluded and all disposal units finally and acceptably closed. That is, while it conducts disposal operations, CNS will remain responsible for long-term monitoring and maintenance of stabilized and closed Phase I areas. This period is referred to in this report as the "interim care period". Once the Phase II closure activities are successfully completed and the site demonstrates that it can meet all applicable regulatory requirements and license conditions without reliance on ongoing active measures, the entire site will be transferred to the Board for institutional control.

Given that expected performance is confirmed during the post-closure observation period and the first 25 years of the institutional control period (Stage I), the intensity of environmental monitoring is assumed to be reduced to that defined in Table 8-9 of the 2005 closure and stabilization plan (CNS 2005a). The monitoring intensity in subsequent stages of institutional control is assumed to be further reduced as described in Section II.2.4.4. It is reasonable in this base case to assume a reduction in the intensity of monitoring over time because the level of radioactivity in the buried waste will be substantially reduced through radioactive decay, especially the levels of tritium, and because several decades of accumulated monitoring data should increase the level of confidence that the site will continue to perform adequately.

I.3 KNOWN CHALLENGES TO POST-CLOSURE MONITORING AND MAINTENANCE

At the request of SCEO, attention was given in this report to two issues that potentially could affect the costs of extended care of the Barnwell facility. One is related to groundwater contamination in the vicinity of the disposal site due to tritium (H-3) migrating from early disposal trenches. The issue is summarized below and the cost impacts are discussed in greater detail in Section III.4 of the report. The other issue is related to the possible disposal of spent fuel segments from a nuclear power plant. The cost impacts for this event, though relatively marginal, are included among the unplanned events considered in Section III.

I.3.1 Tritium Plume

A tritium plume has been known to exist in groundwater beneath the Barnwell facility since 1978. Exposures to these releases have been negligible because groundwater and surface water downgradient of the Barnwell facility is not used for culinary purposes in areas where elevated concentrations have been observed. Nevertheless, observed tritium concentrations in Zone 2 beneath the facility boundaries exceed current allowable drinking water concentrations for tritium by many orders of magnitude (DHEC 2007a; DHEC 2007b; and DHEC 2007c). Substantially elevated tritium concentrations have been observed in Zone 2 groundwater as far as 3,300 feet downgradient (south) from the Barnwell facility. Elevated concentrations have been observed in Zone 2 groundwater and in surface water (Mary's Branch of the Lower Three Runs Creek), near the location where groundwater is discharged and where surface water leaves land owned by CNS.

Groundwater monitoring wells within the disposal area indicate that this contamination plume originates from trenches used for disposal in the early years of the Barnwell facility's operating life (i.e., Trenches 1 through 18). These trenches are located in the southernmost portion of the facility (refer to Figure I-2). In recent years the observed tritium concentrations in some monitoring wells downgradient from this older disposal area have increased, despite efforts to mitigate tritium releases from the disposal units. While the half-life of tritium is only about 12 years, the persistence of the plume creates concerns that tritium concentrations in groundwater beneath, downgradient from, and outside the licensed boundaries of the Barnwell facility, but on land owned by CNS might continue until its gradual dissipation through the process of natural radioactive decay.

Observed and modeled behavior of groundwater under and downgradient from the Barnwell facility strongly suggest that the tritium plume has migrated, will yet migrate, and will produce surface water concentrations in excess of limits specified in CNS's (DHEC-approved) Contingency Plan. Given a horizontal groundwater velocity upwards of 250 feet per year, unacceptable tritium concentrations in surface water are likely to result within the next 10 to 20 years. While radioactive decay will moderate these concentrations, they are nevertheless expected to exceed “trigger levels”.

At present, the first trigger level of the facility’s Contingency Plan has been exceeded (tritium concentrations in excess of 100,000 pCi/L), such that tritium concentrations in Mary’s Branch Creek south of the facility are being monitored more intensely. Groundwater and tritium behavior at Mary’s Branch Creek are also being studied. Were surface water concentrations of tritium to exceed 200,000 pCi/L at the compliance point, the Barnwell facility’s Contingency Plan would require CNS to design a “pump and treat” system acceptable to DHEC. Should these concentrations rise to 280,000 pCi/L, CNS is required to construct (and presumably operate) the “pump and treat” facility.

A program might be required to treat the tritium contamination of groundwater under the facility and under adjacent privately-owned land. This could have a significant effect on the Barnwell Extended Care Fund if it is determined that some or all of the remediation project costs should be paid by the fund.

Section 13-7-30, South Carolina Code of Laws, clearly authorizes the Board to approve disbursal of money from the fund to pay for custodial care of the disposal site property itself. Determining from a legal perspective whether the same law authorizes the Board to disburse money from the Fund to remediate contamination on the property of third parties in proximity to the disposal site is beyond the scope of this report.

However, after consultation with South Carolina regulatory officials and review of relevant documents and data (DHEC, 2007b and CNSI, 1996), we concluded that DHEC might require the remediation of properties owned by CNS that lie to the south of the Barnwell disposal facility within the next 10 to 20 years. The present value of such a remediation project could range between about $20 and $140 million for a 20-year operating life, depending upon the level of confidence and the remediation technology implemented and the extent to which remediation is required (based on Fulbright, 1996 “SRS Report”). The details of the cost to remediate tritium-contaminated groundwater under and adjacent to the Barnwell facility are discussed at the end of Section III.4.3. Details of these calculations are presented in Appendix G.

URS has examined and briefly evaluated information about the groundwater system under and in the vicinity of the facility (CNSI, 1996), as well as environmental monitoring data available from public sources (DHEC, 2007b and CNSI, 1996). Based on this brief evaluation, it has been concluded that it is likely that surface water concentrations at the compliance point established by DHEC will exceed trigger levels (DHEC, 2007c) within 10 to 20 years. Should these remedial measures be required to address such elevated concentrations, remedial measures would have to continue for many years to protect the public health and the environment.

South Carolina disposal regulations are very similar to the federal regulations with which Agreement State programs must be compatible (10 CFR 61). State regulations require that all active maintenance is to be completed prior to the end of the five-year post-closure observation period that immediately precedes the institutional control period. DHEC regulations require that:

> The applicant's proposed disposal site, disposal site design, land disposal facility operations, disposal site closure, and post-closure institutional control are adequate to protect the public health and safety in that they will provide reasonable assurance that long-term stability of the disposed waste and the

> disposal site will be achieved and will ***eliminate to the extent practicable the need for ongoing active maintenance of the disposal site following closure*** (RHA 7.10.6, emphasis added).

License Conditions 98E and 98F of the facility license [http://www.energy.sc.gov/publications/097.pdf] also require the licensee to deliver a closed site that meets the performance objectives in the regulations and for which the need for active maintenance has been largely eliminated prior to license termination.

In other words, the regulatory philosophy relies upon the presumption that no active maintenance beyond minor custodial activities will be required following facility closure. When the responsibility for facility care is transferred to the custodial agency, the facility is expected to be performing in compliance with all regulatory requirements without relying on active measures or systems, such as a program required to treat groundwater contaminated with tritium.

Earlier investigations of groundwater remediation options at the Savannah River Site (Fulbright, 1996) have revealed that the least expensive treatment (evaporative) technologies simply remove tritium from the water and release it to the atmosphere. That study concluded that such technologies would not be acceptable to regulators and the public for implementation at the Savannah River Site.

Fulbright et al also identified more costly but demonstrated technologies that remove and capture tritium, thereby significantly reducing health risks to exposed persons. The next least costly technology that captures tritium is the homogeneous exchange (Girdler Sulfide) that involves isotope separation and removal. The Girdler Sulfide technology has an Facility Effectiveness Index (a measure of risk reduction) of 0.99, meaning virtually all the tritium risk is eliminated or virtually all tritium is captured. The Fulbright report summarizes Girdler Sulfide with the following statement:

> "Girdler-Sulfide (GS) is the least expensive process that performs isotope separation. Calculated costs of GS were in the range of 5x to 50x traditional wastewater treatment costs. GS processes do pose relatively high process risk, high worker risk, and potential catastrophic release risk (a large inventory of high pressure hydrogen sulfide is needed, resulting in combined toxicity and flammability hazards). As with other large-complex facilities, many years would be required for design, construction, and testing prior to operation of a GS plant. GS is potentially viable." (Fulbright, 1996)

The costs of remediating the tritium plume are evaluated in Section III.4 of this report, and are a significant source of the wide variation in the costs of addressing unplanned events and occurrences.

It is unclear whether the current State law allows the Barnwell Extended Care Fund to be used to cover the costs of such a program to treat contaminated groundwater on privately-owned property that is not part of the State-owned Barnwell disposal site. Because of this, the potential financial impact on the Fund of addressing the tritium contamination is not included in the total costs reported for “unplanned events and occurrences” in Section III of this report. However, because the potential costs are so great, and no final legal or policy determination has yet been made, the impacts of using money from the Fund to address this issue are reported in Section III.4.4, separately from other unplanned events.

I.3.2 Nuclear Fuel Rods

In November 2000, Dominion Nuclear Connecticut, Inc., the licensee for the Millstone Unit 1 nuclear power plant, reported to the NRC that the location of two spent fuel rods[1] could not be determined. Following an internal investigation (Millstone, 2001) and an NRC special inspection (NRC, 2002a), the NRC determined that "there is a chance that the rods may have been unintentionally disposed at either the Hanford, Washington, or Barnwell, South Carolina, commercial low-level radioactive waste disposal facility. "The most likely explanation is that the rods were inadvertently shipped to Barnwell in 1988" (NRC, 2002b).

"Near-surface facilities" such as the Barnwell facility are not licensed for disposal of spent fuel. Such material generally contains radionuclides in concentrations much greater than the regulatory limits for Class C radioactive waste that are imposed on this kind of disposal facility.

If the fuel rods were indeed shipped to the Barnwell facility in 1988, they would likely have been disposed of in any of Trenches 48, 54, 55, 57, 60, or 61, according to the report. If disposal at Barnwell occurred in 1989 or 1990, they might also have been disposed of in Trenches 62 through 66, 69, or 70.

A subsequent safety analysis on behalf of the NRC (Ryan, undated) concluded that:

- Transportation of the spent fuel rods did not pose any increased risk.
- Disposal of the spent fuel rods at either LLRW disposal facility does not pose an increased risk to the general population because the radioactivity is bound in a metal matrix that resists any release to ground water.
- Disposal of the spent fuel rods is unlikely to harm an inadvertent intruder to the site because the material is small in size and unlikely to be encountered by chance.
- Exhumation of the spent fuel rods would pose a far greater worker health and safety risk and potential environmental detriment than leaving them buried in their present conditions.

In commenting on the NRC's analysis, representatives from South Carolina and Washington State noted that the program for maintaining institutional control in South Carolina must proceed on the assumption that the two spent fuel rods were indeed disposed of at the Barnwell facility, unless the information is conclusively refuted.

The cost estimate in this report for addressing unplanned events includes consideration of the possible disposal of spent fuel rods from the Millstone plant (Table III-4, Item BW34), but the values assigned to the probability of any impact from their disposal, and the projected cost of responding to any consequences, are relatively low in comparison to other risks that are considered.

[1] A fuel rod consists of a corrosion-resistant metal alloy tube in which are stacked numerous ceramic pellets of uranium oxide. Each rod is roughly ½ inch in diameter and 12 feet long.

I.3.3 Cost Estimating Methodology

In general terms, each cost component is estimated using one of three methods:

- Quantitative estimate – The product of quantity (e.g., 100 tons) and the unit cost (e.g., $20 per ton) equals costs (i.e., $2,000).
- Scaled estimate – A known cost from some other related or similar activity is scaled by an applicable parameter. For example, based on the cost of excavating 10,000 cubic yards in a similar facility (known to be $75,000), the cost of excavating 2,000 cubic yards in question might be estimated as $15,000.
- Experience estimate – The cost is estimated by a professional experienced with the component being estimated.

The cost estimate addresses all activities identified in Section II.2.4 of this document. For each activity, the effort and cost required to accomplish the activity were separately characterized. The estimated costs reported in this study are those that would result if all monitoring and maintenance activities were conducted in 2008. Consistent with this treatment of costs, economic analyses (refer to Section II.4 of this document) are conducted using a real interest rate or 2 percent per year specified by the Board staff for this evaluation based on work done previously for the Board (BB&J, 2002). The “real interest rate” is the interest earned on the balance of the funds in the account each year, minus the inflation rate for the same year.

PART II MID-RANGE COST ESTIMATES

This document consists of three parts that have different purposes:

- Part I, Background Information, provides background and descriptive information about the Barnwell facility and the legal and financial constraints within which the facility must operate and be maintained.
- Part, II, Mid-Range Cost Estimates, describes planned post-closure custodial care activities for the Barnwell LLRW disposal facility and presents the expected cost of conducting those activities. This part does not address uncertainties, contingencies, or the complications and additional costs associated with unplanned events.
- Part III, Financial Risks, addresses the possibility that post-closure custodial care costs at the Barnwell facility might differ from expected costs for two reasons: uncertainties in the costs of planned activities, and costs associated with unplanned (but nevertheless possible) future events.

The objective of this part of the report is to present the results of an independent estimate of all planned and expected post-closure monitoring and maintenance costs—costs associated with post-closure observations and long-term custodial care of the Barnwell facility. This part presents the expected costs of conducting planned post-closure activities.

The estimated costs presented in this part are “mid-range costs.” This means that an equal chance exists that actual costs will be less than those presented in this part and that they will exceed those presented in this part.

Actual costs can differ from the mid-range costs because of uncertainties in the quantities and unit costs used to prepare the cost estimate and because costly events may occur that have not been planned or expected. These “contingent costs” are discussed in PART III of this document.

Background information about the Barnwell facility, the site at which it is located, waste disposed of at the facility, and other matters related to the post-closure care of the facility are presented in PART I of this document.

This document considers the costs associated with facility stabilization and closure only incidentally.

II.1 SUMMARY OF MID-RANGE COST ESTIMATE

The mid-range annual costs to the Barnwell Extended Care Fund of planned monitoring and maintenance activities for the Barnwell facility (refer to Table II-1) are estimated to vary with time as follows:

Table II-1. Summary of Mid-Range Cost for Planned Post-Closure Custodial Care

Program Phase	Years	Estimated Mid-range Costs per Year	Present Value of Mid-range Costs
To Beginning of Phase II of Closure	2010 through 2038	$2.0 million/yr	$41 million
Phase II Post-Closure Observation	2039 through 2043	$4.0 million/yr	$10 million
Stage I Institutional Control	2044 through 2068	$2.3 million/yr	$22 million
Stage II Institutional Control	2069 through 2093	$1.7 million/yr	$9.6 million
Stage III & IV Institutional Control	2094 through 2143	$1.3 million/yr	$7.5 million
		Total	**$90 million**

As shown in Table II-1, the present value of mid-range costs to the Barnwell Extended Care Fund of planned monitoring and maintenance activities for the Barnwell facility are estimated to total about $90 million. With a balance of about $123 million as of December 31, 2007, the Barnwell Extended Care Fund currently contains sufficient funds to cover the mid-range estimate of $90 million for planned and expected post-closure monitoring and maintenance activities. This leaves, with 50 percent confidence, about $33 million to pay for contingent or unplanned costs, which are discussed in Part II.

II.2 BASIS FOR ESTIMATED COSTS

II.2.1 Responsibility for Facility Care

During the period of in-region disposal operations, responsibility for monitoring and maintenance lies with CNS as long as it conducts disposal operations at the Barnwell facility. However, the source of funding for some of the cost components will be shared or apportioned while both disposal operations and monitoring and maintenance activities are conducted. For example, the costs for monitoring and maintaining areas that support and are used for in-region disposal operations are paid for by charges on waste received for disposal, while the costs for monitoring and maintaining closed areas are reimbursed to CNS from the Extended Care Fund.

The plans for apportioning shared monitoring and maintenance costs are being prepared by CNS, in consultation with the DHEC and the Board. While the specific proportions and amounts attributed to each of these “institutional costs” will need to be approved by the South Carolina Public Service Commission, the Board has provided preliminary planning data, which has been used in this report as the basis for projecting the portion of costs for these activities through the end of disposal operations. The preliminary basis for sharing monitoring and maintenance cost through the conclusion of Phase II closure activities is summarized in Table II-2.

Table II-2. Apportioning Monitoring and Maintenance Costs Through Phase II Closure

Cost Category	Basis for Cost Apportioning	Percent Paid by Extended Care Fund
Temporary Facilities	Administrative	25 percent
Vehicles	Administrative	25 percent
Regulatory Oversight (covered by DHEC license fee)	Administrative	25 percent
Post-Closure Staff and Management	Administrative	25 percent
Environmental Monitoring Program	Land Area	91.3 percent
Cover Integrity Monitoring	Land Area	1.3 percent
Maintenance	Land Area	91.3 percent
Waste Disposal	Land Area	91.3 percent
License, Fees, Taxes, and Insurance	Administrative	25 percent

In the cost estimates prepared in support of this document, the total costs of monitoring and maintaining the Barnwell facility were estimated for each time period. For years preceding the conclusion of Phase II closure, the cost to the Extended Care Fund is determined as the sum of all category costs (refer to Table II-2) times the respective percentages stated in Table II-2. At the successful conclusion of the Phase II closure activities, the costs of all monitoring and maintenance activities will be paid from the Extended Care Fund.

II.2.2 Environmental Monitoring

The program for monitoring the environment in the vicinity of the Barnwell facility is designed on the expectation that the facility will perform as required. Throughout the interim care period and the Phase II post-closure observation period, the environmental monitoring program is assumed to be that defined in Table 6-14 of the 2005 stabilization and closure plan (CNS 2005a). As described above, the post-closure observations are expected, for the sole purpose of estimating mid-range custodial care costs, to demonstrate that the facility is performing are required and as designed. To the extent that expected performance is not confirmed by post-closure observations, the facility license will not be terminated and facility operator will undertake remedial measures acceptable to DHEC.

Given that expected performance is confirmed during the post-closure observation period and the first 25 years of the institutional control period (Stage I), the intensity of environmental monitoring is assumed to be reduced to that defined in Table 8-9 of the 2005 closure and stabilization plan (CNS 2005a). Assuming that monitoring during Phase II post-closure observations and the first 25 years of institutional control confirms expected performance of the entire closed facility, the monitoring intensity is assumed to be further reduced to that defined in Section II.2.4.4.

The environmental monitoring programs provided to DHEC and assumed in preparing this mid-range cost estimate are reproduced in Appendix A of this report.

II.2.3 Separate Facility Areas

For the purpose of this evaluation, the Barnwell facility consists of two sets of areas that will be managed on separate timelines. The first area consists of all portions of the site area that are not required to support ongoing in-region disposal operations and is referred to in the text as "Phase I area." The Phase I area involves not only the disposal units closed and stabilized prior to 2008, but also portions of the facility closed beginning July 1, 2008 (Phase I Closure). Phase I areas comprise about 105 acre/s of facility disposal area and are all areas shown in Figure II-1 other than that reserved for in-region disposal operations.

The second area involves those facilities and land areas required to support ongoing in-region disposal operations (referred to as "Phase II areas"). In-region disposal operations will begin in 2008 and last for about 30 years (refer to the area reserved for in-region disposal operations in Figure II-1.

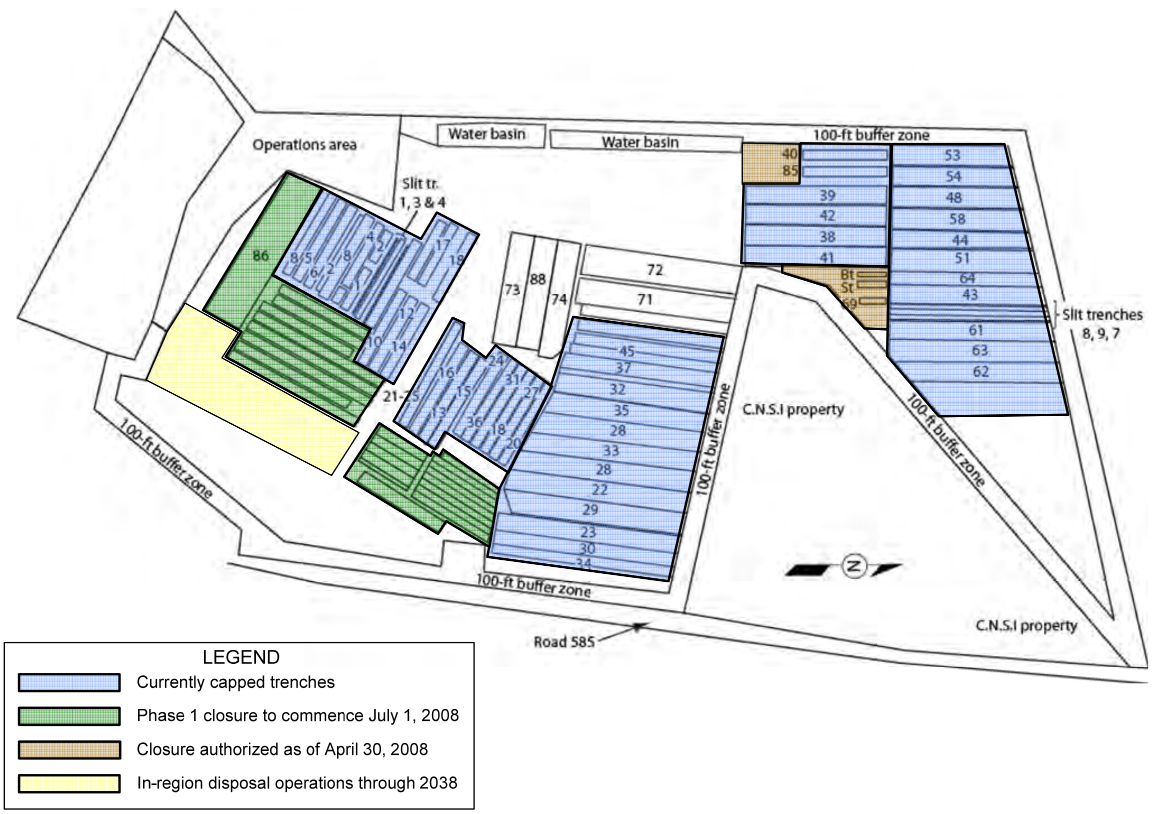


Figure II-1. Separate Groups of Disposal Trenches

II.2.4 Post-Closure Activities

The activities that are planned to be conducted following closure include post-closure monitoring, observation and institutional control activities. These activities and the facilities, services, and equipment required to accomplish them involve the following categories of costs:

- Temporary Facilities
- Equipment
- Regulatory Oversight
- Post-Closure Staff and Management
- Environmental Monitoring
- Cover Integrity
- Maintenance
- Waste Transport and Disposal
- Other
- Aerial Survey (once per stage of institutional control period)
- Performance Evaluations (once per stage of institutional control period)

The cost components that make up each of these categories are identified in the following sections.

II.2.4.1 Temporary Facilities

Temporary facilities are required to support the post-closure care staff that function at the closed facility. Temporary facilities include the office space and necessary supplies and utilities to make it functional:

- Office trailer
- Office equipment
- Office supplies
- Storage unit
- Telephone service
- Lights, heating, ventilation, and air conditions
- Water/sewer
- Waste collection

These costs were estimated as monthly costs, whether for service provided or facilities rented.

II.2.4.2 Vehicles

Vehicles are those considered necessary to carry out all administrative and monitoring functions at the site.

- Pickup truck
- Utility truck, flat bed/dump bed
- Fuel

These costs were estimated as monthly costs, whether for service provided or facilities rented. Fuel consumption was based on one 24-gallon tank of fuel per vehicle each week, with the price of fuel being initially $4.00 per gallon. The variation of the projected vehicle requirements over facility's post-closure life is presented in Table II-3.

Table II-3. Summary of Projected Vehicle Requirements

	Through Phase I Interim Care	Phase II Post Closure Observation	Institutional Control Stage I	Institutional Control Stage II	Institutional Control Stage III and IV
Weeks Required per Year	52	52	26	26	26
Pickup Truck	2 veh	2 veh	2 veh	2 veh	1 veh
Utility Truck, Flat Bed/Dump Bed	2 veh	2 veh	2 veh	2 veh	1 veh
Fuel (gallons per year)	1,248	4,992	2,496	2,496	1,248

No construction or other specialized equipment that typically support field operations and activities are included in this category of costs. Costs for such equipment are accounted for in other maintenance activities described below.

II.2.4.3 Post-Closure Staff and Management

Staff and management responsible to oversee and conduct all monitoring and maintenance activities include the following professional persons:

- Manager (one person)
- Superintendent (one person)
- Certified Health Physicist or CHP (one person)
- Engineer (two persons)
- Environmental Technician (two persons)
- Instrument Technician (one person)

An annual lump sum cost of $20,000 has been allowed beginning in Stage I of the institutional control period for administrative costs to the Board.

Post-closure staff and management are responsible to ensure that all post-closure maintenance and monitoring activities are properly conducted and to administer the ordinary business matters associated with an office and field operation. Environmental monitoring is assumed to the conducted and necessary periodic reports prepared by this staff. Maintenance activities are assumed to be preformed by contractors but overseen by this staff.

Staffing requirements were assumed to decrease throughout the Barnwell facility life, as shown in Table II-4. The apportionment of monitoring and maintenance costs between operating revenues and Extended Care Fund monies are not reflected in this table (refer to Section II.2.1).

Table II-4. Summary of Projected Annual Staffing

	Facility Staffing Requirements (hours per year)			
	Through Phase II Post Closure Observation	Institutional Control Stage I	Institutional Control Stage II	Institutional Control Stage III and IV
Manager	2,080	1,040	520	260
Superintendent	2,080	1,040	520	260
CHP	2,080	1,040	520	260
Environmental Technician	4,160	2,080	1,040	520
Engineer	4,160	2,080	1,040	520
Instrument Technician	2,080	1,040	520	260
Total	**16,640**	**8,320**	**4,160**	**2,080**

II.2.4.4 Environmental Monitoring

Post-closure environmental monitoring plan is defined in Section II.2.2 and involves monitoring of both radiological and non-radiological analytes. According to the environmental monitoring plan, samples are collected and analyzed biweekly, quarterly, and annually and are taken from both on-site and off-site and boundary locations. Samples of groundwater are collected and analyzed from monitoring wells, observation sumps (developed to observe water in the bottoms of the disposal units), and potable water wells. Surface water, sediments, soils, and vegetation samples are also collected and analyzed. The atmosphere and ambient radiation levels are also monitored.

The costs of conducting the environmental monitoring program include the labor cost necessary to collect samples and the cost for a qualified contract laboratory to analyze the samples. The environmental monitoring programs provided to DHEC and assumed in preparing this mid-range cost estimate are reproduced in Appendix A of this report.

The intensity of environmental monitoring at all locations except disposal unit sumps generally decreases from one stage of the institutional control period to the next. However, monitoring of all disposal unit sumps was assumed to remain unchanged throughout the institutional control period. The sumps provide the most immediate indication of the effectiveness of the cover system and the overall facility performance. If leachate is observed in the sumps, immediate action can be taken to minimize the opportunity for radioactive contaminants to be released from the facility into the groundwater system.

Following Phase II post-closure observation, environmental monitoring intensity for locations and media other than the disposal unit sumps was assumed to decrease. The assumed monitoring intensity is presented in Table II-5.

Table II-5. Summary of Environmental Monitoring Samples Analyzed Annually

	Through Phase I Post-Closure Observations	Institutional Control Stage I	Institutional Control Stage II	Institutional Control Stages III and IV
Wells	678	608	312	164
Surface Water	2	34	18	10
Observation Sumps	604	604	604	604
Surface Soil	64	80	40	20
Sediment	4	4	2	1
Samples of Opportunity	1250	400	200	100
Vegetation	64	---	---	---
External Gamma	420	---	---	---
Atmospheric	312	---	---	---

II.2.4.5 Cover Integrity Monitoring

The integrity of cover systems provided for stabilized disposal units is monitored through annual surveys of settlement monuments located on disposal units throughout the closed disposal area. According the 2005 closure and stabilization plan (CNS 2005a), each stabilized disposal unit involves five settlement monuments: one at each corner of the disposal unit and one in the center of the disposal unit. The exact location and elevation of each settlement monument is determined through precise land survey techniques. Costs were estimated for the 130 settlement monitors that exist at facility closure.

II.2.4.6 Maintenance

Maintenance of permanent on-site features requires the following activities:

- Maintain vegetated cover
- Fertilize cover
- Maintain on-site roads
- Maintain storm water drainage and retention structures
- Remove sediment from storm water drainage and retention structures
- Reseed cover systems
- Perform limited cover repairs

- Maintain fence
- Repair monitoring wells and observation sumps

The need for maintenance activities was taken to remain constant across all phases and stages of facility life. The activities, their annual amounts, and rationales for the amounts projected for the cost estimate are summarized in Table II-6.

Table II-6. Summary of Maintenance Activities

	Units	Phase I Post-Closure Observations
Maintain vegetated cover	acres	115
Fertilize cover (10 to 20 percent each year)	sq yd	55,660
Maintain dirt roads (25 to 50 percent each year; 10,000 ft of 20-ft road)	sq yd	5,556
Maintain storm water structures (5 to 10 % of assumed area each year)	sq ft	37,571
Maintain storm water structures (remove 0.5 to 1 ft sediment each year)	cu yd	58
Occasional seeding (10 to 20 percent each year)	1000 sq ft	501
Small cover repairs (1 to 2% of Phase 1 cover each year, 3 ft deep)	cu yd	5,566
Fence (5 to 10 percent of total length , 13200 ft, each year)	ft	660
Well repairs (10 ft for 5 to 10% of all wells each year)	ft	109

II.2.4.7 Waste Transport and Disposal

A small quantity of sediments and other waste is estimated to be collected annually. Through the conclusion of in-region disposal operations, any sediment collected was assumed to be disposed of in the operating disposal unit. Following Phase II closure, such waste was assumed not to be radiologically or otherwise contaminated and to be transported to and disposed of at a nearby industrial landfill. This is consistent with the fundamental premise of this estimate that the facility is assumed to be performing as planned and required.

II.2.4.8 Other

Other cost components include the following:

- Security
- Taxes
- Insurance
- License and other fees

Security during post-closure observation is assumed to be provided round the clock throughout the year through Stage I of the institutional control period. Taxes are those currently imposed.

Based on the most current information available including limited information from EnergySolutions (owner of CNS), professional judgment was made about the levels of insurance that should be maintained following facility closure. The type of insurance coverage recommended and associated premiums are summarized in Table II-7:

Table II-7. Summarized Cost of Post-Closure Insurance Coverage

Type of Insurance	Annual Premium through Phase II Post-Closure Observations	Basis (percent of current premium)	Annual Premium from Institutional Control Phase I through Phase IV	Basis (percent of current premium)
Auto	$4,350	25%	$0	0%
General Insurance	$70,811	50%	$0	0%
Nuclear Policies	$154,976	50%	$77,488	25%
Nuclear Property	$0	0%	$0	0%
Non-Nuclear	$13,299	10%	$6,649	5%
Nuclear Pollution Liability	$0	0%	$0	0%
Total Premium	**$243,435**		**$84,137**	

License and other fees are defined in CNS 2005a and include:

- DHEC license (that covers all expected cost of providing regulatory oversight)
- Site lease fee
- Other (unspecified) fees
- Permits

The costs of regulatory oversight through Phase II Post-Closure Observations were projected to be the amount stated in the Barnwell stabilization and closure plan (CNS 2005a), namely $275,829 per year. Following license termination and transfer of responsibility for facility monitoring and maintenance to the Board, the level of regulatory oversight was projected to substantially decline. During institutional control Stages I (years 2044 through 2068) and Phase II (years 2069 through 2093) the costs of maintaining regulatory oversight were estimated to total about $158,000 per year and further decline to about $78,000 per year during Stages III and IV (years 2094 through 2043).

II.2.4.9 Aerial Survey

Once every 25 years, a detailed aerial survey is assumed to be conducted over an area of 229 acres.

II.2.4.10 Performance Evaluations

Once every 25 years, an evaluation of the facility performance is prepared using results generated by the environmental monitoring program and comparing to result of modeled projections.

II.3 BASE-CASE AND MID-RANGE COST ESTIMATES

The base-case cost estimate addresses all activities identified in Section II.2.4 of this document. The effort and cost of each activity were separately characterized and estimated using the best information available under today's business and regulatory conditions. As described in Section III.3 of this document, the magnitude of each cost component may vary from estimated magnitudes because of uncertainties in quantities and unit costs. The analysis of these uncertainties leads to the mid-range cost estimate presented at the conclusion of this section.

The base-case cost estimates are summarized in Table II-8 for the five major period of post-closure care. Breakdowns of base-case cost estimates are summarized in Table II-9 through Table II-13. These tables show the breakdown of costs for each cost component among the Labor, Equipment, Material, Subcontract, and Other categories. The details of the cost estimates are presented in Appendix B.

Table II-8. Summary of Base-Case Annual Post-Closure Custodial Care Costs

Estimate Items	Prior to Phase I Post Closure Observation (105 of 115 acres) (Years 2010–2038)	Phase II Post Closure Observation (All 115 acres) (Years 2039–2043)	Stage I Institutional Control (All 115 acres) (Years 2044–2068)	Stage II Institutional Control (All 115 acres) (Years 2069–2093)	Stages III and IV Institutional Control (All 115 acres) (Years 2094–2143)
Temporary Facilities *(Admin)*	$12,119	$48,477	$48,477	$48,477	$48,477
Vehicles (*Admin*)	$21,192	$84,768	$74,784	$74,784	$69,792
Post-Closure Staff and Management *(Admin)*	$268,766	$1,164,304	$602,152	$311,076	$165,538
Environmental Monitoring *(Land)*	$874,777	$958,089	$499,227	$339,364	$259,433
Cover Integrity Monitoring *(Land)*	$19,209	$21,039	$21,039	$21,039	$10,519
Maintenance *(Land)*	$308,226	$337,581	$337,581	$337,581	$337,581
Waste Disposal *(Land)*		$7,653	$7,653	$7,653	$7,653
License, Fees, Taxes, and Insurance *(Admin)*	$217,482	$869,929	$574,053	$430,196	$350,270
Subtotal	**$1,721,773**	**$3,491,840**	**$2,164,966**	**$1,570,170**	**$1,249,264**
G&A on Subtotal (3%)	$51,653	$104,755	NA[2]	NA[1]	NA[1]
Fee on Subtotal plus G&A (7.25%)	$128,573	$260,753	NA[1]	NA[1]	NA[1]
Total	**$1,901,999**	**$3,857,348**	**$2,164,966**	**$1,570,170**	**$1,249,264**

[2] Post-closure care not provided by facility operator.

The line titles in Table II-8 and Table II-9 include the italicized notes "*Admin*" and "*Land*". For those with the note "A*dmin,*" total estimated administrative costs are assumed to be shared 75 percent by fund from current disposal operations and 25 percent by Extended Care Fund monies through the conclusion of in-region disposal operations. For those with the note "*Land,*" total estimated costs are assumed to be shared in proportion to the fraction of land applicable areas. For the 10 acres still active in support of in-region disposal operations, this amount is about 9 percent of the total 115 areas of disposal area. Closed disposal area includes about 105 acres, or about 91 percent of total disposal area.

Thus, through the conclusion of in-region disposal operations, current disposal operations will pay for about 9 percent of the total costs of monitoring and maintaining the entire site, while about 91 percent will be paid from Extended Care Fund monies. This allocation pattern is reflected in the results shown in Table II-9. This explains why the annual costs increase at the conclusion of in-region disposal operations or at the end of Phase I Interim Care (as can be seen in the differences between the second and third columns values in Table II-8 and between Table II-9 and Table II-10).

Table II-9. Breakdown of Base-Case Annual Costs To Beginning of Post-Closure Observations (Years 2010 through 2038 for 105 of 115 Acres)

Estimate Items	Material	Labor	Equipment	Subcontract	Other	Total
Temporary Facilities *(Admin)*				$11,219	$900	$12,119
Vehicles (*Admin*)	$4,992		$16,200			$21,192
Post-Closure Staff and Management *(Admin)*		$268,766				$268,766
Environmental Monitoring		$153,652		$721,125		$874,777
Cover Integrity Monitoring *(Land)*		$18,309	$901			$19,209
Maintenance *(Land)*	$181,224	$69,854	$57,149			$308,226
Waste Disposal *(Land)*						
License, Fees, Taxes, and Insurance *(Admin)*		$61,916			$155,566	$217,482
Subtotal	**$186,216**	**$572,497**	**$74,249**	**$732,344**	**$156,466**	**$1,721,773**
G&A (3%)	$5,586	$17,175	$2,227	$21,970	$4,694	$51,653
Fee on Subtotal plus G&A (7.25%)	$13,906	$42,751	$5,545	$54,688	$11,684	$128,573
Total	**$205,708**	**$632,424**	**$82,021**	**$809,003**	**$172,844**	**$1,901,999**

Table II-10. Breakdown of Base-Case Annual Costs for Phase II Post-Closure Observations (Years 2039 through 2043 for All 115 Acres)

Estimate Items	Material	Labor	Equipment	Subcontract	Other	Total
Temporary Facilities				$44,877	$3,600	$48,477
Equipment	$19,968		$64,800			$84,768
Post-Closure Staff and Management		$1,164,304				$1,164,304
Environmental Monitoring		$168,286		$789,804		$958,089
Cover Integrity Monitoring		$20,052	$987			$21,039
Maintenance	$198,483	$76,507	$62,591			$337,581
Waste Disposal				$7,653		$7,653
License, Fees, Taxes, and Insurance		$247,666			$622,263	$869,929
Subtotal	**$218,451**	**$1,676,814**	**$128,378**	**$842,334**	**$625,863**	**$3,491,840**
G&A (3%)	$6,554	$50,304	$3,851	$25,270	$18,776	$104,755
Fee on Subtotal plus G&A (7.25%)	$16,313	$125,216	$9,587	$62,901	$46,736	$260,753
Total	**$241,317**	**$1,852,334**	**$141,816**	**$930,505**	**$691,375**	**$3,857,348**

Table II-11. Breakdown of Base-Case Annual Costs for Institutional Control Stage I (2044 through 2068 for All 115 Acres)

Estimate Items	Material	Labor	Equipment	Subcontract	Other	Total
Temporary Facilities				$44,877	$3,600	$48,477
Equipment	$9,984		$64,800			$74,784
Post-Closure Staff and Management		$582,152			$20,000	$602,152
Environmental Monitoring		$78,473		$420,755		$499,227
Cover Integrity Monitoring		$20,052	$987			$21,039
Maintenance	$198,483	$76,507	$62,591			$337,581
Waste Disposal				$7,653		$7,653
License, Fees, Taxes, and Insurance		$247,666			$326,387	$574,053
Subtotal	**$208,467**	**$1,004,849**	**$128,378**	**$473,285**	**$349,987**	**$2,164,966**
G&A (3%)	NA[1]	NA[1]	NA[1]	NA[1]	NA[1]	NA[1]
Fee on Subtotal plus G&A (7.25%)	NA[1]	NA[1]	NA[1]	NA[1]	NA[1]	NA[1]
Total	**$208,467**	**$1,004,849**	**$128,378**	**$473,285**	**$349,987**	**$2,164,966**

Table II-12. Breakdown of Base-Case Annual Costs for Institutional Control Stage II (2069 through 2093 for All 115 Acres)

Estimate Items	Material	Labor	Equipment	Subcontract	Other	Total
Temporary Facilities				$44,877	$3,600	$48,477
Equipment	$9,984		$64,800			$74,784
Post-Closure Staff and Management		$291,076			$20,000	$311,076
Environmental Monitoring		$53,343		$286,021		$339,364
Cover Integrity Monitoring		$20,052	$987			$21,039
Maintenance	$198,483	$76,507	$62,591			$337,581
Waste Disposal				$7,653		$7,653
License, Fees, Taxes, and Insurance		$123,833			$306,363	$430,196
Subtotal	**$208,467**	**$564,811**	**$128,378**	**$338,551**	**$329,963**	**$1,570,170**
G&A (3%)	NA[1]	NA[1]	NA[1]	NA[1]	NA[1]	NA[1]
Fee on Subtotal plus G&A (7.25%)	NA[1]	NA[1]	NA[1]	NA[1]	NA[1]	NA[1]
Total	**$208,467**	**$564,811**	**$128,378**	**$338,551**	**$329,963**	**$1,570,170**

Table II-13. Breakdown of Base-Case Annual Costs Institutional Control Stages III and IV (2094 through 2143 for All 115 Acres)

Estimate Items	Material	Labor	Equipment	Subcontract	Other	Total
Temporary Facilities				$44,877	$3,600	$48,477
Equipment	$4,992		$64,800			$69,792
Post-Closure Staff and Management		$145,538			$20,000	$165,538
Environmental Monitoring		$40,779		$218,654		$259,433
Cover Integrity Monitoring		$10,026	$493			$10,519
Maintenance	$198,483	$76,507	$62,591			$337,581
Waste Disposal				$7,653		$7,653
License, Fees, Taxes, and Insurance		$123,833			$226,437	$350,270
Subtotal	**$203,475**	**$396,682**	**$127,885**	**$271,184**	**$250,037**	**$1,249,264**
G&A (3%)	NA[1]	NA[1]	NA[1]	NA[1]	NA[1]	NA[1]
Fee on Subtotal plus G&A (7.25%)	NA[1]	NA[1]	NA[1]	NA[1]	NA[1]	NA[1]
Total	**$203,475**	**$396,682**	**$127,885**	**$271,184**	**$250,037**	**$1,249,264**

As described in Section III.3 of this document, probability distributions were selected to bias costs to conservatively large values, thereby providing greater confidence that the evaluation of the Barnwell Extended Care Fund does not overstate its adequacy. The mid-range cost estimate results from that evaluation. The base case and mid-range estimates of annual costs to monitor and maintain the Barnwell facility are summarized in Table II-14. The differences between the base-case and mid-range cost estimates range from $50,000 to $130,000 per year.

Table II-14. Base-Case and Annual Costs to Monitor and Maintain the Barnwell Facility

Period	Base-Case Annual Cost ($ per year)	Mid-Range Annual Cost ($ per year)
To Phase II Post-Closure Observation	$1,900,000	$2,000,000
Phase II Post-Closure Observation	$3,900,000	$4,000,000
Stage I Institutional Control	$2,200,000	$2,300,000
Stage II Institutional Control	$1,600,000	$1,700,000
Stage III & IV Institutional Control	$1,200,000	$1,300,000

II.4 ECONOMIC EVALUATION OF ESTIMATED MID-RANGE COSTS

An economic evaluation is critical to the cost projection because over the long period of custodial care, the amount of money on deposit will earn interest, and the costs of conducting the activities will increase due to inflation. Assumptions regarding interest and inflation have a major impact on the outcome of the analysis.

Economic evaluations were performed of estimated costs as they occur in time using a real interest rate of 2 percent per year. This is the real interest rate recommended in a previous report on the Barnwell Extended Care Fund (BB&J, 2002), which the Board staff requested be used as the basis for long-term real interest in this report. Actual earnings on Extended Care Fund monies have exceeded a real rate of 2 percent per year. A real interest rate is the difference between the nominal interest rate (that includes the effects of inflation) and the inflation rate. For the past 30 years, the real rate of return on secure financial instruments (such as long-term government debt) has generally exceeded 2 percent per year (OMB, 2003).

Using a real interest rate of 2 percent per year is conservative for the purposes of this document. Assuming an interest rates even slightly higher than this (2.5 percent, for example) would generate much greater interest earnings, due to the effects of compounding interest over the long period of time entailed by the extended care program. However, the objective of this work is to ensure that sufficient funds exist to successfully monitor and maintain the facility through 100 years of institutional control. Therefore, a conservatively low value of the interest rate should be used so as to understate the value of the fund at any future date. Moreover, given that historical real interest rates generally exceed 2 percent per year, this conservatism increases confidence that the fund will be no less than the projected amount.

Using the real interest rate helps assure that sufficient funds will be available in the future to cover future costs. Funds invested at a real interest rate grow faster than inflation increases the cost of goods and services. Thus, a future purchase is less expensive if the money is on deposit today because the invested funds grow faster than the prices of goods and services escalate.

Present values of future cash flows (costs) are calculated using the following well-known relation:

$$PV_j = C_j * (1 + i)^{-n}$$

where PV_j is the present value of the cost that occurs in year j,

C_j is the cost that occurs in year j,

i is the real interest rate (percent per year), and

n is the number of year in the future when the cost is incurred.

Present values can be added, just as current costs are added. Their sum, however, is a realistic representation of the cost of activities, whenever they might be conducted. Thus, accumulated present values can be compared to the amount of funds presently available to determine whether the fund is of sufficient magnitude.

The present values of estimated base-case and mid-range costs as reported in Section II.3 were determined using the timing of each cash flow (refer to Appendix B) and the specified real interest rate of 2 percent per year.

The present values of estimated mid-range costs of post-closure activities during the various periods considered in this part are summarized in Table II-15. That table shows that the present value of planned mid-range costs to total about $90 million, through 100 years of institutional control. The mid-range estimate of the total present value of monitoring and maintaining the Barnwell facility as planned following final closure is as likely to be less than $90 million as it is to be greater.

Table II-15. Present Value of Mid-Range Costs of Planned Post-Closure Care

Time Period	Delay to Beginning of Period (yr)	Years of Time Period	Duration of Time Period (yr)	Present Value of Estimated Mid-Range Costs
To Beginning of Post-Closure Observations	2	2010–2038	29	$41 million
Post-Closure Observations	31	2039–2043	5	$10 million
Institutional Control Stage I	36	2044–2068	25	$22 million
Institutional Control Stage II	61	2069–2093	25	$9.7 million
Institutional Control Stage III and IV	86	2094–2143	50	$7.6 million
			Total Present Value	**$90 million**[3]

The balance of the Extended Care Fund on December 31, 2007 was nearly $123 million, which exceeds the present value of the mid-range estimate of post-closure costs presented in by about $33 million. This means that, after all costs of conducting planned post-closure care activities are paid, is it equally likely that more than a present value of $33 million will remain in the

[3] Includes present values of $13,000 for periodic costs and $500,000 additional deposits to the Extended Care Fund during In-Region disposal operations. Totals differ from sum of components because of roundoff error.

Extended Care Fund, as it is that less will remain. Because a 50 percent probability exists that the estimate of $90 million is less than the amount of money that will be needed for extended care of the Barnwell site, it is important to examine contingencies and events that could cause this cost to be exceeded. This analysis is the subject of PART III of this report.

II.5 PROJECTED EXTENDED CARE FUND PERFORMANCE UNDER MID-RANGE COST ESTIMATE

The performance of the Barnwell Extended Care Fund was projected to assess its adequacy. The following conditions were used in projecting the fund performance:

- Initial balance as of December 31, 2007 ($122,751,249)
- The schedule of mid-range cost estimates provided in Section II.3
- New deposits of $22,400 throughout in-region disposal operations
- Annual real interest earnings generated by a real interest rate of 2 percent per year

The projected performance of the Barnwell Extended Care Fund is presented in Figure II-2. With estimated mid-range post-closure care costs, the balance grows monotonically except for the years of Phase II Post-Closure Observation (years 2039 through 2043), when the annual expenditure rate is slightly greater. Assuming expenditures for only the mid-range costs for planned post-closure activities, the fund will total over $500 million (in current dollars) at the end of the institutional control period. Considering only mid-range estimated post-closure care costs. Thus, the current balance of the Barnwell Extended Care Fund is adequate to cover the mid-range costs of all planned post-closure care activities.

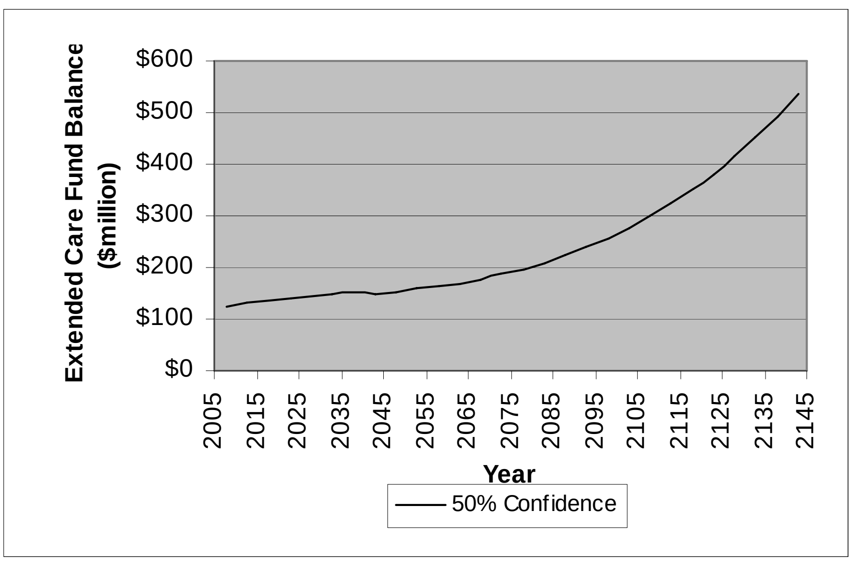


Figure II-2. Projected Performance of Barnwell Extended Care Fund Using Mid-Range Cost Estimates of Planned Post-Closure Care Only

Another point of interest is whether sufficient funds exist to cover facility monitoring and maintenance that might extend beyond the conclusion of the institutional control period, should a decision be made to continue certain activities. The present value of monitoring and maintenance costs estimated to total $1 million per year (about 80 percent of the estimated costs during Stages III and IV of the institutional control period) and continue for 100 years is estimated to be about $2.9 million with a real interest rate of 2 percent per year. The present value of this same level of monitoring and maintenance continued for 200 years following the conclusion of the institutional control is estimated to be only slightly greater than that for 100 additional years, or about $3.3 million.

PART III FINANCIAL RISKS

This document consists of three parts that have different purposes:

- Part I, Background Information, provides background and descriptive information about the Barnwell facility and the legal and financial constraints within which the facility must operate and be maintained.
- Part II, Mid-Range Cost Estimates, describes planned post-closure custodial care activities for the Barnwell LLRW disposal facility and presents the expected cost of conducting those activities. This part does not address uncertainties, contingencies, or the complications and additional costs associated with unplanned events.
- Part III, Financial Risks, addresses the possibility that post-closure custodial care costs at the Barnwell facility might differ from expected costs for two reasons: uncertainties in the costs of planned activities, and costs associated with unplanned (but nevertheless possible) future events.

Actual costs can differ from the mid-range costs because of uncertainties in the quantities and unit costs used to prepare the cost estimate and because costly events may occur that have not been planned or expected. These “contingent costs” are discussed in this part of this document.

Background information about the Barnwell facility, the site at which it is located, waste disposed of at the facility, and other matters related to the post-closure care of the facility are presented in PART I of this document.

PART II presents the results of an independent estimate of all planned and expected post-closure monitoring and maintenance costs—costs associated with post-closure observations and long-term custodial care of the Barnwell facility.

This document considers the costs associated with facility stabilization and closure only incidentally.

III.1 SUMMARY OF FINANCIAL RISKS

The annual costs of planned monitoring and maintenance activities for the Barnwell facility for which the Barnwell Extended Care Fund is responsible might be less than or greater than the mid-range costs presented above in PART II because of uncertainties in the cost estimate. With 80 percent confidence, the costs of planned monitoring and maintenance activities are projected not to exceed the values shown in Table III-1.

Table III-1. Planned Post-Closure Custodial Care with 80 Percent Confidence

Program Phase	Years	Estimated 80-Percent Confidence Costs per Year	Present Value 80-Percent Confidence Costs
To Beginning of Phase II of Closure	2010 through 2038	$2.1 million/yr	$44 million
Phase II Post-Closure Observation	2039 through 2043	$4.2 million/yr	$11 million
Stage I Institutional Control	2044 through 2068	$2.4 million/yr	$23 million
Stage II Institutional Control	2069 through 2093	$1.8 million/yr	$10 million
Stage III & IV Institutional Control	2094 through 2143	$1.4 million/yr	$8.0 million
		Total	**$95 million**

With a balance of about $123 million as of December 31, 2007, the Barnwell Extended Care Fund currently contains, with 80 percent confidence, sufficient funds to cover the costs of planned post-closure monitoring and maintenance activities and leave about $28 million available to cover the costs of unplanned events, consequences, and responses that might occur following facility closure.

With about 60 percent confidence, the present value of the total chance occurrence costs of unplanned events, consequences, and responses is estimated not to exceed $25 million (refer to Figure III-5 below). With 80 percent confidence, the present value of the total chance occurrence costs is estimated not to exceed about $58 million.

Without allowances for unplanned events or tritium plume remediation, the present balance of the Fund is sufficient, with 80 percent confidence, not only to cover planned post-closure costs through the conclusion of the institutional control period but also to grow substantially due to interest earnings on the balances. If, however, an allowance of $28 million were made in 2008 to cover, with 80 percent confidence, all the costs of unplanned events (except tritium plume remediation), planned post-closure care costs would deplete the Fund in 2124, about 19 years before the end of the institutional control period. Finally, if $23 million were also reserved in 2008 for tritium plume remediation, planned post-closure care costs would deplete the Fund in 2059, after only 16 years of the institutional control period.

III.2 OVERVIEW

For the purpose of preparing the best possible plan for the present and future management of the Extended Care Fund, account must be made of the effects of uncertainties and unplanned events and conditions. A detailed plan has been prepared for post-closure custodial activities (both as part of this work and by CNS). Nevertheless, uncertainty remains that could cause the actual costs of planned post-closure activities to differ from estimated costs. These uncertainties exist not only in the prices the Board will have to pay for labor, materials, and equipment, but also in the extent of work that will actually be required each year.

For example, the base-case cost estimate projects that during a typical year of the institutional control period, Stage I (first 25 years), environmental samples will be collected through the commitment of 1,730 hours of technician effort at an annual labor cost of about $78,000. In any year, it is estimated that 4,842 samples will be analyzed at an annual cost of about $421,000.

The annual cost of the environmental monitoring program can vary from the mid-range estimate because:

- The number of technician hours differs
- The hourly cost of technicians changes
- A different number of samples is analyzed
- The cost of analyzing samples varies

An uncertainty can be expressed as a probability distribution, in which the cost or quantity ranges between specified amounts and depends on the probability of occurrence. The probable effects of uncertainties in the mid-range cost estimate must be addressed in developing an effective Extended Care Fund management plan. These uncertainties are considered in Section III.3 below.

In addition to uncertainties in the base-case and mid-range cost estimates, the cost of post-closure activities might differ because of unplanned events that were not factored into the assumptions in developing the post-closure care plan or the Extended Care Fund management plan. Examples of possible unplanned events include:

- Change in public policy regarding environmental protection
- Releases of radioactive materials from the facility beyond acceptable regulatory limits
- Damage to the facility by terrorist, disgruntled workers or extreme weather events

Even though we can postulate the occurrence of numerous events that might incur unplanned costs, it would be imprudent and inappropriate to expect that such costs would actually be incurred. The chance of any particular event occurring might range from as much as 100 percent over the entire extended care period, to as little as one in 10 million. The cost of an event that has a high probability of occurrence should be considered differently than the costs of an event with low probability.

The risk of any event is defined as the product of its cost and its probability. Consider, for example, an event that might cost $100,000 if it was to occur, but whose probability actually occurring is one chance in 100 (a probability of 0.01). The risk of this example event is $100,000 times 0.01, or $1,000. Compare this risk to that of an event whose estimated cost, were it to occur, is $100 million but whose probability of occurring is one in 100 thousand (or 0.00001); $100 million times 0.00001, or $1,000, the same at the previous example. This example illustrates that care should be taken in considering the impacts of low-probability events whose estimated costs are great; their financial risks may not warrant expensive protective efforts.

In responding to each unplanned event that actually occurs, the Board would need to take actions that incur costs beyond those stated in the mid-range cost estimate presented in PART I of this report. The impacts of unplanned events and conditions actually occurring are evaluated in Section III.4 below, together with costs expected to be necessary to respond to those events.

III.3 UNCERTAINTIES IN COSTS OF PLANNED POST-CLOSURE ACTIVITIES

In PART II the present value of mid-range costs was projected to total $90 million for all planned activities related to custodial care of the Barnwell facility. Considering the uncertainties in the cost estimate and using the methodologies described in this section, costs have been also estimated to identify that cost which is only 20 percent likely to be exceeded. The estimates of mid-range costs presented in PART II of this document might differ from those actually incurred because of uncertainties in the quantities and unit costs developed for the cost estimate. The effects of these uncertainties are addressed in this section.

III.3.1 Methodology

Although estimated mid-range costs are presented in PART II of this document for planned activities, actual costs may vary from those projected before the fact. Such differences arise from two sources:

- The duration, number, or quantity of items estimated (such as square feet, cubic yards, hours, and number of samples) to be required may be different from those used in the cost estimate
- Costs of individual activities and items (unit costs or cost per square foot, cubic yard, hour, or sample) may be different from those used in the cost estimate.

Reasonable quantities were prepared in estimating the mid-range cost using the best information currently available. However, these quantities may vary from those estimated. For example, an excessively rainy year might require greater effort to maintain site roadways and to repair erosion damage to cover systems.

In the case of quantity variations, the variations were generally taken to be log-normal, with the 50-percentile value being the value estimated for the cost estimate. The 95-percentile value was determined by increasing the 50-percentile value by factors ranging from 1.25 to 2.00, depending on the judgment of the cost engineer (refer to Appendix C). For example, the 50-percentile quantity for maintaining site roadways was estimated to be 5,072 square yards, based on available information. The 95-percentile value was estimated to be 125 percent of the 50-percentile value or 6,341 square yards.

Unit costs that are quite well known and not particularly subject to market variations were taken to vary according to either a uniform probability distribution or a triangular probability distribution (refer to Appendix C). With a uniform probability distribution, the extremes of cost variation are estimated and any cost within that range may occur with equal probability. For example, the monthly cost of leasing vehicles required by facility staff was assumed to vary uniformly from the ¾ of the estimated level of $1,200 per month (or $960 per month) to 4/3 of the estimated level (or $1,500 per month).

Similarly, in a triangular probability distribution, the extremes of cost variation and the probable cost are estimated. The cost in any trial may range between the minimum and the maximum estimated cost. However, the probability ranges from zero at the minimum cost to zero at the maximum cost, reaching a maximum at the most likely cost. For example, the monthly cost of an office trailer was assumed to vary triangularly from the zero at the minimum value of $342 per month to zero at the maximum value of $492 per month, with the maximum probability occurring at the likely value of $410 per month.

The variability of unit costs that are more sensitive to market variations or other factors (such as fuel cost) was characterized with a log-normal probability distribution. In this case, the likely unit cost was taken as the 50-percentile value. A possible cost that was judged unlikely to be exceeded was taken as the 95-percentile value. For example, the 50-percentile cost of fuel was taken to be the current cost of about $4.00 per gallon, while the 95-percentile value was taken to be a cost of $7.00 per gallon (175 percent of current levels).

Uncertainties in the cost estimate are evaluated using Crystal Ball, an add-in to MS Excel (Oracle, 2008). The character of each uncertainty was judged and quantified by cost estimating professionals and characterized as a probability distribution on the respective quantity or unit cost (refer to Appendix C). The probability distributions used to characterize the uncertainties of costs from planned activities were selected to bias costs in the Crystal Ball simulations to conservatively large values. This approach provides greater confidence that the evaluation of the Barnwell Extended Care Fund does not overstate its adequacy.

Crystal Ball evaluates each probability distribution and its effects on cost estimates for as many trials as the user selects using the well-known Monte Carlo methodology for addressing uncertainty. For this work, the uncertainties and their effects on estimated costs were evaluated 5,000 times each. The results are represented as probability distributions of the estimated costs. These results are summarized in Section III.3.3 and are shown in detail in Appendix C.

III.3.2 Planned Post-Closure Activities

The activities planned for the post-closure care of the Barnwell facility are listed and briefly described in Section II.2.4 of this document. These activities remain unchanged in evaluating the uncertainties associated with planned costs.

III.3.3 Risks of Planned Post-Closure Activities

The uncertainties inherent in estimating the costs of planned monitoring and maintenance activities at the Barnwell facility represent a financial risk to the management of the Extended Care Fund. These uncertainties can cause the actual costs to be less than or greater than those estimated and reported in PART II of this document. These uncertainties were evaluated using the methodology described in Section III.3.1. The results are presented in detain in Appendix C and summarized in Table III-2 (constant dollar estimates of annual costs by time period) and Table III-3 (present value estimates of total costs by time period). Details of the estimated variability in unit costs and quantities can be seen by viewing the Crystal Ball report for planned events presented in Appendix C.

Table III-2. Uncertainties in Annual Post-Closure Costs of Planned Activities[4]

Facility Life Period	50 Percentile Cost[5] ($ million /yr)	80 Percentile Cost ($ million /yr)	95 Percentile Cost ($ million /yr)
To Phase II Closure (Phase I Post-Closure Observation and Phase I Interim Care)	$2.0	$2.1	$2.2
Phase II Post-Closure Observations	$4.0	$4.2	$4.5
Stage I Institutional Controls	$2.3	$2.4	$2.6
State II Institutional Controls	$1.7	$1.8	$1.9
Stages III and IV Institutional Controls	$1.3	$1.4	$1.5

Table III-3. Present Value of Uncertain Post-Closure Costs of Planned Activities[6]

Facility Life Period	50 Percentile (Mid-Range) Present Value ($ million per yr)	80 Percentile Present Value ($ million per yr)	95 Percentile Present Value ($ million per yr)
To Phase II Closure (Phase I Post-Closure Observation and Phase I Interim Care)	$41	$44	$46
Phase II Post-Closure Observations	$10	$11	$12
Stage I Institutional Controls	$22	$23	$25
State II Institutional Controls	$9.7	$10	$11
Stages III & IV Institutional Controls	$7.5	$8.0	$8.5
Total Present Value of Post-Closure Custodial Care[7]	**$90**	**$95**	**$99**

The distribution of the total present value of providing planned custodial care for the 5,000 trials is shown in Figure III-1. This figure shows that it is equally likely that the costs will be less than about $90 million as it is that they will exceed that amount. Furthermore, this figure shows that, with 80 percent confidence, the costs will not exceed about $95 million, while with 95 percent confidence will not exceed about $99 million. Again, the details of these calculations are presented in Appendix C.

[4] Constant 2008 dollars

[5] The 50 percentile values (median) shown in this table differ from mid-range values (mean) presented in Table II-8.

[6] Based on real interest rate of 2 percent per year.

[7] Total differ from sum of components because they are the results of independent Monte Carlo simulations.

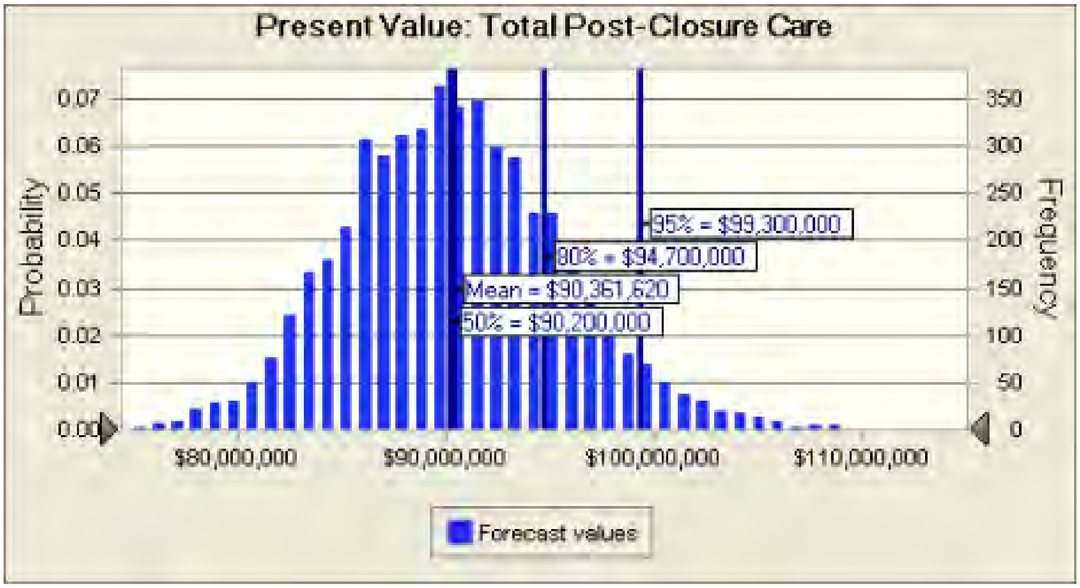


Figure III-1. Distribution of Present Values of Planned Post-Closure Care Activities Including Effects of Uncertainties

The performance of the Barnwell Extended Care Fund was also projected taking account of the greater costs that might result from uncertainties in the mid-range cost estimate of post-closure care costs. The projected performance at the 80 percent confidence level is shown in Figure III-2. This figure illustrates that, with 80 percent confidence, the balance of the Barnwell Extended Care Fund after paying for the costs of planned post-closure care activities through the end of the institutional control period will not be less than about $380 million (in current dollars). This assumes that no additional costs are caused by unplanned events and occurrences.

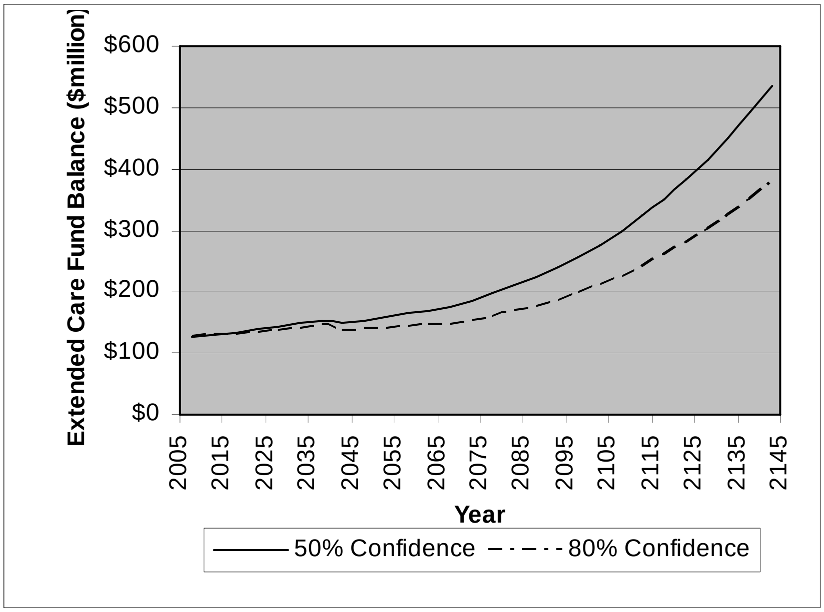


Figure III-2. Projected Performance of Barnwell Extended Care Fund at the 80 percent Confidence Level

III.4 RISKS OF UNPLANNED EVENTS AND CONDITIONS

Unexpected and unplanned events that might require attention and response after closure of the Barnwell facility are a second, potentially more significant source of costs beyond the mid-range costs. It is not obvious in all such events that the Barnwell Extended Care Fund would be the primary or even secondary source of funds to pay the additional cost impacts. In the unlikely event that wars, sabotage, or natural calamities result in the spread of radioactive contamination from the disposal site, federal environmental laws and disaster assistance programs, State laws addressing tort liability, and any commercial insurance products protecting the Barnwell facility would certainly be evaluated prior to assigning responsibility for the costs to the Barnwell Extended Care Fund.

III.4.1 Methodology

The risks associated with unplanned and unexpected events were evaluated following URS' RISQUE methodology (Bowden, 2001). This objective and approach to risk assessment and management has been internationally acknowledged and is used to analyze risk in a format easily usable by decision-makers. The results of such risk assessments have been used in many company financial reports, providing implicit confirmation that the RISQUE method complies with applicable accounting standards including, for example, US regulation SAB92 and SAB99 and Australian Accounting Standard 1031. It has also been successfully audited and has withstood substantial public scrutiny.

The RISQUE methodology and its application to the Barnwell matter are described in Appendix D.

III.4.2 Unplanned Events and Conditions

As described in Appendix D, the unplanned events, consequences, and anticipated responses should the event occur are summarized in this section, together with probabilities for each event, consequence, and response. Further details of cost magnitudes judged to be associated with each event, consequence, and response are presented in Appendices E and F. Also presented in these appendices are definitions of probability distributions associated with input parameter values and forecasts of individual outcomes developed by the Crystal Ball simulations.

Those participating in the RISQUE workshop each possess many years of experience dealing with the design, construction, operation, closure, monitoring, and maintenance of LLRW disposal facilities. The results of the workshop rely upon the judgment of these professionals. Specifically, the costs and probabilities used to characterize the various unplanned events, consequences, and responses are the judgments of workshop participants and the authors of this document.

While the judgments stated in this document and the resulting analyses provide a reasonable basis for decision making involving the effects of unplanned events and their cost impacts, additional precision could be achieved through more extensive research into the probability and costs of the unplanned events that were considered in the analysis. At this point in planning for custodial care of the Barnwell site; however, it is unlikely that the incremental benefits of such extensive research would be justified by its cost.

Table III-4 summarizes the risk events identified during the risk workshop. Some risk events were deemed not material and have therefore been exclude from the table, as described in Appendix D. Similarly, a number for risk events (such as terrorist attacks, warfare and an airplane crash) have been excluded because the Barnwell Extended Care Fund was judged not to be responsible for covering costs that might result from the event.

Special note is necessary for Event BW14 in Table III-4 that addresses the possibility that the tritium plume will require remediation. The tritium plume remediation costs are significant and have the potential of changing the conclusion of whether the fund is adequate to cover all planned and unplanned costs. Because it is uncertain whether a legal basis exists for using the Barnwell Extended Care Fund to clean-up properties that are not part of the disposal facility itself, the evaluations that follow assume as a base case that the Fund will not be responsible for the costs of tritium plume remediation. However, analysis of the cost impacts of such a remediation project on the Barnwell Extended Care Fund are also provided, in the event that the law and public policy support using this source of funding to address contamination on the adjacent land.

Table III-4 Summary of Probabilities Estimated by RISQUE Workshop Panel

Event ID	Brief Description	Event Probability	Consequences	Consequence Probability	Cost-Causing Responses	Response Probability
BW06	Increased Precipitation	10 %	Increased erosion	100 %	Greater cover maintenance and repair costs	100 %
			Raised water table	100 %	Construct and operate enhanced water removal system	100 %
BW07	Extreme Weather	1 in 100,000	Cap erosion, mitigation, and repair	50 %	Increased repair and subsequent maintenance activity	100 %
BW08	Decreased Precipitation	10 %	Lose vegetation leading to erosion requiring increased maintenance cost	100 %	Increase maintenance activity	100 %
			Redesign and implement changes	5 %	Enhance cover design, including rock armor	100 %
			Change vegetation cover	70 %	Change vegetation cover	100 %
BW09	Burrowing Animals	30 %	Increased cover maintenance and repair activities	100 %	Increased cover maintenance & repair costs	100 %
BW13	Geotechnical Model	20 %	Settlement leading to cracking of cap	1 %	Implement mitigative measures and complete repairs	100 %
BW14	Water Contamination (i.e., tritium plume)	0 %[8]	Further characterization	100 %	Additional site characterization costs	100 %
			Pump and treat contaminated groundwater	100 %	Construct and operate system to intercept contamination plume and treat contaminated water	100 %
BW15	Mine/Quarry	1 %	Increased maintenance activities	20 %	Increased maintenance costs	100 %
BW17	Adjacent Development	30 %	Increased security	100 %	Increased security costs	100 %
			Increased maintenance activities	100 %	Increased maintenance costs	100 %
			Upgrade facility design	70 %	Enhance cover design, including rock armor	100 %
			Stakeholder management program	100 %	Management and PR consultant effort to address public concerns	100 %
BW18	Trench Collapse	10 %	Increased cover maintenance and repair activities	100 %	Increased cover maintenance and repair costs	100 %
			Increased monitoring activities	100 %	Increased monitoring costs	100 %
			Cover/Cap damaged	100 %	Reconstruction of cap layers	50 %

[8] Assumed not the responsibility of the Barnwell Extended Care Fund, but its effects, if the Fund is responsible, are considered separately.

Table III-4 Summary of Probabilities Estimated by RISQUE Workshop Panel

Event ID	Brief Description	Event Probability	Consequences	Consequence Probability	Cost-Causing Responses	Response Probability
			Increased leachate generation	5 %	Construct and operate enhanced water removal system	100 %
			Further characterization	50 %	Additional site characterization costs	100 %
			Negative public perception	50 %	Management and PR consultant effort to address public concerns	100 %
BW23	Health Claims	0.7 %	Negative public perception	100 %	Management and PR consultant effort to address public concerns	100 %
			Health monitoring required	100 %	Annual health monitoring costs for potentially affected population	100 %
BW24	Depressed Property Values	0.7 %	Negative public perception	100 %	Management and PR consultant effort to address public concerns	100 %
BW25	Negative Media Attention	100 % in 10 years	Negative public perception	100 %	Management and PR consultant effort to address public concerns	100 %
BW26	Regulatory Changes	10 %	Upgrade facility design	5 %	Enhance cover design, including rock armor	100 %
			Increased monitoring activities	50 %	Increased monitoring costs	100 %
BW29	Worker Exposure	50 %	Fatality attributable to radiation exposure	5 in 10,000,000	Consequential damages awarded	100 %
			Liability claims	100 %	Legal defense against claims	100 %
			Health effects	1 in 1,000,000	Consequential damages awarded	100 %
BW33	More Aggressive Regulations	10 %	More extensive groundwater clean-up	100 %	Construct and operate system to intercept contamination plume and treat contaminated water	100 %
			Contaminated public water supplies	25 %	Provide alternative water supply;	100 %
			Upgrade facility design	50 %	Enhance cover design, including rock armor	100 %
			Increased monitoring activities	100 %	Increased monitoring costs	100 %
BW34	SNF Rods	1 %	Unacceptable releases and/or dose rates	100 %	Increased monitoring	100 %
					Design & Approve Remedial Campaign	100 %
					Retrieve & Ship for Licensed Storage	75 %
					Conduct In-Situ Grouting Campaign	25 %

III.4.3 Risks of Unplanned Events and Conditions

The detailed analyses of unplanned events, consequences, and responses are presented in Appendices E and F. The results are summarized in Table III-5 where projected risk quotients and occurrence costs are presented in order of descending risk quotient. The risk quotient presented is the 80 percent confidence level of the product of the occurrence cost and the probability of occurrence. The 50, 80, and 95 percent confidence levels of costs should they occur (occurrence costs) are also presented in the table.

Table III-5. Summary Results of Unplanned Event Evaluations

	Risk Quotient ($ million)	Occurrence Cost ($ million)		
Unplanned Event	80 Percent Confidence	50 Percent Confidence	80 Percent Confidence	95 Percent Confidence
BW08 Decrease Precipitation	$22	$18	$34	$56
BW17 Adjacent Site Development	$18	$21	$59	$127
BW18 Trench Collapse	$8	$39	$99	$156
BW09 Burrow Animals	$6	$7	$21	$42
BW06 Increase Precipitation	$3	$13	$34	$60
BW29 Worker Exposure	$3	$4	$10	$19
BW33 Aggressive Regulation	$2	$15	$33	$56
BW25 Negative Media	$0	$0	$0	$0
BW26 Regulatory Changes	$0	$6	$15	$31
BW15 Mine/Quarry	$0	$14	$45	$107
BW34 SNF Rod	$0	$1	$3	$4
BW23 Health Claims	$0	$0	$1	$2
BW13 Geotechnical Model	$0	$0	$1	$2
BW24 Property Values	$0	$0	$0	$0
BW07 Extreme Weather	$0	$2	$4	$6

Figure III-3 presents the risk profile of the risks that have been identified and considered both material and the responsibility of the Extended Care Fund. This profile represents the relative risk of one event compared to the other. It shows that the two riskiest events are “BW08, Decreased Precipitation” and “BW17, Adjacent Site Development” both of which are two to three times as risky as the next largest unplanned event (“BW18, Trench Collapse”).

Figure III-4 shows the risk profile (presented alone in Figure III-3, represented by the single blue line). It also shows the present value occurrence cost should the unplanned event actually occur. The occurrence cost does not consider the probability of the event occurring. The occurrence costs for each unplanned event in Figure II-4 are shown as three values, the 50 percent Confidence Level (CL) estimate, as well as the 80 and 95 percent CL estimates. This graphic presentation is useful to highlight any risk events that have a low overall risk, but have significant consequence if they occur, such as "BW15, Mining/Quarrying." Such a risk event, even though it has a lower likelihood of occurrence, may warrant consideration for the implementation of risk control measures.

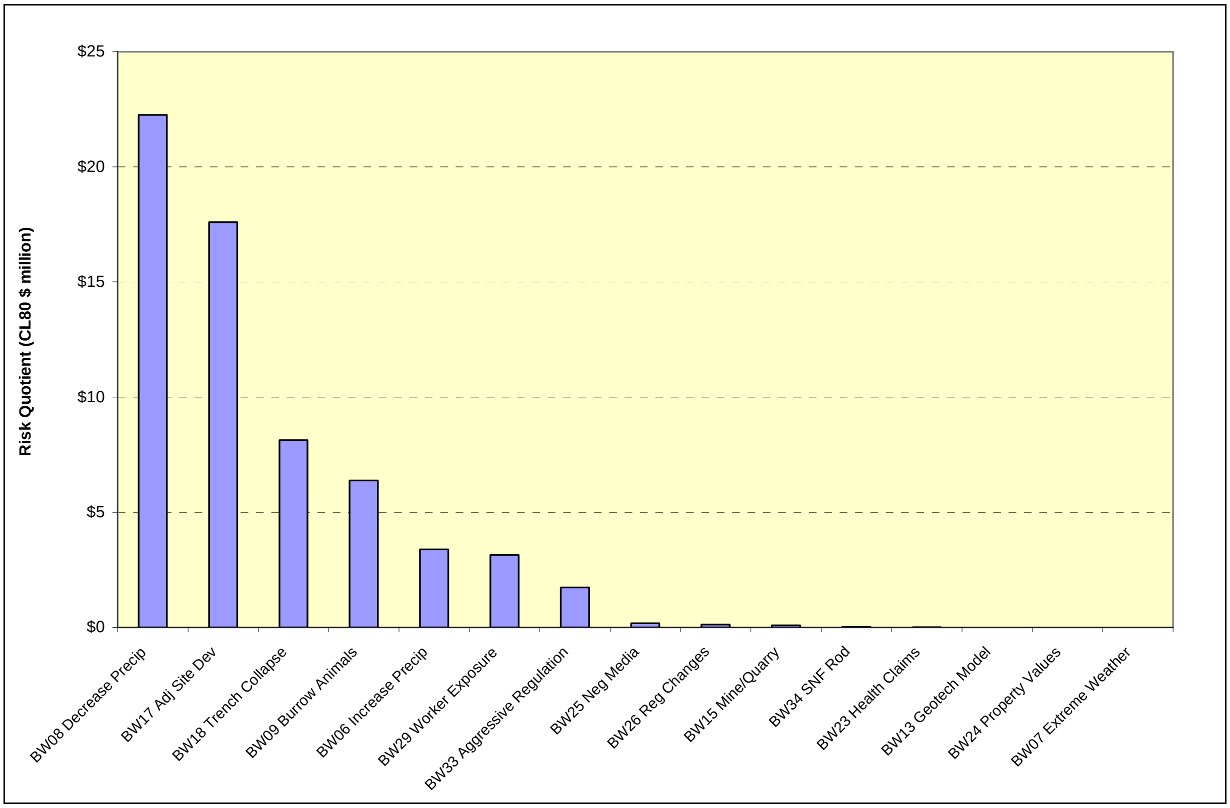


Figure III-3. Risk Profile of Unplanned Events

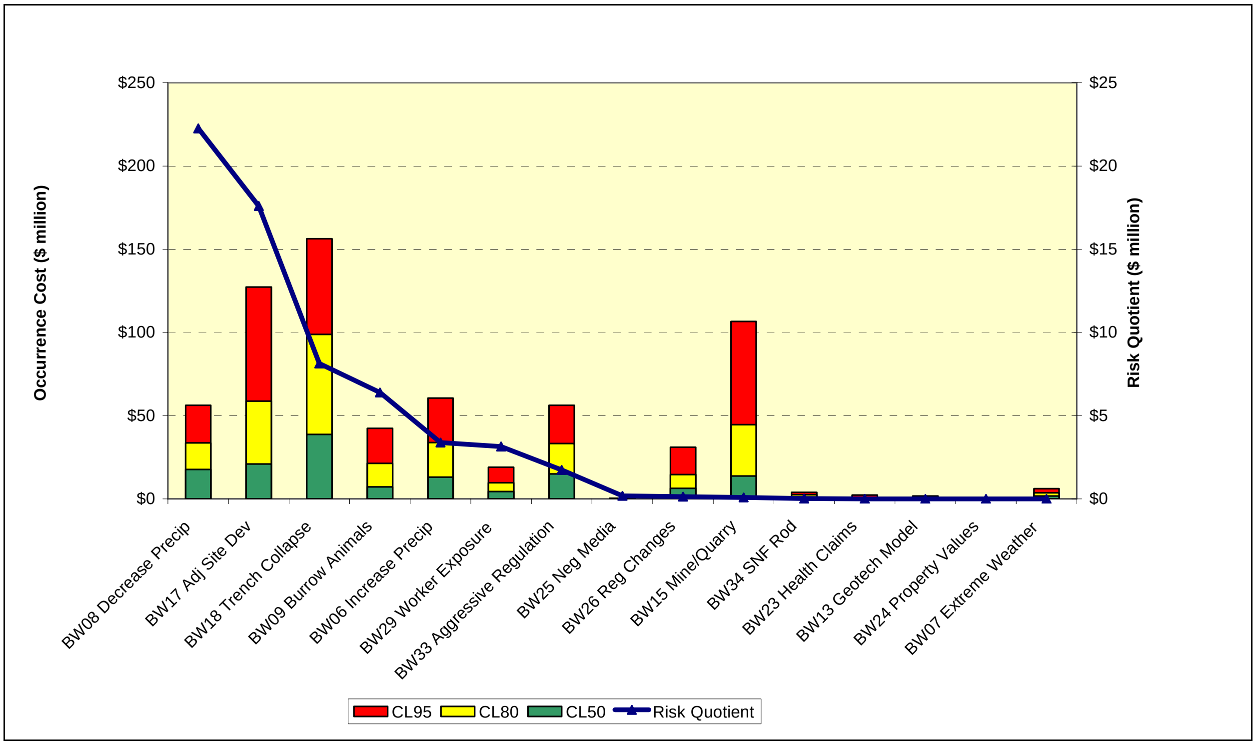


Figure III-4. Risk Occurrence Costs of Unplanned Events

The risk profile and occurrence cost for Figure III-3 and Figure III-4 do not represent the financial cost of the risk. One method to represent that cost is to simulate the risk using a Monte Carlo analysis. Risks were analyzed to determine the total “chance occurrence costs” of responding to unplanned events and outcomes. The analysis considers an inventory of unplanned events that might occur, the judged probability of each, the year in which it might happen, and the judged cost of responding to the occurrence. The total chance occurrence cost is best measure of financial risk. Total chance occurrence cost is shown as a function of confidence level in Figure III-5. The present value of the total chance occurrence cost is aggregated across all unplanned events judged to be both material and the responsibility of the Extended Care Fund (refer to Table III-4).

The results of such an analysis, using Crystal Ball software and 5,000 iterations is presented in Figure III-5, plotting the present value estimate of total risk cost against confidence levels. The analysis concluded with 65 percent confidence that the total chance occurrence cost of unplanned events, consequences, and responses would not exceed the $28 million available after meeting the costs of planned activities (not considering tritium plume remediation). Expressing these figures in another context, they indicate that, on a probabilistic basis, a 50 percent chance exists that the risk cost will be greater than $16 million, a 20 percent chance that it will be greater than $53 million and only a 5 percent chance that it will be greater than $155 million.

The key contributors to this risk cost at 80 percent confidence are from the following risks:

- BW08, Decreased Precipitation (50 percent of total chance occurrence cost)
- BW17, Adjacent Site Development (30 percent of total chance occurrence cost)

- BW09, Burrowing Animals (9 percent of total chance occurrence cost)
- BW29, Worker Exposure (8 percent of total chance occurrence cost)

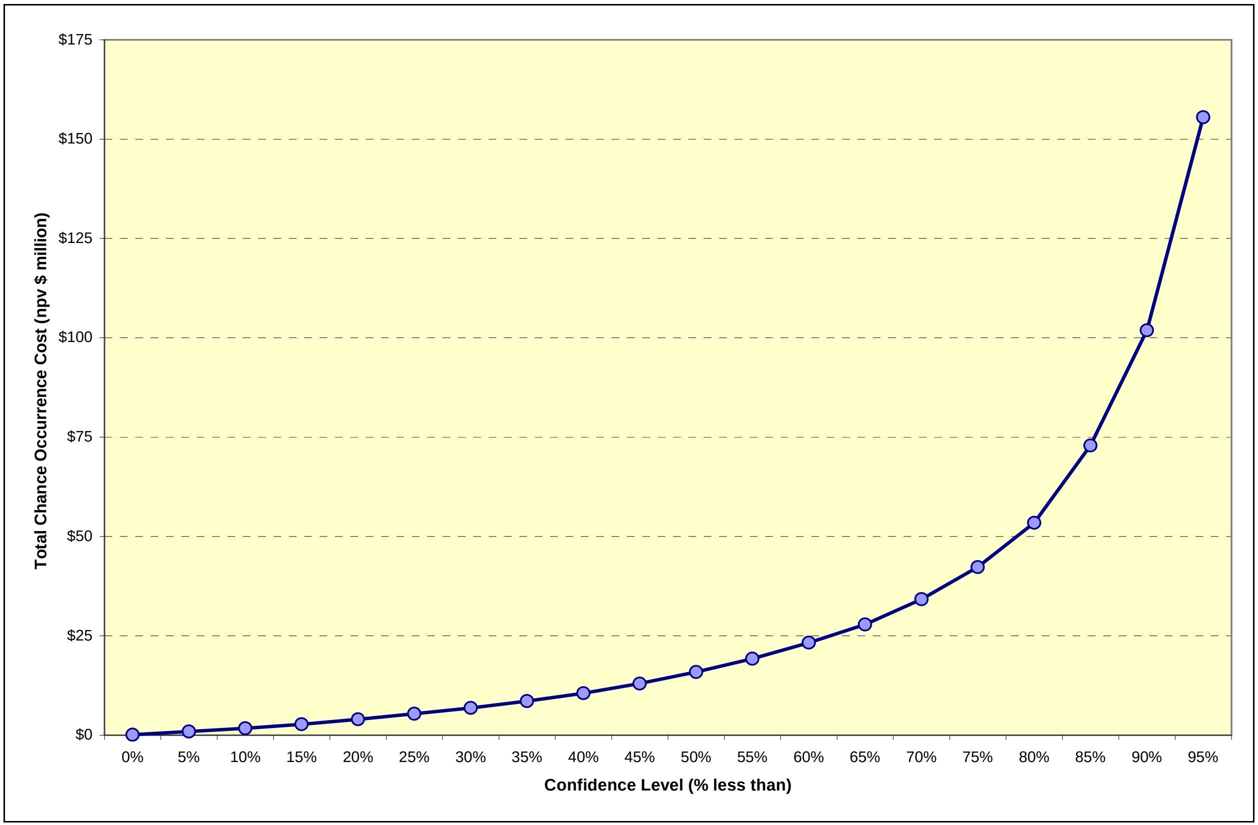


Figure III-5. Present Value of Total Chance Occurrence Cost versus Confidence Level

The present value of monitoring and maintenance costs estimated to total $1 million per year (about 80 percent of the estimated costs during Stages III and IV of the institutional control period) and continue for 100 years is estimated to be about $2.9 million with a real interest rate of 2 percent per year. The present value of this same level of monitoring and maintenance continued for 200 years following the conclusion of the institutional control period is estimated to be only slightly greater than that for 100 additional years, or about $3.3 million.

The basis for developing a risk management plan for the Barnwell Extended Care Fund is the total present value of estimated costs at the 80 percent confidence level. This would include the estimated costs of planned post-closure care activities with 80 percent confidence ($95 million) and the total chance occurrence cost of unplanned events with 80 percent confidence ($53 million). Thus, a present fund balance of $148 million would be adequate, with 80 percent confidence, to cover the risks associated with the post-closure care of the Barnwell facility, excluding tritium plume remediation. Thus, in order to improve confidence from the 65 percent level to the 80 percent level that the Fund balance is adequate to cover all planned and unplanned costs, the balance of the Fund today would need to be increased by $25 million..

Based on information presented in Sections II.5 and III.3.3, it was determined that funds might be available from the Barnwell Extended Care Fund to cover the costs of other than planned post-closure activities. With 50 percent confidence, available funds might total about $33 million and about $28 million with 80 percent confidence. Comparing the funds available after paying planned costs (excluding tritium plume remediation) to the information presented in Figure III-6 reveals that, with 65 percent confidence, the Extended Care Fund currently possesses sufficient funds to cover the costs of planned and unplanned events, consequences, and responses.

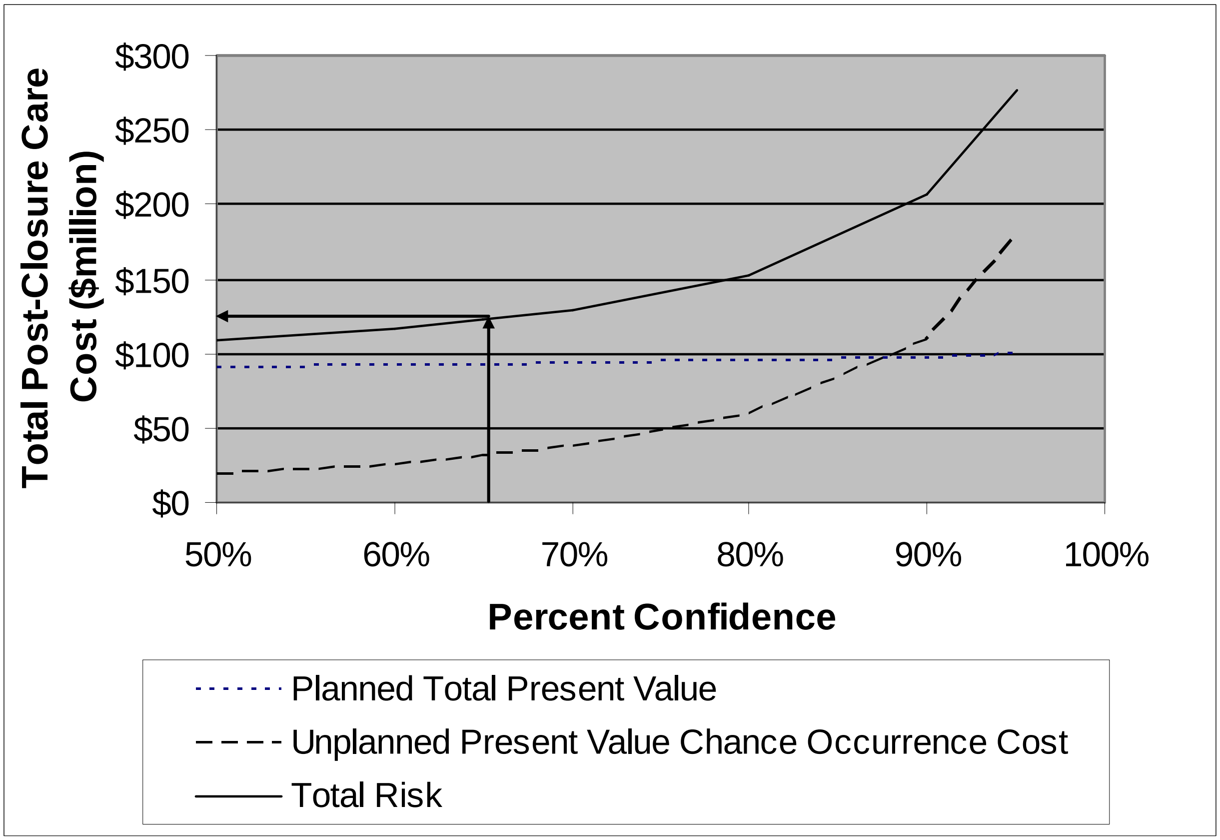


Figure III-6. Total Post-Closure Care Cost Risks as a Function of Level of Confidence

III.4.4 Tritium Plume Remediation

As noted earlier, a program to address the known tritium contamination plume in groundwater under and adjacent the disposal facility is expected to be required within 10 to 20 years. Whether or not the money to pay for this project comes wholly or partially from the Barnwell Extended Care Fund is crucial in determining the adequacy of the Fund.

The least-costly process that performs isotope separation (Girdler-Sulfide) relies upon reacting tritiated water with hydrogen sulfide to transfer tritium from water molecules to hydrogen sulfide molecules. In the reaction, contaminated water is consumed and contaminated hydrogen sulfide is generated. Fulbright et al estimated capital costs of a facility employing the Girdler-Sulfide process for a water flow rate of 25 gpm to be about $6.1 million, with initial annual operating costs of about $2.8 million per year in 1996 dollars (Fulbright, 1996). In 2008 dollars, the capital cost would be about $9.6 million, with initial annual operating costs of about $4.3 million per year for a 25-gpm facility.

Operating costs for Girdler-Sulfide facilities designed to process contaminated water at rates different from the Fulbright rate of 25 gpm were taken to be proportional to the process rate and capital costs to vary with the 0.6 power of the ratio of process rates. Using this approach, the operating and capital costs of implementing the Girdler-Sulfide technology to remediate the tritium-contaminated groundwater under and adjacent to the Barnwell facility were estimated as shown in Table III-6:

Table III-6. Costs to Treat Tritiated Water at Barnwell Facility

Process Rate	Capital Costs ($)	Initial Operating Costs ($/yr)
8.3 gpm (based on environmental monitoring data in CNS, 2005a)	$5 million	$1.4 million
45 gpm (based on intercepting and treating all contaminated water across breadth and depth of tritium plume)	$14 million	$7.8 million

The present value of construction and 20 years of operation of a Girdler-Sulfide facility is estimated, with 80-percent confidence (at 2 percent per year real cost of capital) to range from about $23 million (for pump/process rate of 8.3 gpm) to about $140 million (for intercepting the entire contaminated plume -- pump/process rate of about 45 gpm, depending on actual characteristics). The 50-percent confidence level ranges from about $21 to about $82 million, depending on the pump/process rate. These costs are expressed in 2008 dollars and account for inflation, effects of facility capacity, and process rate.

The present values of implementing the Girdler-Sulfide technology to treat tritium-contaminated groundwater under and adjacent to the Barnwell facility for 20 years are presented in detail in Appendix G and summarized in Table III-7.

Table III-7. Present Values of Barnwell Groundwater Remediation Program

Process Rate	50-Percent Confidence ($)	80-Percent Confidence ($)	95-Percent Confidence ($)
8.3 gpm (based on environmental monitoring data in CNS, 2005a)	$21 million	$23 million	$25 million
45 gpm (based on intercepting and treating all contaminated water across breadth and depth of tritium plume)	$82 million	$140 million	$240 million

As shown in Table III 7, the cost of tritium plume remediation is expected, with 80 percent confidence, to range from $23 to $140 million, depending upon the required pump/process rate.

The projected performance of the Barnwell Extended Care Fund is depicted in Figure III-7 using values that represent the 80-percent confidence level. Without allowances for unplanned events or tritium plume remediation, the present balance of the Fund is sufficient, with 80 percent confidence, not only to cover planned post-closure costs through the conclusion of the institutional control period but also to grow substantially due to interest earnings on the balances. If, however, an allowance of $28 million were made in 2008 to cover, with 80 percent confidence, all the costs of unplanned events (except tritium plume remediation), planned post-closure care costs would deplete the Fund in 2124, about 19 years before the end of the institutional control period. Finally, if $23 million were also reserved in 2008 for tritium plume remediation, planned post-closure care costs would deplete the Fund in 2059, after only 16 years of the institutional control period.

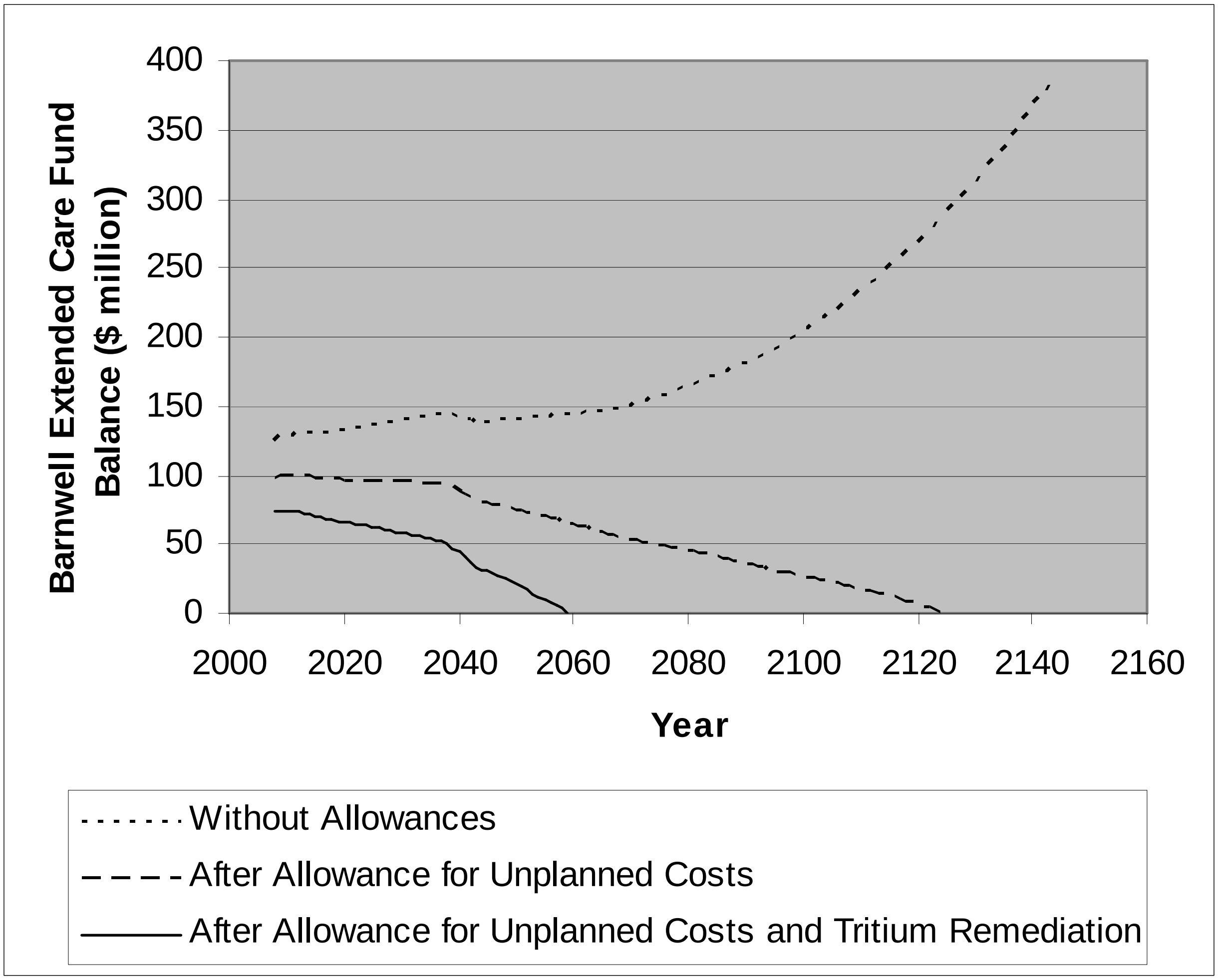


Figure III-7. Projected Performance of Barnwell Extended Care Fund

III.5 MANAGING BARNWELL RISKS

The financial assurance mechanisms available to South Carolina are reviewed in this section, together with an assessment of the State's current risk management profile. A course of action that will protect the State as it assumes the custodianship of the Barnwell facility is presented and its implementation described.

III.5.1 Alternative Assurance Mechanisms

As South Carolina assumes custodianship of the decommissioned Barnwell facility, it must address the possibility that it will be held financially liable to third parties for bodily injury or property damage attributable to the facility. Several financial assurance mechanisms are available, including commercial insurance, self insurance, and other financial mechanisms. These are described in the following sections.

III.5.1.1 Commercial Insurance

Commercial insurance is a term for what the general public calls "insurance." It is a financial arrangement where one party recognized and licensed to do so by the State agrees to compensate another for a loss if it results from the occurrence of a specific event. In general, insurance has been the traditional and ideal way to protect against liabilities to third parties. Risk of loss is transferred to a large, financially secure entity that combines the individual risks into a pool of sufficient size that individual losses become collectively predictable.

Insurance has a number of advantages to the insured (party purchasing insurance) which would be attractive to the State:

- It fixes the insured's cost of risk by the payment of a premium to an insurance company.
- It transfers the risk of loss to that insurance company, which assumes future losses up to the limit of the policy.
- It transfers the obligations of claims handling, claims settlement, and legal defense to a large organization that is expert in those matters.
- It provides stability over time. The insurer is a well capitalized and regulated entity which should be around for the long haul. This is particularly important in the case of the disposal sites which are predicted to have liability exposures for 100 or more years.

Currently, however, only one primary source of insurance for the nuclear industry exists, that being American Nuclear Insurers (ANI). ANI is a consortium of traditional insurance companies pooled together to write liability for the nuclear industry. Because of the potentially catastrophic loss potential and uncertainty associated with the nuclear power industry, no single insurer has offered insurance coverage to the industry. Instead, this consortium was formed to build an efficient organization, expert in the nuclear field and able to spread the large unknown risk over many insurers.

Although we view ANI as the primary insurer for the nuclear industry, commercial insurers have become more willing to consider non-power generation nuclear risks recently. Several of the largest commercial insurers have developed Environmental Liability and Cleanup insurance programs in response to the needs of American industry. At least two of these insurers may be willing to consider offering liability and cleanup insurance coverage for LLRW disposal facilities such as Barnwell. One of them, American International Specialty Lines Insurance (AIS), a subsidiary of AIG Companies, already provides supplemental coverage to Waste Management, Inc., to cover certain liabilities that might be associated with that company’s former tenure as operator of the Barnwell facility.

The amounts of coverage that these insurers would be willing to offer are limited to $50 million each. However, it is likely that the policies can be combined to a total of $100 million in limits (this is a technique commonly used in private industry and the public sector to gain more coverage than any one insurer might wish to provide). Such coverage limits could even be combined with those provided under an ANI policy for a total of $200 million. Other insurers might also be willing to be included for higher limits.

The two carriers that are potentially willing to provide coverage for Barnwell are AIG Companies (AIG) and XL Insurance Companies (XL). Of course, their interest is theoretical at this stage; actual willingness, price, and conditions would be dependent on underwriting the specific risk. In addition, we cannot know whether their current interest is reliable for the future. Insurance companies in the past have offered coverage in order to grow their volume of business, only to eliminate it at a later date. This risk is unacceptable for a longer term facility's coverage needs.

A number of reasons explain why most insurers are not willing to provide this coverage. First, insurance companies experience has been very unfavorable in areas relating to the environment and health. For example, since 1973 the insurance industry has gradually reduced the coverage in traditional liability insurance policies for claims relating to pollution, particularly in modifications to traditional liability insurance policy forms. Despite the insurance companies' apparent attempts to eliminate coverage for environmentally related claims, they have still suffered large losses from such claims, and have even had insurance exclusions interpreted much less broadly than they had intended. Thus, insurance industry executives are reluctant to pursue new markets where insurance for environmental hazards is necessary, despite apparent large profit potential.

Secondly, although insurance companies pursue markets where substantial opportunity for investment income exists through the pursuit of insurance which collects premium currently, but pays potential losses many years in the future, the rapid change in the legal and social atmosphere has caused insurance companies to be reluctant to pursue such so called "long tail" coverages. Despite the best efforts of highly qualified insurance experts, it has been difficult to predict the cost of future losses given the rapidly changing legal and social environment.

While ANI is most frequently associated with the high-profile nuclear power generation industry, it actually provides coverage for facilities, suppliers, and transporters throughout the nuclear fuel cycle, including disposal facilities, through the ANI Facility Form and the ANI Suppliers & Transporters (S&T) Form. Coverage for nuclear worker claims alleging injury due to radiation exposure is also available, with an industry aggregate limit of $300 million.

The pool has traditionally provided third-party liability insurance to disposal facilities. ANI has stated that it is not in a position to guarantee that it will provide liability protection in the distant future, but that it will provide insurance during the post-closure and institutional-care period, subject to its underwriting requirements and the maintenance of adequate engineering safeguards at that facility. ANI provides insurance for some decommissioned facilities around the country.

The ANI policy is continuous and covers losses that occurred during the active period of the contract and are reported within 10 years of the policy cancellation (i.e., 10-year discovery period). Disposal facilities have opted to continue their coverage at reduced premium in the post-closure period to cover any occurrences in that period and keep the 10-year discovery period open. The ANI policy is "site specific" and "omnibus". Site specific refers to the fact that it covers only activities at a particular site and is rated based on the specific attributes of a site; it does not cover a multi location contractor, like EnergySolutions, the parent company of CNS, for activities at all its sites. The coverage is omnibus in that it indemnifies the facility operator and any additional interests who might be held legally liable for property damage and bodily injury to third parties. It should be noted that the limit of liability is a lifetime aggregate, inclusive of indemnity and legal costs. ANI will reinstate coverage for future claims (not the same claim) at its own underwriting discretion.

In 1987, ANI imposed a moratorium on writing coverage for new LLRW disposal facilities. The suspension was related to expanding environmental liabilities in general and the dispute over coverage boundaries as illustrated in the Maxey Flats litigation, a nuclear waste disposal site identified as a Superfund cleanup priority site. U.S. Ecology, which was the site operator, has asserted that the ANI policy will cover response and cleanup costs. ANI has vigorously insisted that the ANI Facility Form was designed to cover an insured's legal liability for damages because of bodily injury or off-site property damages. The Facility Form does not provide coverage for damages at the insured's facility. Certain ANI insureds, faced with cleanup cost demands, have asserted coverage under the Facility Form.

On January 1, 1990, ANI lifted its moratorium, with strengthened language to reaffirm the scope of coverage as strictly third-party coverage. ANI is currently offering coverages up to a limit of $300 million for LLRW facilities on its Facility Form. No other moratoriums have been implemented since Maxey Flats.

As is apparent in this discussion, ANI refuses to and does not write coverage for on-site remediation or cleanup, for which ANI looks to the "conventional market" or some other financial mechanism. However, this policy might produce a gap in commercial insurance coverage. If so, the Barnwell Extended Care Fund, as this report explains, might be adequate to cover at least some of the unplanned costs of monitoring and maintenance of the disposal facility property itself. (See Section III.4)

One of the major limiting conditions on insurance is that insureds have little, if any, control of the mechanism. The ANI moratorium on writing any new LLRW disposal facilities is a case in point. Even though ANI has traditionally shown a high level of cooperation with the nuclear industry, they control the size, scope, and duration of coverage; exclusions; claims handling; and may offer only a limited response to the total needs of a LLRW facility. The example of the standard pollution market indicates that the limitations on the insurance coverage available, time frame covered (claims made), and lack of first-party cleanup insurance make standard insurance an impractical resource for LLRW disposal facilities.

Therefore, the likelihood that competitive commercial insurance for LLRW generators will be available is low, possibly even nonexistent. At times when insurance companies are most competitive, a limited number may enter the liability insurance market for LLRW disposal facility insurance. However, the market would likely be so limited and unreliable that it would not be useful as a financial assurance mechanism. Even at those times when the insurance market may be willing to write such insurance, it would most likely be costly due to heavy engineering assessment cost incurred during the process of underwriting. These costs would be passed along to the insured.

Although ANI currently represents a reasonably stable source of insurance protection, future restrictions, limits, and premiums are uncertain and uncontrollable. Given the continuing expansion of legal opinion relating to the insurance coverage of loss caused by pollution, it will likely be impossible to rely totally on the willingness of one insurance source (ANI) to continue providing insurance for LLRW disposal facilities.

As shown by our observations about the interest of AIG and XL, other insurance sources can develop to replace or supplement ANI. ANI is a consortium of many traditional insurance companies with vast resources. It is difficult, but not impossible, to assemble an alternate consortium of insurance companies, even utilizing the resources of the worldwide insurance market. Thus, the LLRW disposal facilities may be dependent almost completely on the continuing willingness of traditional insurance companies through the ANI consortium to provide capacity and coverage.

Foreign insurers may be interested in the risk, but typically, foreign insurers are quite concerned about the broad legal interpretations of the U.S. court system, and the ability of the courts to override exclusions that insurance companies believe are clear, to the detriment of the insurer. Therefore, foreign insurance companies would not likely be attracted to the U.S. market, except at an extremely high price.

If the loss experience proves to be more severe than that expected by the insurance companies, the capacity represented by ANI might disappear, much as it did as a result of the Maxey Flats case. In the event that traditional commercial insurance was unavailable, for whatever reason, it would be quite possible for the LLRW disposal facility operators to use alternatives to traditional insurance, as described below.

Concern exists that the migration of tritium from the Barnwell site could affect the availability and pricing of insurance. Insurers are often (although not always) unwilling to cover a known event that could give rise to a claim or claims under the policy. Environmental insurance is occasionally the exception to this, where cleanup cost cap protection is sometimes arranged. However, it is doubtful that liability coverage would be available for a known existing problem.

If coverage was available, the limits, deductibles, and premium charges are likely to be negatively affected to shift financial responsibility to the insured. Thus, the insurance, if available, might well be less attractive in terms of price and coverage. In addition, insurers that are otherwise interested in offering coverage may be concerned that, if one release occurs, another might also happen. Underwriters often rely on their impression of the quality of management and of loss prevention activities; knowing that a release has occurred would likely make them less willing to offer attractive insurance terms.

The existence of tritium migration from the Barnwell facility to the south on to privately owned land has been well publicized. The land owner is the same company that operates the disposal facility under lease to the State (CNS). The releases from the disposal facility began while CNS was operating the site and monitoring its performance. Therefore, it can be fairly assumed that ANI or any other insurer would not provide coverage to the State of South Carolina at a reasonable cost and/or deductible level during the extended care period that would cover any claims against the State by the company that operated the disposal site which gave rise to the claims.

III.5.1.2 Self -Insurance

An alternative to traditional commercial insurance is self insurance. Self-insurance is defined as a formal decision to retain risk rather than purchase commercial insurance. A self-insurance program is distinguished from non-insurance or risk retention through deductibles by the need for a financing program (i.e., systems and procedures for the payment of losses as they occur). Note that self-insurance is not simply the absence of insurance. It is a planned, methodical approach to the assumption of risk, including the allocation of resources to pay losses when they occur.

A number of options exist within the general category of self-insurance. These can be described as follows:

Individual	A single entity is covered under the self-insurance mechanism.
Group	A number of entities in similar businesses group together. Because so few currently operating LLRW disposal sites exist and because they are generally planning to cease operations, a grouped approach is impractical. With all activities completed, no further control over the potential cause of liabilities is available. It would be extremely difficult to get the various parties to agree to a group mechanism at this late date. Group self-insurance does not appear feasible for the State of South Carolina.
Funding	A process of building specific funds cash and other assets to pay for losses when they occur. As this report has explained, the Barnwell Extended Care Fund has accumulated cash on deposit to pay the State's costs for custodial care of the site after it closes. Whether money from this fund can be authorized to pay third-party claims arising from off-site contamination of privately held land is a matter of legal interpretation.
Formal Structures	Another route is to establish formal structures for the self-insurance. A "risk retention group" is a legal entity comprised of similar members and regulated by insurance laws. A "captive" is an actual insurance company set up by its members to insure themselves. Captives can be single (one member) or group. In the case of a closed LLRW disposal facility, no advantages appear to establishing formal entities, because of their increased administration cost and regulation for the post-closure period.
Pre Funded	The objective of pre-funded self-insurance is to build a specific fund cash and/or other assets that would be available at any time to pay losses. The fund is built up by assessments over time and is managed to yield returns that support the growth of the fund. If it is determined that the balance of the Barnwell Extended Care Fund exceeds the amount projected to be needed to cover planned and expected costs, the surplus could be set aside in a pre-funded self insurance fund to cover contingencies and liabilities.
Post Funded	In post-funded self-insurance specific mechanisms exist for collecting the necessary funds if and when a loss ever occurs. A post-funded mechanism is best supported by documented procedures and, in the case of a group, contractual obligations to

guarantee that funds are in fact available, when needed. The advantage of post funding is economic efficiency: no working funds are set aside, and money is only expended when necessary. The disadvantage is uncertainty of the future ability of members to support the mechanism. The argument for post funding becomes stronger when the probabilities of losses are particularly remote.

Self-insurance is most appropriate when the "insured" finds insurance to be either unavailable or too expensive compared to the risk transferred. Both characteristics may be present in the Barnwell case. Typically, however, losses that are self insured are frequent and small, rather than infrequent and large as projected in the case of the Barnwell facility.

Self-insurance should, however, be considered. Given that the continued availability of traditional commercial insurance is highly questionable, particularly at a reasonable cost, it is appropriate and necessary to consider self insurance as an alternative. Self insurance programs involve many of the characteristics of traditional insurance, with the major exception that self insurance involves the retention of risk, rather than the transfer of risk. Therefore, the "self insured" can still contract with insurance companies or other providers for required services, such as:

- Engineering
- Underwriting
- Actuarial support
- Claims handling
- Reinsurance (many self insurance programs are supported against unusual frequency or severity catastrophes through the purchase of reinsurance, which transfers some of the risk to specialized parts of the insurance industry through the payment of a premium).

Some or all of these services may still be necessary if self insurance was utilized.

An example~~,~~ of post-funded self insurance might be the State’s “assumption of risk.” The magnitude and probability of loss scenarios for the Barnwell site must be considered in relation to the State’s budget scale ($7 billion annually). Federal guidelines require that LLRW disposal take place on government-owned land because state and federal governments have deep pockets with which to cover liabilities of this scale. Federal disposal sites, for example, have no Extended Care Funds and no commercial insurance. When costs arise and if claims are made, they are addressed as part of the Federal government’s annual budget process. In the absence of other remedies, the CERCLA/Superfund process might be extended to make customers and the site operator responsible for any cleanup costs. For this purpose, the State of South Carolina requires careful recordkeeping of all customers who use the Barnwell site.

III.5.1.3 Financial Guarantee Bonds (Surety)

A guarantee bond or surety is another mechanism which could be used to protect against losses. A surety bond is similar to an insurance policy in that an insurance company (called the "surety") guarantees to pay losses as defined in the surety bond. Unlike insurance policies, however, the surety has the right to recover these losses against the insured. Thus, if a surety is required to pay a loss, it can proceed to collect the loss from its customer, the insured. A surety, in effect, is a guarantor of the financial ability of the insured to make good its promise to pay losses. Therefore, it is heavily dependent upon the financial viability of the insured, and the surety company's willingness to use those resources to recover any claims that it might pay. Typically, surety bonds are used in performance contracts, in contractor's projects, and similar situations.

Surety bonds are used to satisfy a third party with a guarantee of future performance or payment of a loss. Some political or public relations advantage might exist to having a surety contract in place. However, it does not seem likely that the State's promise to make good on losses from the site would be better supported by the surety contract. The institutional stability of the State government seems to be the most reliable pledge, and sufficient for financial assurance. The additional surety mechanism hardly appears economically justified compared to the insurance or self insurance mechanisms.

In addition, surety companies must be convinced of the ability of their insured to make good on the promise to pay losses. In research for private industry waste generators, no examples have been identified of sureties being willing to insure these risks, because of the long-term nature of risk at a disposal site. In the case of the State of South Carolina, the surety would be interested only because of the ability to collect losses from the State in the future. Since the State will not "go out of business," a surety bond does not appear to be an efficient mechanism.

III.5.2 Current Risk Management Profile

The site at which the Barnwell facility is located is leased from the State of South Carolina and operated by CNS. Most of the facility is scheduled to begin closure activities on or around July 1, 2008, and the operator is responsible at that time to decommission the site by initiating a stabilization and closure plan approved by the State (CNS 2005a). Following the Phase II post-closure observation period and termination of the license by DHEC (projected in this report to occur about 2043), the State will assume custodial responsibility for the site.

The current risk financing program maintained by CNS for this site is a combination of commercial insurance and pre-funded self-insurance (i.e., the amounts in the Extended Care Fund that exceed the projected amounts needed for planned activities). CNS maintains a $100-million ANI Facility Form policy for the Barnwell facility, which is paid for as a regular operating cost approved by the State Public Service Commission and passed along in the disposal fees charged to customers. In addition, funds have been collected from waste disposal customers and deposited by the State in escrow for the purposes of facility decommissioning, long-term care, and maintenance.

Several risk management options are available to the State for providing protection from liabilities associated with the Barnwell facility. First, it appears at this time that the ANI policy will continue to be available to the state, at the $100-million limit in place today. Historically, ANI has allowed the transfer of a policy from a site operator to another party at the time of the decommissioning of a facility. ANI has stated that they would be able to continue the coverage at Barnwell after closure with the State named as insured. However, the transfer of a policy is not automatic, but subject to ANI's underwriting standards and inspections. In general, the "grandfathering" process transferring responsibility of decommissioned facilities has been accomplished smoothly. Clearly, the existence of the tritium contamination in groundwater under and adjacent to the Barnwell facility raises questions about whether insurance coverage would be “grandfathered” for the facility or whether this significant source of risk, and any others related to off-site contamination, might be excluded from the policy.

Another more significant provision is, as ANI readily admits, whether capacity will continue to exist at the time of transfer. ANI's moratorium in 1990 affected the writing of new sites only, and ANI continued to offer full limits to existing ones; this pattern continues now, with the $25-million maximum insurance limit applying only to the new sites. Based on history and ANI's current inclinations, it appears likely that ANI insurance will be available to the State. Other carriers may also be available, including the aforementioned AIG and XL. Combining the ANI limit of $100 million with AIG’s and XL’s $50 million each could potentially provide a total coverage of $200 million.

As of December 31, 2007, the balance of the Extended Care Fund was about $123 million. This fund has been accumulated over time through surcharges paid by waste generators using the facility. The primary use of this fund must be for the necessary activities of maintenance and monitoring over the 100 years post-closure care period. The credibility of safe long-term maintenance relies on this fund. However, to the extent that the funds available exceed the anticipated needs for a safe post-closure period, the fund should be viewed as a vehicle for accomplishing self-insurance. Situations may exist where self-insurance may be necessary, as described in Section III.4.

A final element in reviewing the State's liability potential regarding the Barnwell facility is the Tort Claims Act. South Carolina has enacted the Tort Claims Act to limit its liability to the general public. Traditionally, governments have been exempted from liability to the general public through the doctrine of "sovereign immunity." As a matter of public policy and equity, the government's total exemption from liability has generally eroded. South Carolina has a $250,000 per claimant, $500,000 per occurrence limitation on damages for which it is responsible. In the event of an accident or incident at the site, the State's maximum payment for that event would not exceed the $500,000 limit. However, because this is a state law, it will probably only be valid as to claims by citizens of South Carolina.

III.5.3 Recommended Course of Action

Factors that should be considered in developing an approach for managing Barnwell facility financial risks include the following:

- The State is capable of covering most losses, if necessary.
- Losses of a catastrophic nature would most likely invoke sources of funding associated with federal national security, disaster, or CERCLA actions.
- The most likely unplanned cost would result from contamination of nearby properties. But since off-site groundwater contamination is already known and occurring, it is doubtful that any insurance company would offer to cover such a claim at a reasonable price.
- Premium pricing will likely decline over time as the waste becomes less hazardous because of radioactive decay.
- Past disposal site operators should be considered to remain responsible for claims arising from their operations.

In developing risk-management recommendations, the loss scenarios described in Section III.4.2 are addressed. It is necessary to protect against those losses which, though unlikely, could impact the insured. Thus, in reviewing the loss costs, the probabilities assigned to a loss scenario should not be considered. Instead, the impact, were the losses to occur, is the principal basis for a recommendation.

Several ways are available to build the financial assurance mechanisms so that a loss of the required size would be funded. Our primary recommendation for the Barnwell facility is to continue the ANI policy in the future. The policy remains an efficient and effective mechanism to protect the State from financial loss, as well as providing crucial ancillary services like engineering/inspection and legal defense. Should a claim arise, the State already has a mechanism for both defending and settling a loss through its insurance policy. The State thus need not incur defense and (potentially) loss costs itself.

The cost for continuing the ANI coverage is minimal in relation to the coverage and service provided. Benchmark pricing for ANI's policy has been around $1 per $1,000 limit, with some reduction for the closure phase. In discussions with ANI, they stated that a $50,000 annual budget for premium to provide coverage of $100 million was "somewhat low, but in the ballpark." In this scenario for the services provided and protection against uncertainty, no important benefit appears to justify risking a great deal to save a relatively small amount.

Another advantage of commercial insurance as opposed to self-insurance is that full limits are initially available. In the case of self-insurance, protection amounts grow over time. Unless amounts significantly greater than projected losses are immediately set up in the self-insurance fund, worst-case losses may not be sufficiently covered in the early phases. The difficulty of predicting when losses may occur is a strong incentive to use commercial insurance.

The disadvantage of insurance is the lack of control exercised by the buyer. While the insurance policy purchase appears preferable, the self-insurance option must be studied as a backup to insurance. Self-insurance as the primary option is not advisable if commercial insurance is available at a reasonable cost.

Self-insurance would be appropriate:

- As excess or additional protection beyond insurance purchased from ANI or any future source of coverage.
- As additional protection should ANI reduce the available policy limit.
- As a growing source of protection over time as inflation erodes the real value of ANI's policy limits.
- As primary coverage should ANI policy no longer be available (full moratorium).
- To cover losses not covered in the ANI policy (not the topic of this report, but areas of potential loss like onsite cleanup which must be recognized).

In the case of the Barnwell facility, beginning a self-insurance mechanism would be impractical at this time, since operations are closing and insurance appears to be available. However, the long-term care fund should be viewed as a potential source of funds in case actual losses exceed protection ultimately provided by the State.

Projected costs of planned monitoring and maintenance activities during the institutional control period are presented in Table III-2. These annual costs range from $2 to $5 million per year depending on the period of time and the level of confidence. The decreasing pattern reflects decreasing activities and radiological hazard over time and the assumption that acceptable performance will continue to be observed at the closed facility.

By modeling the pattern of expense payments over time, it is possible to determine the level of protection the fund can provide for the losses outlined above. Basically, in a scenario where interest rates exceed inflation by 2 percent annually and current insurance costs are $100,000, the Extended Care Fund could absorb $25 million in losses in the first year and still have sufficient funds to pay for all necessary routine maintenance expenses and insurance costs thereafter (refer to Section III.4.3).

As shown throughout this report, the balance of the Barnwell Extended Care Fund exceeds projected mid-range costs by about $33 million. However, this amount should not be viewed as excess or surplus funds. A reasonable chance exists that the projected mid-range costs will be exceeded because of uncertainties in the cost estimate. With 80 percent confidence, the cost of planned activities is $95 million, leaving about $28 million to cover costs of unplanned events, consequences, and responses. This report shows also that some potential loss scenarios are not likely to be covered by commercial insurance. Funds available from the Barnwell Extended Care Fund appear to be adequate to cover costs of unplanned events with about 65 percent confidence. Thus we recommend that the Fund be maintained as a defense against the uncertainties of future hazards and risks.

No mention is made of reinsurance to protect the fund since the fund is only a second line of defense after insurance. Should insurance be unavailable or limited in coverages offered, as it is now, it is probable that reinsurance would be similarly restricted.

The State should consider transferring or partitioning $28 million from the Extended Care Fund into a separate fund designated as a Barnwell Contingency Fund, the purpose of which would be to pay for costs that go beyond the planned program of routine monitoring and maintenance of the disposal site. Segmenting the fund in this manner might help clarify the scope and purpose of the accumulated money for policy makers and the public. Additional motivation for this action recurs in frequent but mistaken public references to the Barnwell Extended Care Fund as a “clean-up” fund.

As observations, experience, and additional data of the Barnwell facility provide a better basis for assessing the risks of monitoring and maintaining the closed disposal facility, the State would be well served to reassess its risk-management strategy, and the performance of the extended care program itself. While such reassessment might be done on an ongoing basis, we recommend that the State conduct a comprehensive assessment of the adequacy of the Extended Care Fund and the assessment of risk at least every 20 years.

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APPENDICES

A Images of approved monitoring programs for operations, closure, and post-closure periods

B Details of Mid-Range Cost Estimates

C Crystal Ball Report for Planned Events

D RISQUE Methodology and Workshop

E Details of Cost Estimates for Unplanned Event

F Crystal Ball Report for Unplanned Events

G Tritium Plume Treatment Costs and Analyses

APPENDIX A

ENVIRONMENTAL MONITORING PLANS FOR CLOSURE AND CUSTODIAL CARE OF BARNWELL LLRW DISPOSAL FACILITY

ENVIRONMENTAL MONITORING PLANS FOR CLOSURE AND CUSTODIAL CARE OF BARNWELL LLRW DISPOSAL FACILITY

CNS has proposed environmental monitoring programs for the Barnwell LLRW disposal facility following cessation of active disposal operations after decommissioning of all the nuclear power reactors in the Atlantic Compact region. These proposals are included in the report, “Interim Site Stabilization and Closure Plan for the Barnwell Low-Level Radioactive Waste Disposal Facility; 2005 Closure Plan” (PL-CNS-05-001, June 2005), which was submitted to DHEC.

Since implementation of the post-closure environmental monitoring program will likely not occur until the middle of the century, after CNS terminates the site lease and leaves the property, they may be subject to considerable modification due to potential changes in regulatory preferences, proposals from the custodial agency, improvements in technology and techniques, and actual monitoring experience at the site between now and then.

As a basis for cost modeling, however, URS has reviewed the proposed monitoring program and finds it to be a reasonable basis for projecting costs throughout the extended care period.

Images of the two programs used are included here for ease of reference.

Table 6-14 Closure Period Monitoring Program					
Sample Description	# Locations	Type	Collection Media	Frequency	Analysis
Wells[1,2]	120	Grab	Water	Quarterly	Gross alpha/beta, Gamma Isotopic, and Tritium
	28	Grab	Water	Quarterly	pH, Conductivity, Total Organic Carbon, Volatile Organics
	28	Grab	Water	Annually	Carbon-14
	16	Grab	Water	Annually	Acids, Base/Neutrals, Pesticides/PCB's, Phenols, Cyanide, Metals
Surface Water [3]	8	Grab	Water	Quarterly	Gross alpha/beta, Gamma Isotopic, and Tritium
	2	Grab	Water	Annually	Carbon-14
	2	Grab	Water	Quarterly	VOC, TOC
	2	Grab	Water	Annually	Acids, Base/Neutrals, Pesticides/PCBs, Phenols, Cyanide, Metals
Observation Sumps[2,4]	151	Grab	Water	Quarterly	Gamma Isotopic and Tritium
Surface Soil	16	Grab	Soil	Quarterly	Gamma Isotopic and Tritium
Sediment [3]	4	Grab	Sediment	Annually	Gamma Isotopic and Tritium
Samples of Opportunity[5]	500	Grab	Various	Various	Gross alpha/beta, Gamma Isotopic, and Tritium as needed.
Vegetation	16	Grab	Vegetation	Quarterly	Gamma Isotopic and Tritium
External Gamma	105	Continuous	TLD	Quarterly	Exposure
Atmospheric	12	Continuous	Particulate Filter	Every 2 Weeks	Gross Alpha/Beta, Gamma Isotopic,

(1) Includes selected wells from the existing monitoring programs.
(2) Water levels measured quarterly.
(3) Same locations as the current monitoring program.
(4) All sumps monitored for water accumulation with samples collected when available. As of 6/27/2005, there are 151 sumps in the monitoring program.
(5) Samples deemed desirable. The number of locations represents the total number

Table 8-9 Long-Term Care Monitoring Program Phase I					
Sample Description	Locations	Type	Media	Frequency	Analysis
Wells (1,2)	120	Grab	Water	Quarterly	Gross-Alpha-Beta, Gamma Isotopic and Tritium
Wells (1,2)	28	Grab	Water	Annually	Carbon-14
	28	Grab	Water	Quarterly	pH, Conductivity, Total Organic Carbon, Volatile Organics
Wells (1,2)	16	Grab	Water	Annually	Acids, Base/Neutrals, Pesticides/PCB's, Phenols, Cyanide, Metals
Surface Water (3)	2	Grab	Water	Annually	Carbon-14
Surface Water (3)	4	Grab	Water	Quarterly	Gamma Isotopic and Tritium
Surface Water (3)	2	Grab	Water	Quarterly	pH, Conductivity, Total Organic Carbon, Volatile Organics
Surface Water (3)	2	Grab	Water	Annually	Acid, Base/Neutrals, Pesticides/PCB's, Phenols, Cyanide, Metals
Observation Sumps (2, 4)	151	Grab	Water	Quarterly	Gamma Isotopic and Tritium
Surface Soil	20	Grab	Soil	Quarterly	Gamma Isotopic and Tritium
Sediment (3)	4	Grab	Sediment	Annually	Gamma Isotopic and Tritium
Samples of Opportunity (5)	100	Grab	Various	Quarterly	Gamma Isotopic and Tritium

Notes: (1) Includes selected wells from the existing monitoring programs annually.
(2) Water levels measured quarterly.
(3) Subset of current locations as the current monitoring program.
(4) Sump samples are collected when water is available.
(5) Samples deemed desirable by custodian.

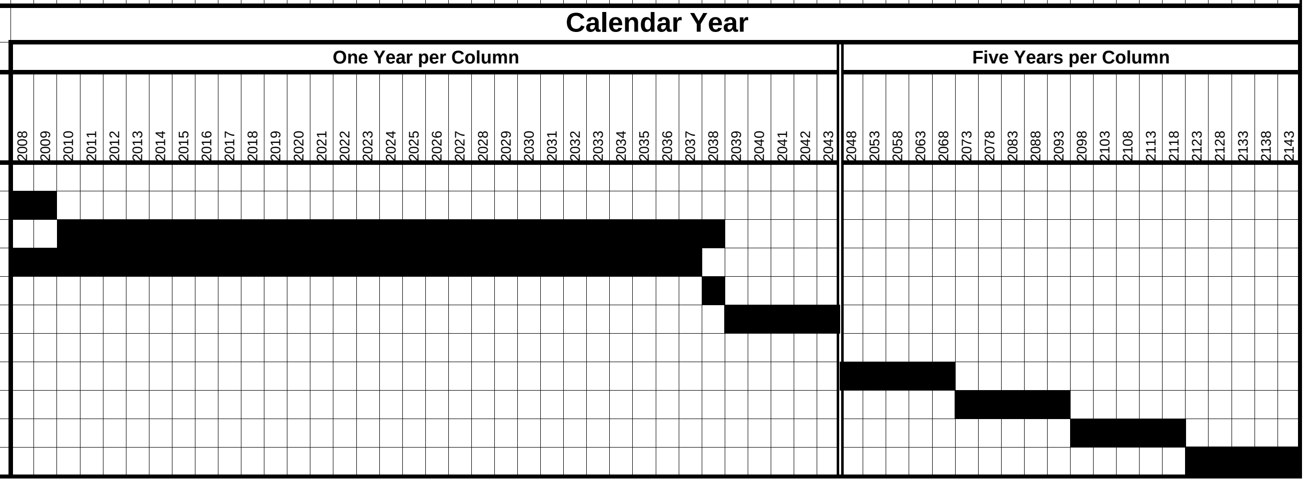
APPENDIX B

DETAILS OF MID-RANGE COST ESTIMATES

Schedule

Source: "Interim Site Stabilization and Closure Plan for the Barnwell Low-Level Radioactive Waste Disposal Facility; 2005 Closure Plan", PL-CNS-05-001, Figure 1-1

Activities	Duration (yr)
Disposal and Closure Activities	
Phase I Closure	2
Phase I Interim Care	29
In-Region Disposal Operations	30
Closure of In-Region Disposal Area	1
Post-Closure Observation	5
Institutional Control	
Stage 1	25
Stage 2	25
Stage 3	25
Stage 4	25



Summary of Post-Closure Custodial Care Costs

Summary of Post-Closure Custodial Care Costs ($/yr)

Estimate Items	Through Phase II Closure and Post-Closure Observations			Stage I	Stage II	Stage III & IV
	Phase I Post Closure Observation (105 of 115 acres) Annual Cost (2010-2014)	**Phase I Interim Care (105 of 115 acres)** Annual Cost (2015-2043)	**Phase II Post Closure Observation (All 115 acres)** Annual Cost (2039-2043)	**Institutional Control (115 acres)** Annual Cost (2044-2068)	**Institutional Control (115 acres)** Annual Cost 2069-2093)	**Institutional Control (115 acres)** Annual Cost (2094-2143)
Temporary Facilities *(Admin)*	$12,119	$12,119	$48,477	$48,477	$48,477	$48,477
Vehicles (Admin)	$21,192	$21,192	$84,768	$74,784	$74,784	$69,792
Post-Closure Staff and Management *(Admin)*	$268,766	$268,766	$1,164,304	$602,152	$311,076	$165,538
Environmental Monitoring Program *(Land)*	$874,777	$874,777	$958,089	$499,227	$339,364	$259,433
Cover Integrity Monitoring *(Land)*	$19,209	$19,209	$21,039	$21,039	$21,039	$10,519
Maintenance *(Land)*	$308,226	$308,226	$337,581	$337,581	$337,581	$337,581
Waste Disposal *(Land)*			$7,653	$7,653	$7,653	$7,653
License, Fees, Taxes, and Insurance *(Admin)*	$217,482	$217,482	$869,929	$574,053	$430,196	$350,270
Subtotal	**$1,721,773**	**$1,721,773**	**$3,491,840**	**$2,164,966**	**$1,570,170**	**$1,249,264**
G&A on Subtotal (3%)	$51,653	$51,653	$104,755	Custodial Agency	Custodial Agency	Custodial Agency
Fee on Subtotal plus G&A (7.25%)	$128,573	$128,573	$260,753	Custodial Agency	Custodial Agency	Custodial Agency
Total	**$1,901,999**	**$1,901,999**	**$3,857,348**	**$2,164,966**	**$1,570,170**	**$1,249,264**

Detailed Summary

Phase I Post Closure Observation (Years 2010 - 2014); 105 of 115 Acres ($/yr)

Estimate Items	Material	Labor	Equipment	Subcontract	Other	Total (incl. O&P)
Temporary Facilities				$11,219	$900	$12,119
Vehicles	$4,992		$16,200			$21,192
Post-Closure Staff and Management		$268,766				$268,766
Environmental Monitoring *(Land)*		$153,652		$721,125		$874,777
Cover Integrity Monitoring		$18,309	$901			$19,209
Maintenance	$181,224	$69,854	$57,149			$308,226
Waste Disposal						
License, Fees, Taxes, and Insurance		$61,916			$155,566	$217,482
Subtotal	**$186,216**	**$572,497**	**$74,249**	**$732,344**	**$156,466**	**$1,721,773**
G&A (3%)	$5,586	$17,175	$2,227	$21,970	$4,694	$51,653
Fee on Subtotal plus G&A (7.25%)	$13,906	$42,751	$5,545	$54,688	$11,684	$128,573
Total	**$205,708**	**$632,424**	**$82,021**	**$809,003**	**$172,844**	**$1,901,999**

Phase I Interim Care (Years 2014 - 2043); 105 of 115 Acres ($/yr)

Estimate Items	Material	Labor	Equipment	Subcontract	Other	Total (incl. O&P)
Temporary Facilities				$11,219	$900	$12,119
Equipment	$4,992		$16,200			$21,192
Post-Closure Staff and Management		$268,766				$268,766
Operational Radiological Monitoring		$153,652		$721,125		$874,777
Cover Integrity Monitoring		$18,309	$901			$19,209
Maintenance	$181,224	$69,854	$57,149			$308,226
Waste Disposal						
License, Fees, Taxes, and Insurance		$61,916			$155,566	$217,482
Subtotal	**$186,216**	**$572,497**	**$74,249**	**$732,344**	**$156,466**	**$1,721,773**
G&A (3%)	$5,586	$17,175	$2,227	$21,970	$4,694	$51,653
Fee on Subtotal plus G&A (7.25%)	$13,906	$42,751	$5,545	$54,688	$11,684	$128,573
Total	**$205,708**	**$632,424**	**$82,021**	**$809,003**	**$172,844**	**$1,901,999**

Phase II Post Closure Observation (Years 2039 - 2043); All 115 Acres ($/yr)

Estimate Items	Material	Labor	Equipment	Subcontract	Other	Total (incl. O&P)
Temporary Facilities				$44,877	$3,600	$48,477
Equipment	$19,968		$64,800			$84,768
Post-Closure Staff and Management		$1,164,304				$1,164,304
Operational Radiological Monitoring		$168,286		$789,804		$958,089
Cover Integrity Monitoring		$20,052	$987			$21,039
Maintenance	$198,483	$76,507	$62,591			$337,581
Waste Disposal				$7,653		$7,653
License, Fees, Taxes, and Insurance		$247,666			$622,263	$869,929
Subtotal	**$218,451**	**$1,676,814**	**$128,378**	**$842,334**	**$625,863**	**$3,491,840**
G&A (3%)	$6,554	$50,304	$3,851	$25,270	$18,776	$104,755
Fee on Subtotal plus G&A (7.25%)	$16,313	$125,216	$9,587	$62,901	$46,736	$260,753
Total	**$241,317**	**$1,852,334**	**$141,816**	**$930,505**	**$691,375**	**$3,857,348**

Stage I Institutional Control (2044 - 2068); All 115 Acres ($/yr)

Estimate Items	Material	Labor	Equipment	Subcontract	Other	Total (incl. O&P)
Temporary Facilities				$44,877	$3,600	$48,477
Equipment	$9,984		$64,800			$74,784
Post-Closure Staff and Management		$582,152			$20,000	$602,152
Operational Radiological Monitoring		$78,473		$420,755		$499,227
Cover Integrity Monitoring		$20,052	$987			$21,039
Maintenance	$198,483	$76,507	$62,591			$337,581
Waste Disposal				$7,653		$7,653
License, Fees, Taxes, and Insurance		$247,666			$326,387	$574,053
Subtotal	**$208,467**	**$1,004,849**	**$128,378**	**$473,285**	**$349,987**	**$2,164,966**
G&A (3%)						
Fee on Subtotal plus G&A (7.25%)						
Total	**$208,467**	**$1,004,849**	**$128,378**	**$473,285**	**$349,987**	**$2,164,966**

Stage II Institutional Control (2069 - 2093); All 115 Acres ($/yr)

Estimate Items	Material	Labor	Equipment	Subcontract	Other	Total (incl. O&P)
Temporary Facilities				$44,877	$3,600	$48,477
Equipment	$9,984		$64,800			$74,784
Post-Closure Staff and Management		$291,076			$20,000	$311,076
Operational Radiological Monitoring		$53,343		$286,021		$339,364
Cover Integrity Monitoring		$20,052	$987			$21,039
Maintenance	$198,483	$76,507	$62,591			$337,581
Waste Disposal				$7,653		$7,653
License, Fees, Taxes, and Insurance		$123,833			$306,363	$430,196
Subtotal	**$208,467**	**$564,811**	**$128,378**	**$338,551**	**$329,963**	**$1,570,170**
G&A (3%)						
Fee on Subtotal plus G&A (7.25%)						
Total	**$208,467**	**$564,811**	**$128,378**	**$338,551**	**$329,963**	**$1,570,170**

Stage III & IV Institutional Control (2094 - 2143); All 115 Acres ($/yr)

Estimate Items	Material	Labor	Equipment	Subcontract	Other	Total (incl. O&P)
Temporary Facilities				$44,877	$3,600	$48,477
Equipment	$4,992		$64,800			$69,792
Post-Closure Staff and Management		$145,538			$20,000	$165,538
Operational Radiological Monitoring		$40,779		$218,654		$259,433
Cover Integrity Monitoring		$10,026	$493			$10,519
Maintenance	$198,483	$76,507	$62,591			$337,581
Waste Disposal				$7,653		$7,653
License, Fees, Taxes, and Insurance		$123,833			$226,437	$350,270
Subtotal	**$203,475**	**$396,682**	**$127,885**	**$271,184**	**$250,037**	**$1,249,264**
G&A (3%)						
Fee on Subtotal plus G&A (7.25%)						
Total	**$203,475**	**$396,682**	**$127,885**	**$271,184**	**$250,037**	**$1,249,264**

Input Summaries

Vehicle Requirements Across Time

	Through Phase I Interim Care	Phase II Post Closure Observation	Institutional Control Stage I	Institutional Control Stage II	Institutional Control Stage III & IV
Weeks Required per Year	52	52	26	26	26
Pickup Truck (ea)	2 veh	2 veh	2 veh	2 veh	1 veh
Utility Truck, Flat Bed/Dump Bed (ea)	2 veh	2 veh	2 veh	2 veh	1 veh
Fuel (gallons)	1,248	4,992	2,496	2,496	1,248

Facility Staffing Across Time

	Through Phase II Post Closure Observation	Institutional Control Stage I	Institutional Control Stage II	Institutional Control Stage III & IV
Manager	2,080	1,040	520	260
Superintendant	2,080	1,040	520	260
CHP	2,080	1,040	520	260
Environmental Technician	4,160	2,080	1,040	520
Engineer	4,160	2,080	1,040	520
Instrument Technician	2,080	1,040	520	260
Total	16,640	8,320	4,160	2,080

Environmental Monitoring Across Time

	Through Phase I Post-Closure Observations	Institutional Control Stage I	Institutional Control Stage II	Institutional Control Stages III & IV
Wells	678	608	312	164
Surface Water	2	34	18	10
Observation Sumps	604	604	604	604
Surface Soil	64	80	40	20
Sediment	4	4	2	1
Samples of Opportunity	1250	400	200	100
Vegetation	64	---	---	---
External Gamma	420	---	---	---
Atmospheric	312	---	---	---

Maintenance Activities

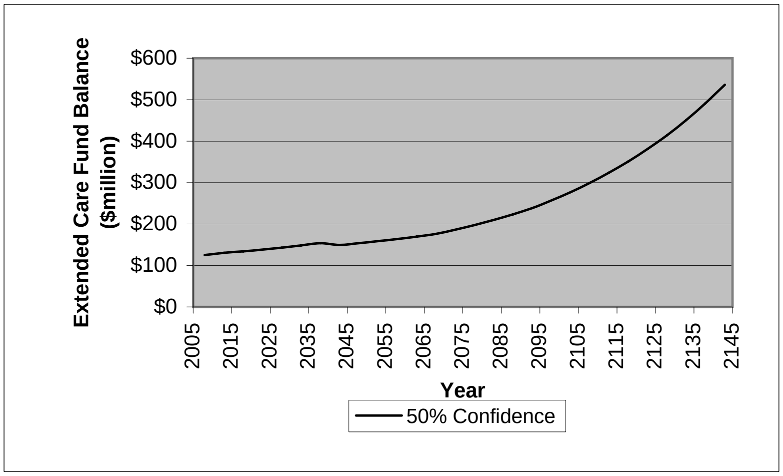
	Units	Phase I Post-Closure Observations
Maintain vegetated cover	acres	115
Fertilize cover (10 to 20 percent each year)	square yards	55,660
Maintain dirt roads (25 to 50 percent each year; 10,000 ft of 20-ft road)	square yards	5,556
Maintain storm water structures (5 to 10 % of assumed area each year)	Square feet	37,571
Maintain storm water structures (remove 0.5 to 1 ft sediment each year)	cubic yards	58
Occasional seeding (10 to 20 percent each year)	1000 square feet	501
Small cover repairs (1 to 2% of Phase 1 cover each year, 3 ft deep)	cubic yards	5,566
Fence (5 to 10 percent of total length , 13200 ft, each year)	feet	660
Well repairs (10 ft for 5 to 10% of all wells each year)	feet	109

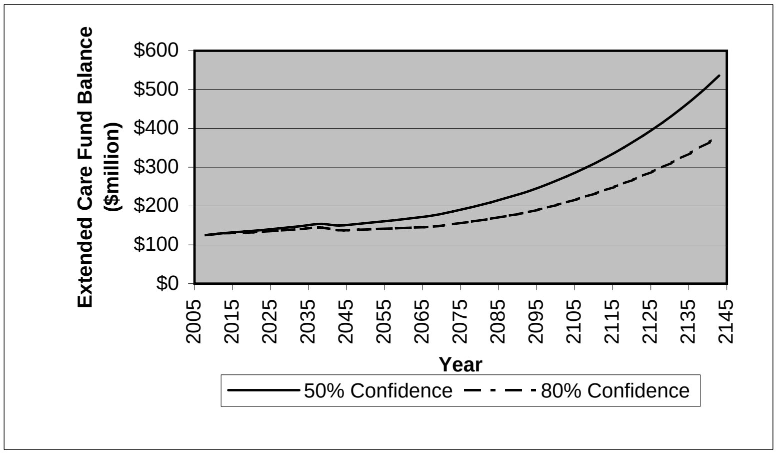
Through Phase II Post-Closure Observation	Institutional Control Stages I & II	Institutional Control Stages III & IV
600000	$158,229	$78,303

Extended Care Fund Balance Performance

Extended Care Fund Balance Performance

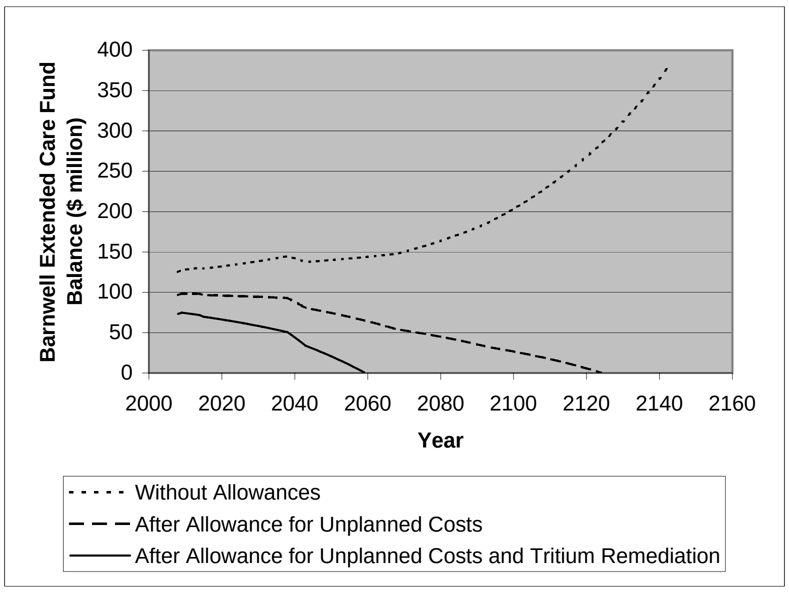
Year	50% Confic	80% Confidence
2008	$125	$125
2013	$131	$130
2018	$134	$131
2023	$138	$134
2028	$143	$137
2033	$148	$141
2038	$154	$145
2043	$150	$138
2048	$154	$139
2053	$159	$141
2058	$164	$143
2063	$170	$145
2068	$176	$147
2073	$186	$153
2078	$197	$160
2083	$210	$168
2088	$223	$176
2093	$238	$185
2098	$257	$197
2103	$277	$210
2108	$299	$225
2113	$324	$241
2118	$351	$259
2123	$381	$278
2128	$414	$300
2133	$451	$324
2138	$491	$351
2143	$536	$380





Projected Performance of ECF

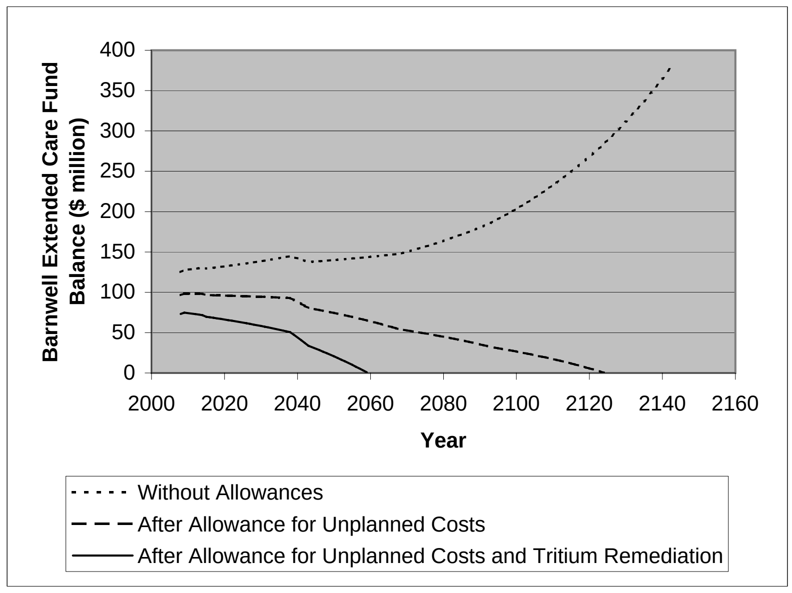
Projected Performance of ECF



Year	Projected Balance Available After Planned Costs ($000)	Allowance for Unplanned Events	Available After Allowance for Unplanned Events	Allowance for Tritium Plume Remediation	Available After Allowance for Unplanned Events and Tritium Plume Remediation
	$123	-$28	$95	-$23	$72
2008	$125		$97		$73
2009	$128		$99		$75
2010	$128		$99		$74
2011	$129		$98		$74
2012	$129		$98		$73
2013	$130		$98		$72
2014	$130		$98		$72
2015	$129		$97		$70
2016	$130		$96		$69
2017	$131		$96		$68
2018	$131		$96		$68
2019	$132		$96		$67
2020	$132		$96		$66
2021	$133		$96		$66
2022	$133		$96		$65
2023	$134		$96		$64
2024	$135		$95		$63
2025	$135		$95		$62
2026	$136		$95		$62
2027	$137		$95		$61
2028	$137		$95		$60
2029	$138		$95		$59
2030	$139		$95		$58
2031	$139		$94		$57
2032	$140		$94		$56
2033	$141		$94		$56
2034	$142		$94		$55
2035	$142		$94		$54
2036	$143		$93		$53
2037	$144		$93		$52
2038	$145		$93		$51
2039	$143		$91		$47
2040	$142		$88		$44
2041	$141		$86		$41
2042	$139		$83		$37
2043	$138		$81		$34
2044	$138		$80		$32
2045	$138		$79		$30
2046	$139		$78		$28
2047	$139		$77		$26
2048	$139		$76		$25
2049	$140		$75		$23
2050	$140		$74		$21
2051	$140		$74		$19
2052	$141		$73		$17
2053	$141		$72		$14
2054	$142		$71		$12
2055	$142		$70		$10
2056	$142		$69		$8
2057	$143		$67		$6
2058	$143		$66		$3
2059	$144		$65		$1
2060	$144		$64		-$2
2061	$145		$63		-$4
2062	$145		$62		-$7
2063	$145		$61		-$9
2064	$146		$59		-$12
2065	$146		$58		-$14
2066	$147		$57		-$17
2067	$147		$56		-$20
2068	$148		$54		-$23
2069	$149		$53		-$25
2070	$150		$53		-$27
2071	$152		$52		-$30
2072	$153		$51		-$32
2073	$154		$51		-$34
2074	$155		$50		-$37
2075	$157		$49		-$39
2076	$158		$48		-$42
2077	$159		$48		-$44
2078	$161		$47		-$47
2079	$162		$46		-$50
2080	$164		$45		-$53
2081	$165		$44		-$55
2082	$167		$43		-$58
2083	$168		$42		-$61
2084	$170		$41		-$64
2085	$172		$41		-$67
2086	$173		$40		-$70

16 years of Institutional Control
84 years short

Projected Performance of ECF



Year	Projected Balance Available After Planned Costs ($000)	Allowance for Unplanned Events	Available After Allowance for Unplanned Events	Allowance for Tritium Plume Remediation	Available After Allowance for Unplanned Events and Tritium Plume Remediation
2087	$175		$39		-$74
2088	$177		$38		-$77
2089	$179		$37		-$80
2090	$180		$36		-$83
2091	$182		$35		-$87
2092	$184		$33		-$90
2093	$186		$32		-$94
2094	$188		$32		-$97
2095	$191		$31		-$101
2096	$193		$30		-$104
2097	$196		$29		-$108
2098	$198		$28		-$111
2099	$201		$28		-$115
2100	$203		$27		-$118
2101	$206		$26		-$122
2102	$209		$25		-$126
2103	$211		$24		-$130
2104	$214		$23		-$134
2105	$217		$22		-$138
2106	$220		$21		-$142
2107	$223		$20		-$146
2108	$226		$19		-$151
2109	$229		$18		-$155
2110	$233		$17		-$160
2111	$236		$16		-$164
2112	$239		$15		-$169
2113	$243		$14		-$174
2114	$246		$13		-$178
2115	$250		$12		-$183
2116	$253		$11		-$188
2117	$257		$10		-$194
2118	$260		$8		-$199
2119	$264		$7		-$204
2120	$268		$6		-$210
2121	$272		$4		-$215
2122	$276		$3		-$221
2123	$280		$2		-$227
2124	$285		$0	**81 years of Institutional Control**	-$233
2125	$289		-$1	**19 years short**	-$239
2126	$293		-$2		-$245
2127	$298		-$4		-$251
2128	$302		-$5		-$258
2129	$307		-$7		-$264
2130	$312		-$8		-$271
2131	$316		-$10		-$278
2132	$321		-$11		-$285
2133	$326		-$13		-$292
2134	$332		-$15		-$299
2135	$337		-$16		-$306
2136	$342		-$18		-$314
2137	$348		-$20		-$322
2138	$353		-$22		-$329
2139	$359		-$23		-$337
2140	$365		-$25		-$346
2141	$371		-$27		-$354
2142	$377		-$29		-$362
2143	$383		-$31		-$371

$153,358

Cash Flows and Changes in Fund Value through 100 Years of Institutional Control; 80% Confidence

Real Investment Growth Rate 2%

Cash Flows and Changes in Fund Value through 100 Years of Institutional Control 80% Confidence

	Ph1 PCO	Ph1 IC	Ph2 PCO	InstCtl1	InstCtl2	InstCtl3&4	Periodic	Revenues	Total Net Present Value		
Delay (yr)	2	7	31	36	61	86				2247	$500
Rounded Net Present Value	$9,400,000	$34,200,000	$10,800,000	$23,400,000	$10,500,000	$8,000,000	$13,000	-$500,000	#REF!	<-- Extract from Data at 80%	
			100 yr Post InstCtl Care @ $500/yr			$1,500,000			$97,600,000		
			200 yr Post InstCtl Care @ $500/yr			$1,700,000					

Year	Phase I; PCO	Phase I; IC	Phase II; PCO	Stage I InstCtl	Stage II InstCtl	Stage III & IV InstCtl	Periodic Expense	Comments	Total ECF Costs	Payment to ECF	Interest Growth at 2% Real	Current Available Funds ($000)
								Phase I Closure; In-Region Disposal				$122,751
2008								Operations (DO)		$22.4	$2,455	$125,229
2009	Extract from Forecasts of Annual Costs (Data) at 80%							Phase I Closure; In-Region DO		$22.4	$2,505	$127,756
2010	$2,078							Phase I Post-Closure Observ (PCO); I	$2,078	$22.4	$2,555	$128,255
2011	$2,078							Phase I PCO; In-Region DO	$2,078	$22.4	$2,565	$128,764
2012	$2,078							Phase I PCO; In-Region DO	$2,078	$22.4	$2,575	$129,284
2013	$2,078						$19	Phase I PCO; In-Region DO; Aerial Su	$2,098	$22.4	$2,586	$129,795
2014	$2,078						$70	Phase I PCO; In-Region DO; 25-yr Pe	$2,148	$22.4	$2,596	$130,265
2015		$2,078			$1,394			Phase I InterimCare (IC); In-Region D	$3,472	$22.4	$2,605	$129,421
2016		$2,078						Phase I IC; In-Region DO	$2,078	$22.4	$2,588	$129,953
2017		$2,078						Phase I IC; In-Region DO	$2,078	$22.4	$2,599	$130,497
2018		$2,078						Phase I IC; In-Region DO	$2,078	$22.4	$2,610	$131,051
2019		$2,078						Phase I IC; In-Region DO	$2,078	$22.4	$2,621	$131,616
2020		$2,078						Phase I IC; In-Region DO	$2,078	$22.4	$2,632	$132,193
2021		$2,078						Phase I IC; In-Region DO	$2,078	$22.4	$2,644	$132,781
2022		$2,078						Phase I IC; In-Region DO	$2,078	$22.4	$2,656	$133,381
2023		$2,078						Phase I IC; In-Region DO	$2,078	$22.4	$2,668	$133,993
2024		$2,078						Phase I IC; In-Region DO	$2,078	$22.4	$2,680	$134,617
2025		$2,078						Phase I IC; In-Region DO	$2,078	$22.4	$2,692	$135,254
2026		$2,078						Phase I IC; In-Region DO	$2,078	$22.4	$2,705	$135,903
2027		$2,078						Phase I IC; In-Region DO	$2,078	$22.4	$2,718	$136,565
2028		$2,078						Phase I IC; In-Region DO	$2,078	$22.4	$2,731	$137,241
2029		$2,078						Phase I IC; In-Region DO	$2,078	$22.4	$2,745	$137,930
2030		$2,078						Phase I IC; In-Region DO	$2,078	$22.4	$2,759	$138,633
2031		$2,078						Phase I IC; In-Region DO	$2,078	$22.4	$2,773	$139,350
2032		$2,078						Phase I IC; In-Region DO	$2,078	$22.4	$2,787	$140,081
2033		$2,078						Phase I IC; In-Region DO	$2,078	$22.4	$2,802	$140,827
2034		$2,078						Phase I IC; In-Region DO	$2,078	$22.4	$2,817	$141,588
2035		$2,078						Phase I IC; In-Region DO	$2,078	$22.4	$2,832	$142,364
2036		$2,078						Phase I IC; In-Region DO	$2,078	$22.4	$2,847	$143,155
2037		$2,078						Phase I IC; In-Region DO	$2,078	$22.4	$2,863	$143,963
2038		$2,078						Phase I IC; Phase II Closure	$2,078		$2,879	$144,764
2039			$4,251					Phase I IC; Phase II PCO	$4,251		$2,895	$143,409
2040			$4,251					Phase I IC; Phase II PCO	$4,251		$2,868	$142,026
2041			$4,251					Phase I IC; Phase II PCO	$4,251		$2,841	$140,616
2042			$4,251				$19	Phase I IC; Phase II PCO; Aerial Surv	$4,270		$2,812	$139,158
2043			$4,251				$70	Phase I IC; Phase II PCO; 25-yr Perf I	$4,320		$2,783	$137,621
2044				$2,447				InstCtl Stage 1	$2,447		$2,752	$137,926
2045				$2,447				InstCtl Stage 1	$2,447		$2,759	$138,237
2046				$2,447				InstCtl Stage 1	$2,447		$2,765	$138,555
2047				$2,447				InstCtl Stage 1	$2,447		$2,771	$138,879
2048				$2,447				InstCtl Stage 1	$2,447		$2,778	$139,209
2049				$2,447				InstCtl Stage 1	$2,447		$2,784	$139,546
2050				$2,447				InstCtl Stage 1	$2,447		$2,791	$139,890
2051				$2,447				InstCtl Stage 1	$2,447		$2,798	$140,241
2052				$2,447				InstCtl Stage 1	$2,447		$2,805	$140,598
2053				$2,447				InstCtl Stage 1	$2,447		$2,812	$140,963
2054				$2,447				InstCtl Stage 1	$2,447		$2,819	$141,335
2055				$2,447				InstCtl Stage 1	$2,447		$2,827	$141,714
2056				$2,447				InstCtl Stage 1	$2,447		$2,834	$142,102
2057				$2,447				InstCtl Stage 1	$2,447		$2,842	$142,496
2058				$2,447				InstCtl Stage 1	$2,447		$2,850	$142,899
2059				$2,447				InstCtl Stage 1	$2,447		$2,858	$143,310
2060				$2,447				InstCtl Stage 1	$2,447		$2,866	$143,729
2061				$2,447				InstCtl Stage 1	$2,447		$2,875	$144,156
2062				$2,447				InstCtl Stage 1	$2,447		$2,883	$144,592
2063				$2,447				InstCtl Stage 1	$2,447		$2,892	$145,037
2064				$2,447				InstCtl Stage 1	$2,447		$2,901	$145,490
2065				$2,447				InstCtl Stage 1	$2,447		$2,910	$145,953
2066				$2,447				InstCtl Stage 1	$2,447		$2,919	$146,425
2067				$2,447			$19	InstCtl Stage 1; Aerial Survey	$2,467		$2,928	$146,887
2068				$2,447			$70	InstCtl Stage 1; 25-yr Perf Eval	$2,517		$2,938	$147,307
2069					$1,767			InstCtl Stage 2	$1,767		$2,946	$148,487
2070					$1,767			InstCtl Stage 2	$1,767		$2,970	$149,690
2071					$1,767			InstCtl Stage 2	$1,767		$2,994	$150,917
2072					$1,767			InstCtl Stage 2	$1,767		$3,018	$152,169
2073					$1,767			InstCtl Stage 2	$1,767		$3,043	$153,446
2074					$1,767			InstCtl Stage 2	$1,767		$3,069	$154,748
2075					$1,767			InstCtl Stage 2	$1,767		$3,095	$156,077
2076					$1,767			InstCtl Stage 2	$1,767		$3,122	$157,431
2077					$1,767			InstCtl Stage 2	$1,767		$3,149	$158,814
2078					$1,767			InstCtl Stage 2	$1,767		$3,176	$160,223
2079					$1,767			InstCtl Stage 2	$1,767		$3,204	$161,661
2080					$1,767			InstCtl Stage 2	$1,767		$3,233	$163,128
2081					$1,767			InstCtl Stage 2	$1,767		$3,263	$164,624
2082					$1,767			InstCtl Stage 2	$1,767		$3,292	$166,150
2083					$1,767			InstCtl Stage 2	$1,767		$3,323	$167,706
2084					$1,767			InstCtl Stage 2	$1,767		$3,354	$169,294
2085					$1,767			InstCtl Stage 2	$1,767		$3,386	$170,913
2086					$1,767			InstCtl Stage 2	$1,767		$3,418	$172,564
2087					$1,767			InstCtl Stage 2	$1,767		$3,451	$174,249
2088					$1,767			InstCtl Stage 2	$1,767		$3,485	$175,968
2089					$1,767			InstCtl Stage 2	$1,767		$3,519	$177,720
2090					$1,767			InstCtl Stage 2	$1,767		$3,554	$179,508
2091					$1,767			InstCtl Stage 2	$1,767		$3,590	$181,332
2092					$1,767		$19	InstCtl Stage 2; Aerial Survey	$1,786		$3,627	$183,172
2093					$1,767		$70	InstCtl Stage 2; 25-yr Perf Eval	$1,836		$3,663	$184,999
2094						$1,395		InstCtl Stage 3	$1,395		$3,700	$187,304
2095						$1,395		InstCtl Stage 3	$1,395		$3,746	$189,655
2096						$1,395		InstCtl Stage 3	$1,395		$3,793	$192,053
2097						$1,395		InstCtl Stage 3	$1,395		$3,841	$194,499
2098						$1,395		InstCtl Stage 3	$1,395		$3,890	$196,994
2099						$1,395		InstCtl Stage 3	$1,395		$3,940	$199,539
2100						$1,395		InstCtl Stage 3	$1,395		$3,991	$202,135
2101						$1,395		InstCtl Stage 3	$1,395		$4,043	$204,783
2102						$1,395		InstCtl Stage 3	$1,395		$4,096	$207,483
2103						$1,395		InstCtl Stage 3	$1,395		$4,150	$210,238
2104						$1,395		InstCtl Stage 3	$1,395		$4,205	$213,047
2105						$1,395		InstCtl Stage 3	$1,395		$4,261	$215,913
2106						$1,395		InstCtl Stage 3	$1,395		$4,318	$218,837
2107						$1,395		InstCtl Stage 3	$1,395		$4,377	$221,818
2108						$1,395		InstCtl Stage 3	$1,395		$4,436	$224,860
2109						$1,395		InstCtl Stage 3	$1,395		$4,497	$227,962
2110						$1,395		InstCtl Stage 3	$1,395		$4,559	$231,126
2111						$1,395		InstCtl Stage 3	$1,395		$4,623	$234,353
2112						$1,395		InstCtl Stage 3	$1,395		$4,687	$237,645
2113						$1,395		InstCtl Stage 3	$1,395		$4,753	$241,003
2114						$1,395		InstCtl Stage 3	$1,395		$4,820	$244,428
2115						$1,395		InstCtl Stage 3	$1,395		$4,889	$247,922
2116						$1,395		InstCtl Stage 3	$1,395		$4,958	$251,485
2117						$1,395	$19	InstCtl Stage 3; Aerial Survey	$1,415		$5,030	$255,100
2118						$1,395	$70	InstCtl Stage 3; 25-yr Perf Eval	$1,465		$5,102	$258,737
2119						$1,395		IntCtl Stage 4	$1,395		$5,175	$262,517
2120						$1,395		IntCtl Stage 4	$1,395		$5,250	$266,372

Real Investment Growth Rate 2%

Cash Flows and Changes in Fund Value through 100 Years of Institutional Control 80% Confidence

	Ph1 PCO	Ph1 IC	Ph2 PCO	InstCtl1	InstCtl2	InstCtl3&4	Periodic	Revenues	**Total Net Present Value**		
Delay (yr)	2	7	31	36	61	86				2247	$500
Rounded Net Present Value	$9,400,000	$34,200,000	$10,800,000	$23,400,000	$10,500,000	$8,000,000	$13,000	-$500,000	**#REF!**	<-- Extract from Data at 80%	
			100 yr Post InstCtl Care @ $500/yr			$1,500,000			$97,600,000		
			200 yr Post InstCtl Care @ $500/yr			$1,700,000					

Year	**Phase I; PCO**	**Phase I; IC**	**Phase II; PCO**	**Stage I InstCtl**	**Stage II InstCtl**	**Stage III & IV InstCtl**	**Periodic Expense**	**Comments**	**Total ECF Costs**	**Payment to ECF**	**Interest Growth at 2% Real**	**Current Available Funds ($000)**
2121						$1,395		IntCtl Stage 4	$1,395		$5,327	$270,305
2122						$1,395		IntCtl Stage 4	$1,395		$5,406	$274,316
2123						$1,395		IntCtl Stage 4	$1,395		$5,486	$278,407
2124						$1,395		IntCtl Stage 4	$1,395		$5,568	$282,580
2125						$1,395		IntCtl Stage 4	$1,395		$5,652	$286,837
2126						$1,395		IntCtl Stage 4	$1,395		$5,737	$291,178
2127						$1,395		IntCtl Stage 4	$1,395		$5,824	$295,607
2128						$1,395		IntCtl Stage 4	$1,395		$5,912	$300,124
2129						$1,395		IntCtl Stage 4	$1,395		$6,002	$304,731
2130						$1,395		IntCtl Stage 4	$1,395		$6,095	$309,431
2131						$1,395		IntCtl Stage 4	$1,395		$6,189	$314,224
2132						$1,395		IntCtl Stage 4	$1,395		$6,284	$319,114
2133						$1,395		IntCtl Stage 4	$1,395		$6,382	$324,101
2134						$1,395		IntCtl Stage 4	$1,395		$6,482	$329,188
2135						$1,395		IntCtl Stage 4	$1,395		$6,584	$334,377
2136						$1,395		IntCtl Stage 4	$1,395		$6,688	$339,669
2137						$1,395		IntCtl Stage 4	$1,395		$6,793	$345,068
2138						$1,395		IntCtl Stage 4	$1,395		$6,901	$350,574
2139						$1,395		IntCtl Stage 4	$1,395		$7,011	$356,190
2140						$1,395		IntCtl Stage 4	$1,395		$7,124	$361,919
2141						$1,395		IntCtl Stage 4	$1,395		$7,238	$367,762
2142						$1,395	$19	IntCtl Stage 4; Aerial Survey	$1,415		$7,355	$373,703
2143						$1,395	$70	IntCtl Stage 4; 25-yr Perf Eval	$1,465		$7,474	$379,712

Cash Flows and Changes in Fund Value through 100 Years of Institutional Control; Base Case

Cash Flows and Changes in Fund Value through 100 Years of Institutional Control; Base Case

	Ph1 PCO	Ph1 IC	Ph2 PCO	InstCtl1	InstCtl2	InstCtl3&4	Periodic	Revenues	**Total Net Present Value**			
Delay (yr)	2	7	31	36	61	86				2247	$500	
Rounded Net Present Value	$8,600,000	$31,300,000	$9,800,000	$20,700,000	$9,200,000	$7,100,000	$13,000	-$500,000	**$86,200,000**	$86,213,000		
	$39,900,000		100 yr Post InstCtl Care @ $1000/yr			$2,900,000			$87,000,000			
			200 yr Post InstCtl Care @ $1000/yr			$3,300,000						

Year	**Phase I; PCO**	**Phase I; IC**	**Phase II; PCO**	**Stage I InstCtl**	**Stage II InstCtl**	**Stage III & IV InstCtl**	**Periodic Expense**	**Comments**	**Total ECF Costs**	**Payment to ECF**	**Interest Growth at 2% Real**	**Current Available Funds ($000)**
												$122,751
2008								Phase I Closure; In-Region Disposal Operations (DO)		$22.4	$2,455	$125,229
2009								Phase I Closure; In-Region DO		$22.4	$2,505	$127,756
2010	$1,902							Phase I Post-Closure Observ (PCO);	$1,902	$22.4	$2,555	$128,431
2011	$1,902							Phase I PCO; In-Region DO	$1,902	$22.4	$2,569	$129,120
2012	$1,902							Phase I PCO; In-Region DO	$1,902	$22.4	$2,582	$129,823
2013	$1,902						$19	Phase I PCO; In-Region DO; Aerial S	$1,921	$22.4	$2,596	$130,520
2014	$1,902						$70	Phase I PCO; In-Region DO; 25-yr Pe	$1,972	$22.4	$2,610	$131,181
2015		$1,902						Phase I InterimCare (IC); In-Region D	$1,902	$22.4	$2,624	$131,926
2016		$1,902						Phase I IC; In-Region DO	$1,902	$22.4	$2,639	$132,684
2017		$1,902						Phase I IC; In-Region DO	$1,902	$22.4	$2,654	$133,459
2018		$1,902						Phase I IC; In-Region DO	$1,902	$22.4	$2,669	$134,248
2019		$1,902						Phase I IC; In-Region DO	$1,902	$22.4	$2,685	$135,053
2020		$1,902						Phase I IC; In-Region DO	$1,902	$22.4	$2,701	$135,875
2021		$1,902						Phase I IC; In-Region DO	$1,902	$22.4	$2,717	$136,713
2022		$1,902						Phase I IC; In-Region DO	$1,902	$22.4	$2,734	$137,567
2023		$1,902						Phase I IC; In-Region DO	$1,902	$22.4	$2,751	$138,439
2024		$1,902						Phase I IC; In-Region DO	$1,902	$22.4	$2,769	$139,328
2025		$1,902						Phase I IC; In-Region DO	$1,902	$22.4	$2,787	$140,235
2026		$1,902						Phase I IC; In-Region DO	$1,902	$22.4	$2,805	$141,160
2027		$1,902						Phase I IC; In-Region DO	$1,902	$22.4	$2,823	$142,104
2028		$1,902						Phase I IC; In-Region DO	$1,902	$22.4	$2,842	$143,067
2029		$1,902						Phase I IC; In-Region DO	$1,902	$22.4	$2,861	$144,048
2030		$1,902						Phase I IC; In-Region DO	$1,902	$22.4	$2,881	$145,050
2031		$1,902						Phase I IC; In-Region DO	$1,902	$22.4	$2,901	$146,071
2032		$1,902						Phase I IC; In-Region DO	$1,902	$22.4	$2,921	$147,113
2033		$1,902						Phase I IC; In-Region DO	$1,902	$22.4	$2,942	$148,176
2034		$1,902						Phase I IC; In-Region DO	$1,902	$22.4	$2,964	$149,259
2035		$1,902						Phase I IC; In-Region DO	$1,902	$22.4	$2,985	$150,365
2036		$1,902						Phase I IC; In-Region DO	$1,902	$22.4	$3,007	$151,493
2037		$1,902						Phase I IC; In-Region DO	$1,902	$22.4	$3,030	$152,643
2038		$1,902						Phase I IC; Phase II Closure	$1,902		$3,053	$153,794
2039			$3,857					Phase I IC; Phase II PCO	$3,857		$3,076	$153,012
2040			$3,857					Phase I IC; Phase II PCO	$3,857		$3,060	$152,215
2041			$3,857					Phase I IC; Phase II PCO	$3,857		$3,044	$151,402
2042			$3,857				$19	Phase I IC; Phase II PCO; Aerial Surv	$3,877		$3,028	$150,553
2043			$3,857				$70	Phase I IC; Phase II PCO; 25-yr Perf	$3,927		$3,011	$149,637
2044				$2,165				InstCtl Stage 1	$2,165		$2,993	$150,465
2045				$2,165				InstCtl Stage 1	$2,165		$3,009	$151,310
2046				$2,165				InstCtl Stage 1	$2,165		$3,026	$152,171
2047				$2,165				InstCtl Stage 1	$2,165		$3,043	$153,049
2048				$2,165				InstCtl Stage 1	$2,165		$3,061	$153,945
2049				$2,165				InstCtl Stage 1	$2,165		$3,079	$154,859
2050				$2,165				InstCtl Stage 1	$2,165		$3,097	$155,791
2051				$2,165				InstCtl Stage 1	$2,165		$3,116	$156,742
2052				$2,165				InstCtl Stage 1	$2,165		$3,135	$157,712
2053				$2,165				InstCtl Stage 1	$2,165		$3,154	$158,701
2054				$2,165				InstCtl Stage 1	$2,165		$3,174	$159,711
2055				$2,165				InstCtl Stage 1	$2,165		$3,194	$160,740
2056				$2,165				InstCtl Stage 1	$2,165		$3,215	$161,790
2057				$2,165				InstCtl Stage 1	$2,165		$3,236	$162,860
2058				$2,165				InstCtl Stage 1	$2,165		$3,257	$163,953
2059				$2,165				InstCtl Stage 1	$2,165		$3,279	$165,067
2060				$2,165				InstCtl Stage 1	$2,165		$3,301	$166,203
2061				$2,165				InstCtl Stage 1	$2,165		$3,324	$167,362
2062				$2,165				InstCtl Stage 1	$2,165		$3,347	$168,545
2063				$2,165				InstCtl Stage 1	$2,165		$3,371	$169,750
2064				$2,165				InstCtl Stage 1	$2,165		$3,395	$170,980
2065				$2,165				InstCtl Stage 1	$2,165		$3,420	$172,235
2066				$2,165				InstCtl Stage 1	$2,165		$3,445	$173,515
2067				$2,165			$19	InstCtl Stage 1; Aerial Survey	$2,184		$3,470	$174,801
2068				$2,165			$70	InstCtl Stage 1; 25-yr Perf Eval	$2,235		$3,496	$176,062
2069					$1,570			InstCtl Stage 2	$1,570		$3,521	$178,013
2070					$1,570			InstCtl Stage 2	$1,570		$3,560	$180,003
2071					$1,570			InstCtl Stage 2	$1,570		$3,600	$182,033
2072					$1,570			InstCtl Stage 2	$1,570		$3,641	$184,104
2073					$1,570			InstCtl Stage 2	$1,570		$3,682	$186,215
2074					$1,570			InstCtl Stage 2	$1,570		$3,724	$188,370
2075					$1,570			InstCtl Stage 2	$1,570		$3,767	$190,567
2076					$1,570			InstCtl Stage 2	$1,570		$3,811	$192,808
2077					$1,570			InstCtl Stage 2	$1,570		$3,856	$195,094
2078					$1,570			InstCtl Stage 2	$1,570		$3,902	$197,426
2079					$1,570			InstCtl Stage 2	$1,570		$3,949	$199,804
2080					$1,570			InstCtl Stage 2	$1,570		$3,996	$202,230
2081					$1,570			InstCtl Stage 2	$1,570		$4,045	$204,704
2082					$1,570			InstCtl Stage 2	$1,570		$4,094	$207,228
2083					$1,570			InstCtl Stage 2	$1,570		$4,145	$209,803
2084					$1,570			InstCtl Stage 2	$1,570		$4,196	$212,429
2085					$1,570			InstCtl Stage 2	$1,570		$4,249	$215,107
2086					$1,570			InstCtl Stage 2	$1,570		$4,302	$217,839
2087					$1,570			InstCtl Stage 2	$1,570		$4,357	$220,626
2088					$1,570			InstCtl Stage 2	$1,570		$4,413	$223,468
2089					$1,570			InstCtl Stage 2	$1,570		$4,469	$226,367
2090					$1,570			InstCtl Stage 2	$1,570		$4,527	$229,324
2091					$1,570			InstCtl Stage 2	$1,570		$4,586	$232,341
2092					$1,570		$19	InstCtl Stage 2; Aerial Survey	$1,590		$4,647	$235,398
2093					$1,570		$70	InstCtl Stage 2; 25-yr Perf Eval	$1,640		$4,708	$238,466
2094						$1,249		InstCtl Stage 3	$1,249		$4,769	$241,986
2095						$1,249		InstCtl Stage 3	$1,249		$4,840	$245,576
2096						$1,249		InstCtl Stage 3	$1,249		$4,912	$249,239
2097						$1,249		InstCtl Stage 3	$1,249		$4,985	$252,974
2098						$1,249		InstCtl Stage 3	$1,249		$5,059	$256,784
2099						$1,249		InstCtl Stage 3	$1,249		$5,136	$260,671
2100						$1,249		InstCtl Stage 3	$1,249		$5,213	$264,635
2101						$1,249		InstCtl Stage 3	$1,249		$5,293	$268,678
2102						$1,249		InstCtl Stage 3	$1,249		$5,374	$272,803
2103						$1,249		InstCtl Stage 3	$1,249		$5,456	$277,009
2104						$1,249		InstCtl Stage 3	$1,249		$5,540	$281,300
2105						$1,249		InstCtl Stage 3	$1,249		$5,626	$285,677
2106						$1,249		InstCtl Stage 3	$1,249		$5,714	$290,141
2107						$1,249		InstCtl Stage 3	$1,249		$5,803	$294,695
2108						$1,249		InstCtl Stage 3	$1,249		$5,894	$299,340
2109						$1,249		InstCtl Stage 3	$1,249		$5,987	$304,077
2110						$1,249		InstCtl Stage 3	$1,249		$6,082	$308,909

Cash Flows and Changes in Fund Value through 100 Years of Institutional Control; Base Case

	Ph1 PCO	Ph1 IC	Ph2 PCO	InstCtl1	InstCtl2	InstCtl3&4	Periodic	Revenues	**Total Net Present Value**			
Delay (yr)	2	7	31	36	61	86				2247	$500	
Rounded Net Present Value	$8,600,000	$31,300,000	$9,800,000	$20,700,000	$9,200,000	$7,100,000	$13,000	-$500,000	**$86,200,000**	$86,213,000		
	$39,900,000		100 yr Post InstCtl Care @ $1000/yr			$2,900,000			$87,000,000			
			200 yr Post InstCtl Care @ $1000/yr			$3,300,000						
Year	**Phase I; PCO**	**Phase I; IC**	**Phase II; PCO**	**Stage I InstCtl**	**Stage II InstCtl**	**Stage III & IV InstCtl**	**Periodic Expense**	**Comments**	**Total ECF Costs**	**Payment to ECF**	**Interest Growth at 2% Real**	**Current Available Funds ($000)**
2111						$1,249		InstCtl Stage 3	$1,249		$6,178	$313,838
2112						$1,249		InstCtl Stage 3	$1,249		$6,277	$318,866
2113						$1,249		InstCtl Stage 3	$1,249		$6,377	$323,994
2114						$1,249		InstCtl Stage 3	$1,249		$6,480	$329,224
2115						$1,249		InstCtl Stage 3	$1,249		$6,584	$334,560
2116						$1,249		InstCtl Stage 3	$1,249		$6,691	$340,002
2117						$1,249	$19	InstCtl Stage 3; Aerial Survey	$1,269		$6,800	$345,533
2118						$1,249	$70	InstCtl Stage 3; 25-yr Perf Eval	$1,319		$6,911	$351,125
2119						$1,249		IntCtl Stage 4	$1,249		$7,022	$356,898
2120						$1,249		IntCtl Stage 4	$1,249		$7,138	$362,787
2121						$1,249		IntCtl Stage 4	$1,249		$7,256	$368,793
2122						$1,249		IntCtl Stage 4	$1,249		$7,376	$374,920
2123						$1,249		IntCtl Stage 4	$1,249		$7,498	$381,169
2124						$1,249		IntCtl Stage 4	$1,249		$7,623	$387,543
2125						$1,249		IntCtl Stage 4	$1,249		$7,751	$394,044
2126						$1,249		IntCtl Stage 4	$1,249		$7,881	$400,676
2127						$1,249		IntCtl Stage 4	$1,249		$8,014	$407,440
2128						$1,249		IntCtl Stage 4	$1,249		$8,149	$414,340
2129						$1,249		IntCtl Stage 4	$1,249		$8,287	$421,377
2130						$1,249		IntCtl Stage 4	$1,249		$8,428	$428,556
2131						$1,249		IntCtl Stage 4	$1,249		$8,571	$435,878
2132						$1,249		IntCtl Stage 4	$1,249		$8,718	$443,346
2133						$1,249		IntCtl Stage 4	$1,249		$8,867	$450,963
2134						$1,249		IntCtl Stage 4	$1,249		$9,019	$458,733
2135						$1,249		IntCtl Stage 4	$1,249		$9,175	$466,659
2136						$1,249		IntCtl Stage 4	$1,249		$9,333	$474,743
2137						$1,249		IntCtl Stage 4	$1,249		$9,495	$482,988
2138						$1,249		IntCtl Stage 4	$1,249		$9,660	$491,399
2139						$1,249		IntCtl Stage 4	$1,249		$9,828	$499,978
2140						$1,249		IntCtl Stage 4	$1,249		$10,000	$508,728
2141						$1,249		IntCtl Stage 4	$1,249		$10,175	$517,653
2142						$1,249	$19	IntCtl Stage 4; Aerial Survey	$1,269		$10,353	$526,738
2143						$1,249	$70	IntCtl Stage 4; 25-yr Perf Eval	$1,319		$10,535	$535,953

Summary by Phase

ANNUAL COSTS

Period	1000 Base-Case	Mean	$1,000 CL50	CL80	CL95
Phase I Post-Closure Observation	$1,900,000	$1,966	$1,961	$2,079	$2,204
Phase II Post-Closure Observation	$3,860,000	$3,990	$3,977	$4,248	$4,536
Stage I Institutional Control	$2,160,000	$2,310	$2,305	$2,440	$2,579
Stage II Institutional Control	$1,570,000	$1,666	$1,654	$1,769	$1,899
Stage III & IV Institutional Control	$1,250,000	$1,322	$1,315	$1,394	$1,480

PRESENT VALUES

Period	Base-Case	Mean	CL50	CL80	CL95
To Phase II Post-Closure Observation	$39,900	$41,269	$41,100	$43,600	$46,400
Phase II Post-Closure Observation	$9,800	$10,175	$10,100	$10,800	$11,500
Stage I Institutional Control	$20,700	$22,123	$22,100	$23,400	$24,800
Stage II Institutional Control	$9,200	$9,717	$9,700	$10,300	$11,000
Stage III & IV Institutional Control	$7,100	$7,580	$7,500	$8,000	$8,500
Periodic Costs	$13	$14	$13	$16	$19
Revenues from In-Region Disposal Operations	-$500	-$499	-$500	-$370	-$300
TOTAL	$86,200	$90,362	$90,100	$94,600	$99,400

Phase I Post Closure Observation (Years 2010 - 2014); 105 of 115 Acres

Phase I Post Closure Observation (Years 2010 - 2014); 105 of 115 Acres

Flag for CNS Proposed PC EnvMon | 1 | *SF Land* 0.91 | *SF Admin* 0.25

TOTALS: $186,216 $572,497 $74,249 $732,344 $156,466 $1,721,773

	Quantity	Units	Material /Unit	Labor /Unit	Equipment /Unit	Sub contract	Other	Total (incl. O&P) /Unit	BestEst	MaxEst	Material	Labor	Equipment	Sub contract	Other	Total (incl. O&P)	Subtotals	Reference	Notes
Temporary Facilities *(Admin)*																	$ 12,119		
Office Trailer	*9*	mo				$410.00		410.00	$410.00	615.00				$3,690		**$3,690**		015213.20.0550	Building Co
Office Equipment	*9*	mo				$165.00		165.00	$165.00	247.50				$1,485		**$1,485**		015213.40.0100	
Office Supplies	*9*	mo				$105.00		105.00	$105.00	157.50				$945		**$945**		015213.40.0120	
Storage box	*9*	mo				$80.50		80.50	$80.50	120.75				$725		**$725**		015213.20.1250	
Telephone	*9*	mo				$231.00		231.00	$231.00	346.50				$2,079		**$2,079**		015213.40.0140	
Lights & HVAC	*9*	mo				$121.00		121.00	$121.00	242.00				$1,089		**$1,089**		015213.40.0160	
Water/Sewer	*9*	mo				$134.08		134.08	$134.08	201.13				$1,207		**$1,207**			
Muni Waste Mgmt	*9*	mo					$100.00	100.00	$100.00	150.00					$900	**$900**			
Vehicles *(Admin)*																	$ 21,192		
Pickup truck	*6*	mo			$1,200.00			1,200.00	$1,200.00	2,000.00			$7,200			**$7,200**		$26k at 7% for 24 mo	
Utility truck, flat bed/dump bed	*6*	mo			$1,500.00			1,500.00	$1,500.00	2,500.00			$9,000			**$9,000**		$33k at 7% for 24 mo	
Fuel (4 veh; 1 tanks/wk; 52 weeks; 24 gal/tank); SF_Admin; =4*1*52*24*0.25	1248	gal	$4.00					4.00	$4.00	7.00	$4,992					**$4,992**			
1248																			
Regulatory Oversight -- *Covered by License Fees*																	$ -		
Program manager		hr		$ 122.85				122.85											
Engineer		hr		$ 51.79				51.79											
Administration		hr		$ 41.58				41.58											
Post-Closure Staff and Management *(Admin = 25%)*	***520***																$ 268,766		
Manager	520	hr		$ 122.85				122.85				$63,882				$63,882			
Superintendant	520	hr		$ 90.10				90.10				$46,850				$46,850			
CHP	520	hr		$ 66.15				66.15				$34,398				$34,398			Walkover, t
Environmental technician	1040	hr		$ 45.36				45.36				$47,174				$47,174			
Engineer	1040	hr		$ 51.79				51.79				$53,857				$53,857			
Instrument technician	520	hr		$ 43.47				43.47				$22,604				$22,604			
EnvMon Monitoring Program *(Scale by Land)*																	$ 874,777		
Based on Proposed LTC EnvMon Prog (Table 6-14, PL-CNS-05-001)												$153,652		$721,125		**$874,777**			
Cover Integrity Monitoring *(Land)*																	$ 19,209		
Monument survey	*118.70*	ea		154.25	7.59			161.84				$18,309	$901			**$19,209**		022113.13.0600	
Maintenance *(Land)*																	$ 308,226		
Maintain vegetated cover	*105.00*	acre		240.40	145.44			385.84	115.00			$25,242	$15,271			**$40,513**		311313.10.1020	entire area
Fertilize cover (10 to 20 percent each year)	50820	sy	0.18	0.15	0.066			0.40	55,660.00	50,820.00	$8,944	$7,852	$3,354			**$20,150**		329219.13.1000	22 acre are
Maintain dirt roads (25 to 50 percent each year; 10,000 ft of 20-f	5,072	sy	5.20	3.30	0.44			8.94	5,555.56	5,072.46	$26,392	$16,731	$2,232			**$45,355**		015523.50.0050	entire area
																		312216.10.0012	entire area
Maintain storm water structures (5 to 10 % of assumed area eac	34303.5	sf		0.21	0.1474			0.36	37,570.50	34,303.50		$7,352	$5,056			**$12,408**		312216.10.0016	entire area
Maintain storm water structures (remove 0.5 to 1 ft sediment eac	52.94	cy		6.10	2.2264			8.33	57.98	52.94		$323	$118			**$441**		312316.13.5050	Remove an
Occasional seeding (10 to 20 percent each year)	457.38	msf	19.58	2.07	24.2			45.85	500.94	457.38	$8,956	$947	$11,069			**$20,971**		329219.13.0800	5% of 22 ac
Small cover repairs (1 to 2% of Phase 1 cover each year, 3 ft de	5082	cy	24.20	1.55	3.806			29.56	5,566.00	5,082.00	$122,984	$7,877	$19,342			**$150,204**			1% of 22 ac
Fence (5 to 10 percent of total length , 13200 ft, each year)	602.6087	ft	16.06	4.65	0.858			21.57	660.00	602.61	$9,678	$2,804	$517			**$12,999**		323113.20.0200	% of entire
Well repairs (10 ft for 5 to 10% of all wells each year)	99.521739	ft	42.90	7.30	1.903			52.10	109.00	99.52	$4,269	$727	$189			**$5,185**		312319.30.0020	% of entire
Waste Transport and Disposal *(Land)*																	$ -		
Disposal of soil and other wastes		cy				132		132.00										026510.30.1110	
Other *(Admin)*																	$ 217,482		
Security (Year-round 24-7)	2,184	hr		28.35				28.35				$61,916				**$61,916**		015632.50.0100	
Taxes	0.25	ls					102,999	102,999.00	102,999.00						$25,750	**$25,750**			
Insurance	0.25	ls					243,435	243,435.10	243,435.10						$60,859	**$60,859**			
License & Other fees	0.25	ls					275829	275,829.00	275,829.00						$68,957	**$68,957**			
Subtotal Phase I PCO											**$186,216**	**$572,497**	**$74,249**	**$732,344**	**$156,466**	**$1,721,773**	**$ 1,721,773**		
Aerial Survey (Once per Stage)																	$ 19,465		
Aerial survey	229	acre				85		85.00	85.00	170.00						**$19,465**		022113.16.1850	
Performance Evaluations (Once per Stage)																	$ 69,722		Report and
CHP	340	hr		122.85				122.85	340.00	510.00						**$41,769**			
Scientist	510	hr		43.47				43.47	510.00	765.00						**$22,170**			
Admin.	170	hr		34.02				34.02	170.00	255.00						**$5,783**			

Phase I Interim Care (Years 2014 - 2043); 105 of 115 Acres

Phase I Interim Care (Years 2014 - 2043); 105 of 115 Acres

Flag for CNS Proposed PC EnvMon	1	*SF Lan*	*0.91*	*SF Admin*	*0.25*					TOTALS:	$186,216	$572,497	$74,249	$732,344	$156,466	$1,721,773	
	Quantity	Units	Material /Unit	Labor /Unit	Equipment /Unit	Sub contract	Other	Total (incl. O&P) /Unit	BestEst	MaxEst	Material	Labor	Equipment	Sub contract	Other	Total (incl. O&P)	Subtotals
Temporary Facilities *(Admin)*																	$12,119
Office Trailer	*9*	mo				410		410.00	$410.00	615.00	$0	$0	$0	$3,690	$0	**$3,690**	
Office Equipment	*9*	mo				165		165.00	$165.00	247.50	$0	$0	$0	$1,485	$0	**$1,485**	
Office Supplies	*9*	mo				105		105.00	$105.00	157.50	$0	$0	$0	$945	$0	**$945**	
Storage box	*9*	mo				80.5		80.50	$80.50	120.75	$0	$0	$0	$725	$0	**$725**	
Telephone	*9*	mo				231		231.00	$231.00	346.50	$0	$0	$0	$2,079	$0	**$2,079**	
Lights & HVAC	*9*	mo				121		121.00	$121.00	242.00	$0	$0	$0	$1,089	$0	**$1,089**	
Water/Sewer	*9*	mo				134.0833333		134.08	$134.08	201.13	$0	$0	$0	$1,207	$0	**$1,207**	
Muni Waste Mgmt	*9*	mo					100	100.00	$100.00	200.00	$0	$0	$0	$0	$900	**$900**	
Vehicles *(Admin)*																	$21,192
Pickup truck	*6*	mo			1200			1,200.00	$1,200.00	2,000.00	$0	$0	$7,200	$0	$0	**$7,200**	
Utility truck, flat bed/dump bed	*6*	mo			1500			1,500.00	$1,500.00	2,500.00	$0	$0	$9,000	$0	$0	**$9,000**	
Fuel (4 veh; 1 tanks/wk; 52 weeks; 24 gal/tank)	1248	gal	4					4.00	$4.00	7.00	$4,992	$0	$0	$0	$0	**$4,992**	
	1248																
Regulatory Oversight -- *Covered by License Fees*																	$0
Program manager		hr		$ 122.85				122.85	$ 122.85	153.56	$0	$0	$0	$0	$0	**$0**	
Engineer		hr		$ 51.79				51.79	$ 75.34	94.17	$0	$0	$0	$0	$0	**$0**	
Administration		hr		$ 41.58				41.58	$ 34.02	42.53	$0	$0	$0	$0	$0	**$0**	
Post-Closure Staff and Management *(Admin)*	***520***																$268,766
Manager	520	hr		$ 122.85				122.85	$ 109.05	136.32	$0	$63,882	$0	$0	$0	**$63,882**	
Superintendant	520	hr		$ 90.10				90.10	$ 90.10	112.62	$0	$46,850	$0	$0	$0	**$46,850**	
CHP	520	hr		$ 66.15				66.15	$ 122.85	153.56	$0	$34,398	$0	$0	$0	**$34,398**	
Environmental technician	1040	hr		$ 45.36				45.36	$ 45.36	56.70	$0	$47,174	$0	$0	$0	**$47,174**	
Engineer	1040	hr		$ 51.79				51.79	$ 51.79	64.73	$0	$53,857	$0	$0	$0	**$53,857**	
Instrument technician	520	hr		$ 43.47				43.47	$ 43.47	54.34	$0	$22,604	$0	$0	$0	**$22,604**	
EnvMon Monitoring Program*(Scale by Land)*																	$874,777
Based on Proposed LTC EnvMon Prog (Table 6-14, PL-CNS-05-001)												$153,652		$721,125		**$874,777**	
	0.00																
Cover Integrity Monitoring *(Land)*	*0.00*																$19,209
Monument survey	*118.70*	ea		154.25	7.59			161.84			$0	$18,309	$901	$0	$0	**$19,209**	
Maintenance *(Land)*																	$308,226
Maintain vegetated cover	*105.00*	acre		240.40	145.44			385.84	115.00		$0	$25,242	$15,271	$0	$0	**$40,513**	
Fertilize cover (10 percent each year)	50820	sy	0.18	0.15	0.07			0.40	55,660.00	50,820.00	$8,944	$7,852	$3,354	$0	$0	**$20,150**	
Maintain dirt roads (25 percent each year; 10,000 ft of 20-ft road	5,072	sy	5.20	3.30	0.44			8.94	5,555.56	5,072.46	$26,392	$16,731	$2,232	$0	$0	**$45,355**	
								0.00			$0	$0	$0	$0	$0	**$0**	
Maintain storm water structures (5% of assumed area each year	34303.5	sf		0.21	0.15			0.36	37,570.50	34,303.50	$0	$7,352	$5,056	$0	$0	**$12,408**	
Maintain storm water structures (remove 0.5" sediment each yea	52.94	cy		6.10	2.23			8.33	57.98	52.94	$0	$323	$118	$0	$0	**$441**	
Occasional seeding (10 percent each year)	457.38	msf	19.58	2.07	24.20			45.85	500.94	457.38	$8,956	$947	$11,069	$0	$0	**$20,971**	
Small cover repairs (1% of Phase 1 cover each year)	5082	cy	24.20	1.55	3.81			29.56	5,566.00	5,082.00	$122,984	$7,877	$19,342	$0	$0	**$150,204**	
Fence (5 percent of total length , 13200 ft, each year)	602.6087	ft	16.06	4.65	0.86			21.57	660.00	602.61	$9,678	$2,804	$517	$0	$0	**$12,999**	
Well repairs (10 ft for 5% of all wells each year)	99.521739	ft	42.90	7.30	1.90			52.10	109.00	99.52	$4,269	$727	$189	$0	$0	**$5,185**	
Waste Transport and Disposal *(Land)*																	$0
Disposal of soil and other wastes		cy				132		132.00			$0	$0	$0	$0	$0	**$0**	
Other *(Admin)*																	$217,482
Security	2,184	hr		28.35				28.35			$0	$61,916	$0	$0	$0	**$61,916**	
Taxes	0.25	ls					102,999	102,999.00	102,999.00		$0	$0	$0	$0	$25,750	**$25,750**	
Insurance	0.25	ls					243,435	243,435.10	243,435.10		$0	$0	$0	$0	$60,859	**$60,859**	
License & Other fees	0.25	ls					275829	275,829.00	275,829.00		$0	$0	$0	$0	$68,957	**$68,957**	
Subtotal Phase I IC											$186,216	$572,497	$74,249	$732,344	$156,466	$1,721,773	$1,721,773
Aerial Survey (Once per Stage)																	$19,465
Aerial survey	229	acre				85		85.00								**$19,465**	
Performance Evaluations (Once per Stage)																	$69,722
CHP	340	hr		122.85				122.85								**$41,769**	
Scientist	510	hr		43.47				43.47								**$22,170**	
Admin.	170	hr		34.02				34.02								**$5,783**	

Phase II Post Closure Observation (Years 2039 - 2043); All 115 Acres

Phase II Post Closure Observation (Years 2039 - 2043); All 115 Acres

Flag for CNS Proposed PC EnvMon	0	SF Lanc	0.91	SF Admin	0.25	Area Scaling	0.0869565			TOTALS:	$218,451	$1,676,814	$128,378	$842,334	$625,863	$3,491,840		
	Quantity	Units	Material /Unit	Labor /Unit	Equipment /Unit	Sub contract	Other	Total (incl. O&P) /Unit	BestEst	MaxEst	Material	Labor	Equipment	Sub contract	Other	Total (incl. O&P)	Subtotals	Reference
Temporary Facilities																	$48,477	
Office Trailer	36	mo				410		410.00	$410.00	615.00	$0	$0	$0	$14,760	$0	**$14,760**		015213.20.0550
Office Equipment	36	mo				165		165.00	$165.00	247.50	$0	$0	$0	$5,940	$0	**$5,940**		015213.40.0100
Office Supplies	36	mo				105		105.00	$105.00	157.50	$0	$0	$0	$3,780	$0	**$3,780**		015213.40.0120
Storage box	36	mo				80.5		80.50	$80.50	120.75	$0	$0	$0	$2,898	$0	**$2,898**		015213.20.1250
Telephone	36	mo				231		231.00	$231.00	346.50	$0	$0	$0	$8,316	$0	**$8,316**		015213.40.0140
Lights & HVAC	36	mo				121		121.00	$121.00	242.00	$0	$0	$0	$4,356	$0	**$4,356**		015213.40.0160
Water/Sewer	36	mo				134.0833333		134.08	$134.08	201.13	$0	$0	$0	$4,827	$0	**$4,827**		
Muni Waste Mgmt	36	mo					100	100.00	$100.00	200.00	$0	$0	$0	$0	$3,600	**$3,600**		
Vehicles																	$84,768	
Pickup truck	24	mo			1200			1,200.00	$1,200.00	2,000.00	$0	$0	$28,800	$0	$0	**$28,800**		$26k at 7% for 24
Utility truck, flat bed/dump bed	24	mo			1500			1,500.00	$1,500.00	2,500.00	$0	$0	$36,000	$0	$0	**$36,000**		$33k at 7% for 24
Fuel (4 veh; 1 tanks/wk; 52 weeks; 24 gal/tank)	4992	gal	4					4.00	$4.00	7.00	$19,968	$0	$0	$0	$0	**$19,968**		
	4992																	
Regulatory Oversight --*Covered by License Fees*																	$0	
Program manager		hr		$ 122.85				122.85	$ 122.85	153.56	$0	$0	$0	$0	$0	**$0**		
Engineer		hr		$ 51.79				51.79	$ 75.34	94.17	$0	$0	$0	$0	$0	**$0**		
Administration		hr		$ 41.58				41.58	$ 34.02	42.53	$0	$0	$0	$0	$0	**$0**		
Post-Closure Staff and Management																	$1,164,304	
Manager	2080	hr		$ 122.85				122.85	$ 109.05	136.32	$0	$226,830	$0	$0	$0	**$226,830**		
Superintendant	2080	hr		$ 90.10				90.10	$ 90.10	112.62	$0	$187,400	$0	$0	$0	**$187,400**		
CHP	2080	hr		$ 66.15				66.15	$ 122.85	153.56	$0	$255,528	$0	$0	$0	**$255,528**		
Environmental technician	4160	hr		$ 45.36				45.36	$ 45.36	56.70	$0	$188,698	$0	$0	$0	**$188,698**		
Engineer	4160	hr		$ 51.79				51.79	$ 51.79	64.73	$0	$215,430	$0	$0	$0	**$215,430**		
Instrument technician	2080	hr		$ 43.47				43.47	$ 43.47	54.34	$0	$90,418	$0	$0	$0	**$90,418**		
EnvMon Monitoring Program																	$958,089	
Based on Proposed LTC EnvMon Prog (Table 6-14, PL-CNS-05-001)												$168,286		$789,804		**$958,089**		
Cover Integrity Monitoring																	$21,039	
Monument survey	130	ea		154.25	7.59			161.84			$0	$20,052	$987	$0	$0	**$21,039**		022113.13.0600
Maintenance																	$337,581	
Maintain vegetated cover	115	acre		240.40	145.44			385.84	115.00		$0	$27,646	$16,726	$0	$0	**$44,372**		311313.10.1020
Fertilize cover (10 percent each year)	55660	sy	0.18	0.15	0.07			0.40	55,660.00	55,660.00	$9,796	$8,599	$3,674	$0	$0	**$22,069**		329219.13.1000
Maintain dirt roads (25 percent each year; 10,000 ft of 20-ft road	5,556	sy	5.20	3.30	0.44			8.94	5,555.56	5,555.56	$28,906	$18,325	$2,444	$0	$0	**$49,675**		015523.50.0050
								0.00			$0	$0	$0	$0	$0	**$0**		312216.10.0012
Maintain storm water structures (5% of assumed area each year	37570.5	sf	0.00	0.21	0.15			0.36	37,570.50	37,570.50	$0	$8,052	$5,538	$0	$0	**$13,590**		312216.10.0016
Maintain storm water structures (remove 0.5" sediment each yea	57.98	cy	0.00	6.10	2.23			8.33	57.98	57.98	$0	$354	$129	$0	$0	**$483**		312316.13.5050
Occasional seeding (10 percent each year)	500.94	msf	19.58	2.07	24.20			45.85	500.94	500.94	$9,808	$1,037	$12,123	$0	$0	**$22,968**		329219.13.0800
Small cover repairs (1% of Phase 1 cover each year)	5566	cy	24.20	1.55	3.81			29.56	5,566.00	5,566.00	$134,697	$8,627	$21,184	$0	$0	**$164,509**		
Fence (5 percent of total length , 13200 ft, each year)	660	ft	16.06	4.65	0.86			21.57	660.00	660.00	$10,600	$3,071	$566	$0	$0	**$14,237**		323113.20.0200
Well repairs (10 ft for 5% of all wells each year)	109	ft	42.90	7.30	1.90			52.10	109.00	109.00	$4,676	$796	$207	$0	$0	**$5,679**		312319.30.0020
Waste Transport and Disposal																	$7,653	
Disposal of soil and other wastes	57.98	cy				132		132.00			$0	$0	$0	$7,653	$0	**$7,653**		026510.30.1110
Other																	$869,929	
Security	8,736	hr		28.35				28.35			$0	$247,666	$0	$0	$0	**$247,666**		015632.50.0100
Taxes	1	ls					102999	102,999.00	102,999.00		$0	$0	$0	$0	$102,999	**$102,999**		
Insurance	1	ls					243435.1	243,435.10	243,435.10		$0	$0	$0	$0	$243,435	**$243,435**		
License & Other fees	1	ls					275829	275,829.00	275,829.00		$0	$0	$0	$0	$275,829	**$275,829**		
Subtotal Phase I1 PCO											**$218,451**	**$1,676,814**	**$128,378**	**$842,334**	**$625,863**	**$3,491,840**	**$3,491,840**	
Aerial Survey (Once per Stage)																	$19,465	
Aerial survey	229	acre				85		85.00								**$19,465**		022113.16.1850
Performance Evaluations (Once per Stage)																	$69,722	
CHP	340	hr		122.85				122.85								**$41,769**		
Scientist	510	hr		43.47				43.47								**$22,170**		
Admin.	170	hr		34.02				34.02								**$5,783**		

Stage I Institutional Control (2069 - 2093); 115 Acres

Stage I Institutional Control (2069 - 2093); 115 Acres

Flag for CNS Proposed PC EnvMon: 0

TOTALS: $208,467 | $1,004,849 | $128,378 | $473,285 | $349,987 | $2,164,966

	Quantity	Units	Material /Unit	Labor /Unit	Equipment /Unit	Sub contract	Other	Total (incl. O&P) /Unit	BestEst	MaxEst	Material	Labor	Equipment	Sub contract	Other	Total (incl. O&P)	Subtotals	Reference	Notes
Temporary Facilities																	**$48,477**		
Office Trailer	36	mo				410		410.00	$410.00	615.00	$0	$0	$0	$14,760	$0	**$14,760**		015213.20.0550	Building Construction Data RSMeans 2008
Office Equipment	36	mo				165		165.00	$165.00	247.50	$0	$0	$0	$5,940	$0	**$5,940**		015213.40.0100	
Office Supplies	36	mo				105		105.00	$105.00	157.50	$0	$0	$0	$3,780	$0	**$3,780**		015213.40.0120	
Storage box	36	mo				80.5		80.50	$80.50	120.75	$0	$0	$0	$2,898	$0	**$2,898**		015213.20.1250	
Telephone	36	mo				231		231.00	$231.00	346.50	$0	$0	$0	$8,316	$0	**$8,316**		015213.40.0140	
Lights & HVAC	36	mo				121		121.00	$121.00	242.00	$0	$0	$0	$4,356	$0	**$4,356**		015213.40.0160	
Water/Sewer	36	mo				134.0833333		134.08	$134.08	201.13	$0	$0	$0	$4,827	$0	**$4,827**			
Muni Waste Mgmt	36	mo					100	100.00	$100.00	200.00	$0	$0	$0	$0	$3,600	**$3,600**			
Vehicles																	**$74,784**		
Pickup truck	24	mo			1200			1,200.00	$1,200.00	2,000.00	$0	$0	$28,800	$0	$0	**$28,800**		$26k at 7% for 24 mo	
Utility truck, flat bed/dump bed	24	mo			1500			1,500.00	$1,500.00	2,500.00	$0	$0	$36,000	$0	$0	**$36,000**		$33k at 7% for 24 mo	
Fuel (4 veh; 1 tanks/wk; 26 weeks; 24 gal/tank)	2496	gal	4					4.00	$4.00	7.00	$9,984	$0	$0	$0	$0	**$9,984**			
	2496																		
Regulatory Oversight -- *Covered by License Fees*																	**$0**		
Program manager		hr		$ 122.85				122.85	$ 122.85	153.56	$0	$0	$0	$0	$0	**$0**			
Engineer		hr		$ 51.79				51.79	$ 75.34	94.17	$0	$0	$0	$0	$0	**$0**			
Administration		hr		$ 41.58				41.58	$ 34.02	42.53	$0	$0	$0	$0	$0	**$0**			
Post-Closure Staff and Management																	**$602,152**		
Manager	1040	hr		$ 122.85				122.85	$ 109.05	136.32	$0	$113,415	$0	$0	$0	**$113,415**			
Superintendant	1040	hr		$ 90.10				90.10	$ 90.10	112.62	$0	$93,700	$0	$0	$0	**$93,700**			
CHP	1040	hr		$ 66.15				66.15	$ 122.85	153.56	$0	$127,764	$0	$0	$0	**$127,764**			Walkover, take notes
Environmental technician	2080	hr		$ 45.36				45.36	$ 45.36	56.70	$0	$94,349	$0	$0	$0	**$94,349**			
Engineer	2080	hr		$ 51.79				51.79	$ 51.79	64.73	$0	$107,715	$0	$0	$0	**$107,715**			
Instrument technician	1040	hr		$ 43.47				43.47	$ 43.47	54.34	$0	$45,209	$0	$0	$0	**$45,209**			
State Land Management Costs	1	lot					20000	20,000.00							$20,000	**$20,000**			
EnvMon Monitoring Program																	**$499,227**		
Based on Proposed LTC EnvMon Prog (Table 6-14, PL-CNS-05-001)												$78,473		$420,755		**$499,227**			
Cover Integrity Monitoring																	**$21,039**		
Monument survey	130	ea		154.25	7.59			161.84			$0	$20,052	$987	$0	$0	**$21,039**		022113.13.0600	
Maintenance																	**$337,581**		
Maintain vegetated cover	115	acre		240.40	145.44			385.84	115.00		$0	$27,646	$16,726	$0	$0	**$44,372**		311313.10.1020	entire area
Fertilize cover (10 percent each year)	55660	sy	0.18	0.15	0.07			0.40	55,660.00	55,660.00	$9,796	$8,599	$3,674	$0	$0	**$22,069**		329219.13.1000	22 acre area for phase 1 cover EVERY TWO YEARS
Maintain dirt roads (25 percent each year; 10,000 ft of 20-ft road)	5,556	sy	5.20	3.30	0.44			8.94	5,555.56	5,555.56	$28,906	$18,325	$2,444	$0	$0	**$49,675**		015523.50.0050	entire area
								0.00			$0	$0	$0	$0	$0	**$0**		312216.10.0012	entire area
Maintain storm water structures (5% of assumed area each year)	37570.5	sf	0.00	0.21	0.15			0.36	37,570.50	37,570.50	$0	$8,052	$5,538	$0	$0	**$13,590**		312216.10.0016	entire area
Maintain storm water structures (remove 0.5" sediment each yea	57.98	cy	0.00	6.10	2.23			8.33	57.98	57.98	$0	$354	$129	$0	$0	**$483**		312316.13.5050	Remove and haul sediment offsite
Occasional seeding (10 percent each year)	500.94	msf	19.58	2.07	24.20			45.85	500.94	500.94	$9,808	$1,037	$12,123	$0	$0	**$22,968**		329219.13.0800	5% of 22 acre phase 1 cover
Small cover repairs (1% of Phase 1 cover each year)	5566	cy	24.20	1.55	3.81			29.56	5,566.00	5,566.00	$134,697	$8,627	$21,184	$0	$0	**$164,509**			1% of 22 acre phase 1 cover
Fence (5 percent of total length , 13200 ft, each year)	660	ft	16.06	4.65	0.86			21.57	660.00	660.00	$10,600	$3,071	$566	$0	$0	**$14,237**		323113.20.0200	% of entire area
Well repairs (10 ft for 5% of all wells each year)	109	ft	42.90	7.30	1.90			52.10	109.00	109.00	$4,676	$796	$207	$0	$0	**$5,679**		312319.30.0020	% of entire area
Waste Transport and Disposal																	**$7,653**		
Disposal of soil and other wastes	57.98	cy				132		132.00			$0	$0	$0	$7,653	$0	**$7,653**		026510.30.1110	
Other																	**$574,053**		
Security	8,736	hr		28.35				28.35			$0	$247,666	$0	$0	$0	**$247,666**		015632.50.0100	
Taxes	1	ls					84,021	84,021.00	84,021.00		$0	$0	$0	$0	$84,021	**$84,021**			
Insurance	1	ls					84,137	84,137.30	84,137.30		$0	$0	$0	$0	$84,137	**$84,137**			
License & Other fees	1	ls					158,229	158,228.73	158,228.73		$0	$0	$0	$0	$158,229	**$158,229**			
Subtotal IntCtl 1											**$208,467**	**$1,004,849**	**$128,378**	**$473,285**	**$349,987**	**$2,164,966**	**$2,164,966**		
Aerial Survey (Once per Stage)																	**$19,465**		
Aerial survey	229	acre				85		85.00								**$19,465**		022113.16.1850	
Performance Evaluations (Once per Stage)																	**$69,722**		Report and Analysis on collected data for each Stage
CHP	340	hr		122.85				122.85								**$41,769**			
Scientist	510	hr		43.47				43.47								**$22,170**			
Admin.	170	hr		34.02				34.02								**$5,783**			

Stage II Institutional Control (2069 - 2093); 115 Acres

Stage II Institutional Control (2069 - 2093); 115 Acres

Flag for CNS Proposed PC EnvMon 0 | Bi-Annual Scaling 0.5

TOTALS: $208,467 $564,811 $128,378 $338,551 $329,963 $1,570,170

	Quantity	Units	Material /Unit	Labor /Unit	Equipment /Unit	Sub contract	Other	Total (incl. O&P) /Unit	BestEst	MaxEst	Material	Labor	Equipment	Sub contract	Other	Total (incl. O&P)	Subtotals	Reference	Notes
Temporary Facilities																	$48,477		
Office Trailer	36	mo				410		410.00	$410.00	615.00	$0	$0	$0	$14,760	$0	**$14,760**		015213.20.0550	Building Construction Data RSM
Office Equipment	36	mo				165		165.00	$165.00	247.50	$0	$0	$0	$5,940	$0	**$5,940**		015213.40.0100	
Office Supplies	36	mo				105		105.00	$105.00	157.50	$0	$0	$0	$3,780	$0	**$3,780**		015213.40.0120	
Storage box	36	mo				80.5		80.50	$80.50	120.75	$0	$0	$0	$2,898	$0	**$2,898**		015213.20.1250	
Telephone	36	mo				231		231.00	$231.00	346.50	$0	$0	$0	$8,316	$0	**$8,316**		015213.40.0140	
Lights & HVAC	36	mo				121		121.00	$121.00	242.00	$0	$0	$0	$4,356	$0	**$4,356**		015213.40.0160	
Water/Sewer	36	mo				134.0833333		134.08	$134.08	201.13	$0	$0	$0	$4,827	$0	**$4,827**			
Muni Waste Mgmt	36	mo					100	100.00	$100.00	200.00	$0	$0	$0	$0	$3,600	**$3,600**			
Vehicles																	$74,784		
Pickup truck	24	mo			1200			1,200.00	$1,200.00	2,000.00	$0	$0	$28,800	$0	$0	**$28,800**		$26k at 7% for 24 mo	
Utility truck, flat bed/dump bed	24	mo			1500			1,500.00	$1,500.00	2,500.00	$0	$0	$36,000	$0	$0	**$36,000**		$33k at 7% for 24 mo	
Fuel (4 veh; 1 tanks/wk; 26 weeks; 24 gal/tank)	2496	gal	4					4.00	$4.00	7.00	$9,984	$0	$0	$0	$0	**$9,984**			
	2496																		
Regulatory Oversight -- ***Covered by License Fees***																	$0		
Program manager		hr		$ 122.85				122.85	$ 122.85	153.56	$0	$0	$0	$0	$0	**$0**			
Engineer		hr		$ 51.79				51.79	$ 75.34	94.17	$0	$0	$0	$0	$0	**$0**			
Administration		hr		$ 41.58				41.58	$ 34.02	42.53	$0	$0	$0	$0	$0	**$0**			
Post-Closure Staff and Management																	$311,076		
Manager	520	hr		$ 122.85				122.85	$ 109.05	136.32	$0	$56,708	$0	$0	$0	**$56,708**			
Superintendant	520	hr		$ 90.10				90.10	$ 90.10	112.62	$0	$46,850	$0	$0	$0	**$46,850**			
CHP	520	hr		$ 66.15				66.15	$ 122.85	153.56	$0	$63,882	$0	$0	$0	**$63,882**			Walkover, take notes
Environmental technician	1040	hr		$ 45.36				45.36	$ 45.36	56.70	$0	$47,174	$0	$0	$0	**$47,174**			
Engineer	1040	hr		$ 51.79				51.79	$ 51.79	64.73	$0	$53,857	$0	$0	$0	**$53,857**			
Instrument technician	520	hr		$ 43.47				43.47	$ 43.47	54.34	$0	$22,604	$0	$0	$0	**$22,604**			
State Land Management Costs	1	lot					20000	20,000.00							$20,000	**$20,000**			
EnvMon Monitoring Program																	$339,364		
Based on Proposed LTC EnvMon Prog (Table 6-14, PL-CNS-05-001)												$53,343		$286,021		**$339,364**			
Cover Integrity Monitoring																	$21,039		
Monument survey	130	ea		154.25	7.59			161.84			$0	$20,052	$987	$0	$0	**$21,039**		022113.13.0600	
Maintenance																	$337,581		
Maintain vegetated cover	115	acre		240.40	145.44			385.84	115.00		$0	$27,646	$16,726	$0	$0	**$44,372**		311313.10.1020	entire area
																			22 acre area for phase 1 cover
Fertilize cover (10 percent each year)	55660	sy	0.18	0.15	0.07			0.40	55,660.00	55,660.00	$9,796	$8,599	$3,674	$0	$0	**$22,069**		329219.13.1000	EVERY TWO YEARS
Maintain dirt roads (25 percent each year; 10,000 ft of 20-ft road	5,556	sy	5.20	3.30	0.44			8.94	5,555.56	5,555.56	$28,906	$18,325	$2,444	$0	$0	**$49,675**		015523.50.0050	entire area
								0.00			$0	$0	$0	$0	$0	**$0**		312216.10.0012	entire area
Maintain storm water structures (5% of assumed area each year	37570.5	sf	0.00	0.21	0.15			0.36	37,570.50	37,570.50	$0	$8,052	$5,538	$0	$0	**$13,590**		312216.10.0016	entire area
																			Remove and haul sediment
Maintain storm water structures (remove 0.5" sediment each yea	57.98	cy	0.00	6.10	2.23			8.33	57.98	57.98	$0	$354	$129	$0	$0	**$483**		312316.13.5050	offsite
Occasional seeding (10 percent each year)	500.94	msf	19.58	2.07	24.20			45.85	500.94	500.94	$9,808	$1,037	$12,123	$0	$0	**$22,968**		329219.13.0800	5% of 22 acre phase 1 cover
Small cover repairs (1% of Phase 1 cover each year)	5566	cy	24.20	1.55	3.81			29.56	5,566.00	5,566.00	$134,697	$8,627	$21,184	$0	$0	**$164,509**			1% of 22 acre phase 1 cover
Fence (5 percent of total length , 13200 ft, each year)	660	ft	16.06	4.65	0.86			21.57	660.00	660.00	$10,600	$3,071	$566	$0	$0	**$14,237**		323113.20.0200	% of entire area
Well repairs (10 ft for 5% of all wells each year)	109	ft	42.90	7.30	1.90			52.10	109.00	109.00	$4,676	$796	$207	$0	$0	**$5,679**		312319.30.0020	% of entire area
Waste Transport and Disposal																	$7,653		
Disposal of soil and other wastes	57.98	cy				132		132.00			$0	$0	$0	$7,653	$0	**$7,653**		026510.30.1110	
Other																	$430,196		
Security	4,368	hr		28.35				28.35			$0	$123,833	$0	$0	$0	**$123,833**		015632.50.0100	
Taxes	1	ls					88,766	88,765.50	84,021.00		$0	$0	$0	$0	$88,766	**$88,766**			
Insurance	1	ls					59,369	59,368.55	84,137.30		$0	$0	$0	$0	$59,369	**$59,369**			
License & Other fees	1	ls					158,229	158,228.73	158,228.73		$0	$0	$0	$0	$158,229	**$158,229**			
Subtotal InstCtl 2											**$208,467**	**$564,811**	**$128,378**	**$338,551**	**$329,963**	**$1,570,170**	**$1,570,170**		
Aerial Survey (Once per Stage)																	$19,465		
Aerial survey	229	acre				85		85.00								**$19,465**		022113.16.1850	
Performance Evaluations (Once per Stage)																	$69,722		Report and Analysis on collecte
CHP	340	hr		122.85				122.85								**$41,769**			
Scientist	510	hr		43.47				43.47								**$22,170**			
Admin.	170	hr		34.02				34.02								**$5,783**			

Stage III & IV Institutional Control (2094 - 2143); 115 Acres

Stage III & IV Institutional Control (2094 - 2143); 115 Acres

	Quantity	Units	Material /Unit	Labor /Unit	Equipment /Unit	Sub contract	Other	Total (incl. O&P) /Unit	BestEst	MaxEst	Material	Labor	Equipment	Sub contract	Other	Total (incl. O&P)	Subtotals	Reference	Notes
Flag for CNS Proposed PC EnvMon	0	Bi-Annual Scaling		0.5						**TOTALS:**	**$203,475**	**$396,682**	**$127,885**	**$271,184**	**$250,037**	**$1,249,264**			
Temporary Facilities																	**$48,477**		
Office Trailer	36	mo				410		410.00	$410.00	615.00	$0	$0	$0	$14,760	$0	**$14,760**		015213.20.0550	Building Construction Data RSMeans 2008
Office Equipment	36	mo				165		165.00	$165.00	247.50	$0	$0	$0	$5,940	$0	**$5,940**		015213.40.0100	
Office Supplies	36	mo				105		105.00	$105.00	157.50	$0	$0	$0	$3,780	$0	**$3,780**		015213.40.0120	
Storage box	36	mo				80.5		80.50	$80.50	120.75	$0	$0	$0	$2,898	$0	**$2,898**		015213.20.1250	
Telephone	36	mo				231		231.00	$231.00	346.50	$0	$0	$0	$8,316	$0	**$8,316**		015213.40.0140	
Lights & HVAC	36	mo				121		121.00	$121.00	242.00	$0	$0	$0	$4,356	$0	**$4,356**		015213.40.0160	
Water/Sewer	36	mo				134.0833333		134.08	$134.08	201.13	$0	$0	$0	$4,827	$0	**$4,827**			
Muni Waste Mgmt	36	mo					100	100.00	$50.00	75.00	$0	$0	$0	$0	$3,600	**$3,600**			
Vehicles																	**$69,792**		
Pickup truck	24	mo			1200			1,200.00	$1,200.00	2,000.00	$0	$0	$28,800	$0	$0	**$28,800**		$26k at 7% for 24 mo	
Utility truck, flat bed/dump bed	24	mo			1500			1,500.00	$1,500.00	2,500.00	$0	$0	$36,000	$0	$0	**$36,000**		$33k at 7% for 24 mo	
Fuel (4 veh; 1 tanks/wk; 13 weeks; 24 gal/tank)	1248	gal	4					4.00	$4.00	7.00	$4,992	$0	$0	$0	$0	**$4,992**			
	1248																		
Regulatory Oversight -- *Covered by License Fees*																	**$0**		
Program manager		hr		$ 122.85				122.85	$ 122.85	153.56	$0	$0	$0	$0	$0	**$0**			
Engineer		hr		$ 51.79				51.79	$ 75.34	94.17	$0	$0	$0	$0	$0	**$0**			
Administration		hr		$ 41.58				41.58	$ 34.02	42.53	$0	$0	$0	$0	$0	**$0**			
Post-Closure Staff and Management																	**$165,538**		
Manager	260	hr		$ 122.85				122.85	$ 109.05	136.32	$0	$28,354	$0	$0	$0	**$28,354**			
Superintendant	260	hr		$ 90.10				90.10	$ 90.10	112.62	$0	$23,425	$0	$0	$0	**$23,425**			
CHP	260	hr		$ 66.15				66.15	$ 122.85	153.56	$0	$31,941	$0	$0	$0	**$31,941**			Walkover, take notes
Environmental technician	520	hr		$ 45.36				45.36	$ 45.36	56.70	$0	$23,587	$0	$0	$0	**$23,587**			
Engineer	520	hr		$ 51.79				51.79	$ 51.79	64.73	$0	$26,929	$0	$0	$0	**$26,929**			
Instrument technician	260	hr		$ 43.47				43.47	$ 43.47	54.34	$0	$11,302	$0	$0	$0	**$11,302**			
State Land Management Costs	1	lot					20000	20,000.00							$20,000	**$20,000**			
EnvMon Monitoring Program																	**$259,433**		
Based on Proposed LTC EnvMon Prog (Table 6-14, PL-CNS-05-001)												$40,779		$218,654		**$259,433**			
Cover Integrity Monitoring																	**$10,519**		
Monument survey	65	ea		154.25	7.59			161.84			$0	$10,026	$493	$0	$0	**$10,519**		022113.13.0600	
Maintenance																	**$337,581**		
Maintain vegetated cover	115	acre		240.40	145.44			385.84	115.00		$0	$27,646	$16,726	$0	$0	**$44,372**		311313.10.1020	entire area
Fertilize cover (10 percent each year)	55660	sy	0.18	0.15	0.07			0.40	55,660.00	55,660.00	$9,796	$8,599	$3,674	$0	$0	**$22,069**		329219.13.1000	22 acre area for phase 1 cover EVERY TWO YEARS
Maintain dirt roads (25 percent each year; 10,000 ft of 20-ft road)	5,556	sy	5.20	3.30	0.44			8.94	5,555.56	5,555.56	$28,906	$18,325	$2,444	$0	$0	**$49,675**		015523.50.0050	entire area
								0.00			$0	$0	$0	$0	$0	**$0**		312216.10.0012	entire area
Maintain storm water structures (5% of assumed area each year	37570.5	sf	0.00	0.21	0.15			0.36	37,570.50	37,570.50	$0	$8,052	$5,538	$0	$0	**$13,590**		312216.10.0016	entire area
Maintain storm water structures (remove 0.5" sediment each yea	57.98	cy	0.00	6.10	2.23			8.33	57.98	57.98	$0	$354	$129	$0	$0	**$483**		312316.13.5050	Remove and haul sediment offsite
Occasional seeding (10 percent each year)	500.94	msf	19.58	2.07	24.20			45.85	500.94	500.94	$9,808	$1,037	$12,123	$0	$0	**$22,968**		329219.13.0800	5% of 22 acre phase 1 cover
Small cover repairs (1% of Phase 1 cover each year)	5566	cy	24.20	1.55	3.81			29.56	5,566.00	5,566.00	$134,697	$8,627	$21,184	$0	$0	**$164,509**			1% of 22 acre phase 1 cover
Fence (5 percent of total length , 13200 ft, each year)	660	ft	16.06	4.65	0.86			21.57	660.00	660.00	$10,600	$3,071	$566	$0	$0	**$14,237**		323113.20.0200	% of entire area
Well repairs (10 ft for 5% of all wells each year)	109	ft	42.90	7.30	1.90			52.10	109.00	109.00	$4,676	$796	$207	$0	$0	**$5,679**		312319.30.0020	% of entire area
Waste Transport and Disposal																	**$7,653**		
Disposal of soil and other wastes	57.98	cy				132		132.00			$0	$0	$0	$7,653	$0	**$7,653**		026510.30.1110	
Other																	**$350,270**		
Security	4,368	hr		28.35				28.35			$0	$123,833	$0	$0	$0	**$123,833**		015632.50.0100	
Taxes	1	ls					88,766	88,765.50	84,021.00		$0	$0	$0	$0	$88,766	**$88,766**			
Insurance	1	ls					59,369	59,368.55	84,137.30		$0	$0	$0	$0	$59,369	**$59,369**			
License & Other fees	1	ls					78,303	78,303.36	78,303.36		$0	$0	$0	$0	$78,303	**$78,303**			
Subtotal InstCtl 3&4											**$203,475**	**$396,682**	**$127,885**	**$271,184**	**$250,037**	**$1,249,264**	**$1,249,264**		
Aerial Survey (Once per Stage)																	**$19,465**		
Aerial survey	229	acre				85		85.00								**$19,465**		022113.16.1850	
Performance Evaluations (Once per Stage)																	**$69,722**		Report and Analysis on collected data for each Stage
CHP	340	hr		122.85				122.85								**$41,769**			
Scientist	510	hr		43.47				43.47								**$22,170**			
Admin.	170	hr		34.02				34.02								**$5,783**			

PL-CNS-05-001: Table 6-14. Closure Period Monitoring Program

PL-CNS-05-001: Table 6-14. Closure Period Monitoring Program

Sample Collection Time (pers-hrs/ea) 1

Sample Description	Locations	Type	Media	Analysis	Analysis Cost ($/ea)	Frequency (times per year)	Sample Collection Time (pers-hr)	Code	LIVE Analysis Cost ($/ea)	Analysis Cost ($)
Wells (1,2)	120	Grab	Water	Gross-Alpha-Beta	$52	4	480	WGAB	$52	$24,932
	120			Gamma Isotopic	$134	4		WGI	$134	$64,110
	120			Tritium	$89	4		WH3	$89	$42,742
	120			Water level		4				
	28	Grab	Water	pH	$18	4	112	WPH	$18	$2,016
	28			Conductivity	$20	4		WCOND	$10	$1,120
	28			Total Organic Carbon	$40	4		WTOC	$40	$4,480
	28			Volatile Organics	$190	4		WVOC	$190	$21,280
	28			Water Level		4				
	28	Grab	Water	Carbon-14	$193	1	28	WC14	$193	$5,402
	16	Grab	Water	Acids/Bases/Neutrals	$40	1	16	WBN	$40	$640
	16			Pesticides/PCBs	$165	1		WPPCB	$165	$2,640
	16			Phenols	$155	1		WPNL	$155	$2,480
	16			Cyanides	$40	1		WVCY	$40	$640
	16			Metals	$109	1		WM	$109	$1,744
	16			Water Level		1				
	8	Grab	Water	Gross-Alpha-Beta	$52	4	32	WGAB	$52	$1,662
	8			Gamma Isotopic	$134	4		WGI	$134	$4,274
	8			Tritium	$89	4		WH3	$89	$2,849
	8			Water level		4				
	2	Grab	Water	Carbon-14	$193	1	2	WC14	$193	$386
	2	Grab	Water	Total Organic Carbon	$40	4	8	WTOC	$40	$320
	2			Volatile Organics	$190	4		WVOC	$190	$1,520
Surface Water (3)	2	Grab	Water	Acids/Bases/Neutrals	$40	1	2	WABN	$40	$80
	2			Pesticides/PCBs	$165	1		WPPCB	$165	$330
	2			Phenols	$155	1		WPNL	$155	$310
	2			Cyanides	$50	1		WCY	$50	$100
	2			Metals	$109	1		WM	$109	$218
Observation Sumps (2,4)	151	Grab	Water	Gamma Isotopic	$134	4	604	WGI	$134	$80,671
	151			Tritium	$89	4		WH3	$89	$53,783
	151			Water level		4				$0
Surface Soil	16	Grab	Soil	Gamma Isotopic	$138	4	64	SGI	$129	$8,256
	16			Tritium	$89	4		WH3	$89	$5,699
Sediment (3)	4	Grab	Sediment	Gamma Isotopic	$138	1	4	SGI	$129	$516
	4			Tritium	$89	1		SH3	$89	$356
Samples of Opportunity (5)	250	Grab	Various	Gross-Alpha-Beta	$52	4	1000	WGAB	$52	$51,941
	250			Gamma Isotopic	$134	4		WGI	$134	$133,562
	250			Tritium	$89	4		WH3	$89	$89,045
	250	Grab	Various	Gross-Alpha-Beta	$52	1	250	WGAB	$52	$12,985
	250			Gamma Isotopic	$134	1		WGI	$134	$33,390
	250			Tritium	$89	1		WH3	$89	$22,261
Vegetation	16	Grab	Vegetation	Gamma Isotopic	$129	4	64	VGI	$129	$8,256
	16			Tritium	$58	4		VH3	$58	$3,712
External Gamma	105	Continuous	TLD	Exposre	$89	4	420	TLD	$57	$23,973
Atmospheric	12	Continuous	Particulate Filter	Gamma Isotopic	$103	26	312	AGI	$103	$31,980
	12			Tritium	$138	26	312	AH3	$138	$43,144
				Annual Analyses		**9,630**	**3,710**			**$789,804**
						Labor Rate	$ 45.36			
				Annual Labor Cost						**$168,286**
										$958,089
									Cost per Analysis	$99.49

NOTES

-1 Includes selected wells from the existing monitoring programs

-2 Water levels measured quarterly.

-3 Same locations as the current monitoring program.

-4 All sumps monitored for water accumulation with samples. As of 6/27/2005, there are 151 sumps in the monitoring program

-5 Samples deemed desirable. The number of locations represents of samples collected annually.

PL-CNS-05-001: Table 8-9. Long-Term Care Monitoring Program

PL-CNS-05-001: Table 8-9. Long-Term Care Monitoring Program

Sample Collection Time (pers-hrs/ea) 1

Sample Description	Locations	Type	Media	Analysis	Analysis Cost ($/ea)	Stage I: Frequency (times per year)	Stage I: Sample Collection Time (pers-hr)	Code	LIVE Analysis Cost ($/ea)	Pre Stage II Analysis Cost ($)	Stage II: Frequency (times per year)	Stage II: Sample Collection Time (pers-hr)	Analysis Cost ($)	Stage III: Frequency (times per year)	Stage III: Sample Collection Time (pers-hr)	Analysis Cost ($)	Stage IV: Frequency (times per year)	Stage IV: Sample Collection Time (pers-hr)	Analysis Cost ($)
Wells (1,2)	120	Grab	Water	Gross-Alpha-Beta	$52	4	480	WGAB	$52	$24,932	2	240	$12,466	1	120	$6,233	1	120	$6,233
	120			Gamma Isotopic	$134	4		WGI	$134	$64,110	2		$32,055	1		$16,027	1		$16,027
	120			Tritium	$89	4		WH3	$89	$42,742	2		$21,371	1		$10,685	1		$10,685
	120			Water Level		4				$0	2		$0	1		$0	1		$0
Wells (1,2)	28	Grab	Water	Carbon-14	$193	4	112	WC14	$193	$21,607	2	56	$10,804	1	28	$5,402	1	28	$5,402
	28			Water Level		4				$0	2		$0	1		$0	1		$0
	28	Grab	Water	pH	$18	4		WPH	$18	$2,016	2		$1,008	1		$504	1		$504
	28			Conductivity	$20	4		WCOND	$10	$1,120	2		$560	1		$280	1		$280
	28			Total Organic Carbon	$40	1		WTOC	$40	$1,120	1		$1,120	1		$1,120	1		$1,120
	28			Volatile Organics	$190	1		WVOC	$190	$5,320	1		$5,320	1		$5,320	1		$5,320
	28			Water Level		1				$0	1		$0	1		$0	1		$0
Wells (1,2)	16	Grab	Water	Acids/Bases/Neutrals	$40	1	16	WABN	$40	$640	1	16	$640	1	16	$640	1		$640
	16			Pesticides/PCBs	$155	1		WPPCB	$165	$2,640	1		$2,640	1		$2,640	1		$2,640
	16			Phenols	$155	1		WPNL	$155	$2,480	1		$2,480	1		$2,480	1		$2,480
	16			Cyanides	$50	1		WCY	$50	$800	1		$800	1		$800	1		$800
	16			Metals	$109	4		WM	$109	$6,977	2		$3,489	1		$1,744	1		$1,744
	16			Water Level		4				$0	2		$0	1		$0	1		$0
Surface Water (3)	***2***	***Grab***	***Water***	***Carbon-14***	***$193***	***4***	***8***	***WC14***	***$193***	$1,543	***2***	***4***	$772	***1***	***2***	$386	***1***	***2***	$386
Surface Water (3)	***4***	***Grab***	***Water***	***Gamma Isotopic***	***$134***	***4***	***16***	***WGI***	***$134***	$2,137	***2***	***8***	$1,068	***1***	***4***	$534	***1***	***4***	$534
	4			***Tritium***	$89	***4***		***WH3***	$89	$1,425	***2***		$712	***1***		$356	***1***		$356
Surface Water (3)	2	Grab	Water	pH	$18	4	8	WPH	$18	$144	2	4	$72	1	2	$36	1	2	$36
	2			Conductivity	$20	4		WCOND	$10	$80	2		$40	1		$20	1		$20
	2			Total Organic Carbon	$40	1		WTOC	$40	$80	1		$80	1		$80	1		$80
	2			VolatileOrganics	$190	1		WVOC	$190	$380	1		$380	1		$380	1		$380
Surface Water (3)	2	Grab	Water	Acids/Bases/Neutrals	$40	1	2	WABN	$40	$80	1	2	$80	1	2	$80	1		$80
	2			Pesticides/PCBs	$165	1		WPPCB	$165	$330	1		$330	1		$330	1		$330
	2			Phenols	$155	1		WPNL	$155	$310	1		$310	1		$310	1		$310
	2			Cyanides	$50	4		WCY	$50	$400	2		$200	1		$100	1		$100
	2			Metals	$109	4		WM	$109	$872	2		$436	1		$218	1		$218
Observation Sumps (2,4)	***151***	***Grab***	***Water***	***Gamma Isotopic***	***$134***	***4***	***604***	***WGI***	$134	$80,671	***4***	***604***	$80,671	***4***	***604***	$80,671	***4***	***604***	$80,671
	151			***Tritium***	***$89***	***4***		***WH3***	$89	$53,783	***4***		$53,783	***4***		$53,783	***4***		$53,783
Surface Soil	20	Grab	Soil	Gamma Isotopic	$138	4	80	SGI	$129	$10,320	2	40	$5,160	1	20	$2,580	1	20	$2,580
	20			Tritium	$89	1		SH3	$89	$1,781	1		$1,781	1		$1,781	1		$1,781
Sediment (3)	4	Grab	Sediment	Gamma Isotopic	$138	1	4	SGI	$129	$516	1	2	$516	1	1	$516	1	1	$516
	4			Tritium	$89	1		SH3	$89	$356	1		$356	1		$356	1		$356
Samples of Opportunity (5)	100	Grab	Various	Gamma Isotopic	$134	4	400	WGI	$134	$53,425	2	200	$26,712	1	100	$13,356	1	100	$13,356
	100			Tritium	$89	4		WH3	$89	$35,618	2		$17,809	1		$8,904	1		$8,904
				Annual Analyses		**4,842**	**1,730**			**$420,755**	**3,118**	**1,176**	**$286,021**	**2,256**	**899**	**$218,654**	**2,256**	**881**	**$218,654**
						Labor Rate $	45.36												
NOTES:				**Annual Labor Cost**						**$78,473**			**$53,343**			**$40,779**			**$39,962**
										$499,227			**$339,364**			**$259,433**			**$258,616**

(1) Includes selected wells from the existing monitoring programs annually.
(2) Water levels measured quarterly.
(3) Subset of current locations as the current monitoring program.
(4) Sump samples are collected when water is available.
(5) Samples deemed desirable by custodian.

Sample Analysis Unit Costs Lookup Table

SAMPLE ANALYSIS UNIT COSTS Lookup Table

Media/Analyses	Code	Cost Per Sample	Base	Factor 1	Factor 1.5	Means 2008	Reference
Air: Gross Alpha/Beta	AGAB	$38	$38	$38	$57	$ 53.08	ACZ Laboratories
Air: Gamma Isotopic	AGI	$103	$103	$103	$154	$ 263.70	ACZ Laboratories
Air: Tritium	AH3	$138	$138	$138	$207		2005 ECHOS 33 02 22 30 * 1.1416
Soil: Gamma Isotopic	SGI	$129	$129	$129	$194		2005 ECHOS 33 02 23 42 * 1.1416
Soil: Tritium	SH3	$89	$89	$89	$134	$ 89.04	2005 ECHOS 33 02 22 84 * 1.1416
External Gamma Exposure	TLD	$57	$57	$57	$86		RDB
VegSoilSed: Gamma Isotopic	VGI	$129	$129	$129	$193	$ 129.00	2005 ECHOS 33 02 23 42 * 1.1416
VegSoilSed: Tritium	VH3	$58	$58	$58	$87	$ 102.17	ACZ Laboratories
Water: Bases, Neutrals & Acids	WABN	$40	$40	$40	$60	$ 285.39	Analytical Resources Inc
Water: Carbon-14	WC14	$193	$193	$193	$289	$ 192.92	2005 ECHOS 33 02 22 77 * 1.1416
Water: Chloroform	WCf	$20	$20	$20	$30	$ -	Analytical Resources Inc
Water: Conductance	WCOND	$10	$10	$10	$15	$ 12.91	ACZ Laboratories
Water: Cyanide	WCY	$50	$50	$50	$75	$ 38.24	Analytical Resources Inc
Water: Gross Alpha/Beta	WGAB	$52	$52	$52	$78	$ 51.94	2005 ECHOS 33 02 22 88 thru 90 * 1.1416
Water: Gamma Isotopic	WGI	$134	$134	$134	$200	$ 133.56	2005 ECHOS 33 02 22 71 * 1.1416
Water: Tritium	WH3	$89	$89	$89	$134	$ 89.04	2005 ECHOS 33 02 22 84 * 1.1416
Water: Library Search	WLS	$55	$55	$55	$83	$ -	ACZ Laboratories
Water: Metals	WM	$109	$109	$109	$164		2005 ECHOS 33 02 05 17 01954 7423 * 1.1416
Water: pH	WPH	$18	$18	$18	$27	$ 7.71	Analytical Resources Inc
Water: Phenols	WPNL	$155	$155	$155	$233	$ 178.08	Analytical Resources Inc
Water: Pesticides/PCBs	WPPCB	$165	$165	$165	$248	$ 192.13	Analytical Resources Inc
Water: Temperature	WT	$13	$13	$13	$19	$ 12.50	2005 ECHOS 33 02 16 07 * 1.1416
Water: Total Organic Carbon	WTOC	$40	$40	$40	$60	$ 27.40	Analytical Resources Inc
Water: Volatile Organics	WVOC	$190	$190	$190	$285	$ 158.68	Analytical Resources Inc

Post Closure and Long-Term Care Cost Estimates

Post Closure & Long-Term Care Cost Estimates

Given:

	Previously Closed Trench Area	96	ac	2005 Barnwell Stablization and Closure Plan, Table 6-7
	Phase I Closure	22.4	ac	2005 Barnwell Stablization and Closure Plan, Table 6-8
	Phase I Post Closure Observation	5	yr	2005 Barnwell Stablization and Closure Plan, Figure 1-1
	Phase I Interim Care	29	yr	2005 Barnwell Stablization and Closure Plan, Figure 1-1
	Phase II Closure	4	ac	URS Report on Operating Alternatives for ACC, 2007
	Phase II Post Closure Observation	5	yr	2005 Barnwell Stablization and Closure Plan, Figure 1-1
Stage 1	Institutional Control (25 years)	25	yr	2005 Barnwell Stablization and Closure Plan
Stage 2	Institutional Control (25 years)	25	yr	2005 Barnwell Stablization and Closure Plan
Stage 3	Institutional Control (25 years)	25	yr	2005 Barnwell Stablization and Closure Plan
Stage 4	Institutional Control (25 years)	25	yr	2005 Barnwell Stablization and Closure Plan
	Cover area running into West Pond	185	ac	2005 Barnwell Stablization and Closure Plan, Section 6.2.2.1
	Cover area running into East Pond	44	ac	2005 Barnwell Stablization and Closure Plan, Section 6.2.2.1
	Erosion rate	0.06	ton/ac/yr	2005 Barnwell Stablization and Closure Plan, Section 6.2.2.4
	Annual Erosion from Covered Trenches	7.3	tons/yr	
	Soil Density	120	pcf	URS/Mday (text book)
	Annual Erosion from Covered Trenches	4.53	cy/yr	
	Settlement Monuments to be surveyed at the corners of each trench	130	ea	2005 Barnwell Stablization and Closure Plan

Assumptions:

1) Split between InstCtl and Operating Fund during Phase 1 PCO & IC

SF Land	91%
SF Admin	25%

2) Management and General Overight Duties:
   - manage site
   - supervise activities
   - conduct observations and inspections
   - conduct rad and non-rad monitoring
   - create reports from records

3) Monitoring Scope
   Monitoring of water (subgrade and surface), air, soil, and vegetation is for the whole site, including boundary and off-site monitoring locations.

4) Maintenance Scope:
   Maintenance is for the specific site being closed.

5) Dirt roads through the site are considered to be 5% of entire 229 acres

498,762 sf considered road area

6) Storm water features are considered 15% of entire 229 acres

1,496,286 sf considered storm water ditch or pond

7) Env Monitoring applies to the entire site.

			FinData 2005, pg 34	Ph1 PCO/IC		InstCtlr 1-4	
8)	Taxes	In lieu of Real Estate taxes	$84,021	$84,021	100%	$84,021	100%
		Personal Property	$18,978	$18,978	100%	$0	0%
		Vehicles	$3,753	$0	Rented	$0	Rented
		Security	$845	$0	Calc'd	0	Calc'd
			$107,597	$102,999		$84,021	
9)	Insurances (2005 FinDat; Clos Pg 34)	Auto	$17,400	$4,350	25%	$0	0%
	State Div of general Service doing all care	General Insurance	$141,621	$70,811	50%	$0	0%
		Nuclear Policies	$309,952	$154,976	50%	$77,488	25%
		Nuclear Property	$197,165	$0	0%	$0	0%
		Non-Nuclear	$132,986	$13,299	10%	$6,649	5%
		NuclearPoln Liability (2008)	$142,080	$0	0%	$0	0%
			$941,204	$243,435		$84,137	
10)	License and Permits	DHEC License	$275,829	$275,829	New fees	$600,000	
		In Lieu of DHEC License Fees					
		Tech FTEs		*1.00*		*0.50*	
		Mgmt/Admin FTEs		*0.40*		*0.20*	
		Annual LABOR cost		*$153,207*		*$76,603*	
		Veh-Days/yr		*24*		*12*	
		Annual VEHICLE Cost		*$2,400*		*$1,200*	
		Misc costs/yr		*$1,000*		*$500*	
		Total Annual Cost	*$275,829*	*$156,607*		*$78,303*	
		Lease	$50	$50		$0	
		Other Fees	$1,085	$1,085		$0	
		Permits	$487	$487		$0	
		State of Tenn	$2,100	$0		$0	
		TOTAL LIC/PERM FEES	**$279,551**	**$158,229**		**$78,303**	

Wage Table

URS Corp.						
ESTIMATE NO:				**ARCH / ENER:**		
PROJECT:				**EST. DATE:**		
CLIENT:				**PLAN DATE:**		
LOCATION:				**ESTIMATE BY:**		
WAGE INFO. FROM:						
ANALYSIS (HOURLY LABOR RATES)			FIELD			
Building Construction Trades	**Base Wage Rate**	**Fringe Benefits 50.00%**	**Labor OH-Office 20.00%**	**G & A 5.00%**	**Field Labor Total**	**Multiplier**
Program Manager	$ 65.00	$ 32.50	$ 19.50	$ 5.85	$ 122.85	1.89000
Project Manager	$ 57.70	$ 28.85	$ 17.31	$ 5.19	$ 109.05	1.89000
Project Engineer	$ 39.86	$ 19.93	$ 11.96	$ 3.59	$ 75.34	1.89000
Administrative Assistant, I	$ 15.00	$ 7.50	$ 4.50	$ 1.35	$ 28.35	1.89000
Administrative Assistant, II	$ 18.00	$ 9.00	$ 5.40	$ 1.62	$ 34.02	1.89000
Administrative Assistant, III	$ 20.00	$ 10.00	$ 6.00	$ 1.80	$ 37.80	1.89000
Administrative Assistant, IV	$ 22.00	$ 11.00	$ 6.60	$ 1.98	$ 41.58	1.89000
Architect	$ 52.00	$ 26.00	$ 15.60	$ 4.68	$ 98.28	1.89000
Chemical Engineer	$ 45.00	$ 22.50	$ 13.50	$ 4.05	$ 85.05	1.89000
Civil Engineer	$ 53.86	$ 26.93	$ 16.16	$ 4.85	$ 101.80	1.89000
Geologist	$ 39.56	$ 19.78	$ 11.87	$ 3.56	$ 74.77	1.89000
Chemist	$ 45.00	$ 22.50	$ 13.50	$ 4.05	$ 85.05	1.89000
Structural Engineer	$ 45.00	$ 22.50	$ 13.50	$ 4.05	$ 85.05	1.89000
Mechanical Engineer	$ 45.00	$ 22.50	$ 13.50	$ 4.05	$ 85.05	1.89000
Electrical Engineer	$ 45.00	$ 22.50	$ 13.50	$ 4.05	$ 85.05	1.89000
H & S Manager	$ 42.56	$ 21.28	$ 12.77	$ 3.83	$ 80.44	1.89000
Waste Management Manger	$ 42.50	$ 21.25	$ 12.75	$ 3.83	$ 80.33	1.89000
Industrial Hygene Manager	$ 40.00	$ 20.00	$ 12.00	$ 3.60	$ 75.60	1.89000
Industrial Hygenist Technician	$ 30.43	$ 15.22	$ 9.13	$ 2.74	$ 57.51	1.89000
Superintendent	$ 47.67	$ 23.84	$ 14.30	$ 4.29	$ 90.10	1.89000
Environmental Engineer	$ 27.40	$ 13.70	$ 8.22	$ 2.47	$ 51.79	1.89000
Radiological Technician	$ 24.00	$ 12.00	$ 7.20	$ 2.16	$ 45.36	1.89000
QA Manager	$ 48.00	$ 24.00	$ 14.40	$ 4.32	$ 90.72	1.89000
Radiological Manager	$ 45.00	$ 22.50	$ 13.50	$ 4.05	$ 85.05	1.89000
HP Supervisor	$ 35.00	$ 17.50	$ 10.50	$ 3.15	$ 66.15	1.89000
Rad Shipper	$ 35.00	$ 17.50	$ 10.50	$ 3.15	$ 66.15	1.89000
Project Director	$ 49.00	$ 24.50	$ 14.70	$ 4.41	$ 92.61	1.89000
Senior Rad Manager	$ 48.00	$ 24.00	$ 14.40	$ 4.32	$ 90.72	1.89000
Administrative Assistant (Duratek)	$ 17.00	$ 8.50	$ 5.10	$ 1.53	$ 32.13	1.89000
Senior HP Technician	$ 23.00	$ 11.50	$ 6.90	$ 2.07	$ 43.47	1.89000
Junior HP Technician	$ 18.00	$ 9.00	$ 5.40	$ 1.62	$ 34.02	1.89000
Project Director	$ 49.00	$ 24.50	$ 14.70	$ 4.41	$ 92.61	1.89000
Senior Rad Manager	$ 48.00	$ 24.00	$ 14.40	$ 4.32	$ 90.72	1.89000
Instrument Technican	$ 23.00	$ 11.50	$ 6.90	$ 2.07	$ 43.47	1.89000
Trainer	$ 28.00	$ 14.00	$ 8.40	$ 2.52	$ 52.92	1.89000
	$ -	$ -	$ -	$ -	$ -	
Notes:						

CB Data

Percentiles	Present Value: ECF Deposits during In-Region Ops	Present Value: InstCtl 1	Present Value: InstCtl 2	Present Value: InstCtl 3&4	Present Value: Periodic Costs	Present Value: Ph1 IC	Present Value: Ph1 PCO	Present Value: Ph2 PCO
0%	-$730,000	$17,200,000	$7,500,000	$6,000,000	$7,000	$25,700,000	$7,000,000	$7,600,000
5%	-$700,000	$19,700,000	$8,600,000	$6,800,000	$9,000	$28,700,000	$7,900,000	$8,900,000
10%	-$680,000	$20,300,000	$8,800,000	$7,000,000	$10,000	$29,500,000	$8,100,000	$9,200,000
15%	-$660,000	$20,600,000	$8,900,000	$7,100,000	$11,000	$30,100,000	$8,300,000	$9,400,000
20%	-$630,000	$20,900,000	$9,000,000	$7,100,000	$11,000	$30,400,000	$8,400,000	$9,500,000
25%	-$610,000	$21,100,000	$9,200,000	$7,200,000	$11,000	$30,800,000	$8,500,000	$9,600,000
30%	-$590,000	$21,300,000	$9,300,000	$7,300,000	$12,000	$31,100,000	$8,500,000	$9,700,000
35%	-$570,000	$21,500,000	$9,400,000	$7,400,000	$12,000	$31,400,000	$8,600,000	$9,800,000
40%	-$550,000	$21,700,000	$9,400,000	$7,400,000	$12,000	$31,600,000	$8,700,000	$9,900,000
45%	-$520,000	$21,900,000	$9,500,000	$7,500,000	$13,000	$31,900,000	$8,800,000	$10,000,000
50%	-$500,000	$22,100,000	$9,600,000	$7,500,000	$13,000	$32,200,000	$8,900,000	$10,100,000
55%	-$480,000	$22,300,000	$9,700,000	$7,600,000	$14,000	$32,500,000	$8,900,000	$10,200,000
60%	-$460,000	$22,500,000	$9,800,000	$7,700,000	$14,000	$32,800,000	$9,000,000	$10,300,000
65%	-$430,000	$22,700,000	$9,900,000	$7,700,000	$14,000	$33,100,000	$9,100,000	$10,500,000
70%	-$410,000	$22,900,000	$10,000,000	$7,800,000	$15,000	$33,400,000	$9,200,000	$10,600,000
75%	-$390,000	$23,200,000	$10,200,000	$7,900,000	$15,000	$33,800,000	$9,300,000	$10,700,000
80%	-$370,000	$23,400,000	$10,300,000	$8,000,000	$16,000	$34,200,000	$9,400,000	$10,800,000
85%	-$350,000	$23,700,000	$10,500,000	$8,100,000	$17,000	$34,700,000	$9,600,000	$11,000,000
90%	-$320,000	$24,200,000	$10,700,000	$8,200,000	$17,000	$35,300,000	$9,700,000	$11,200,000
95%	-$300,000	$24,800,000	$11,100,000	$8,500,000	$19,000	$36,300,000	$10,000,000	$11,600,000
100%	-$280,000	$28,600,000	$13,500,000	$10,000,000	$32,000	$42,700,000	$11,400,000	$14,600,000

Present Value: Total Post-Closure Care	Present Value: Total Post-Closure Care by Year	Total Annual Cost to Phase II Closure	Total Annual Cost: Phase II Post-Closure Observations	Total Annual Cost: Stage I Insitutional Controls	Total Annual Cost: Stage II Institutional Controls	Total Annual Cost: Stages III & IV Institutional Controls
$74,000,000	$74,500,000	$1,541,898	$2,977,524	$1,801,233	$1,290,530	$1,053,396
$82,300,000	$83,000,000	$1,748,831	$3,500,859	$2,062,578	$1,466,358	$1,187,340
$83,900,000	$84,600,000	$1,794,459	$3,610,848	$2,121,148	$1,504,922	$1,216,159
$85,000,000	$85,700,000	$1,825,514	$3,668,447	$2,154,005	$1,530,328	$1,232,872
$86,000,000	$86,700,000	$1,848,647	$3,718,830	$2,179,025	$1,550,457	$1,247,506
$86,800,000	$87,500,000	$1,868,995	$3,769,206	$2,204,491	$1,569,455	$1,260,855
$87,500,000	$88,200,000	$1,885,937	$3,815,036	$2,226,310	$1,588,714	$1,273,512
$88,200,000	$88,800,000	$1,903,856	$3,854,923	$2,247,393	$1,604,694	$1,284,481
$88,800,000	$89,500,000	$1,919,749	$3,893,887	$2,268,705	$1,619,163	$1,296,179
$89,500,000	$90,200,000	$1,936,936	$3,930,100	$2,288,498	$1,633,486	$1,307,169
$90,200,000	$90,800,000	$1,954,181	$3,968,065	$2,308,141	$1,648,643	$1,317,767
$90,800,000	$91,500,000	$1,973,626	$4,010,019	$2,328,198	$1,664,110	$1,328,943
$91,400,000	$92,000,000	$1,992,666	$4,052,935	$2,349,967	$1,680,602	$1,339,180
$92,000,000	$92,700,000	$2,012,262	$4,097,132	$2,372,296	$1,698,498	$1,351,855
$92,800,000	$93,500,000	$2,032,803	$4,141,400	$2,395,186	$1,720,586	$1,365,570
$93,600,000	$94,300,000	$2,052,713	$4,195,380	$2,419,871	$1,743,611	$1,379,257
$94,600,000	$95,200,000	$2,078,109	$4,250,664	$2,447,206	$1,766,587	$1,395,061
$95,700,000	$96,400,000	$2,108,218	$4,319,372	$2,479,739	$1,797,499	$1,415,012
$97,300,000	$98,000,000	$2,145,072	$4,408,637	$2,523,688	$1,831,535	$1,439,699
$99,300,000	$100,000,000	$2,209,483	$4,544,764	$2,590,076	$1,896,575	$1,481,512
$110,300,000	$111,200,000	$2,525,684	$5,731,253	$2,992,841	$2,318,070	$1,749,004

APPENDIX C

CRYSTAL BALL REPORT FOR PLANNED EVENTS

Report

Crystal Ball Report - Full; Barnwell Planned Events
Simulation started on 6/18/2008 at 11:19:25
Simulation stopped on 6/18/2008 at 11:19:36

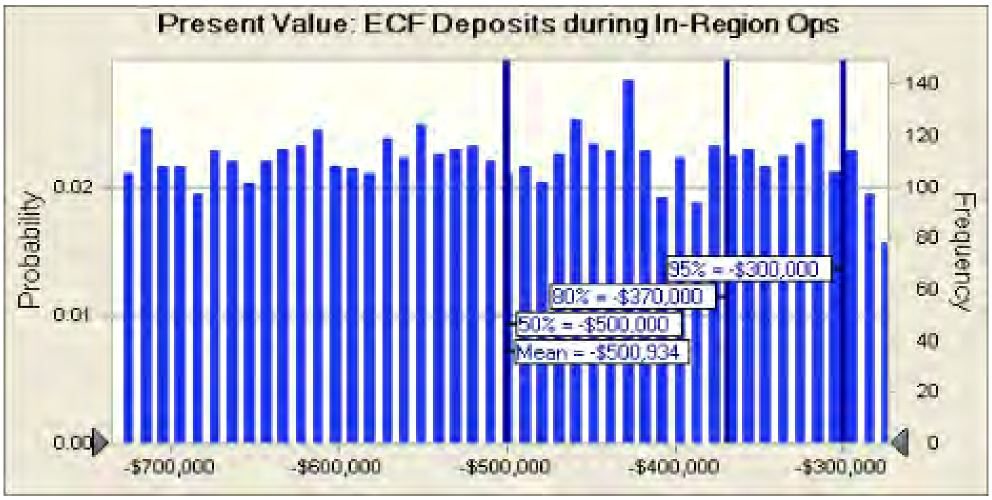
Run preferences:	
Number of trials run	5,000
Extreme speed	
Monte Carlo	
Random seed	
Precision control on	
Confidence level	95.00%
Run statistics:	
Total running time (sec)	10.74
Trials/second (average)	465
Random numbers per sec	79,599
Crystal Ball data:	
Assumptions	171
Correlations	0
Correlated groups	0
Decision variables	0
Forecasts	15

Forecasts

Worksheet: [Appendix B 080618.xls]50% CashFlows

Forecast: Present Value: ECF Deposits during In-Region Ops **Cell: I5**

Summary:
Entire range is from -$730,000 to -$280,000
Base case is -$500,000
After 5,000 trials, the std. error of the mean is $1,815



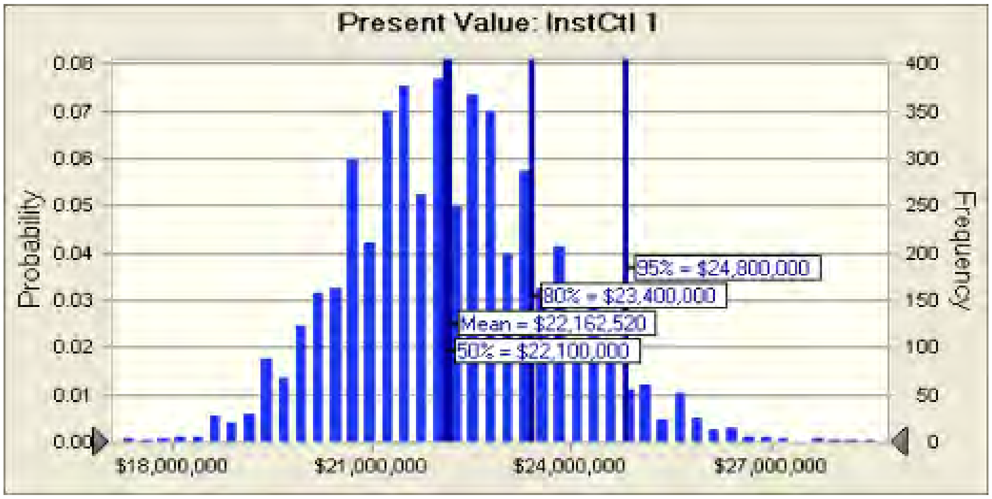
Statistics:	Forecast values
Trials	5,000
Mean	-$500,934
Median	-$500,000
Mode	-$430,000
Standard Deviation	$128,305
Variance	$16,462,120,068
Skewness	-0.0073
Kurtosis	1.81
Coeff. of Variability	-0.2561
Minimum	-$730,000
Maximum	-$280,000
Range Width	$450,000
Mean Std. Error	$1,815

Forecast: Present Value: ECF Deposits during In-Region Ops (cont'd) **Cell: I5**

Percentiles:	Forecast values
0%	-$730,000
10%	-$680,000
20%	-$630,000
30%	-$590,000
40%	-$550,000
50%	-$500,000
60%	-$460,000
70%	-$410,000
80%	-$370,000
90%	-$320,000
100%	-$280,000

Forecast: Present Value: InstCtl 1 **Cell: E5**

Summary:
Entire range is from $17,200,000 to $28,600,000
Base case is $20,700,000
After 5,000 trials, the std. error of the mean is $21,659



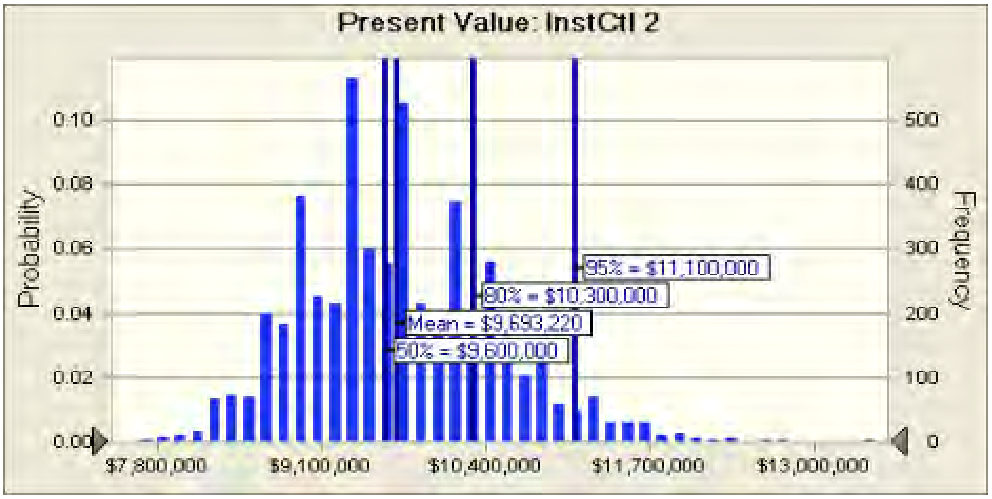
Statistics:	Forecast values
Trials	5,000
Mean	$22,162,520
Median	$22,100,000
Mode	$21,800,000
Standard Deviation	$1,531,503
Variance	###############
Skewness	0.2665
Kurtosis	3.18
Coeff. of Variability	0.0691
Minimum	$17,200,000
Maximum	$28,600,000
Range Width	$11,400,000
Mean Std. Error	$21,659

Forecast: Present Value: InstCtl 1 (cont'd) **Cell: E5**

Percentiles:	Forecast values
0%	$17,200,000
10%	$20,300,000
20%	$20,900,000
30%	$21,300,000
40%	$21,700,000
50%	$22,100,000
60%	$22,500,000
70%	$22,900,000
80%	$23,400,000
90%	$24,200,000
100%	$28,600,000

Forecast: Present Value: InstCtl 2 **Cell: F5**

Summary:
Entire range is from $7,500,000 to $13,500,000
Base case is $9,200,000
After 5,000 trials, the std. error of the mean is $10,777



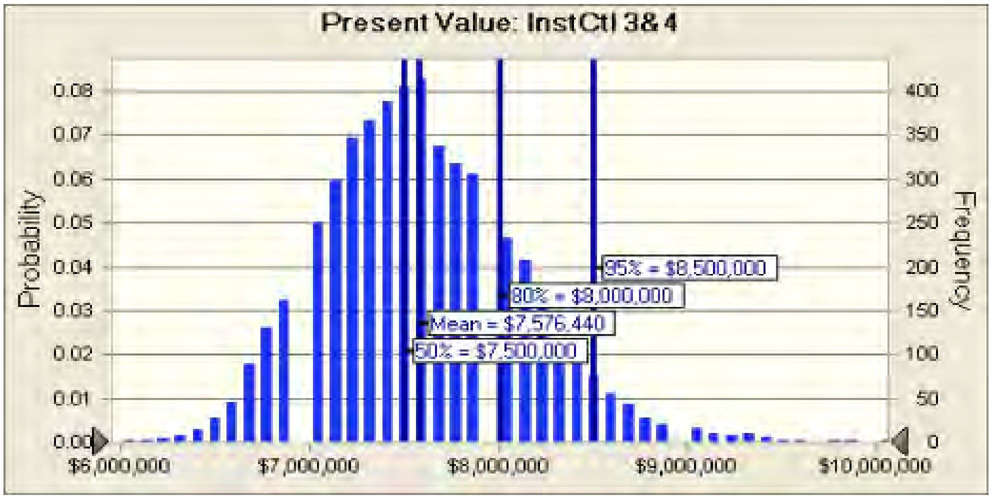
Statistics:	Forecast values
Trials	5,000
Mean	$9,693,220
Median	$9,600,000
Mode	$9,400,000
Standard Deviation	$762,066
Variance	$580,744,180,436
Skewness	0.5369
Kurtosis	3.55
Coeff. of Variability	0.0786
Minimum	$7,500,000
Maximum	$13,500,000
Range Width	$6,000,000
Mean Std. Error	$10,777

Forecast: Present Value: InstCtl 2 (cont'd) **Cell: F5**

Percentiles:	Forecast values
0%	$7,500,000
10%	$8,800,000
20%	$9,000,000
30%	$9,300,000
40%	$9,400,000
50%	$9,600,000
60%	$9,800,000
70%	$10,000,000
80%	$10,300,000
90%	$10,700,000
100%	$13,500,000

Forecast: Present Value: InstCtl 3&4 **Cell: G5**

Summary:
Entire range is from $6,000,000 to $10,000,000
Base case is $7,100,000
After 5,000 trials, the std. error of the mean is $7,273



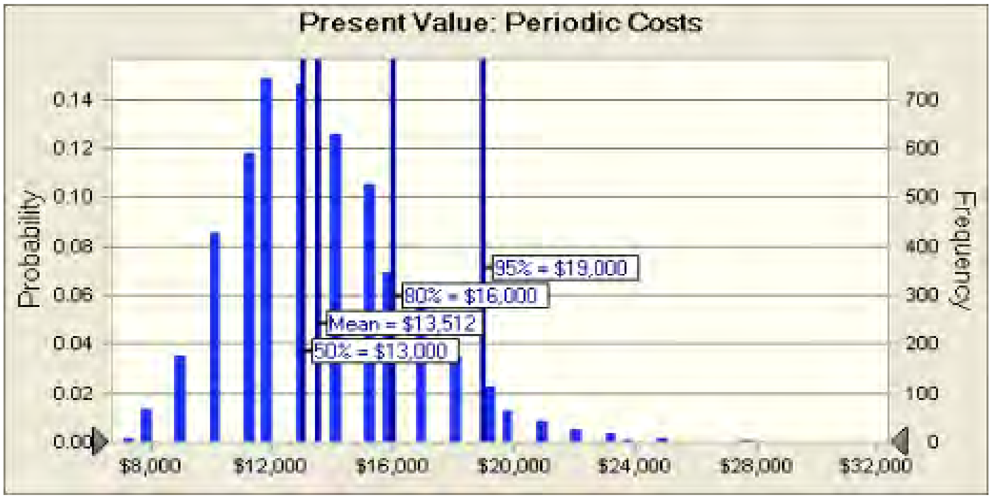
Statistics:	Forecast values
Trials	5,000
Mean	$7,576,440
Median	$7,500,000
Mode	$7,600,000
Standard Deviation	$514,247
Variance	$264,449,816,363
Skewness	0.4727
Kurtosis	3.51
Coeff. of Variability	0.0679
Minimum	$6,000,000
Maximum	$10,000,000
Range Width	$4,000,000
Mean Std. Error	$7,273

Forecast: Present Value: InstCtl 3&4 (cont'd) **Cell: G5**

Percentiles:	Forecast values
0%	$6,000,000
10%	$7,000,000
20%	$7,100,000
30%	$7,300,000
40%	$7,400,000
50%	$7,500,000
60%	$7,700,000
70%	$7,800,000
80%	$8,000,000
90%	$8,200,000
100%	$10,000,000

Forecast: Present Value: Periodic Costs **Cell: H5**

Summary:
Entire range is from \$7,000 to \$32,000
Base case is \$13,000
After 5,000 trials, the std. error of the mean is \$41



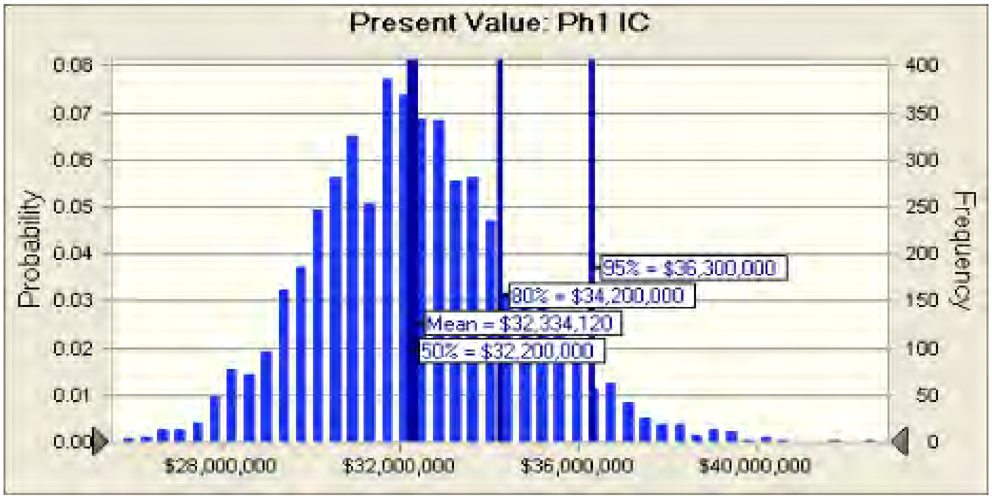
Statistics:	Forecast values
Trials	5,000
Mean	\$13,512
Median	\$13,000
Mode	\$12,000
Standard Deviation	\$2,893
Variance	\$8,369,135
Skewness	0.7668
Kurtosis	4.15
Coeff. of Variability	0.2141
Minimum	\$7,000
Maximum	\$32,000
Range Width	\$25,000
Mean Std. Error	\$41

Forecast: Present Value: Periodic Costs (cont'd) **Cell: H5**

Percentiles:	Forecast values
0%	$7,000
10%	$10,000
20%	$11,000
30%	$12,000
40%	$12,000
50%	$13,000
60%	$14,000
70%	$15,000
80%	$16,000
90%	$17,000
100%	$32,000

Forecast: Present Value: Ph1 IC **Cell: C5**

Summary:
Entire range is from $25,700,000 to $42,700,000
Base case is $31,300,000
After 5,000 trials, the std. error of the mean is $32,152



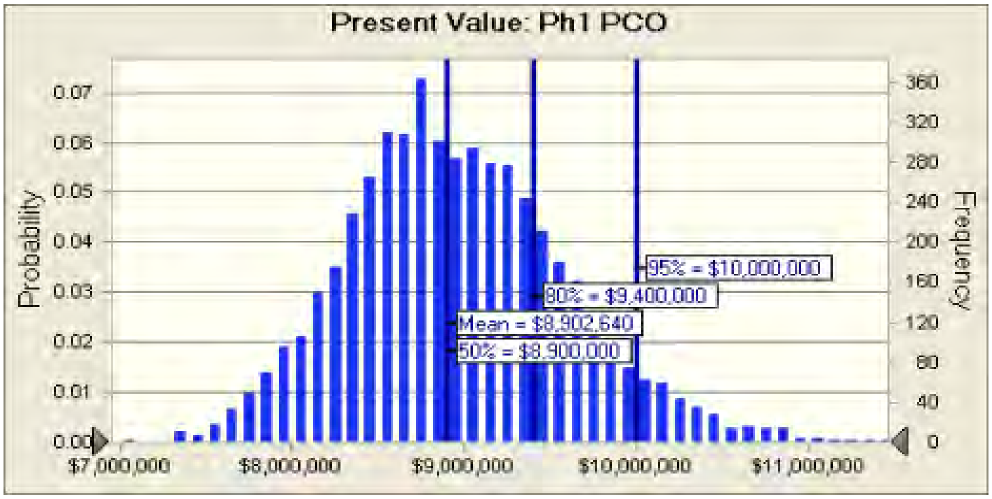
Statistics:	Forecast values
Trials	5,000
Mean	$32,334,120
Median	$32,200,000
Mode	$31,600,000
Standard Deviation	$2,273,456
Variance	###############
Skewness	0.3203
Kurtosis	3.24
Coeff. of Variability	0.0703
Minimum	$25,700,000
Maximum	$42,700,000
Range Width	$17,000,000
Mean Std. Error	$32,152

Forecast: Present Value: Ph1 IC (cont'd) **Cell: C5**

Percentiles:	Forecast values
0%	$25,700,000
10%	$29,500,000
20%	$30,400,000
30%	$31,100,000
40%	$31,600,000
50%	$32,200,000
60%	$32,800,000
70%	$33,400,000
80%	$34,200,000
90%	$35,300,000
100%	$42,700,000

Forecast: Present Value: Ph1 PCO **Cell: B5**

Summary:
Entire range is from $7,000,000 to $11,400,000
Base case is $8,600,000
After 5,000 trials, the std. error of the mean is $8,932



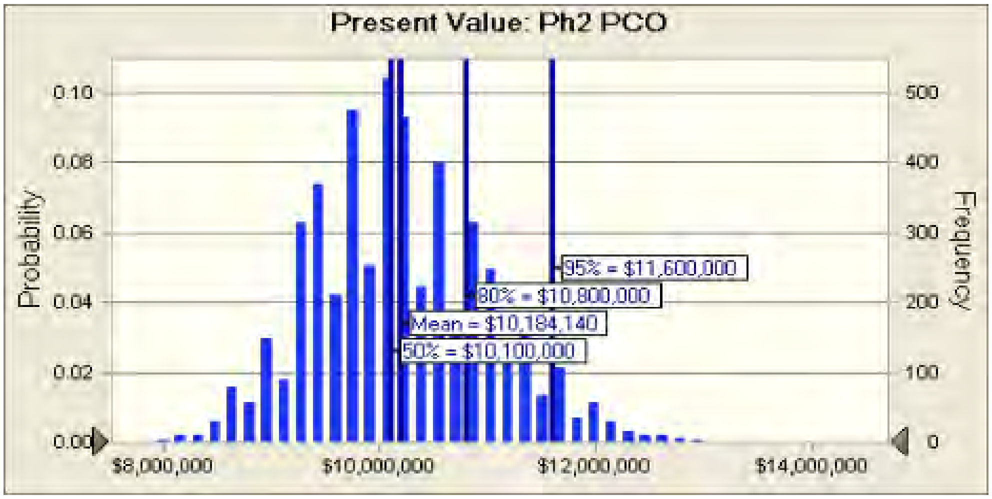
Statistics:	Forecast values
Trials	5,000
Mean	$8,902,640
Median	$8,900,000
Mode	$8,700,000
Standard Deviation	$631,595
Variance	$398,912,812,963
Skewness	0.3547
Kurtosis	3.16
Coeff. of Variability	0.0709
Minimum	$7,000,000
Maximum	$11,400,000
Range Width	$4,400,000
Mean Std. Error	$8,932

Forecast: Present Value: Ph1 PCO (cont'd) **Cell: B5**

Percentiles:	Forecast values
0%	$7,000,000
10%	$8,100,000
20%	$8,400,000
30%	$8,500,000
40%	$8,700,000
50%	$8,900,000
60%	$9,000,000
70%	$9,200,000
80%	$9,400,000
90%	$9,700,000
100%	$11,400,000

Forecast: Present Value: Ph2 PCO **Cell: D5**

Summary:
Entire range is from $7,600,000 to $14,600,000
Base case is $9,800,000
After 5,000 trials, the std. error of the mean is $11,396



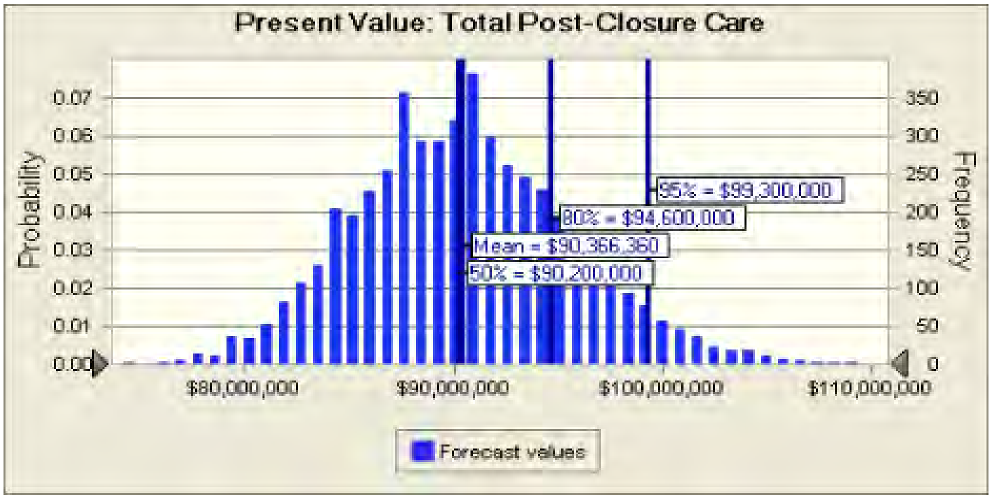
Statistics:	Forecast values
Trials	5,000
Mean	$10,184,140
Median	$10,100,000
Mode	$10,000,000
Standard Deviation	$805,814
Variance	$649,336,327,666
Skewness	0.3637
Kurtosis	3.28
Coeff. of Variability	0.0791
Minimum	$7,600,000
Maximum	$14,600,000
Range Width	$7,000,000
Mean Std. Error	$11,396

Forecast: Present Value: Ph2 PCO (cont'd) **Cell: D5**

Percentiles:	Forecast values
0%	$7,600,000
10%	$9,200,000
20%	$9,500,000
30%	$9,700,000
40%	$9,900,000
50%	$10,100,000
60%	$10,300,000
70%	$10,600,000
80%	$10,800,000
90%	$11,200,000
100%	$14,600,000

Forecast: Present Value: Total Post-Closure Care **Cell: J5**

Summary:
Entire range is from $74,000,000 to $110,300,000
Base case is $86,200,000
After 5,000 trials, the std. error of the mean is $73,177



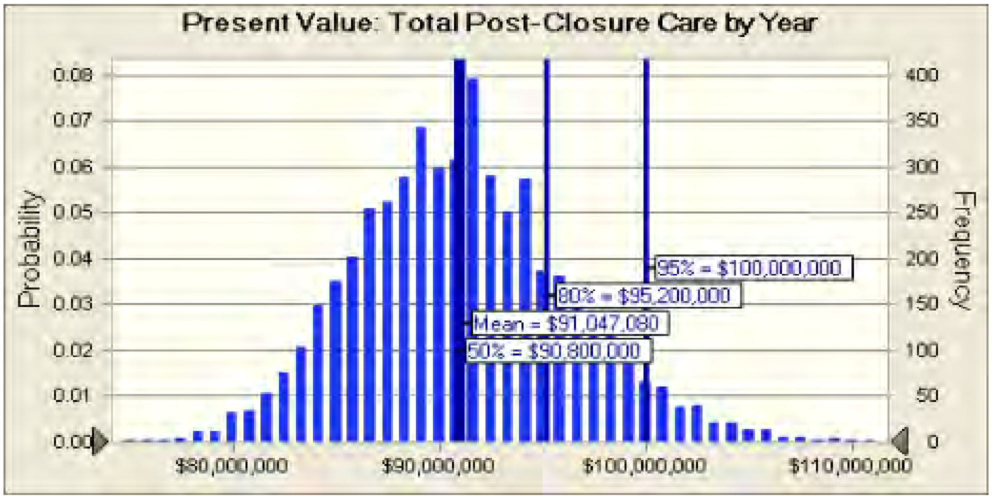
Statistics:	Forecast values
Trials	5,000
Mean	$90,366,360
Median	$90,200,000
Mode	$90,700,000
Standard Deviation	$5,174,361
Variance	###############
Skewness	0.2878
Kurtosis	3.14
Coeff. of Variability	0.0573
Minimum	$74,000,000
Maximum	$110,300,000
Range Width	$36,300,000
Mean Std. Error	$73,177

Forecast: Present Value: Total Post-Closure Care (cont'd) **Cell: J5**

Percentiles:	Forecast values
0%	$74,000,000
10%	$83,900,000
20%	$86,000,000
30%	$87,500,000
40%	$88,800,000
50%	$90,200,000
60%	$91,400,000
70%	$92,800,000
80%	$94,600,000
90%	$97,300,000
100%	$110,300,000

Forecast: Present Value: Total Post-Closure Care by Year **Cell: J6**

Summary:
Entire range is from $74,500,000 to $111,200,000
Base case is $87,000,000
After 5,000 trials, the std. error of the mean is $73,224



Statistics:	Forecast values
Trials	5,000
Mean	$91,047,080
Median	$90,800,000
Mode	$87,900,000
Standard Deviation	$5,177,693
Variance	###############
Skewness	0.2869
Kurtosis	3.14
Coeff. of Variability	0.0569
Minimum	$74,500,000
Maximum	$111,200,000
Range Width	$36,700,000
Mean Std. Error	$73,224

Forecast: Present Value: Total Post-Closure Care by Year (cont'd) **Cell: J6**

Percentiles:	Forecast values
0%	$74,500,000
10%	$84,600,000
20%	$86,700,000
30%	$88,200,000
40%	$89,500,000
50%	$90,800,000
60%	$92,000,000
70%	$93,500,000
80%	$95,200,000
90%	$98,000,000
100%	$111,200,000

Worksheet: [Appendix B 080618.xls]Summary

Forecast: Total Annual Cost to Phase II Closure **Cell: B16**

Summary:
Entire range is from $1,541,898 to $2,525,684
Base case is $1,901,999
After 5,000 trials, the std. error of the mean is $1,969

Statistics:	Forecast values
Trials	5,000
Mean	$1,965,056
Median	$1,954,226
Mode	---
Standard Deviation	$139,195
Variance	$19,375,182,335
Skewness	0.3581
Kurtosis	3.17
Coeff. of Variability	0.0708
Minimum	$1,541,898
Maximum	$2,525,684
Range Width	$983,786
Mean Std. Error	$1,969

Forecast: Total Annual Cost to Phase II Closure (cont'd) **Cell: B16**

Percentiles:	Forecast values
0%	$1,541,898
10%	$1,794,459
20%	$1,848,647
30%	$1,885,937
40%	$1,919,749
50%	$1,954,181
60%	$1,992,666
70%	$2,032,803
80%	$2,078,109
90%	$2,145,072
100%	$2,525,684

Forecast: Total Annual Cost: Phase II Post-Closure Observations **Cell: D16**

Summary:
Entire range is from $2,977,524 to $5,731,253
Base case is $3,857,348
After 5,000 trials, the std. error of the mean is $4,468

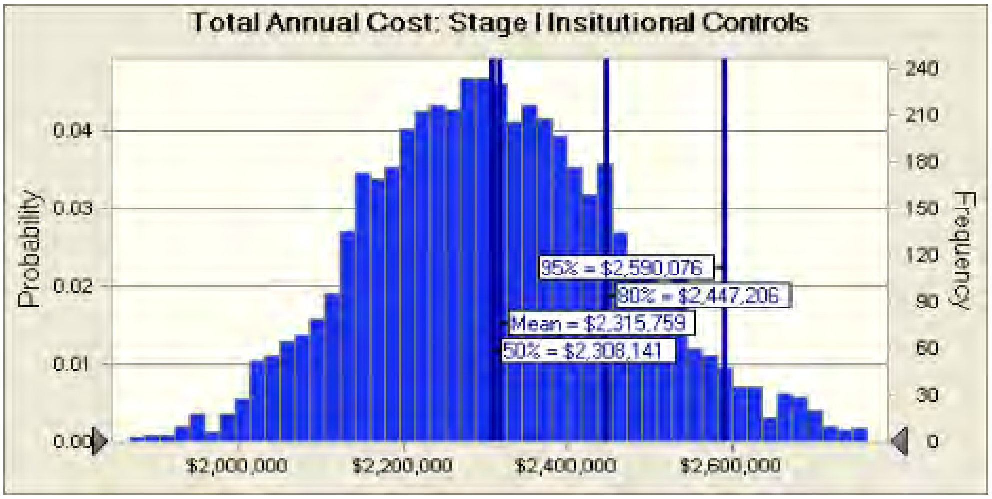
Statistics:	Forecast values
Trials	5,000
Mean	$3,991,958
Median	$3,968,083
Mode	---
Standard Deviation	$315,901
Variance	$99,793,613,670
Skewness	0.3684
Kurtosis	3.28
Coeff. of Variability	0.0791
Minimum	$2,977,524
Maximum	$5,731,253
Range Width	$2,753,729
Mean Std. Error	$4,468

Forecast: Total Annual Cost: Phase II Post-Closure Observations (cont'd) **Cell: D16**

Percentiles:	Forecast values
0%	$2,977,524
10%	$3,610,848
20%	$3,718,830
30%	$3,815,036
40%	$3,893,887
50%	$3,968,065
60%	$4,052,935
70%	$4,141,400
80%	$4,250,664
90%	$4,408,637
100%	$5,731,253

Forecast: Total Annual Cost: Stage I Insitutional Controls **Cell: E16**

Summary:
Entire range is from $1,801,233 to $2,992,841
Base case is $2,164,966
After 5,000 trials, the std. error of the mean is $2,263



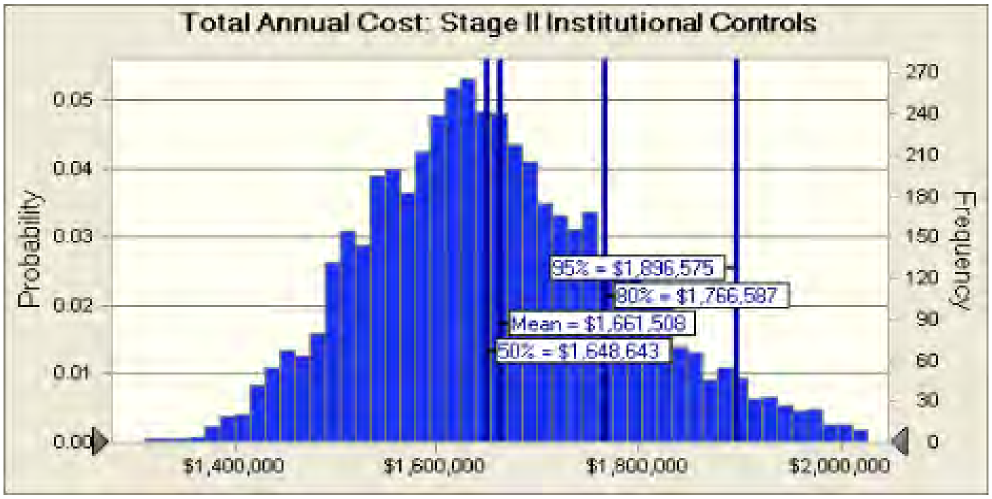
Statistics:	Forecast values
Trials	5,000
Mean	$2,315,759
Median	$2,308,207
Mode	---
Standard Deviation	$159,989
Variance	$25,596,568,990
Skewness	0.2677
Kurtosis	3.19
Coeff. of Variability	0.0691
Minimum	$1,801,233
Maximum	$2,992,841
Range Width	$1,191,608
Mean Std. Error	$2,263

Forecast: Total Annual Cost: Stage I Insitutional Controls (cont'd) **Cell: E16**

Percentiles:	Forecast values
0%	$1,801,233
10%	$2,121,148
20%	$2,179,025
30%	$2,226,310
40%	$2,268,705
50%	$2,308,141
60%	$2,349,967
70%	$2,395,186
80%	$2,447,206
90%	$2,523,688
100%	$2,992,841

Forecast: Total Annual Cost: Stage II Institutional Controls **Cell: F16**

Summary:
Entire range is from $1,290,530 to $2,318,070
Base case is $1,570,170
After 5,000 trials, the std. error of the mean is $1,846



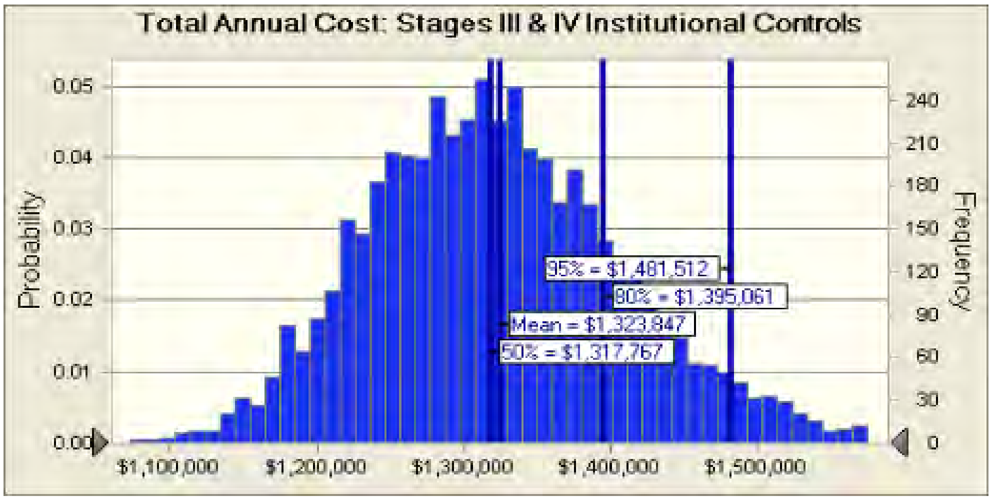
Statistics:	Forecast values
Trials	5,000
Mean	$1,661,508
Median	$1,648,661
Mode	---
Standard Deviation	$130,526
Variance	$17,037,062,005
Skewness	0.5380
Kurtosis	3.55
Coeff. of Variability	0.0786
Minimum	$1,290,530
Maximum	$2,318,070
Range Width	$1,027,540
Mean Std. Error	$1,846

Forecast: Total Annual Cost: Stage II Institutional Controls (cont'd) **Cell: F16**

Percentiles:	Forecast values
0%	$1,290,530
10%	$1,504,922
20%	$1,550,457
30%	$1,588,714
40%	$1,619,163
50%	$1,648,643
60%	$1,680,602
70%	$1,720,586
80%	$1,766,587
90%	$1,831,535
100%	$2,318,070

Forecast: Total Annual Cost: Stages III & IV Institutional Controls **Cell: G16**

Summary:
Entire range is from $1,053,396 to $1,749,004
Base case is $1,249,264
After 5,000 trials, the std. error of the mean is $1,270



Statistics:	Forecast values
Trials	5,000
Mean	$1,323,847
Median	$1,317,803
Mode	---
Standard Deviation	$89,768
Variance	$8,058,282,573
Skewness	0.4734
Kurtosis	3.52
Coeff. of Variability	0.0678
Minimum	$1,053,396
Maximum	$1,749,004
Range Width	$695,608
Mean Std. Error	$1,270

Forecast: Total Annual Cost: Stages III & IV Institutional Controls (cont'd) **Cell: G16**

Percentiles:	Forecast values
0%	$1,053,396
10%	$1,216,159
20%	$1,247,506
30%	$1,273,512
40%	$1,296,179
50%	$1,317,767
60%	$1,339,180
70%	$1,365,570
80%	$1,395,061
90%	$1,439,699
100%	$1,749,004

End of Forecasts

Assumptions

Worksheet: [Appendix B 080618.xls]50% CashFlows

Assumption: K11 **Cell: K11**

Uniform distribution with parameters:

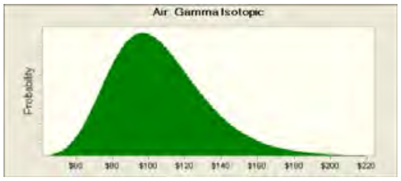
Minimum	$12.4
Maximum	$32.4

Worksheet: [Appendix B 080618.xls]Analysis Prices

Assumption: Air: Gamma Isotopic **Cell: C5**

Lognormal distribution with parameters:

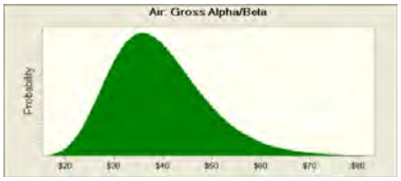
50%	$103	(=E5)
95%	$154	(=F5)



Assumption: Air: Gross Alpha/Beta **Cell: C4**

Lognormal distribution with parameters:

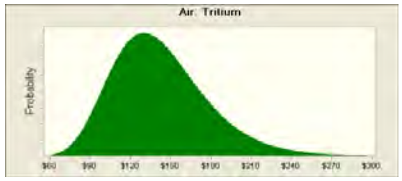
50%	$38	(=E4)
95%	$57	(=F4)



Assumption: Air: Tritium **Cell: C6**

Lognormal distribution with parameters:

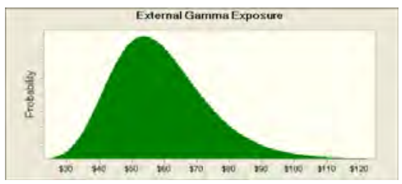
50%	$138	(=E6)
95%	$207	(=F6)



Assumption: External Gamma Exposure **Cell: C9**

Lognormal distribution with parameters:

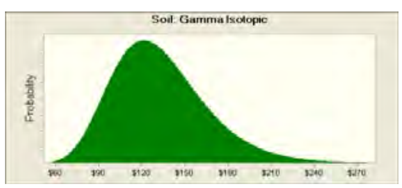
50%	$57	(=E9)
95%	$86	(=F9)



Assumption: Soil: Gamma Isotopic **Cell: C7**

Lognormal distribution with parameters:

50%	$129	(=E7)
95%	$194	(=F7)

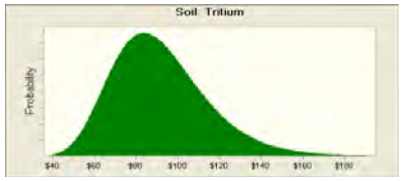


Assumption: Soil: Tritium **Cell: C8**

Lognormal distribution with parameters:

50%	$89	(=E8)
95%	$134	(=F8)

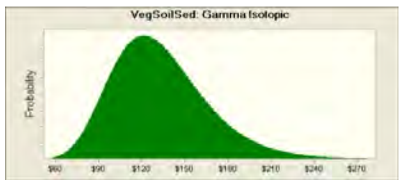
Assumption: Soil: Tritium (cont'd) **Cell: C8**



Assumption: VegSoilSed: Gamma Isotopic **Cell: C10**

Lognormal distribution with parameters:

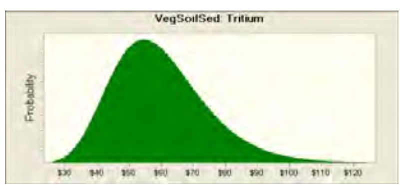
50%	$129	(=E10)
95%	$193	(=F10)



Assumption: VegSoilSed: Tritium **Cell: C11**

Lognormal distribution with parameters:

50%	$58	(=E11)
95%	$87	(=F11)

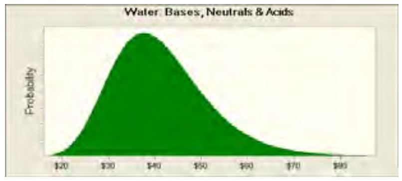


Assumption: Water: Bases, Neutrals & Acids **Cell: C12**

Lognormal distribution with parameters:

50%	$40	(=E12)
95%	$60	(=F12)

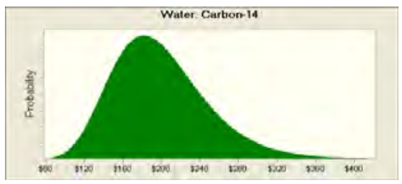
Assumption: Water: Bases, Neutrals & Acids (cont'd) **Cell: C12**



Assumption: Water: Carbon-14 **Cell: C13**

Lognormal distribution with parameters:

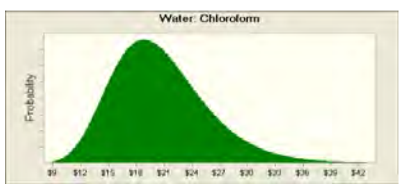
50%	$193	(=E13)
95%	$289	(=F13)



Assumption: Water: Chloroform **Cell: C14**

Lognormal distribution with parameters:

50%	$20	(=E14)
95%	$30	(=F14)

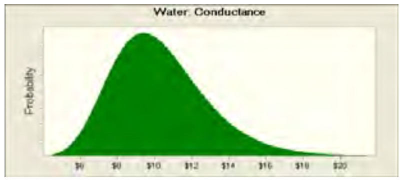


Assumption: Water: Conductance **Cell: C15**

Lognormal distribution with parameters:

50%	$10	(=E15)
95%	$15	(=F15)

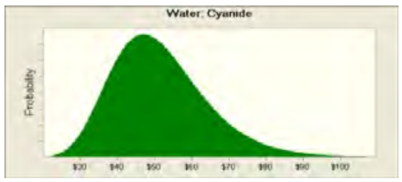
Assumption: Water: Conductance (cont'd) **Cell: C15**



Assumption: Water: Cyanide **Cell: C16**

Lognormal distribution with parameters:

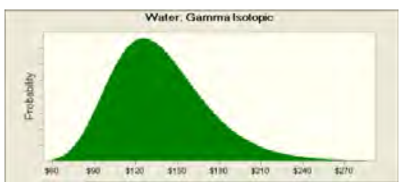
50%	$50	(=E16)
95%	$75	(=F16)



Assumption: Water: Gamma Isotopic **Cell: C18**

Lognormal distribution with parameters:

50%	$134	(=E18)
95%	$200	(=F18)

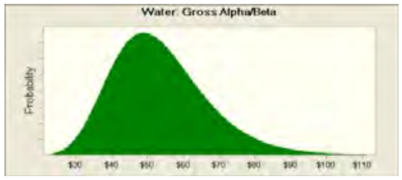


Assumption: Water: Gross Alpha/Beta **Cell: C17**

Lognormal distribution with parameters:

50%	$52	(=E17)
95%	$78	(=F17)

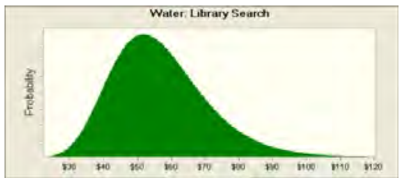
Assumption: Water: Gross Alpha/Beta (cont'd) **Cell: C17**



Assumption: Water: Library Search **Cell: C20**

Lognormal distribution with parameters:

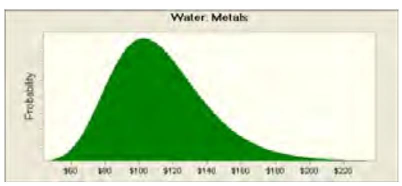
50%	$55	(=E20)
95%	$83	(=F20)



Assumption: Water: Metals **Cell: C21**

Lognormal distribution with parameters:

50%	$109	(=E21)
95%	$164	(=F21)

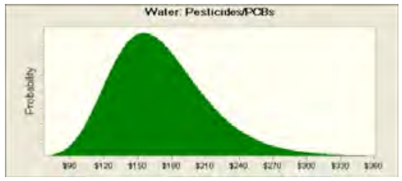


Assumption: Water: Pesticides/PCBs **Cell: C24**

Lognormal distribution with parameters:

50%	$165	(=E24)
95%	$248	(=F24)

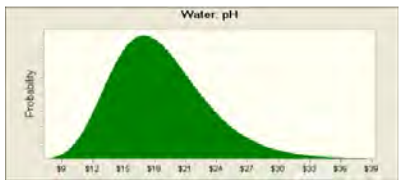
Assumption: Water: Pesticides/PCBs (cont'd) **Cell: C24**



Assumption: Water: pH **Cell: C22**

Lognormal distribution with parameters:

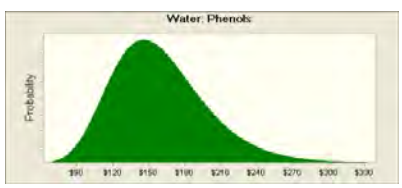
50%	$18	(=E22)
95%	$27	(=F22)



Assumption: Water: Phenols **Cell: C23**

Lognormal distribution with parameters:

50%	$155	(=E23)
95%	$233	(=F23)

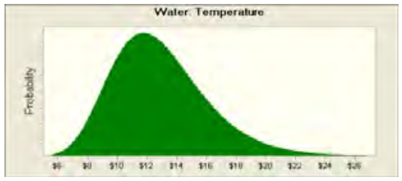


Assumption: Water: Temperature **Cell: C25**

Lognormal distribution with parameters:

50%	$13	(=E25)
95%	$19	(=F25)

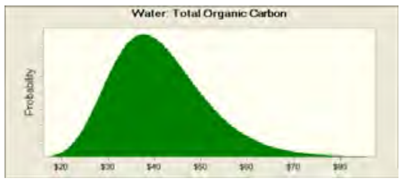
Assumption: Water: Temperature (cont'd) **Cell: C25**



Assumption: Water: Total Organic Carbon **Cell: C26**

Lognormal distribution with parameters:

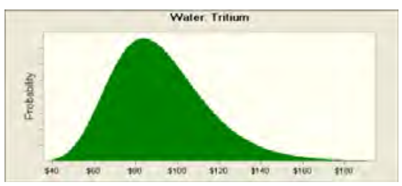
50%	$40	(=E26)
95%	$60	(=F26)



Assumption: Water: Tritium **Cell: C19**

Lognormal distribution with parameters:

50%	$89	(=E19)
95%	$134	(=F19)

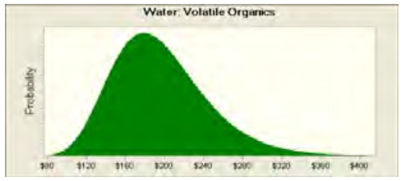


Assumption: Water: Volatile Organics **Cell: C27**

Lognormal distribution with parameters:

50%	$190	(=E27)
95%	$285	(=F27)

Assumption: Water: Volatile Organics (cont'd) **Cell: C27**



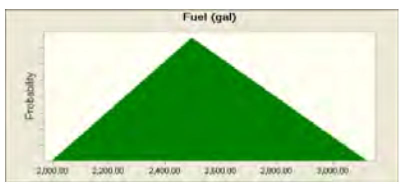
Worksheet: [Appendix B 080618.xls]InstCtl1

Assumption: Fuel (gal) **Cell: B17**

Robert Baird:
=2*2*26*24

Triangular distribution with parameters:

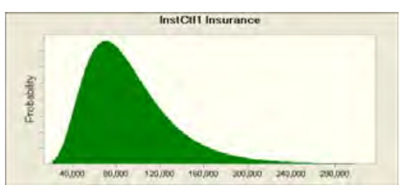
Minimum	1,996.80	(=B17/1.25)
Likeliest	2,496.00	(=B17)
Maximum	3,120.00	(=B17*1.25)



Assumption: InstCtl1 Insurance **Cell: H231**

Lognormal distribution with parameters:

50%	84,137	(=J231)
95%	168,275	(=J231*2)



Assumption: InstCtl1 License & Fees **Cell: H232**

Uniform distribution with parameters:

Minimum	158,229	(=H232)
Maximum	316,457	(=H232*2)

Assumption: Ph 1 PCO Manager Hours **Cell: B25**

Lognormal distribution with parameters:

50%	1,040.00	(=B25)
95%	1,300.00	(=B25*1.25)

Assumption: Ph1 PCO Fertilize Cover (sy) **Cell: B215**

Lognormal distribution with parameters:

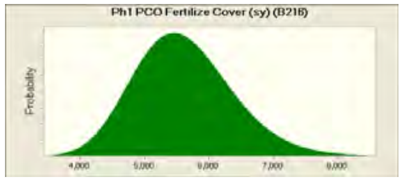
50%	55,660.00	(=K215)
95%	69,575.00	(=K215*1.25)

Assumption: Ph1 PCO Fertilize Cover (sy) (B216) **Cell: B216**

Lognormal distribution with parameters:

50%	5,556	(=K216)
95%	6,944	(=K216*1.25)

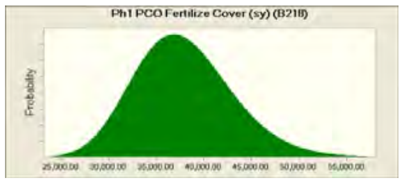
Assumption: Ph1 PCO Fertilize Cover (sy) (B216) (cont'd) **Cell: B216**



Assumption: Ph1 PCO Fertilize Cover (sy) (B218) **Cell: B218**

Lognormal distribution with parameters:

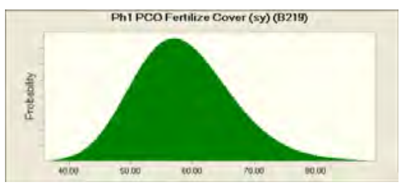
50%	37,570.50	(=K218)
95%	46,963.13	(=K218*1.25)



Assumption: Ph1 PCO Fertilize Cover (sy) (B219) **Cell: B219**

Lognormal distribution with parameters:

50%	57.98	(=K219)
95%	72.47	(=K219*1.25)



Assumption: Ph1 PCO Fertilize Cover (sy) (B220) **Cell: B220**

Lognormal distribution with parameters:

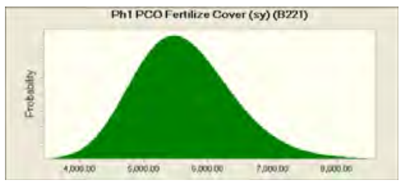
50%	500.94	(=K220)
95%	626.18	(=K220*1.25)

Assumption: Ph1 PCO Fertilize Cover (sy) (B220) (cont'd) **Cell: B220**

Assumption: Ph1 PCO Fertilize Cover (sy) (B221) **Cell: B221**

Lognormal distribution with parameters:

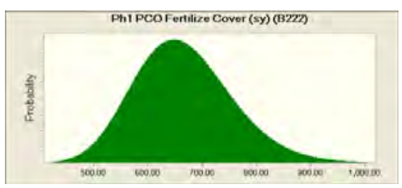
50%	5,566.00	(=K221)
95%	6,957.50	(=K221*1.25)



Assumption: Ph1 PCO Fertilize Cover (sy) (B222) **Cell: B222**

Lognormal distribution with parameters:

50%	660.00	(=K222)
95%	825.00	(=K222*1.25)

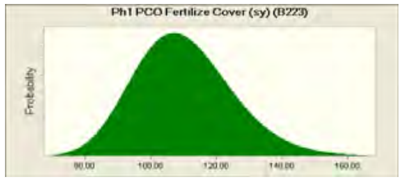


Assumption: Ph1 PCO Fertilize Cover (sy) (B223) **Cell: B223**

Lognormal distribution with parameters:

50%	109.00	(=K223)
95%	136.25	(=K223*1.25)

Assumption: Ph1 PCO Fertilize Cover (sy) (B223) (cont'd) **Cell: B223**

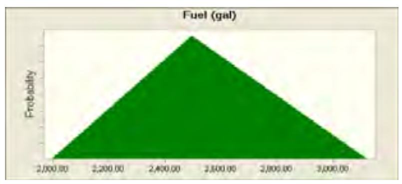


Worksheet: [Appendix B 080618.xls]InstCtl2

Assumption: Fuel (gal) **Cell: B17**

Triangular distribution with parameters:

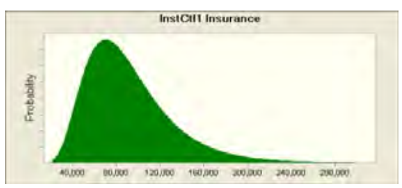
Minimum	1,996.80	(=B17/1.25)
Likeliest	2,496.00	(=B17)
Maximum	3,120.00	(=B17*1.25)



Assumption: InstCtl1 Insurance **Cell: H231**

Lognormal distribution with parameters:

50%	84,137	(=J231)
95%	168,275	(=J231*2)

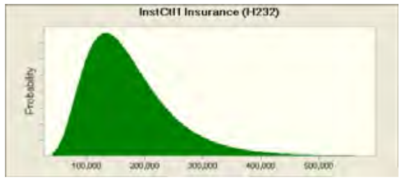


Assumption: InstCtl1 Insurance (H232) **Cell: H232**

Lognormal distribution with parameters:

50%	158,229	(=J232)
95%	316,457	(=J232*2)

Assumption: InstCtl1 Insurance (H232) (cont'd) **Cell: H232**



Assumption: Ph 1 PCO Manager Hours **Cell: B25**

Lognormal distribution with parameters:

50%	520.00	(=B25)
95%	650.00	(=B25*1.25)

Assumption: Ph1 PCO Fertilize Cover (sy) **Cell: B215**

Lognormal distribution with parameters:

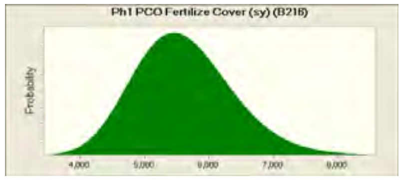
50%	55,660.00	(=K215)
95%	69,575.00	(=K215*1.25)

Assumption: Ph1 PCO Fertilize Cover (sy) (B216) **Cell: B216**

Lognormal distribution with parameters:

50%	5,556	(=K216)
95%	6,944	(=K216*1.25)

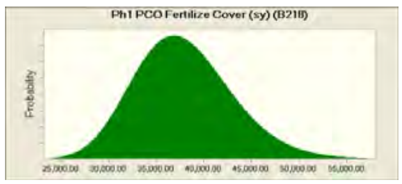
Assumption: Ph1 PCO Fertilize Cover (sy) (B216) (cont'd) **Cell: B216**



Assumption: Ph1 PCO Fertilize Cover (sy) (B218) **Cell: B218**

Lognormal distribution with parameters:

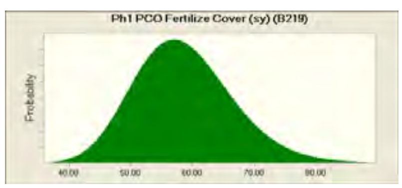
50%	37,570.50	(=K218)
95%	46,963.13	(=K218*1.25)



Assumption: Ph1 PCO Fertilize Cover (sy) (B219) **Cell: B219**

Lognormal distribution with parameters:

50%	57.98	(=K219)
95%	72.47	(=K219*1.25)



Assumption: Ph1 PCO Fertilize Cover (sy) (B220) **Cell: B220**

Lognormal distribution with parameters:

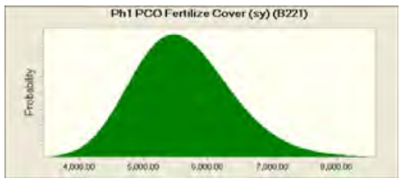
50%	500.94	(=K220)
95%	626.18	(=K220*1.25)

Assumption: Ph1 PCO Fertilize Cover (sy) (B220) (cont'd) **Cell: B220**

Assumption: Ph1 PCO Fertilize Cover (sy) (B221) **Cell: B221**

Lognormal distribution with parameters:

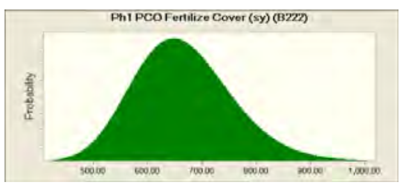
50%	5,566.00	(=K221)
95%	6,957.50	(=K221*1.25)



Assumption: Ph1 PCO Fertilize Cover (sy) (B222) **Cell: B222**

Lognormal distribution with parameters:

50%	660.00	(=K222)
95%	825.00	(=K222*1.25)

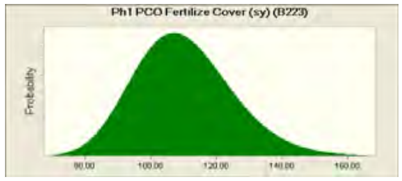


Assumption: Ph1 PCO Fertilize Cover (sy) (B223) **Cell: B223**

Lognormal distribution with parameters:

50%	109.00	(=K223)
95%	136.25	(=K223*1.25)

Assumption: Ph1 PCO Fertilize Cover (sy) (B223) (cont'd) **Cell: B223**

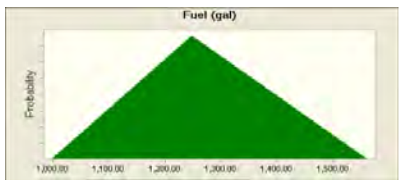


Worksheet: [Appendix B 080618.xls]InstCtl34

Assumption: Fuel (gal) **Cell: B17**

Triangular distribution with parameters:

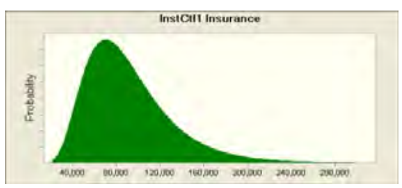
Minimum	998.40	(=B17/1.25)
Likeliest	1,248.00	(=B17)
Maximum	1,560.00	(=B17*1.25)



Assumption: InstCtl1 Insurance **Cell: H231**

Lognormal distribution with parameters:

50%	84,137	(=J231)
95%	168,275	(=J231*2)

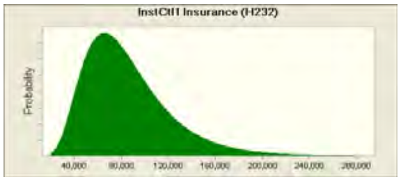


Assumption: InstCtl1 Insurance (H232) **Cell: H232**

Lognormal distribution with parameters:

50%	78,303	(=J232)
95%	156,607	(=J232*2)

Assumption: InstCtl1 Insurance (H232) (cont'd) **Cell: H232**



Assumption: Ph 1 PCO Manager Hours **Cell: B25**

Lognormal distribution with parameters:

50%	260.00	(=B25)
95%	325.00	(=B25*1.25)

Assumption: Ph1 PCO Fertilize Cover (sy) **Cell: B215**

Lognormal distribution with parameters:

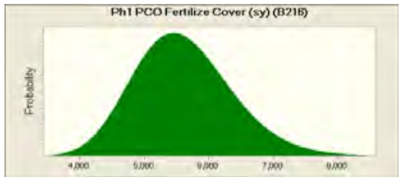
50%	55,660.00	(=K215)
95%	69,575.00	(=K215*1.25)

Assumption: Ph1 PCO Fertilize Cover (sy) (B216) **Cell: B216**

Lognormal distribution with parameters:

50%	5,556	(=K216)
95%	6,944	(=K216*1.25)

Assumption: Ph1 PCO Fertilize Cover (sy) (B216) (cont'd) **Cell: B216**



Assumption: Ph1 PCO Fertilize Cover (sy) (B218) **Cell: B218**

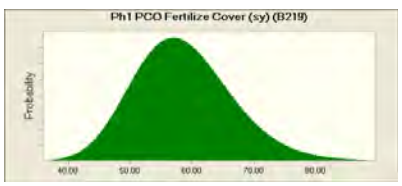
Lognormal distribution with parameters:

50%	37,570.50	(=K218)
95%	46,963.13	(=K218*1.25)

Assumption: Ph1 PCO Fertilize Cover (sy) (B219) **Cell: B219**

Lognormal distribution with parameters:

50%	57.98	(=K219)
95%	72.47	(=K219*1.25)



Assumption: Ph1 PCO Fertilize Cover (sy) (B220) **Cell: B220**

Lognormal distribution with parameters:

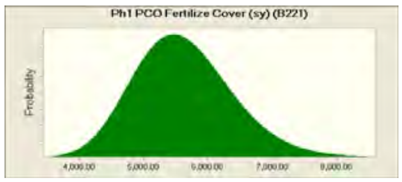
50%	500.94	(=K220)
95%	626.18	(=K220*1.25)

Assumption: Ph1 PCO Fertilize Cover (sy) (B220) (cont'd) **Cell: B220**

Assumption: Ph1 PCO Fertilize Cover (sy) (B221) **Cell: B221**

Lognormal distribution with parameters:

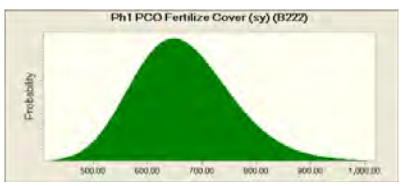
50%	5,566.00	(=K221)
95%	6,957.50	(=K221*1.25)



Assumption: Ph1 PCO Fertilize Cover (sy) (B222) **Cell: B222**

Lognormal distribution with parameters:

50%	660.00	(=K222)
95%	825.00	(=K222*1.25)

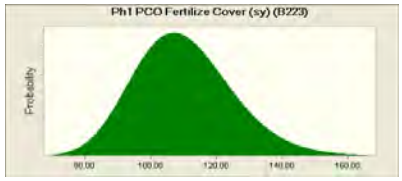


Assumption: Ph1 PCO Fertilize Cover (sy) (B223) **Cell: B223**

Lognormal distribution with parameters:

50%	109.00	(=K223)
95%	136.25	(=K223*1.25)

Assumption: Ph1 PCO Fertilize Cover (sy) (B223) (cont'd) **Cell: B223**

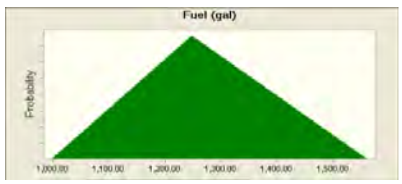


Worksheet: [Appendix B 080618.xls]Ph1 IC

Assumption: Fuel (gal) **Cell: B17**

Triangular distribution with parameters:

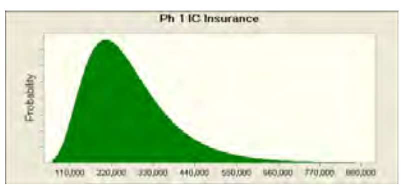
Minimum	998.40	(=B17/1.25)
Likeliest	1,248.00	(=B17)
Maximum	1,560.00	(=B17*1.25)



Assumption: Ph 1 IC Insurance **Cell: H230**

Lognormal distribution with parameters:

50%	243,435	(=J230)
95%	486,870	(=J230*2)



Assumption: Ph 1 PCO Manager Hours **Cell: B25**

Lognormal distribution with parameters:

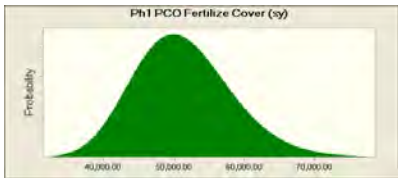
50%	520.00	(=B25)
95%	650.00	(=B25*1.25)

Assumption: Ph 1 PCO Manager Hours (cont'd) **Cell: B25**

Assumption: Ph1 PCO Fertilize Cover (sy) **Cell: B214**

Lognormal distribution with parameters:

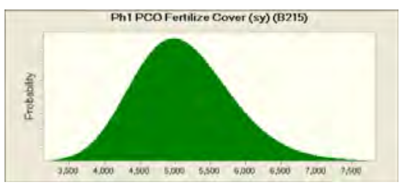
50%	50,820.00	(=K214)
95%	63,525.00	(=K214*1.25)



Assumption: Ph1 PCO Fertilize Cover (sy) (B215) **Cell: B215**

Lognormal distribution with parameters:

50%	5,072	(=K215)
95%	6,341	(=K215*1.25)



Assumption: Ph1 PCO Fertilize Cover (sy) (B217) **Cell: B217**

Lognormal distribution with parameters:

50%	34,303.50	(=K217)
95%	42,879.38	(=K217*1.25)

Assumption: Ph1 PCO Fertilize Cover (sy) (B217) (cont'd) **Cell: B217**

Assumption: Ph1 PCO Fertilize Cover (sy) (B218) **Cell: B218**

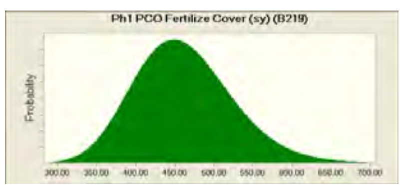
Lognormal distribution with parameters:

50%	52.94	(=K218)
95%	66.17	(=K218*1.25)

Assumption: Ph1 PCO Fertilize Cover (sy) (B219) **Cell: B219**

Lognormal distribution with parameters:

50%	457.38	(=K219)
95%	571.73	(=K219*1.25)



Assumption: Ph1 PCO Fertilize Cover (sy) (B220) **Cell: B220**

Lognormal distribution with parameters:

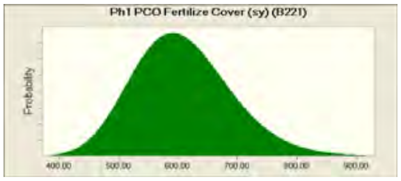
50%	5,082.00	(=K220)
95%	6,352.50	(=K220*1.25)

Assumption: Ph1 PCO Fertilize Cover (sy) (B220) (cont'd) **Cell: B220**

Assumption: Ph1 PCO Fertilize Cover (sy) (B221) **Cell: B221**

Lognormal distribution with parameters:

50%	602.61	(=K221)
95%	753.26	(=K221*1.25)



Assumption: Ph1 PCO Fertilize Cover (sy) (B222) **Cell: B222**

Lognormal distribution with parameters:

50%	99.52	(=K222)
95%	124.40	(=K222*1.25)

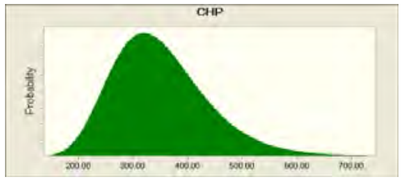
Worksheet: [Appendix B 080618.xls]Ph1 PCO

Assumption: CHP **Cell: B239**

Lognormal distribution with parameters:

50%	340.00	(=J239)
95%	510.00	(=K239)

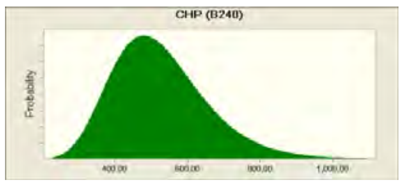
Assumption: CHP (cont'd) **Cell: B239**



Assumption: CHP (B240) **Cell: B240**

Lognormal distribution with parameters:

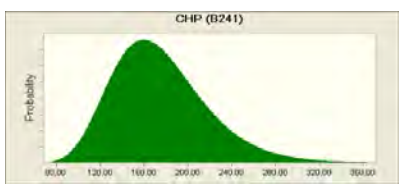
50%	510.00	(=J240)
95%	765.00	(=K240)



Assumption: CHP (B241) **Cell: B241**

Lognormal distribution with parameters:

50%	170.00	(=J241)
95%	255.00	(=K241)



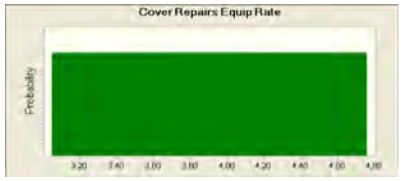
Assumption: Cover Repairs Equip Rate **Cell: F220**

Robert Baird:
3.806

Uniform distribution with parameters:

Minimum	3.04	(=F220/1.25)
Maximum	4.76	(=F220*1.25)

Assumption: Cover Repairs Equip Rate (cont'd) **Cell: F220**

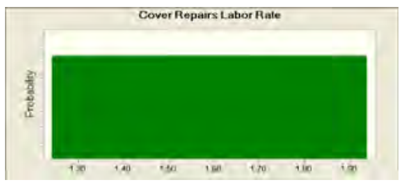


Assumption: Cover Repairs Labor Rate **Cell: E220**

Robert Baird:
1.55

Uniform distribution with parameters:

Minimum	1.24	(=E220/1.25)
Maximum	1.94	(=E220*1.25)

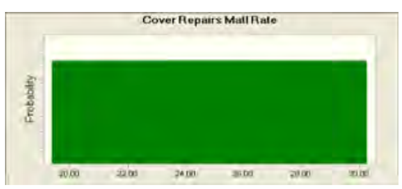


Assumption: Cover Repairs Matl Rate **Cell: D220**

Robert Baird:
=22*1.1

Uniform distribution with parameters:

Minimum	19.36	(=D220/1.25)
Maximum	30.25	(=D220*1.25)

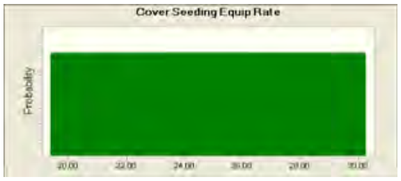


Assumption: Cover Seeding Equip Rate **Cell: F219**

Uniform distribution with parameters:

Minimum	19.36	(=F219/1.25)
Maximum	30.25	(=F219*1.25)

Assumption: Cover Seeding Equip Rate (cont'd) **Cell: F219**

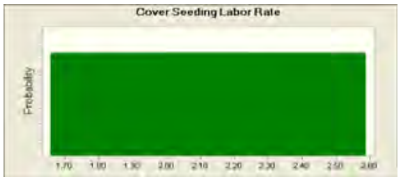


Assumption: Cover Seeding Labor Rate **Cell: E219**

Robert Baird:
=47.05*0.044

Uniform distribution with parameters:

Minimum	1.66	(=E219/1.25)
Maximum	2.59	(=E219*1.25)

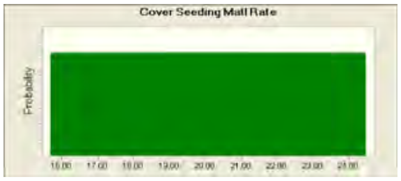


Assumption: Cover Seeding Matl Rate **Cell: D219**

Robert Baird:
=17.8*1.1

Uniform distribution with parameters:

Minimum	15.66	(=D219/1.25)
Maximum	24.48	(=D219*1.25)

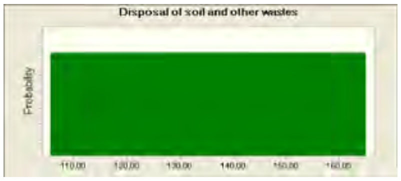


Assumption: Disposal of soil and other wastes **Cell: G225**

Uniform distribution with parameters:

Minimum	105.60	(=G225/1.25)
Maximum	165.00	(=G225*1.25)

Assumption: Disposal of soil and other wastes (cont'd) **Cell: G225**



Assumption: Fertilize Cover Equip Rate **Cell: F214**

Robert Baird:
=0.06*1.1

Uniform distribution with parameters:

Minimum	0.05	(=F214/1.25)
Maximum	0.08	(=F214*1.25)

Assumption: Fertilize Cover Labor Rate **Cell: E214**

Robert Baird:
=51.5*0.003

Uniform distribution with parameters:

Minimum	0.12	(=E214/1.25)
Maximum	0.19	(=E214*1.25)

Assumption: Fertilize Cover Matl Rate **Cell: D214**

Robert Baird:
=0.16*1.1

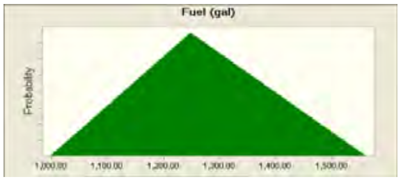
Uniform distribution with parameters:

Minimum	0.14	(=D214/1.25)
Maximum	0.22	(=D214*1.25)

Assumption: Fuel (gal) **Cell: B17**

Triangular distribution with parameters:

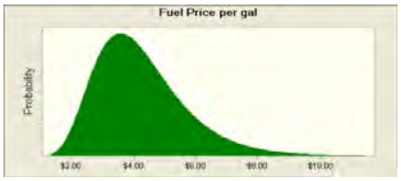
Minimum	998.40	(=B17/1.25)
Likeliest	1,248.00	(=B17)
Maximum	1,560.00	(=B17*1.25)



Assumption: Fuel Price per gal **Cell: D17**

Lognormal distribution with parameters:

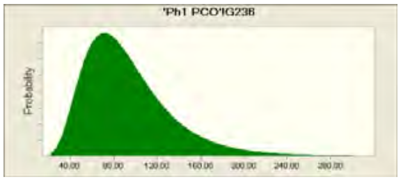
50%	$4.00	(=J17)
95%	$7.00	(=K17)



Assumption: G236 **Cell: G236**

Lognormal distribution with parameters:

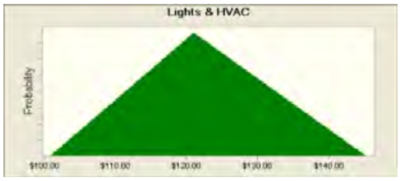
50%	85.00	(=J236)
95%	170.00	(=K236)



Assumption: Lights & HVAC **Cell: G10**

Triangular distribution with parameters:

Minimum	$100.83	(=G10/1.2)
Likeliest	$121.00	(=G10)
Maximum	$145.20	(=G10*1.2)

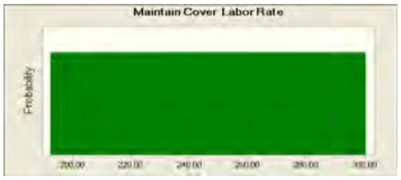


Assumption: Maintain Cover Labor Rate **Cell: E213**

Robert Baird:
=60.1*4

Uniform distribution with parameters:

Minimum	192.32	(=E213/1.25)
Maximum	300.50	(=E213*1.25)

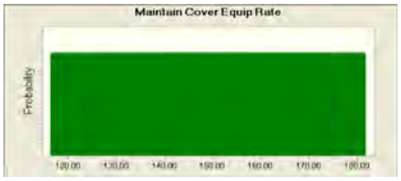


Assumption: Maintain Cover Equip Rate **Cell: F213**

Robert Baird:
=36.36*4

Uniform distribution with parameters:

Minimum	116.35	(=F213/1.25)
Maximum	181.80	(=F213*1.25)

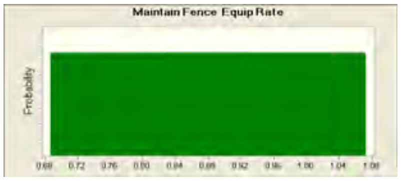


Assumption: Maintain Fence Equip Rate **Cell: F221**

Robert Baird:
=0.78*1.1

Uniform distribution with parameters:

Minimum	0.69	(=F221/1.25)
Maximum	1.07	(=F221*1.25)

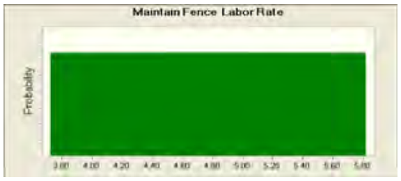


Assumption: Maintain Fence Labor Rate **Cell: E221**

Robert Baird:
=46.53*0.1

Uniform distribution with parameters:

Minimum	3.72	(=E221/1.25)
Maximum	5.82	(=E221*1.25)



Assumption: Maintain Fence Matl Rate **Cell: D221**

Robert Baird:
=14.6*1.1

Uniform distribution with parameters:

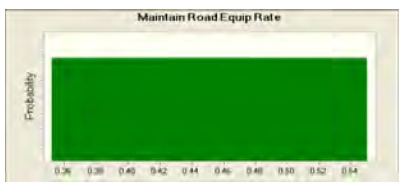
Minimum	12.85	(=D221/1.25)
Maximum	20.08	(=D221*1.25)

Assumption: Maintain Road Equip Rate **Cell: F215**

Robert Baird:
=0.4*1.1

Uniform distribution with parameters:

Minimum	0.35	(=F215/1.25)
Maximum	0.55	(=F215*1.25)

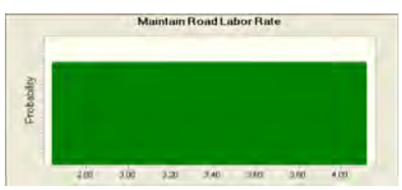


Assumption: Maintain Road Labor Rate **Cell: E215**

Robert Baird:
=49.23*0.067

Uniform distribution with parameters:

Minimum	2.64	(=E215/1.25)
Maximum	4.12	(=E215*1.25)

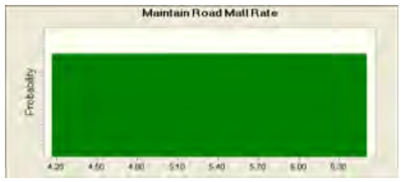


Assumption: Maintain Road Matl Rate **Cell: D215**

Robert Baird:
=4.73*1.1

Uniform distribution with parameters:

Minimum	4.16	(=D215/1.25)
Maximum	6.50	(=D215*1.25)

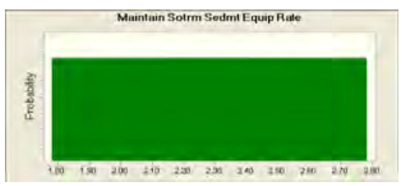


Assumption: Maintain Sotrm Sedmt Equip Rate **Cell: F218**

Robert Baird:
=1.76*1.1*1.15

Uniform distribution with parameters:

Minimum	1.78	(=F218/1.25)
Maximum	2.78	(=F218*1.25)

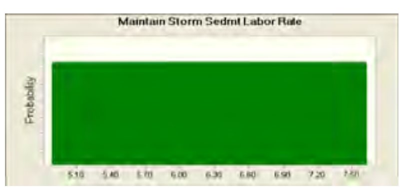


Assumption: Maintain Storm Sedmt Labor Rate **Cell: E218**

Robert Baird:
=53.58*0.099*1.15

Uniform distribution with parameters:

Minimum	4.88	(=E218/1.25)
Maximum	7.63	(=E218*1.25)

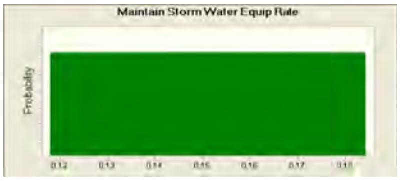


Assumption: Maintain Storm Water Equip Rate **Cell: F217**

Robert Baird:
=134*1.1/1000

Uniform distribution with parameters:

Minimum	0.12	(=F217/1.25)
Maximum	0.18	(=F217*1.25)



Assumption: Maintain Storm Water Labor Rate **Cell: E217**

Robert Baird:
=53.58*4/1000

Uniform distribution with parameters:

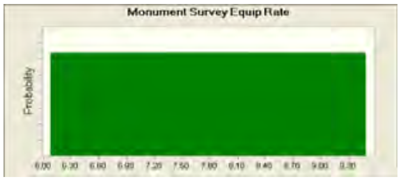
Minimum	0.17	(=E217/1.25)
Maximum	0.27	(=E217*1.25)

Assumption: Monument Survey Equip Rate **Cell: F210**

Robert Baird:
=6.9*1.1

Uniform distribution with parameters:

Minimum	6.07	(=F210/1.25)
Maximum	9.49	(=F210*1.25)

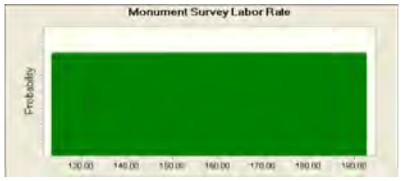


Assumption: Monument Survey Labor Rate **Cell: E210**

Robert Baird:
=67.27*2.4

Uniform distribution with parameters:

Minimum	123.40	(=E210/1.25)
Maximum	192.81	(=E210*1.25)



Assumption: Muni Waste Mgmt **Cell: H12**

Triangular distribution with parameters:

Minimum	$83.33	(=H12/1.2)
Likeliest	$100.00	(=H12)
Maximum	$120.00	(=H12*1.2)

Assumption: Office Equipment **Cell: G6**

Triangular distribution with parameters:

Minimum	$137.50	(=G6/1.2)
Likeliest	$165.00	(=G6)
Maximum	$198.00	(=G6*1.2)

Assumption: Office Supplies **Cell: G7**

Triangular distribution with parameters:

Minimum	$87.50	(=G7/1.2)
Likeliest	$105.00	(=G7)
Maximum	$126.00	(=G7*1.2)

Assumption: Office Trailer **Cell: G5**

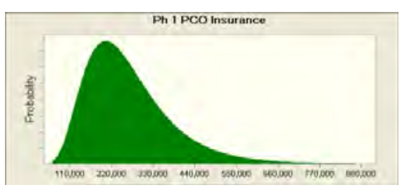
Triangular distribution with parameters:

Minimum	$341.67	(=G5/1.2)
Likeliest	$410.00	(=G5)
Maximum	$492.00	(=G5*1.2)

Assumption: Ph 1 PCO Insurance **Cell: H230**

Lognormal distribution with parameters:

50%	243,435	(=J230)
95%	486,870	(=J230*2)



Assumption: Ph 1 PCO Manager Hours **Cell: B25**

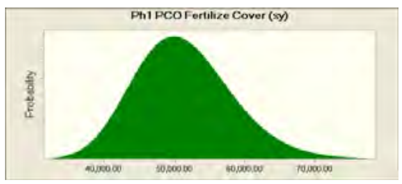
Lognormal distribution with parameters:

50%	520.00	(=B25)
95%	650.00	(=B25*1.25)

Assumption: Ph1 PCO Fertilize Cover (sy) **Cell: B214**

Lognormal distribution with parameters:

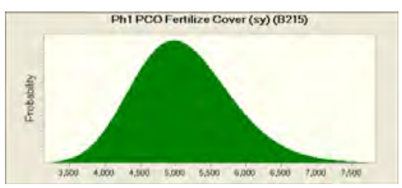
50%	50,820.00	(=K214)
95%	63,525.00	(=K214*1.25)



Assumption: Ph1 PCO Fertilize Cover (sy) (B215) **Cell: B215**

Lognormal distribution with parameters:

50%	5,072	(=K215)
95%	6,341	(=K215*1.25)



Assumption: Ph1 PCO Fertilize Cover (sy) (B217) **Cell: B217**

Lognormal distribution with parameters:

50%	34,303.50	(=K217)
95%	42,879.38	(=K217*1.25)

Assumption: Ph1 PCO Fertilize Cover (sy) (B217) (cont'd) **Cell: B217**

Assumption: Ph1 PCO Fertilize Cover (sy) (B218) **Cell: B218**

Lognormal distribution with parameters:

50%	52.94	(=K218)
95%	66.17	(=K218*1.25)

Assumption: Ph1 PCO Fertilize Cover (sy) (B219) **Cell: B219**

Lognormal distribution with parameters:

50%	457.38	(=K219)
95%	571.73	(=K219*1.25)

Assumption: Ph1 PCO Fertilize Cover (sy) (B220) **Cell: B220**

Lognormal distribution with parameters:

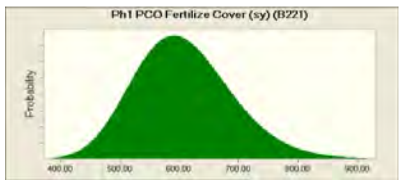
50%	5,082.00	(=K220)
95%	6,352.50	(=K220*1.25)

Assumption: Ph1 PCO Fertilize Cover (sy) (B220) (cont'd) **Cell: B220**

Assumption: Ph1 PCO Fertilize Cover (sy) (B221) **Cell: B221**

Lognormal distribution with parameters:

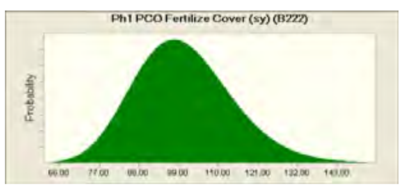
50%	602.61	(=K221)
95%	753.26	(=K221*1.25)



Assumption: Ph1 PCO Fertilize Cover (sy) (B222) **Cell: B222**

Lognormal distribution with parameters:

50%	99.52	(=K222)
95%	124.40	(=K222*1.25)



Assumption: Pickup truck **Cell: F15**

Uniform distribution with parameters:

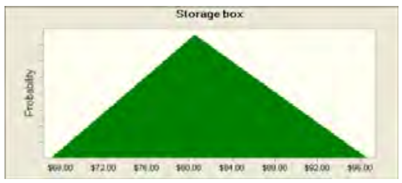
Minimum	$960.00	(=F15/1.25)
Maximum	$1,500.00	(=F15*1.25)

Assumption: Pickup truck (cont'd) **Cell: F15**

Assumption: Storage box **Cell: G8**

Triangular distribution with parameters:

Minimum	$67.08	(=G8/1.2)
Likeliest	$80.50	(=G8)
Maximum	$96.60	(=G8*1.2)



Assumption: Telephone **Cell: G9**

Triangular distribution with parameters:

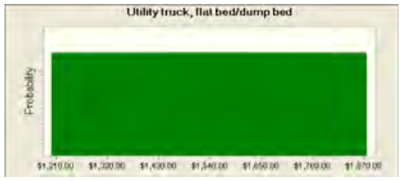
Minimum	$192.50	(=G9/1.2)
Likeliest	$231.00	(=G9)
Maximum	$277.20	(=G9*1.2)

Assumption: Utility truck, flat bed/dump bed **Cell: F16**

Uniform distribution with parameters:

Minimum	$1,200.00	(=F16/1.25)
Maximum	$1,875.00	(=F16*1.25)

Assumption: Utility truck, flat bed/dump bed (cont'd) **Cell: F16**



Assumption: Water/Sewer **Cell: G11**

Triangular distribution with parameters:

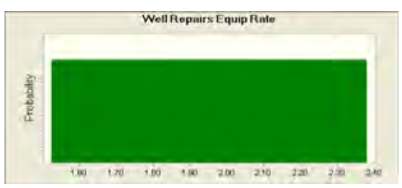
Minimum	$111.74	(=G11/1.2)
Likeliest	$134.08	(=G11)
Maximum	$160.90	(=G11*1.2)

Assumption: Well Repairs Equip Rate **Cell: F222**

Robert Baird:
=1.73*1.1

Uniform distribution with parameters:

Minimum	1.52	(=F222/1.25)
Maximum	2.38	(=F222*1.25)

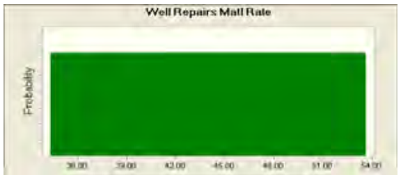


Assumption: Well Repairs Matl Rate **Cell: D222**

Robert Baird:
=39*1.1

Uniform distribution with parameters:

Minimum	34.32	(=D222/1.25)
Maximum	53.63	(=D222*1.25)

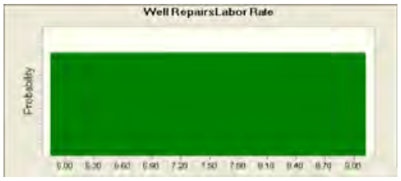


Assumption: Well RepairsLabor Rate **Cell: E222**

Robert Baird:
=50.35*0.145

Uniform distribution with parameters:

Minimum	5.84	(=E222/1.25)
Maximum	9.13	(=E222*1.25)

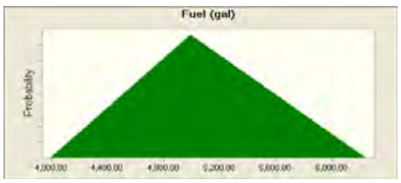


Worksheet: [Appendix B 080618.xls]Ph2 PCO

Assumption: Fuel (gal) **Cell: B17**

Triangular distribution with parameters:

Minimum	3,993.60	(=B17/1.25)
Likeliest	4,992.00	(=B17)
Maximum	6,240.00	(=B17*1.25)



Assumption: Ph 1 PCO Manager Hours **Cell: B25**

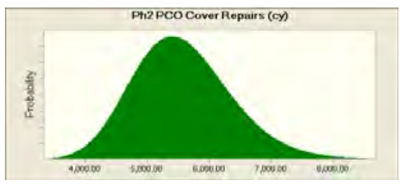
Lognormal distribution with parameters:

50%	2,080.00	(=B25)
95%	2,600.00	(=B25*1.25)

Assumption: Ph2 PCO Cover Repairs (cy) **Cell: B220**

Lognormal distribution with parameters:

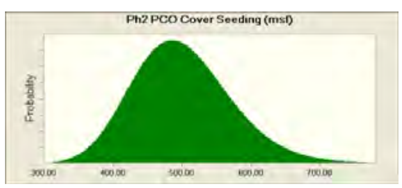
Mean	5,566.00	(=K220)
95%	6,957.50	(=K220*1.25)



Assumption: Ph2 PCO Cover Seeding (msf) **Cell: B219**

Lognormal distribution with parameters:

Mean	500.94	(=K219)
95%	626.18	(=K219*1.25)

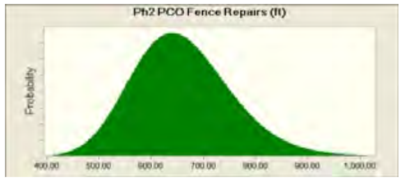


Assumption: Ph2 PCO Fence Repairs (ft) **Cell: B221**

Lognormal distribution with parameters:

Mean	660.00	(=K221)
95%	825.00	(=K221*1.25)

Assumption: Ph2 PCO Fence Repairs (ft) (cont'd) **Cell: B221**



Assumption: Ph2 PCO Fertilize Cover (sy) **Cell: B214**

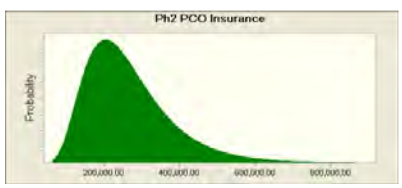
Lognormal distribution with parameters:

Mean	55,660.00	(=K214)
95%	69,575.00	(=K214*1.25)

Assumption: Ph2 PCO Insurance **Cell: H230**

Lognormal distribution with parameters:

50%	243,435.10	(=J230)
95%	486,870.20	(=J230*2)

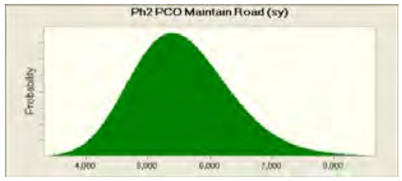


Assumption: Ph2 PCO Maintain Road (sy) **Cell: B215**

Lognormal distribution with parameters:

Mean	5,556	(=K215)
95%	6,944	(=K215*1.25)

Assumption: Ph2 PCO Maintain Road (sy) (cont'd) **Cell: B215**



Assumption: Ph2 PCO Maintain SW Sedmt (cy) **Cell: B218**

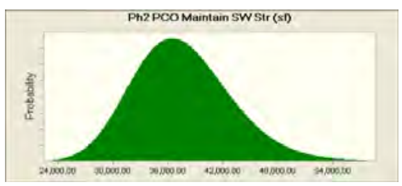
Lognormal distribution with parameters:

Mean	57.98	(=K218)
95%	72.47	(=K218*1.25)

Assumption: Ph2 PCO Maintain SW Str (sf) **Cell: B217**

Lognormal distribution with parameters:

Mean	37,570.50	(=K217)
95%	46,963.13	(=K217*1.25)

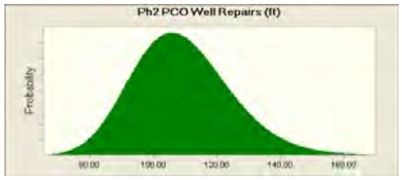


Assumption: Ph2 PCO Well Repairs (ft) **Cell: B222**

Lognormal distribution with parameters:

Mean	109.00	(=K222)
95%	136.25	(=K222*1.25)

Assumption: Ph2 PCO Well Repairs (ft) (cont'd) **Cell: B222**

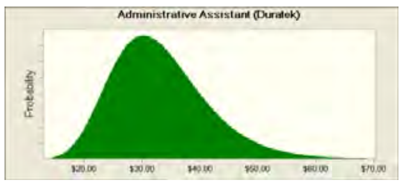


Worksheet: [Appendix B 080618.xls]Wage Table

Assumption: Administrative Assistant (Duratek) **Cell: F39**

Lognormal distribution with parameters:

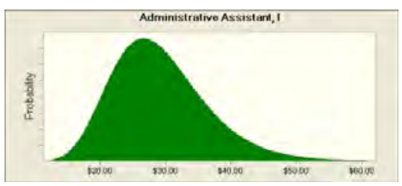
50%	$32.13	(=I39)
95%	$48.20	(=J39)



Assumption: Administrative Assistant, I **Cell: F14**

Lognormal distribution with parameters:

50%	$28.35	(=I14)
95%	$42.53	(=J14)

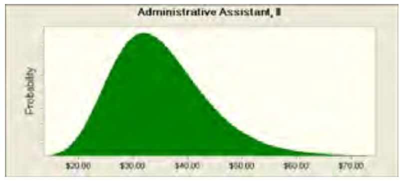


Assumption: Administrative Assistant, II **Cell: F15**

Lognormal distribution with parameters:

50%	$34.02	(=I15)
95%	$51.03	(=J15)

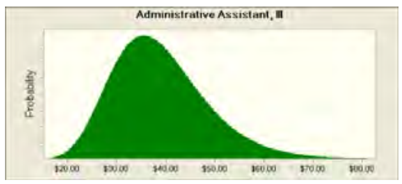
Assumption: Administrative Assistant, II (cont'd) **Cell: F15**



Assumption: Administrative Assistant, III **Cell: F16**

Lognormal distribution with parameters:

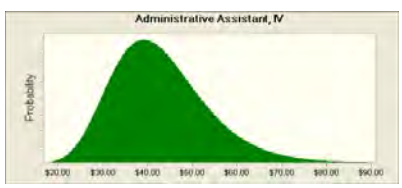
50%	$37.80	(=I16)
95%	$56.70	(=J16)



Assumption: Administrative Assistant, IV **Cell: F17**

Lognormal distribution with parameters:

50%	$41.58	(=I17)
95%	$62.37	(=J17)



Assumption: Architect **Cell: F18**

Lognormal distribution with parameters:

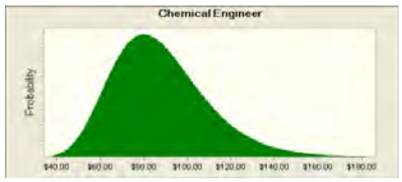
50%	$98.28	(=I18)
95%	$147.42	(=J18)

Assumption: Architect (cont'd) **Cell: F18**

Assumption: Chemical Engineer **Cell: F19**

Lognormal distribution with parameters:

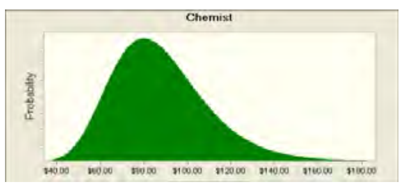
50%	$85.05	(=I19)
95%	$127.58	(=J19)



Assumption: Chemist **Cell: F22**

Lognormal distribution with parameters:

50%	$85.05	(=I22)
95%	$127.58	(=J22)

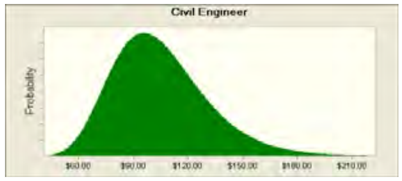


Assumption: Civil Engineer **Cell: F20**

Lognormal distribution with parameters:

50%	$101.80	(=I20)
95%	$152.69	(=J20)

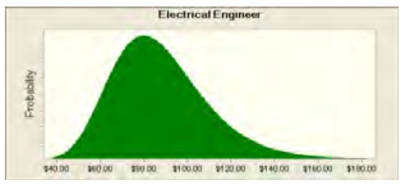
Assumption: Civil Engineer (cont'd) **Cell: F20**



Assumption: Electrical Engineer **Cell: F25**

Lognormal distribution with parameters:

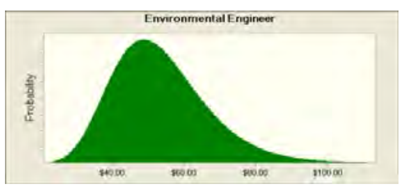
50%	$85.05	(=I25)
95%	$127.58	(=J25)



Assumption: Environmental Engineer **Cell: F31**

Lognormal distribution with parameters:

50%	$51.79	(=I31)
95%	$77.68	(=J31)

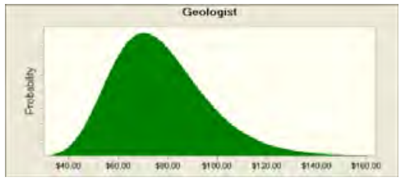


Assumption: Geologist **Cell: F21**

Lognormal distribution with parameters:

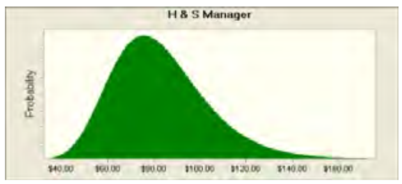
50%	$74.77	(=I21)
95%	$112.15	(=J21)

Assumption: Geologist (cont'd) **Cell: F21**



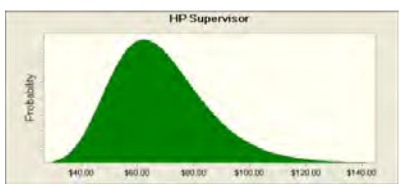
Assumption: H & S Manager **Cell: F26**

Lognormal distribution with parameters:		
50%	$80.44	(=I26)
95%	$120.66	(=J26)



Assumption: HP Supervisor **Cell: F35**

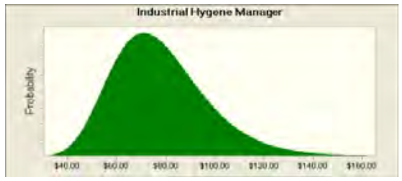
Lognormal distribution with parameters:		
50%	$66.15	(=I35)
95%	$99.23	(=J35)



Assumption: Industrial Hygene Manager **Cell: F28**

Lognormal distribution with parameters:		
50%	$75.60	(=I28)
95%	$113.40	(=J28)

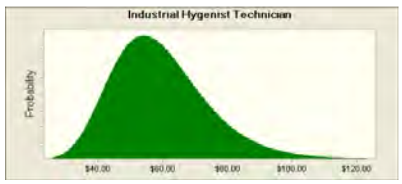
Assumption: Industrial Hygene Manager (cont'd) **Cell: F28**



Assumption: Industrial Hygenist Technician **Cell: F29**

Lognormal distribution with parameters:

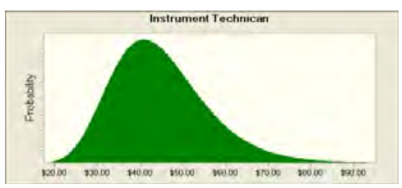
50%	$57.51	(=I29)
95%	$86.27	(=J29)



Assumption: Instrument Technican **Cell: F44**

Lognormal distribution with parameters:

50%	$43.47	(=I44)
95%	$65.21	(=J44)

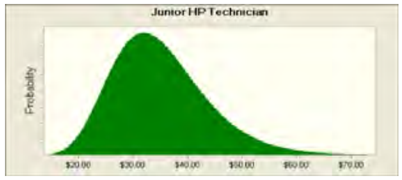


Assumption: Junior HP Technician **Cell: F41**

Lognormal distribution with parameters:

50%	$34.02	(=I41)
95%	$51.03	(=J41)

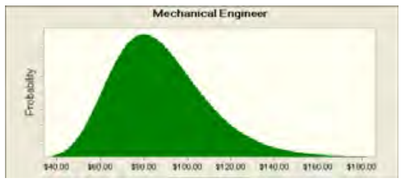
Assumption: Junior HP Technician (cont'd) **Cell: F41**



Assumption: Mechanical Engineer **Cell: F24**

Lognormal distribution with parameters:

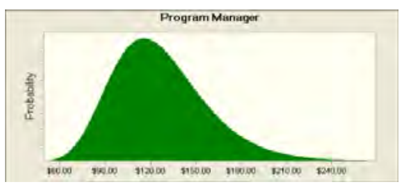
50%	$85.05	(=I24)
95%	$127.58	(=J24)



Assumption: Program Manager **Cell: F11**

Lognormal distribution with parameters:

50%	$122.85	(=I11)
95%	$184.28	(=J11)



Assumption: Project Director **Cell: F37**

Lognormal distribution with parameters:

50%	$92.61	(=I37)
95%	$138.92	(=J37)

Assumption: Project Director (cont'd) **Cell: F37**

Assumption: Project Director **Cell: F42**

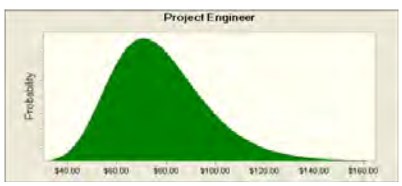
Lognormal distribution with parameters:

50%	$92.61	(=I42)
95%	$138.92	(=J42)

Assumption: Project Engineer **Cell: F13**

Lognormal distribution with parameters:

50%	$75.34	(=I13)
95%	$113.00	(=J13)



Assumption: Project Manager **Cell: F12**

Lognormal distribution with parameters:

50%	$109.05	(=I12)
95%	$163.58	(=J12)

Assumption: Project Manager (cont'd) **Cell: F12**

Assumption: QA Manager **Cell: F33**

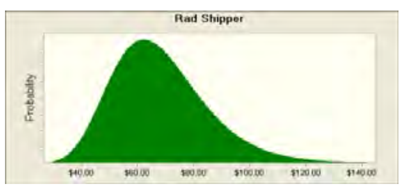
Lognormal distribution with parameters:

50%	$90.72	(=I33)
95%	$136.08	(=J33)

Assumption: Rad Shipper **Cell: F36**

Lognormal distribution with parameters:

50%	$66.15	(=I36)
95%	$99.23	(=J36)



Assumption: Radiological Manager **Cell: F34**

Lognormal distribution with parameters:

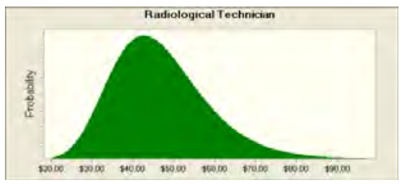
50%	$85.05	(=I34)
95%	$127.58	(=J34)

Assumption: Radiological Manager (cont'd) **Cell: F34**

Assumption: Radiological Technician **Cell: F32**

Lognormal distribution with parameters:

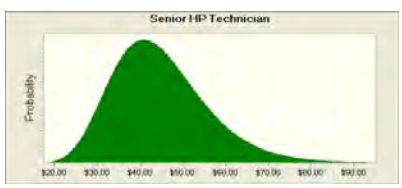
50%	$45.36	(=I32)
95%	$68.04	(=J32)



Assumption: Senior HP Technician **Cell: F40**

Lognormal distribution with parameters:

50%	$43.47	(=I40)
95%	$65.21	(=J40)



Assumption: Senior Rad Manager **Cell: F43**

Lognormal distribution with parameters:

50%	$90.72	(=I43)
95%	$136.08	(=J43)

Assumption: Senior Rad Manager (cont'd) **Cell: F43**

Assumption: Senior Rad Manager **Cell: F38**

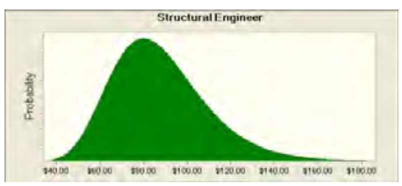
Lognormal distribution with parameters:

50%	$90.72	(=I38)
95%	$136.08	(=J38)

Assumption: Structural Engineer **Cell: F23**

Lognormal distribution with parameters:

50%	$85.05	(=I23)
95%	$127.58	(=J23)

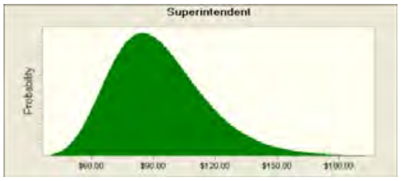


Assumption: Superintendent **Cell: F30**

Lognormal distribution with parameters:

50%	$90.10	(=I30)
95%	$135.14	(=J30)

Assumption: Superintendent (cont'd) **Cell: F30**



Assumption: Trainer **Cell: F45**

Lognormal distribution with parameters:

50%	$52.92	(=I45)
95%	$79.38	(=J45)

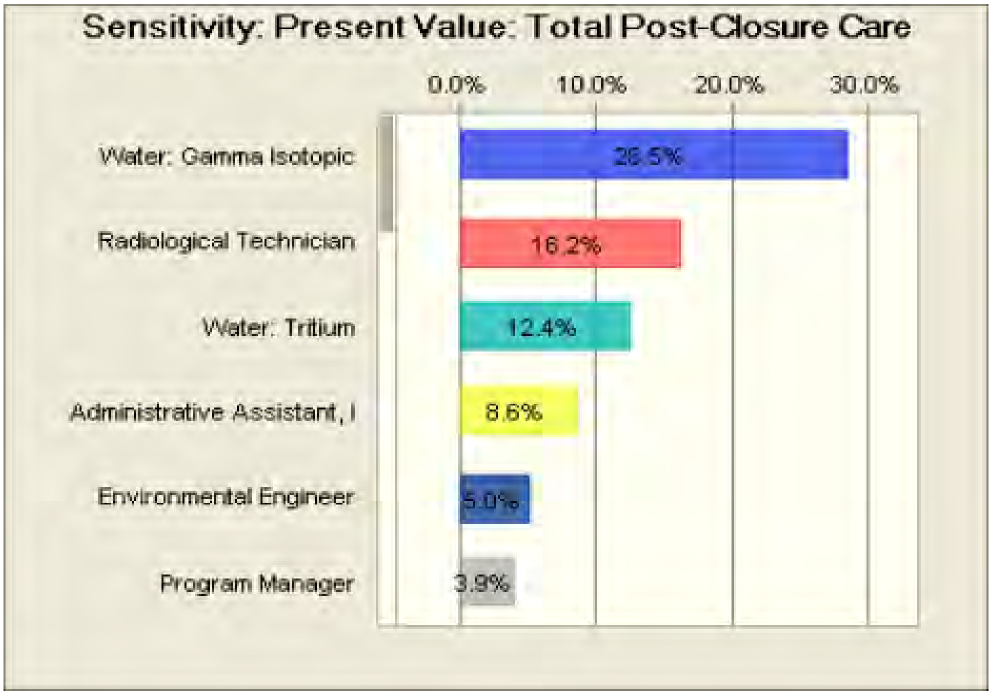
Assumption: Waste Management Manger **Cell: F27**

Lognormal distribution with parameters:

50%	$80.33	(=I27)
95%	$120.49	(=J27)

End of Assumptions

Sensitivity Charts



End of Sensitivity Charts

Index

Forecasts; Barnwell Planned Events

Worksheet: [Appendix B 080618.xls]50% CashFlows

Forecast: Present Value: ECF Deposits during In-Region Ops	**Cell: I5**
Forecast: Present Value: InstCtl 1	**Cell: E5**
Forecast: Present Value: InstCtl 2	**Cell: F5**
Forecast: Present Value: InstCtl 3&4	**Cell: G5**
Forecast: Present Value: Periodic Costs	**Cell: H5**
Forecast: Present Value: Ph1 IC	**Cell: C5**
Forecast: Present Value: Ph1 PCO	**Cell: B5**
Forecast: Present Value: Ph2 PCO	**Cell: D5**
Forecast: Present Value: Total Post-Closure Care	**Cell: J5**
Forecast: Present Value: Total Post-Closure Care by Year	**Cell: J6**

Worksheet: [Appendix B 080618.xls]Summary

Forecast: Total Annual Cost to Phase II Closure	**Cell: B16**
Forecast: Total Annual Cost: Phase II Post-Closure Observations	**Cell: D16**
Forecast: Total Annual Cost: Stage I Insitutional Controls	**Cell: E16**
Forecast: Total Annual Cost: Stage II Institutional Controls	**Cell: F16**
Forecast: Total Annual Cost: Stages III & IV Institutional Controls	**Cell: G16**

End of Forecasts

Assumptions

Worksheet: [Appendix B 080618.xls]50% CashFlows

Assumption: K11	**Cell: K11**

Worksheet: [Appendix B 080618.xls]Analysis Prices

Assumption: Air: Gamma Isotopic	**Cell: C5**
Assumption: Air: Gross Alpha/Beta	**Cell: C4**
Assumption: Air: Tritium	**Cell: C6**
Assumption: External Gamma Exposure	**Cell: C9**
Assumption: Soil: Gamma Isotopic	**Cell: C7**
Assumption: Soil: Tritium	**Cell: C8**
Assumption: VegSoilSed: Gamma Isotopic	**Cell: C10**
Assumption: VegSoilSed: Tritium	**Cell: C11**
Assumption: Water: Bases, Neutrals & Acids	**Cell: C12**
Assumption: Water: Carbon-14	**Cell: C13**
Assumption: Water: Chloroform	**Cell: C14**
Assumption: Water: Conductance	**Cell: C15**
Assumption: Water: Cyanide	**Cell: C16**
Assumption: Water: Gamma Isotopic	**Cell: C18**
Assumption: Water: Gross Alpha/Beta	**Cell: C17**
Assumption: Water: Library Search	**Cell: C20**
Assumption: Water: Metals	**Cell: C21**
Assumption: Water: Pesticides/PCBs	**Cell: C24**
Assumption: Water: pH	**Cell: C22**
Assumption: Water: Phenols	**Cell: C23**
Assumption: Water: Temperature	**Cell: C25**
Assumption: Water: Total Organic Carbon	**Cell: C26**
Assumption: Water: Tritium	**Cell: C19**
Assumption: Water: Volatile Organics	**Cell: C27**

Worksheet: [Appendix B 080618.xls]InstCtl1

Assumption: Fuel (gal)	**Cell: B17**

Robert Baird:
=2*2*26*24

Assumption: InstCtl1 Insurance	**Cell: H231**
Assumption: InstCtl1 License & Fees	**Cell: H232**
Assumption: Ph 1 PCO Manager Hours	**Cell: B25**
Assumption: Ph1 PCO Fertilize Cover (sy)	**Cell: B215**
Assumption: Ph1 PCO Fertilize Cover (sy) (B216)	**Cell: B216**
Assumption: Ph1 PCO Fertilize Cover (sy) (B218)	**Cell: B218**
Assumption: Ph1 PCO Fertilize Cover (sy) (B219)	**Cell: B219**
Assumption: Ph1 PCO Fertilize Cover (sy) (B220)	**Cell: B220**
Assumption: Ph1 PCO Fertilize Cover (sy) (B221)	**Cell: B221**
Assumption: Ph1 PCO Fertilize Cover (sy) (B222)	**Cell: B222**
Assumption: Ph1 PCO Fertilize Cover (sy) (B223)	**Cell: B223**

Worksheet: [Appendix B 080618.xls]InstCtl2

Assumption: Fuel (gal)	**Cell: B17**
Assumption: InstCtl1 Insurance	**Cell: H231**
Assumption: InstCtl1 Insurance (H232)	**Cell: H232**
Assumption: Ph 1 PCO Manager Hours	**Cell: B25**
Assumption: Ph1 PCO Fertilize Cover (sy)	**Cell: B215**
Assumption: Ph1 PCO Fertilize Cover (sy) (B216)	**Cell: B216**
Assumption: Ph1 PCO Fertilize Cover (sy) (B218)	**Cell: B218**
Assumption: Ph1 PCO Fertilize Cover (sy) (B219)	**Cell: B219**
Assumption: Ph1 PCO Fertilize Cover (sy) (B220)	**Cell: B220**
Assumption: Ph1 PCO Fertilize Cover (sy) (B221)	**Cell: B221**
Assumption: Ph1 PCO Fertilize Cover (sy) (B222)	**Cell: B222**
Assumption: Ph1 PCO Fertilize Cover (sy) (B223)	**Cell: B223**
Worksheet: [Appendix B 080618.xls]InstCtl34	
Assumption: Fuel (gal)	**Cell: B17**
Assumption: InstCtl1 Insurance	**Cell: H231**
Assumption: InstCtl1 Insurance (H232)	**Cell: H232**
Assumption: Ph 1 PCO Manager Hours	**Cell: B25**
Assumption: Ph1 PCO Fertilize Cover (sy)	**Cell: B215**
Assumption: Ph1 PCO Fertilize Cover (sy) (B216)	**Cell: B216**
Assumption: Ph1 PCO Fertilize Cover (sy) (B218)	**Cell: B218**
Assumption: Ph1 PCO Fertilize Cover (sy) (B219)	**Cell: B219**
Assumption: Ph1 PCO Fertilize Cover (sy) (B220)	**Cell: B220**
Assumption: Ph1 PCO Fertilize Cover (sy) (B221)	**Cell: B221**
Assumption: Ph1 PCO Fertilize Cover (sy) (B222)	**Cell: B222**
Assumption: Ph1 PCO Fertilize Cover (sy) (B223)	**Cell: B223**
Worksheet: [Appendix B 080618.xls]Ph1 IC	
Assumption: Fuel (gal)	**Cell: B17**
Assumption: Ph 1 IC Insurance	**Cell: H230**
Assumption: Ph 1 PCO Manager Hours	**Cell: B25**
Assumption: Ph1 PCO Fertilize Cover (sy)	**Cell: B214**
Assumption: Ph1 PCO Fertilize Cover (sy) (B215)	**Cell: B215**
Assumption: Ph1 PCO Fertilize Cover (sy) (B217)	**Cell: B217**
Assumption: Ph1 PCO Fertilize Cover (sy) (B218)	**Cell: B218**
Assumption: Ph1 PCO Fertilize Cover (sy) (B219)	**Cell: B219**
Assumption: Ph1 PCO Fertilize Cover (sy) (B220)	**Cell: B220**
Assumption: Ph1 PCO Fertilize Cover (sy) (B221)	**Cell: B221**
Assumption: Ph1 PCO Fertilize Cover (sy) (B222)	**Cell: B222**
Worksheet: [Appendix B 080618.xls]Ph1 PCO	
Assumption: CHP	**Cell: B239**
Assumption: CHP (B240)	**Cell: B240**
Assumption: CHP (B241)	**Cell: B241**
Assumption: Cover Repairs Equip Rate	**Cell: F220**

Robert Baird:
3.806
Assumption: Cover Repairs Labor Rate **Cell: E220**

Robert Baird:
1.55
Assumption: Cover Repairs Matl Rate **Cell: D220**

Robert Baird:
=22*1.1
Assumption: Cover Seeding Equip Rate **Cell: F219**
Assumption: Cover Seeding Labor Rate **Cell: E219**

Robert Baird:
=47.05*0.044
Assumption: Cover Seeding Matl Rate **Cell: D219**

Robert Baird:
=17.8*1.1
Assumption: Disposal of soil and other wastes **Cell: G225**
Assumption: Fertilize Cover Equip Rate **Cell: F214**

Robert Baird:
=0.06*1.1
Assumption: Fertilize Cover Labor Rate **Cell: E214**

Robert Baird:
=51.5*0.003
Assumption: Fertilize Cover Matl Rate **Cell: D214**

Robert Baird:
=0.16*1.1
Assumption: Fuel (gal) **Cell: B17**
Assumption: Fuel Price per gal **Cell: D17**
Assumption: G236 **Cell: G236**
Assumption: Lights & HVAC **Cell: G10**
Assumption: Maintain Cover Labor Rate **Cell: E213**

Robert Baird:
=60.1*4
Assumption: Maintain Cover Equip Rate **Cell: F213**

Robert Baird:
=36.36*4
Assumption: Maintain Fence Equip Rate **Cell: F221**

Robert Baird:
=0.78*1.1
Assumption: Maintain Fence Labor Rate **Cell: E221**

Robert Baird:
=46.53*0.1
Assumption: Maintain Fence Matl Rate **Cell: D221**

Robert Baird:
=14.6*1.1
Assumption: Maintain Road Equip Rate **Cell: F215**

Robert Baird:
=0.4*1.1

Assumption: Maintain Road Labor Rate	**Cell: E215**

Robert Baird:
=49.23*0.067

Assumption: Maintain Road Matl Rate	**Cell: D215**

Robert Baird:
=4.73*1.1

Assumption: Maintain Sotrm Sedmt Equip Rate	**Cell: F218**

Robert Baird:
=1.76*1.1*1.15

Assumption: Maintain Storm Sedmt Labor Rate	**Cell: E218**

Robert Baird:
=53.58*0.099*1.15

Assumption: Maintain Storm Water Equip Rate	**Cell: F217**

Robert Baird:
=134*1.1/1000

Assumption: Maintain Storm Water Labor Rate	**Cell: E217**

Robert Baird:
=53.58*4/1000

Assumption: Monument Survey Equip Rate	**Cell: F210**

Robert Baird:
=6.9*1.1

Assumption: Monument Survey Labor Rate	**Cell: E210**

Robert Baird:
=67.27*2.4

Assumption: Muni Waste Mgmt	**Cell: H12**
Assumption: Office Equipment	**Cell: G6**
Assumption: Office Supplies	**Cell: G7**
Assumption: Office Trailer	**Cell: G5**
Assumption: Ph 1 PCO Insurance	**Cell: H230**
Assumption: Ph 1 PCO Manager Hours	**Cell: B25**
Assumption: Ph1 PCO Fertilize Cover (sy)	**Cell: B214**
Assumption: Ph1 PCO Fertilize Cover (sy) (B215)	**Cell: B215**
Assumption: Ph1 PCO Fertilize Cover (sy) (B217)	**Cell: B217**
Assumption: Ph1 PCO Fertilize Cover (sy) (B218)	**Cell: B218**
Assumption: Ph1 PCO Fertilize Cover (sy) (B219)	**Cell: B219**
Assumption: Ph1 PCO Fertilize Cover (sy) (B220)	**Cell: B220**
Assumption: Ph1 PCO Fertilize Cover (sy) (B221)	**Cell: B221**
Assumption: Ph1 PCO Fertilize Cover (sy) (B222)	**Cell: B222**
Assumption: Pickup truck	**Cell: F15**
Assumption: Storage box	**Cell: G8**
Assumption: Telephone	**Cell: G9**
Assumption: Utility truck, flat bed/dump bed	**Cell: F16**
Assumption: Water/Sewer	**Cell: G11**
Assumption: Well Repairs Equip Rate	**Cell: F222**

Robert Baird:
=1.73*1.1

Assumption: Well Repairs Matl Rate **Cell: D222**

Robert Baird:
=39*1.1

Assumption: Well RepairsLabor Rate **Cell: E222**

Robert Baird:
=50.35*0.145

Worksheet: [Appendix B 080618.xls]Ph2 PCO

Assumption: Fuel (gal)	**Cell: B17**
Assumption: Ph 1 PCO Manager Hours	**Cell: B25**
Assumption: Ph2 PCO Cover Repairs (cy)	**Cell: B220**
Assumption: Ph2 PCO Cover Seeding (msf)	**Cell: B219**
Assumption: Ph2 PCO Fence Repairs (ft)	**Cell: B221**
Assumption: Ph2 PCO Fertilize Cover (sy)	**Cell: B214**
Assumption: Ph2 PCO Insurance	**Cell: H230**
Assumption: Ph2 PCO Maintain Road (sy)	**Cell: B215**
Assumption: Ph2 PCO Maintain SW Sedmt (cy)	**Cell: B218**
Assumption: Ph2 PCO Maintain SW Str (sf)	**Cell: B217**
Assumption: Ph2 PCO Well Repairs (ft)	**Cell: B222**

Worksheet: [Appendix B 080618.xls]Wage Table

Assumption: Administrative Assistant (Duratek)	**Cell: F39**
Assumption: Administrative Assistant, I	**Cell: F14**
Assumption: Administrative Assistant, II	**Cell: F15**
Assumption: Administrative Assistant, III	**Cell: F16**
Assumption: Administrative Assistant, IV	**Cell: F17**
Assumption: Architect	**Cell: F18**
Assumption: Chemical Engineer	**Cell: F19**
Assumption: Chemist	**Cell: F22**
Assumption: Civil Engineer	**Cell: F20**
Assumption: Electrical Engineer	**Cell: F25**
Assumption: Environmental Engineer	**Cell: F31**
Assumption: Geologist	**Cell: F21**
Assumption: H & S Manager	**Cell: F26**
Assumption: HP Supervisor	**Cell: F35**
Assumption: Industrial Hygene Manager	**Cell: F28**
Assumption: Industrial Hygenist Technician	**Cell: F29**
Assumption: Instrument Technican	**Cell: F44**
Assumption: Junior HP Technician	**Cell: F41**
Assumption: Mechanical Engineer	**Cell: F24**
Assumption: Program Manager	**Cell: F11**
Assumption: Project Director	**Cell: F37**
Assumption: Project Director	**Cell: F42**
Assumption: Project Engineer	**Cell: F13**
Assumption: Project Manager	**Cell: F12**
Assumption: QA Manager	**Cell: F33**

Assumption: Rad Shipper	**Cell: F36**
Assumption: Radiological Manager	**Cell: F34**
Assumption: Radiological Technician	**Cell: F32**
Assumption: Senior HP Technician	**Cell: F40**
Assumption: Senior Rad Manager	**Cell: F43**
Assumption: Senior Rad Manager	**Cell: F38**
Assumption: Structural Engineer	**Cell: F23**
Assumption: Superintendent	**Cell: F30**
Assumption: Trainer	**Cell: F45**
Assumption: Waste Management Manger	**Cell: F27**

End of Assumptions

APPENDIX D

RISQUE METHODOLOGY AND WORKSHOP

Appendix D
RISQUE Methodology and Workshop

D.1 RISQUE Methodology Overview

The risks associated with unplanned and unexpected events were evaluated following URS' RISQUE methodology (Bowden, 2001). This objective and approach to risk assessment and management has been internationally acknowledged and is used to analyze risk in a format easily usable by decision-makers. The results of such risk assessments have been used in many company financial reports, providing implicit confirmation that the RISQUE method complies with applicable accounting standards including, for example, US regulation SAB92 and SAB99 and Australian Accounting Standard 1031. It has also been successfully audited and has withstood public scrutiny.

The RISQUE methodology was developed expressly to support assessing strategic business risk and liability. The methodology involves identifying and quantifying business-related risks, based on sound, traditional probabilistic techniques with the purpose of developing objective and defensible business decisions.

The RISQUE method helps decision-makers to:

- Gain a clear understanding of strategic and enterprise-wide risk presented as risk profiles
- Rationally assess options
- Carry out cost-effective risk management actions
- Translate complex environmental, social and reputational risk information into financial terms that bridged the apparent lack of analytical tools for assessing societal and environmental risks in financial context
- Justify all risk management actions and plans
- Demonstrate an auditable and transparent risk management process
- Demonstrate due diligence

The RISQUE methodology involves using an expert panel to identify all substantial risk events, estimate their probabilities of occurrence, and project their ranges of potential cost impacts. This data collection is facilitated in a risk management workshop. For complex risk assessments, as with the Barnwell facility, a series of workshops could beneficially be held involving additional expert panelists to facilitate and extend the evaluation of risks.

The RISQUE methodology follows a systematic procedure and incorporates uncertainty into the assessment, rather than making simplifying and conservative assumptions that ignore inherent uncertainties. Uncertainties are usually associated with probabilities and the cost impacts of consequential events.

The RISQUE method allows the production of simple outputs displaying the confidence limits of each risk event or group of risk events. These outputs allow decision-makers to base decisions considering the “risk appetite” of the responsible organization. The RISQUE methodology can also be used in developing, evaluating, and managing risk mitigation strategies. This process might include conducting separate workshops and/or conducting benefit cost analyses.

The RISQUE methodology involves the following major steps:

- Establish the context of the evaluation (constraints administrative objectives, and requirements)
- Identify uncertain events
- Evaluate probabilities and cost impacts of uncertain events
- Rank order uncertain events based on the financial risks they present
- Refine estimated probabilities and cost impacts

The processing of information generated by the RISQUE methodology involves the use of the software package known as Crystal Ball (Oracle, 2008). Crystal Ball is an “add-in” for Microsoft Excel® that facilitates evaluation and description of risks. For each uncertain event, Crystal Ball receives probability distribution and cost impact inputs (developed in the workshops). Crystal Ball is a Monte Carlo engine that performs hundreds or thousands of evaluation trials using the estimated probability distributions and cost impacts.

The results of Crystal Ball simulations are distributions of estimated cost impacts that quantify the confidence associated with different magnitudes of cost impacts. For example, Crystal Ball outputs provide the basis for concluding that, “The probable cost is $X million, while the likelihood that costs would exceed $Y million is only 20 percent, and we are 95 percent confident that costs will not exceed $Z million.”

D.2 Application of the RISQUE Methodology to the Barnwell Facility

URS Corporation (the Board’s contractor for this work) convened a panel of technical professionals, all URS employees and all experienced either in LLRW facility design, construction, operations, closure, and/or custodial care or in risk evaluation and management. The purpose of convening this panel was to solicit their judgment about unplanned and unanticipated but possible future events and outcomes that could affect the cost of providing post-closure custodial care for the Barnwell facility.

The panel participated in a workshop that followed the RISQUE methodology (Bowden, 2001). In the workshop, the experts collaborated to:

- Identify and briefly characterize unexpected or unplanned events that might increase the costs of monitoring and maintaining the closed Barnwell facility
- Estimate the probability of events occurring and resulting actions being taken
- Estimate the range of costs that might result from the events and resulting actions

Details of the estimated probabilities and cost impacts can be seen by viewing the Crystal Ball report on unplanned events presented in Appendix F.

Prior to the workshop, several events and outcomes had been identified and organized so that the workshop could focus primarily on the questions involving professional experience and judgment. The workshop utilized the initiating events and responses or reactions identified earlier as a starting point for its deliberations, but extended or simplified them where the workshop participants judged appropriate. Table 1 presents possible future initiating events identified prior to and used during the workshop.

Table 1. Possible Unplanned Events Identified Prior to RISQUE Workshop

Type of Event	Event	Description
Intrusion	Airplane impact	Large airplane crashes into closed disposal unit; Resulting crater exposes radioactive materials and throws it into the air; Adjacent properties contaminated with radioactive deposition.
	Terrorist activity	Terrorist (including disgruntled employee or member of the public) targets closed disposal unit; Places explosive device that exposes radioactive materials and throws it into the air; Adjacent properties contaminated with radioactive deposition.
	War	Similar to Terrorist Activity
Natural Site	Increased precipitation	Climate changes produce significantly more precipitation at closed facility; Excessive erosion results; Excessive infiltration into disposal units causes excessive concentrations of radioactive contaminants in groundwater.
	Decreased precipitation	Climate changes produce significantly less precipitation at closed facility; Loss of surface-stabilizing vegetation; Increased potential for wind erosion; Reduced vegetative cover increases infiltration.
	Increase in burrowing animal population	Number and types of burrowing animals at the site increase and threaten integrity of cover systems; Increased potential for infiltration and releases to groundwater.
	Change in plant succession	Number and type of deep-rooted vegetation at the site increase and threaten integrity of cover systems; Increased concentrations of radioactive contaminants in surface vegetation; Damage causes increased releases to groundwater
	Acid rain deposition	Sources of acid rain cause deposition onto

Table 1. Possible Unplanned Events Identified Prior to RISQUE Workshop		
Type of Event	**Event**	**Description**
		closed disposal units; Acid attacks concrete vaults and degrades structures; Waste consolidates and disrupts integrity of cover system; Damage causes increased releases to atmosphere and groundwater
	Seismic event exceeds planning basis	Seismic event in excess of design basis occurs; Structures below ground in the absence of void spaces supported by adjacent earth and other structures.
	Worse geotechnical characteristics than used in design	Foundation soils have less bearing capacity than determined during facility design and licensing; Settlement threatens integrity of cover system; Damage causes increased releases to atmosphere and groundwater
	Worse geochemical characteristics than used in design	Transport of radioactive contaminants in groundwater faster than determined during design and licensing; Greater concentrations than projected exist at offsite monitoring locations.
	Natural resource exploitation	Deposits of natural resource (such as gravel, clay, other minerals, or petroleum) developed adjacent to the closed disposal facility; Facility stability compromised.
Facility	Voids remaining within vaults and disposal area	Waste consolidates and compromises integrity of cover system; Damage causes increased releases to atmosphere and groundwater
	Cover design inadequate	Cover found to allow increased releases to atmosphere or groundwater
	Foundation soils inadequate	Same as “Worse geotechnical characteristics than used in design”; Damage causes increased releases to atmosphere and groundwater
Waste	Radionuclide concentrations in LLRW incorrect	Inventory of critical radionuclides greater than reported; Releases to atmosphere or groundwater greater than projected
	Waste form degrades	Waste consolidates and compromises integrity of cover system; Damage causes increased releases to atmosphere and groundwater
Population	Observed health effects without clear	Health effects near the closed facility attributed to presence of facility without

Table 1. Possible Unplanned Events Identified Prior to RISQUE Workshop

Type of Event	Event	Description
	cause & effect relationship	evidence; Litigation to obtain financial relief.
	Property damage without clear cause & effect relationship	Property values alleged to be depressed because of releases from closed facility; Litigation to obtain financial relief.
	Population density adjacent to facility increases	Greater populations in close proximity to closed facility creates greater exposure to radioactive releases than previously projected; Pressure to improve facility characteristics as defense of neighbors.
External Changes	Regulatory requirements become more demanding	Changes must be made to closed facility, as well as plans for monitoring and maintaining the facility; In the extreme, previously disposed waste must be excavated and relocated.
	Statutes change	Same effect as “Regulatory requirements become more demanding”
	Dose/risk conversion factors increase	Changes must be made to closed facility, as well as plans for monitoring and maintaining the facility; Previously acceptable concentrations in air and groundwater now found to be unacceptable.
	Insufficient disposal capacity	Pressure increases to allow disposal of waste other than that generated in Atlantic Compact member states.

These same scoping activities conducted prior to the workshop also produced the list of potential responses and reactions to the initiating events shown in Table 2.

Table 2. Responses and Reactions to Possible Unplanned Events

Type of Response or Reaction	Response or Reaction
Radiological Effects	Suddenly increased releases to ground water
	Suddenly increased releases to surface soils/water
	Suddenly increased releases to atmosphere
	Gradually increased releases to ground water
	Gradually increased releases to surface soils/water
	Gradually increased releases to atmosphere

Table 2. Responses and Reactions to Possible Unplanned Events

Type of Response or Reaction	Response or Reaction
	More rapid GW transport
	Increased doses
Technical Response	State closes facility with 3rd party contractor
	Cleanup adjacent contaminated areas & media
	Decontaminate metro area
	Dispose of decontamination waste
	More intensive facility maintenance
	Monitor facility more intensively
	Repair cover
	Supplement cover
	Intercept and treat releases to GW
	Implement more extensive isolation technologies
	Drain local water accumulations
	Construct SW diversion berms
	Construct local SW retention berms
	Monitor public health
	Retrieve and relocate disposed waste
	Recovering entity responsible for facility
Public Reaction	Normal commerce disrupted
	Law enforcement mobilized
	At-risk populations evacuated
	Perceived risk judged unacceptable
	Regulations strengthened and extended
	Statutes strengthened and extended
	Law suits alleging property damage
	Law suits alleging decreased property value (local image)
	Law suits alleging bodily damage -- adjacent residents
	Law suits alleging bodily damage -- facility workers

The expert panel defined numerous specific possible future events in connection with the Barnwell facility. Those initiating events and associated consequences judged to be the responsibility of the Barnwell Extended Care Fund and material (of consequential cost) are presented in Table 3.

Table 3. Events, Consequences Judged to be Material, and Actions Taken in Response

Event ID	Description	Consequences	Cost-Causing Responses
BW06	Long term increased precipitation on site	Increased erosion	Greater cover maintenance and repair costs
		Raised water table	Construct and operate enhanced water removal system
BW07	Extreme weather event beyond design parameters	Cap erosion, mitigation, and repair	Increased repair and subsequent maintenance activity
BW08	Long term decreased precipitation on site	Lose vegetation leading to erosion requiring increased maintenance cost	Increase maintenance activity
		Redesign and implement changes	Enhance cover design, including rock armor
		Change vegetation cover	Change vegetation cover
BW09	Increase of burrowing animals on site	Increased cover maintenance and repair activities	Increased cover maintenance & repair costs
BW13	Worse geotechnical model to that used in design	Settlement leading to cracking of cap	Implement mitigative measures and complete repairs
BW14	Unacceptable contaminant levels on neighboring properties	Further characterization	Additional site characterization costs
		Pump and treat contaminated groundwater	Construct and operate system to intercept contamination plume and treat contaminated water
BW15	Mining/quarrying adjacent to site	Increased maintenance activities	Increased maintenance costs
BW17	Residential/Industrial/Commercial development adjacent to site	Increased security	Increased security costs
		Increased maintenance activities	Increased maintenance costs
		Upgrade facility design	Enhance cover design, including rock armor
		Stakeholder management program	Management and PR consultant effort to address public concerns

Table 3. Events, Consequences Judged to be Material, and Actions Taken in Response

Event ID	Description	Consequences	Cost-Causing Responses
BW18	Trench collapse due to waste subsidence	Increased cover maintenance and repair activities	Increased cover maintenance and repair costs
		Increased monitoring activities	Increased monitoring costs
		Cover/Cap damaged	Reconstruction of cap layers
		Increased leachate generation	Construct and operate enhanced water removal system
		Further characterization	Additional site characterization costs
		Negative public perception	Management and PR consultant effort to address public concerns
BW23	Community health impacts blamed on the facility	Negative public perception	Management and PR consultant effort to address public concerns
		Health monitoring required	Annual health monitoring costs for potentially affected population
BW24	Depressed property values blamed on presence of facility	Negative public perception	Management and PR consultant effort to address public concerns
BW25	Negative media relating to incident on site	Negative public perception	Management and PR consultant effort to address public concerns
BW26	Regulatory changes resulting in liability to Fund	Upgrade facility design	Enhance cover design, including rock armor
		Increased monitoring activities	Increased monitoring costs
BW29	Excessive radiation exposure to worker(s) on site	Fatality attributable to radiation exposure	Consequential damages awarded
		Liability claims	Legal defense against claims
		Health effects	Consequential damages awarded
BW33	More aggressive regulation	More extensive groundwater clean-up	Construct and operate system to intercept contamination plume and treat contaminated water
		Contaminated public water supplies	Provide alternative water supply;
		Upgrade facility design	Enhance cover design, including rock armor
		Increased monitoring activities	Increased monitoring costs

Table 3. Events, Consequences Judged to be Material, and Actions Taken in Response			
Event ID	**Description**	**Consequences**	**Cost-Causing Responses**
BW34	SNF Fuel Rod	Increased monitoring activities	Increased monitoring costs
		Design remedial campaign and receive regulatory approval	Design and Approve Remedial Campaign
		Retrieve all previously disposed LLRW and transfer to other LLRW disposal facility	Retrieve and Ship LLRW for Storage
		Provide grout curtain to limit release of radionuclides from fuel rods	Conduct In-Situ Grouting Campaign

Many possible future events identified in the workshop were judged not to be material (of inconsequential cost, its impacts were bounded by some other event, or the associated costs were judged no to be the responsibility of the Barnwell Extended Care Fund). The events the expert panel identified that were judged not to be material are identified in Table 4, together with brief justifications for the judgment.

Table 4. Events and Associated Consequences Judged Not Material		
Event ID	**Description**	**Judged Not Material Because:**
BW01	Terrorist attack on facility resulting in atmospheric release	Extended Care Fund responsible for neither event nor consequences
BW02	Sabotage facility resulting in release of contaminated material	Commercial insurance responsible for costs incurred
BW03	Accidental release of contaminated material	Bounded by BW01 and BW02
BW04	Large airplane crash	Extended Care Fund responsible for neither event nor consequences
BW05	Attack during War	Extended Care Fund responsible for neither event nor consequences
BW10	Change of native plant succession	Mitigated by planned maintenance activities
BW11	Acid rain deposition	Not realistic under current atmospheric protection laws
BW12	Seismic event exceeds planning basis	Previous analyses show damage to below-grade structures to be minimal

Table 4. Events and Associated Consequences Judged Not Material		
Event ID	**Description**	**Judged Not Material Because:**
BW16	Well field installed adjacent to site for water extraction	Deeper uncontaminated water more likely to be extracted
BW19	Cover design inadequate	Bounded by BW18
BW20	Foundation soils inadequate	Bounded by BW13 and BW18
BW21	Radionuclide concentrations incorrect	Bounded by BW14
BW22	Waste form degrades	Bounded by BW13 and BW14
BW26	Portions of regulatory changes resulting in liability to Fund	Responsibility for the most extreme legislative/regulatory change (excavated and relocate disposed LLRW) assumed to be borne by the State of South Carolina in one way or another but not exclusively by the Extended Care Fund
BW27	Dose/risk conversion factors increase	Causal factor to "Regulatory Change" (BW26 and BW33)
BW28	Insufficient disposal capacity	SC B&CB not responsible to ensure availability of disposal capacity
BW30	Accident to worker on site	Covered by Workers Compensation Fund
BW31	Reduced investment returns from Fund; Insufficient funds to cover operating costs leading to shortened Institutional Control period	This outcome is a restatement of the concern for which the current work was commissioned
BW32	Fund recommitted by other government entity	Responsibility resides with the entity that recommits fund

During the workshop, the workshop participants projected probabilities and costs of each cost-causing response based on their individual and collective experience and judgment. Consensus was sought and generally attained. The results of this workshop were incorporated into Crystal Ball simulations. These inputs (i.e., judged probabilities and cost impacts) and Crystal Ball results can be seen in Appendices E and F.

Table 5. Summary of Probabilities Estimated by RISQUE Workshop Panel

Event ID	Brief Description	Chance of Event	Consequences	Chance of Consequence	Cost-Causing Responses	Chance of Response
BW06	Increased Precipitation	1 in 10	Increased erosion	1 in 1	Greater cover maintenance and repair costs	1 in 1
			Raised water table	1 in 1	Construct and operate enhanced water removal system	1 in 1
BW07	Extreme Weather	1 in 100,000	Cap erosion, mitigation, and repair	1 in 2	Increased repair and subsequent maintenance activity	1 in 1
BW08	Decreased Precipitation	1 in 10	Lose vegetation leading to erosion requiring increased maintenance cost	1 in 1	Increase maintenance activity	1 in 1
			Redesign and implement changes	1 in 20	Enhance cover design, including rock armor	1 in 1
			Change vegetation cover	7 in 10	Change vegetation cover	1 in 1
BW09	Burrowing Animals	3 in 10	Increased cover maintenance and repair activities	1 in 1	Increased cover maintenance & repair costs	1 in 1
BW13	Geotechnical Model	2 in 10	Settlement leading to cracking of cap	1 in 100	Implement mitigative measures and complete repairs	1 in 1
BW14	Water Contamination	1 in 1	Further characterization	1 in 1	Additional site characterization costs	1 in 1
			Pump and treat contaminated	1 in 1	Construct and operate system to intercept contamination	1 in 1

Table 5. Summary of Probabilities Estimated by RISQUE Workshop Panel

Event ID	Brief Description	Chance of Event	Consequences	Chance of Consequence	Cost-Causing Responses	Chance of Response
			groundwater		plume and treat contaminated water	
BW15	Mine/Quarry	1 in 100	Increased maintenance activities	1 in 5	Increased maintenance costs	1 in 1
BW17	Adjacent Development	3 in 10	Increased security	1 in 1	Increased security costs	1 in 1
			Increased maintenance activities	1 in 1	Increased maintenance costs	1 in 1
			Upgrade facility design	7 in 10	Enhance cover design, including rock armor	1 in 1
			Stakeholder management program	1 in 1	Management and PR consultant effort to address public concerns	1 in 1
BW18	Trench Collapse	1 in 10	Increased cover maintenance and repair activities	1 in 1	Increased cover maintenance and repair costs	1 in 1
			Increased monitoring activities	1 in 1	Increased monitoring costs	1 in 1
			Cover/Cap damaged	1 in 1	Reconstruction of cap layers	1 in 2
			Increased leachate generation	1 in 20	Construct and operate enhanced water removal system	1 in 1
			Further characterization	1 in 2	Additional site characterization costs	1 in 1
			Negative public perception	1 in 2	Management and PR consultant effort to address public concerns	1 in 1

Table 5. Summary of Probabilities Estimated by RISQUE Workshop Panel						
Event ID	**Brief Description**	**Chance of Event**	**Consequences**	**Chance of Consequence**	**Cost-Causing Responses**	**Chance of Response**
BW23	Health Claims	7 in 1000	Negative public perception	1 in 1	Management and PR consultant effort to address public concerns	1 in 1
			Health monitoring required	1 in 1	Annual health monitoring costs for potentially affected population	1 in 1
BW24	Depressed Property Values	7 in 1000	Negative public perception	1 in 1	Management and PR consultant effort to address public concerns	1 in 1
BW25	Negative Media Attention	1 in 1 in 10 years	Negative public perception	1 in 1	Management and PR consultant effort to address public concerns	1 in 1
BW26	Regulatory Changes	1 in 10	Upgrade facility design	1 in 20	Enhance cover design, including rock armor	1 in 1
			Increased monitoring activities	1 in 2	Increased monitoring costs	1 in 1
BW29	Worker Exposure	1 in 1	Fatality attributable to radiation exposure	5 in 10,000,000	Consequential damages awarded	1 in 1
			Liability claims	1 in 1	Legal defense against claims	1 in 1
			Health effects	1 in 1,000,000	Consequential damages awarded	1 in 1
BW33	More Aggressive Regulation	1 in 2	More extensive groundwater clean-up	1 in 1	Construct and operate system to intercept contamination plume and treat contaminated water	1 in 1
			Contaminated public water supplies	1 in 4	Provide alternative water supply;	1 in 1

Table 5. Summary of Probabilities Estimated by RISQUE Workshop Panel						
Event ID	**Brief Description**	**Chance of Event**	**Consequences**	**Chance of Consequence**	**Cost-Causing Responses**	**Chance of Response**
			Upgrade facility design	1 in 2	Enhance cover design, including rock armor	1 in 1
			Increased monitoring activities	1 in 1	Increased monitoring costs	1 in 1
BW34	SNF Rods	1 in 1,000	Increased monitoring activities	1 in 1	Increased monitoring costs	1 in 1
			Design remedial campaign and receive regulatory approval	1 in 1	Design and Approve Remedial Campaign	1 in 1
			Retrieve all previously disposed LLRW and transfer to other LLRW disposal facility	1 in 4	Retrieve and Ship LLRW for Storage	1 in 1
			Provide grout curtain to limit release of radionuclides from fuel rods	3 in 4	Conduct In-Situ Grouting Campaign	1 in 1

APPENDIX E

DETAILS OF COST ESTIMATES FOR UNPLANNED EVENT

Details

Risk Event ID	Summary Description	Event Likelihood/Frequency	Consequence	Units	Best Estimate	High Estimate	Consequence Likelihood	Occurrence Cost	Total likelihood	Risk Quotient	Chance Occurrence cost	Commence year range start	Commence year range end	Commence year range	Commence Yr (integer)	Spend duration	Event Description	Total Risk Quotient	Chance Occurrence cost	Total Occurrence Cost
BW01	Terror Attack	5.0E-06	Clean-up of fallout	$000	$4,000	$10,000	100%					1	134	1.0	1.0	1				
				$000NPV	$4,000.00			$ 4,000	5.0E-06	0.02	$ 4,000									
			Legal claims	$000	$3,000	$5,000	5%								1.0	1				
				$000NPV	$3,000.00			$ 3,000	2.5E-07	0.00	$ 3,000									
			Economic impacts																	
			Agricultural impacts	yrs	2	3	100%													
				Households affected	50	100														
				Annual Loss/hsehld	$25	$50														
				$000	$2,500	$15,000									1.0	1				
				$000NPV	$2,500			$ 2,500	5.0E-06	0.01	$ 2,500									
			Negative public perception	$000	41.2	160	100%								1.0	1				
				$000NPV	$41			$ 41	5.0E-06	0.00	$ 41									
			Evacuation of community				Covered by FEMA													
			Mobilisation of military				Covered by federal national emergency funds													
			TOTAL NPV	$000NPV	$9,541												BW01 Terror Attack	=SUM(Q5:Q1	=SUM(R5:R15)	=SUM(O5:O15)
BW02	Sabotage	1.0E-03	Contaminated public water supplies				10%													
			Alternative water supply for 100 yr																	
				Hsehlds exp	50	80														
				per/hsehld	2	5														
				Pers	100	400														
				gal/pers/day	60	120														
				10000 gal/yr	219	876														
				$/10000gal	$10	$20														
				$000/yr	$2	$18						1	134	1.0	1.0	134				
				$000NPV	$104			$ 104	1.0E-04	0.01	$ 104									
			Economic impacts				100%													
			Agricultural impacts (See BW1)	$000	$2,500	$15,000								1.0	1.0	1				
				$000NPV	$2,500			$ 2,500	1.0E-03	2.50	$ 2,500									
			TOTAL NPV		$0												BW02 Sabotage	=SUM(Q20:Q	=SUM(R20:R32)	=SUM(O20:O32)
BW03	Accidental Release	Not material																		
			TOTAL NPV		$0												BW03 Accidental Release			
BW04	Airplane Crash	1.0E-05	see Terrorist (BW1)																	
			Clean-up of fallout (See BW1)	$000NPV	$4,000	$10,000	100%	$ 4,000	1.0E-05	0.04	$ 4,000	1	134	1.0	1.0	1				
			Legal claims (See BW1)	$000NPV	$3,000	$5,000	5%	$ 3,000	5.0E-07	0.0015	$ 3,000				1.0	1				
			Economic impacts																	
			Agricultural impacts (See BW1)	$000NPV	$2,500	$15,000	100%	$ 2,500	1.0E-05	0.03	$ 2,500				1.0	1.0				
			Negative public perception (See BV	$000NPV	$41	0	100%	$ 41	1.0E-05	0.0004	$ 41				1.0	10.0				
			TOTAL NPV		$9,541												BW04 Airplane Crash	=SUM(Q38:Q	=SUM(R38:R44)	=SUM(O39:O44)
BW05	Attack in War	1.0E-05	see Terrorist (BW1)																	
			Clean-up of fallout (See BW1)	$000NPV	$4,000	$10,000	100%	$ 4,000	1.0E-05	0.04	$ 4,000	1	134	1.0	1.0	1				
			Legal claims (See BW1)	$000NPV	$3,000	$5,000	5%	$ 3,000	5.0E-07	0.0015	$ 3,000				1.0	1				
			Economic impacts																	
			Agricultural impacts (See BW1)	$000NPV	$2,500	$15,000	100%	$ 2,500	1.0E-05	0.03	$ 2,500				1.0	1.0				
			Negative public perception	$000NPV	$41	0	100%	$ 41	1.0E-05	0.0004	$ 41				1.0	10.0				
			TOTAL NPV		$9,541												BW05 Attack in War	=SUM(Q47:Q	=SUM(R47:R52)	=SUM(O47:O52)
BW06	Increase Precip	1.0E-01	Increased erosion																	
			Increased cover maintenance & repair costs	%	200%	500%	100%													
			Annual Maint & Repair Costs	"PC CostEst"	$360	$400														
				$000/yr	$720	$1,800						1	134	1.0	1.0	134				
				$000NPV	$34,135			$ 34,135	1.0E-01	3,413	$ 34,135									
			Raised water table																	
			dewatering capex	$000	$10,000	$25,000	100%								1.0	1.0				
				$000NPV	$10,000			$ 10,000	1.0E-01	1,000.00	$ 10,000									
			opex	$000/yr	$200	$600	100%								1.0	134.0				
				$000NPV	$9,482			$ 9,482	1.0E-01	948	$ 9,482									
			TOTAL NPV	$000NPV	$53,617												BW06 Increase Precip	$5,361.68	$53,616.80	$53,616.80
BW07	Extreme Weather	1.0E-05	Cap erosion																	
			rectification/repairs	$000	$6,000	$10,000						1	134	1.0	1.0	1				
			TOTAL NPV	$000NPV	$6,000		50%	$ 6,000	5.0E-06	0.03	$ 0.00001						BW07 Extreme Weather	$0.03	$0.00	$6,000.00

Risk Event ID	Summary Description	Event Likelihood/Frequency	Consequence	Units		Best Estimate	High Estimate	Consequence Likelihood	Occurrence Cost	Total likelihood	Risk Quotient	Chance Occurrence cost	Commence year range start	Commence year range end	Commence year range	Commence Yr (integer)	Spend duration	Event Description	Total Risk Quotient	Chance Occurrence cost	Total Occurrence Cost
BW08	Decrease Precip	1.0E-01	Lose vegetation leading to erosion																		
			Increased maintenance costs	%		200%	500%	100%													
				$000NPV		$34,135			$ 34,135	1.1E+00	37,548	$ 34,135	1	134	1.0	1.0	134				
			Redesign & implement changes					5%													
			rock armour	acres		100	125														
			thickness	in		18	36														
				$/yd3		$100	$125														
				$000		$24,200									1.0	1.0	1.0				
				$000NPV		$24,200			$ 24,200	5.0E-03	121	$ 24,200									
			Change vegetation cover	$/acre		$6,000	$12,000	70%													
				$000		$600	$1,200								1.0	1.0	1.0				
				$000NPV		$600			$ 600	7.0E-02	42	$ 600									
			TOTAL NPV	$000NPV		$58,935												BW08 Decrease Precip	$37,711.37	$58,934.89	$58,934.89
BW09	Burrow Animals	3.0E-01	Increased cover maintenance & repair costs	%		200%	500%	100%													
				$000		$720	$1,800						1	134	1.0	1.0	134				
				$000NPV		$34,135			$ 34,135	3.0E-01	10,240	$ 34,135									
			TOTAL NPV	$000NPV		$34,135												BW09 Burrow Animals	$10,240.47	$34,134.89	$34,134.89
BW10	Plant Succession	Not material																BW10 Plant Succession			
BW11	Acid Rain Depo	Not material																BW11 Acid Rain Deposition			
BW12	Seismic Event	Not material																BW12 Seismic Event			
BW13	Geotech Model	2.0E-01	Settlement leading to cracking of cap																		
			rectification/repairs	$000		$1,300	$3,500	1%					1	134	1.0	1.0	1				
				$000NPV		$1,300			$ 1,300	2.0E-03	2.60	$ 1,300									
			TOTAL NPV	$000NPV		$1,300												BW13 Geotech Model	$2.60	$1,300.00	$1,300.00
BW14	GW/SW Contam	0.0E+00	Further characterisation	$000	IF(V100>W105,0,'Common		2000	0%					1	20	1.0	1.0	1				
	Threat for only 3 H-3 half lives			$000NPV		$0			$ -	0.0E+00	0.00	$ -									
			Pump & GS treat; 8.3 gpm			80%	75%	60%													
			Capex	$000	IF(V100>W105,0,'Common Data		$6,000								1.0	1.0	1.0				
			WWTP	$000	'Common Data'!D44		$0								1.0	1.0	1.0				
			Opex	$000/yr	IF(V100>W105,0,'Common Data		$1,726								1.0	1.0	37.0	Three H-3 Halflives			
				$000NPV		$0			$ -	0.0E+00	0.00	$ -									
			Pump & GS treat; Entire Zone 2			80%	25%	20%													
			Capex	$000	IF(V100>W105,0,'Common Data		$0								1.0	1.0	1.0				
			WWTP	$000											1.0	1.0	1.0				
			Opex	$000/yr	IF(V100>W105,0,'Common Data		$0								1.0	1.0	37.0	Three H-3 Halflives			
				$000NPV		$0			$ -	0.0E+00	0.00	$ -									
			TOTAL NPV	$000NPV		$0												BW14 GW/SW Contam	$0.00	$0.00	$0.00
BW15	Mine/Quarry	1.0E-02	Increased maintenance costs	%		200%	500%	20%													
				$000		$1,440	$1,800						1	134	1.0	1.0	134				
			TOTAL NPV	$000NPV		$68,270			$ 68,270	2.0E-03	136.54	$ 68,270						BW15 Mine/Quarry	$136.54	$68,269.77	$68,269.77
BW16	Well field	Not material																BW16 Well field			
BW17	Adj Site Dev	3.0E-01	Increased security	% of Base		125%	200%	100%													
						$360	$400														
				$000/yr		$450							1	134	1.0	1.0	134				
				$000NPV		$21,334			$ 21,334	3.0E-01	6,400	$ 21,334									
			opex increase (Increased maintenance costs)	%		200%	500%	100%													
				$000/yr		$1,440	$1,800								1.0	1.0	134				
				$000NPV		$68,270			$ 68,270	3.0E-01	20,481	$ 68,270									
67.5			upgrading	$000		$500	$1,500	70%							1.0	1.0	1.0				
				$000NPV		$500			$ 500	2.1E-01	105	$ 500									

Risk Event ID	Summary Description	Event Likelihood/Frequency	Consequence	Units	Best Estimate	High Estimate	Consequence Likelihood	Occurrence Cost	Total likelihood	Risk Quotient	Chance Occurrence cost	Commence year range start	Commence year range end	Commence year range	Commence Yr (integer)	Spend duration	Event Description	Total Risk Quotient	Chance Occurrence cost	Total Occurrence Cost
			Stakeholder management program	$000/yr	$200	$300	100%							1.0	1.0	20				
				$000NPV	$3,336			$ 3,336	3.0E-01	1,001	$ 3,336									
			TOTAL NPV	$000NPV	$93,440												BW17 Adj Site Dev	$27,986.93	$93,439.77	$93,439.77
BW18	Trench Collapse	1.0E-01	Increased cover maintenance & repair costs	%	500%	1000%	100%													
				$000/yr	$1,800	$3,600						1	134	1.0	1.0	134				
				$000NPV	$85,337			$ 85,337	1.0E-01	8,533.72	$ 85,337									
			Increased monitoring costs	%	10%	20%	100%													
					$980															
				$000/yr	$1,078	$1,090								1.0	1.0	134.0				
				$000NPV	$51,108			$ 51,108	1.0E-01	5,110.75	$ 51,108									
			Reconstruction of cap layers	$000			50%													
			trench area	yd2	6,000	10,000														
			cover material	yd3	12,000	20,000														
			cover material	$000	$600															
			FML	$/yd2	$8	$30														
			FML	$000	$48															
			GCL	$/yd2	$32	$90														
			GCL	$000	$192															
			cost	$000	$840									1.0	1.0	1.0				
				$000NPV	$840			$ 840	5.0E-02	42.00	$ 840									
			Further characterisation	$000	600	2000	50%							1.0	1.0	1.0				
				$000NPV	$600			$ 600	5.0E-02	30.00	$ 600									
			Pump & treat																	
			Capex	$000	$5,000	$6,000	5%													
			WWTP	$000	$0	$0	5%													
				$000	$5,000	$6,000								1.0	1.0	1.0				
				$000NPV	$5,000			$ 5,000	5.0E-03	25.00	$ 5,000									
			Opex	$000/yr	$1,438	$1,726	5%							1.0	1.0	20.0				
				$000NPV	$23,984			$ 23,984	5.0E-03	119.92	$ 23,984									
			Negative public perception				50%													
				$000	$41	$160								1.0	1.0	1				
				$000NPV	$41			$ 41	5.0E-02	2.06	$ 41									
			TOTAL NPV	$000NPV	$166,910												BW18 Trench Collapse	$13,863.45	$166,909.55	$166,909.55
BW19	Cover design inadequate	Not material															BW19 Cover design inadequate			
BW20	Foundation Soils																BW20 Foundation Soils			
BW21	Waste Concentrations																BW21 Waste Concentrations			
BW22	Waste Form Degrades																BW22 Waste Form Degrades			
BW23	Health Claims	6.7E-03	Negative public perception				100%													
				$000	$41	$160						1	134	1.0	1.0	1.0				
				$000NPV	$41			$ 41	6.7E-03	0.27	$ 41									
			Health monitoring				100%													
			costs	$000/yr/pers	$0.5	$1.5														
			people	#/household	2	5														
				$000/yr	$50	$375								1.0	1.0	30.0				
				$000NPV	$1,142			$ 1,142	6.7E-03	7.61	$ 1,142									
			TOTAL NPV	$000NPV	$1,183												BW23 Health Claims	$7.89	$1,183.42	$1,183.42
BW24	Property Values	6.7E-03	Negative public perception				100%													
				$000	$41	$160						1	134	1.0	1.0	1.0				
			TOTAL NPV	$000NPV	$41			$ 41	6.7E-03	0.27	$ 41						BW24 Property Values	$0.27	$41.20	$41.20
BW25	Neg Media	100%	Negative public perception				100%													

Risk Event ID	Summary Description	Event Likelihood/Frequency	Consequence	Units	Best Estimate	High Estimate	Consequence Likelihood	Occurrence Cost	Total likelihood	Risk Quotient	Chance Occurrence cost	Commence year range start	Commence year range end	Commence year range	Commence Yr (integer)	Spend duration	Event Description	Total Risk Quotient	Chance Occurrence cost	Total Occurrence Cost
			First at 100 percent	$000	$41	$160						1	10	1.0	1.0	1.0				
				$000NPV	$41			$ 41	1	41.20	$ 41									
			Subsequent at uncertain reduced rate (1/10 rate per year to account for occurring every 10 years)	%	50%	100%	50%	$34	50%	16.90	$ 34	11	20	11.0	11.0	1				
					50%	100%	50%	$28	50%	13.86	$ 28	21	30	21.0	21.0	1				
					50%	100%	50%	$23	50%	11.37	$ 23	31	40	31.0	31.0	1				
					50%	100%	50%	$19	50%	9.33	$ 19	41	50	41.0	41.0	1				
					50%	100%	50%	$15	50%	7.65	$ 15	51	60	51.0	51.0	1				
					50%	100%	50%	$13	50%	6.28	$ 13	61	70	61.0	61.0	1				
					50%	100%	50%	$10	50%	5.15	$ 10	71	80	71.0	71.0	1				
					50%	100%	50%	$8	50%	4.23	$ 8	81	90	81.0	81.0	1				
					50%	100%	50%	$7	50%	3.47	$ 7	91	100	91.0	91.0	1				
					50%	100%	50%	$6	50%	2.84	$ 6	101	110	101.0	101.0	1				
					50%	100%	50%	$5	50%	2.33	$ 5	111	120	111.0	111.0	1				
					50%	100%	50%	$4	50%	1.91	$ 4	121	130	121.0	121.0	1				
					50%	100%	50%	$3	50%	1.57	$ 3	131	134	131.0	131.0	1				
			TOTAL NPV	$000NPV													BW25 Neg Media	$128	$215	$215
BW26	Reg Changes	10%	Upgrade facility				5%													
			additional cover																	
			Redesign	$000	$1,000	$3,500						1	134	1.0	1.0	1.0				
				$000NPV	$1,000			$ 1,000	1%	5.00	$ 1,000									
			Implement re-design	acres	115															
				$/yd3	50	100														
				thickness (ft)	2	5														
				$000/acre	$161	$807														
				$000	$18,553	$92,767								1.0	1.0	1.0				
				$000NPV	$18,553			$ 18,553	1%	92.77	$ 18,553									
			Increased monitoring	%	200%	500%	50%													
				$000/yr	$1,960									1.0	1.0	1.0				
				$000NPV	$1,960			$ 1,960	5%	98.00	$ 1,960									
			Excavate & re-locate				0.000%													
		Excavate	non-canisterized waste	ft3 (25,000,000 to 30,000,000 cf)	1	2														
				yd3	0															
				$/yd3	$300	$500														
				$000	$0									1.0	1.0	1.0				
				$000NPV	$0			$ 0	0.0000%	0.00	$ -									
			build new facility	$/ft3	$600	$2,000														
				$000	$600									6.0	6.0	1.0				
				$000NPV	$543			$ 543	0.0000%	0	$ -									
			TOTAL NPV	$000NPV	$22,057												BW26 Reg Changes	$195.77	$21,513	$22,057
BW27	Dose/Risk Conversion Factors	Causal factor in regulatory change															BW27 Dose/Risk Conversion Factors			
BW28	Disposal Capa	Not material															BW28 Disposal Capacity			
BW29	Worker Exposure	50%	Fatality attributable to radiation exposure	$000	$3,000	$5,000	5.00E-07					1	134	1.0	1.0	1.0				
				$000NPV	$3,000			$ 3,000	2.5E-07	0.0008	$ 3,000									
			Legal defense against claims																	
				# claims	3	10	100%													
				$000/claim	$3,000	$5,000														
				$000	$9,000	$50,000								1.0	1.0	1.0				
				$000NPV	$9,000			$ 9,000	5.0E-01	4,500.00	$ 9,000									
			Health Effect	$000/HE	$3,000		1.00E-06							1.0	1.0	1.0				
				$000NPV	$3,000			$ 3,000	5.0E-07	0.0015	$ 3,000									
			TOTAL NPV	$000NPV	$15,000												BW29 Worker Exposure	$4,500.00	$15,000.00	$15,000.00
BW30	Worker Accide	Covered by Worker's Comp.															BW30 Worker Accident			
BW31	Fund Inadequate	Not material	Insufficient funds to cover operating costs																	
		Reduced institutional control period		years																
																	BW31 Fund Inadequate			
BW32	Fund Recomm	Not material															BW32 Fund Recommitted			

Risk Event ID	Summary Description	Event Likelihood/Frequency	Consequence	Units	Best Estimate	High Estimate	Consequence Likelihood	Occurrence Cost	Total likelihood	Risk Quotient	Chance Occurrence cost	Commence year range start	Commence year range end	Commence year range	Commence Yr (integer)	Spend duration	Event Description	Total Risk Quotient	Chance Occurrence cost	Total Occurrence Cost
BW33	Aggressive Re	10%	More extensive groundwater clean-up																	
			Further characterisation	$000	$600	$2,000	100%					1	134	1.0	1.0	1.0				
				$000NPV	$600			$ 600	10%	60.00	$ 600									
			Pump & treat																	
			Capex	$000			75%							1.0	1.0	1.0				
			Treatment facility or buy additional buffer land	$000			0%							1.0	1.0	1.0				
				$000NPV				$ -	8%	0.00	$ -									
			Opex	$000/yr			75%							1.0	1.0	1.0				
				$000NPV				$ -	7.5E-02	0.00	$ -									
			Alternative water supply for 100 yr	Hsehlds exp	50		25%													
				per/hsehld	2	5														
				Pers	100	250														
				gal/pers/day	60															
				10000 gal/yr	219	548														
				$/10000gal	$10	$20														
				$000/yr	$2	$11								1.0	1.0	1.0				
				$000NPV	$2			$ 2	2.5E-02	0.05	$ 2									
			Upgrade facility				50%													
			additional cover	acres	115															
				in	18	36														
				$/yd3	$100	$125														
				$000	$27,830									1.0	1.0	1.0				
				$000NPV	$27,830			$ 27,830	5.0E-02	1,391.50	$ 27,830									
			Redesign	$000	$1,500	$4,000								1.0	1.0	1.0				
				$000NPV	$1,500			$ 1,500	5.0E-02	75.00	$ 1,500									
			Implement re-design	acres	100															
				$/yd3	50	100														
				thickness (ft)	2	5														
				$000/acre	$161	$807														
				$000	$18,553	$92,767								1.0	1.0	1.0				
				$000NPV	$18,553			$ 18,553	5.0E-02	927.67	$ 18,553									
			Increased monitoring	%	150%	500%	100%													
				$000/yr	$1,470	$1,090								1.0	1.0	1.0				
				$000NPV	$1,470			$ 1,470	1.0E-01	147	$ 1,470									
			TOTAL NPV		$49,956												BW33 Aggressive Regul	$2,601.22	$49,956	$49,955.52

Common Data

COMMON DATA

Discount Rate		2%				
	Units					
Exposed households			50	80		
Claims			20	40		
Claim			500	1500		
Legal			3000	5000	state limit on claims	
Random Chance			0.000000001			
Proportion liable by South Carolina						
Negative public perception						
Manage crisis	$'000					
Mgmt/Admin Time	Hr		40	80		
Mgmt/Admin Rates	$/hr		280			
	$'000		11.2	22.4		
PR Consultant Services	$'000		10	30		
Legal Support	Hr		20	50		
	$'000		20	50		
	$'000		41.2	160		
Increased regulatory control						
Increased security		%	100	300		
Redesign	$'000		1000	4000		
Implement re-design	acres		100			
	$/yd3		50	100		
	thickness (ft)		2	5		
	$000/acre		161333.3333	806666.6667		
	$'000		16133.33333	80666.66667		
Class action claim due to property value loss						
legal costs	$'000		3000			
Grading	cents/sq yd		0.5			
Random Chance			0.500045			
Pump & GS treat 8.3 gpm			Best		95%	Source: Fulbright, 1996
Capex		$000		$5,000	$6,000	
WWTP		$000		$0	$0	
Opex		$000/yr		$1,438	$1,726	
Pump & GS treat Entire zone 2						
Capex		$000		13500	$15,200	
WWTP		$000				
Opex		$000/yr		7796	$9,355	
Further Characterization				$600	$2,000	

Monitoring costs	$000/yr	$ 980	$ 1,090

Retrieval Campaign Cost

Labor	Clerical (ea/wk)	**5**	$6,426
	Managers (ea/wk)	**3**	$13,086
	Operators (ea/wk)	**5**	$13,230
	Professionals (ea/wk)	**10**	$40,718
	Semi-Skilled Laborers (ea/wl	**10**	$13,608
	Supervisors (ea/wk)	**10**	$30,134
	Technicians (ea/wk)	**20**	$36,288
			$153,491

URS Corp.

ESTIMATE NO:	**ARCH / ENER:**
PROJECT:	**EST. DATE:**
CLIENT:	**PLAN DATE:**
LOCATION:	**ESTIMATE BY:**
WAGE INFO. FROM:	

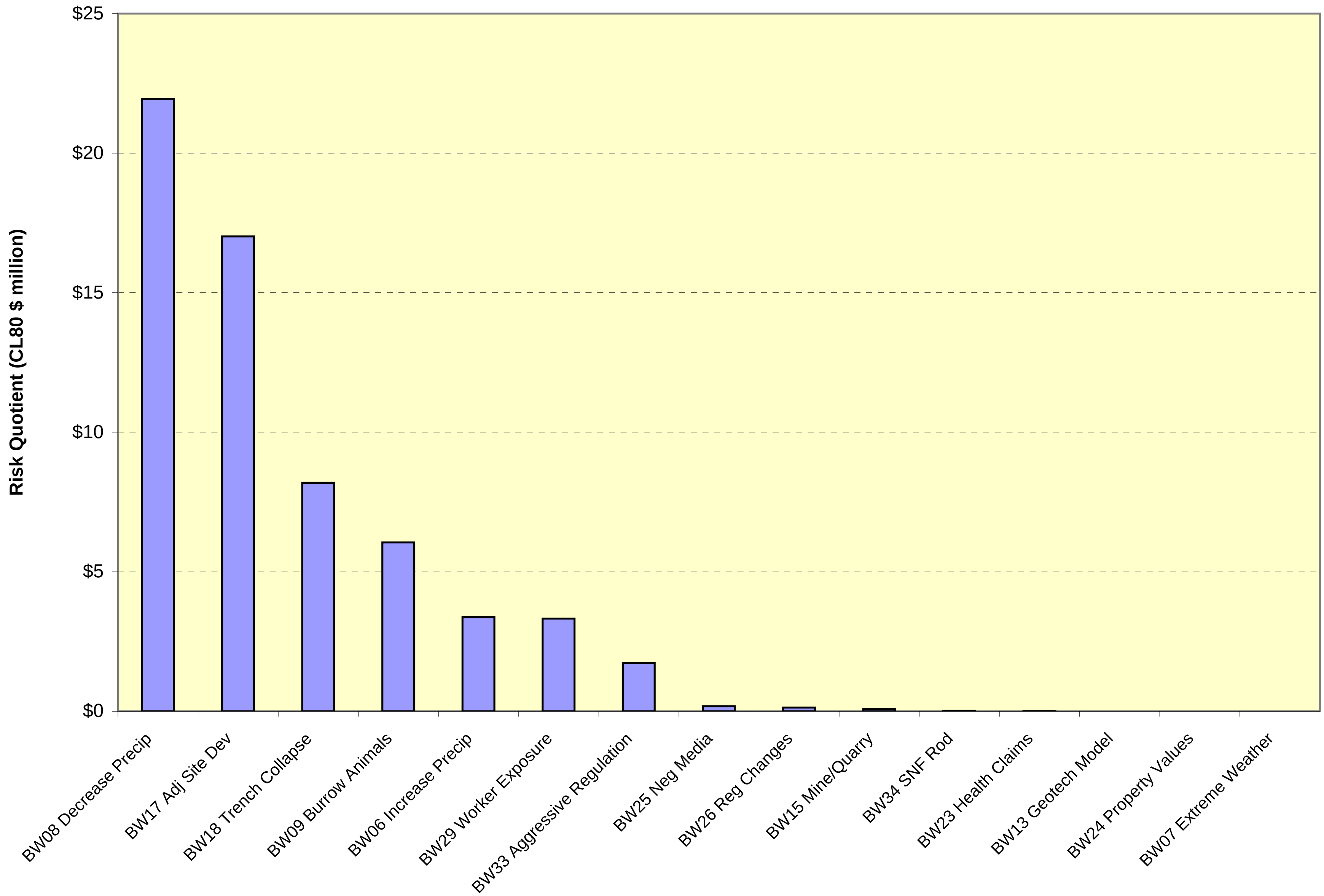
ANALYSIS (HOURLY LABOR RATES) **FIELD**

Building Construction Trades	**Base Wage Rate**	**Fringe Benefits 50.00%**	**Labor OH-Office 20.00%**	**G & A 5.00%**	**Field Labor Total**	**Multiplier**	Live (paste into Col F)	Factor 1	Factor 1.5
Clerical (Administrative Assistant (Du	$ 17.00	$ 8.50	$ 5.10	$ 1.53	$ 32.13	1.89000	$ 32.13	$ 32.13	$ 48.20
Manager (Project Manager)	$ 57.70	$ 28.85	$ 17.31	$ 5.19	$ 109.05	1.89000	$ 109.05	$ 109.05	$ 163.58
Operator (Rad Shipper)	$ 35.00	$ 17.50	$ 10.50	$ 3.15	$ 66.15	1.89000	$ 66.15	$ 66.15	$ 99.23
Professional (Civil Engineer)	$ 53.86	$ 26.93	$ 16.16	$ 4.85	$ 101.80	1.89000	$ 101.80	$ 101.80	$ 152.69
SemiSk Lab (Junior HP Technician)	$ 18.00	$ 9.00	$ 5.40	$ 1.62	$ 34.02	1.89000	$ 34.02	$ 34.02	$ 51.03
Supervisor (Project Engineer)	$ 39.86	$ 19.93	$ 11.96	$ 3.59	$ 75.34	1.89000	$ 75.34	$ 75.34	$ 113.00
Technician (Radiological Technician)	$ 24.00	$ 12.00	$ 7.20	$ 2.16	$ 45.36	1.89000	$ 45.36	$ 45.36	$ 68.04
	$ -	$ -	$ -	$ -	$ -		$ -		

Notes:

		2005$ -> 2008$	$0.876	
Equipment	1-cy Trackhoe (Means 2005	2	$1,463 $/wk	$2,925.23
	50-T Crane (Means 2005; 01	1	$2,219 $/wk	$2,218.89
	45 hp Backhoe/Loader (Mea	2	$563.64 $/wk	$1,127.28
	12-T Dump Truck (Means 2C	2	$699.20 $/wk	$1,398.40
				$7,669.81

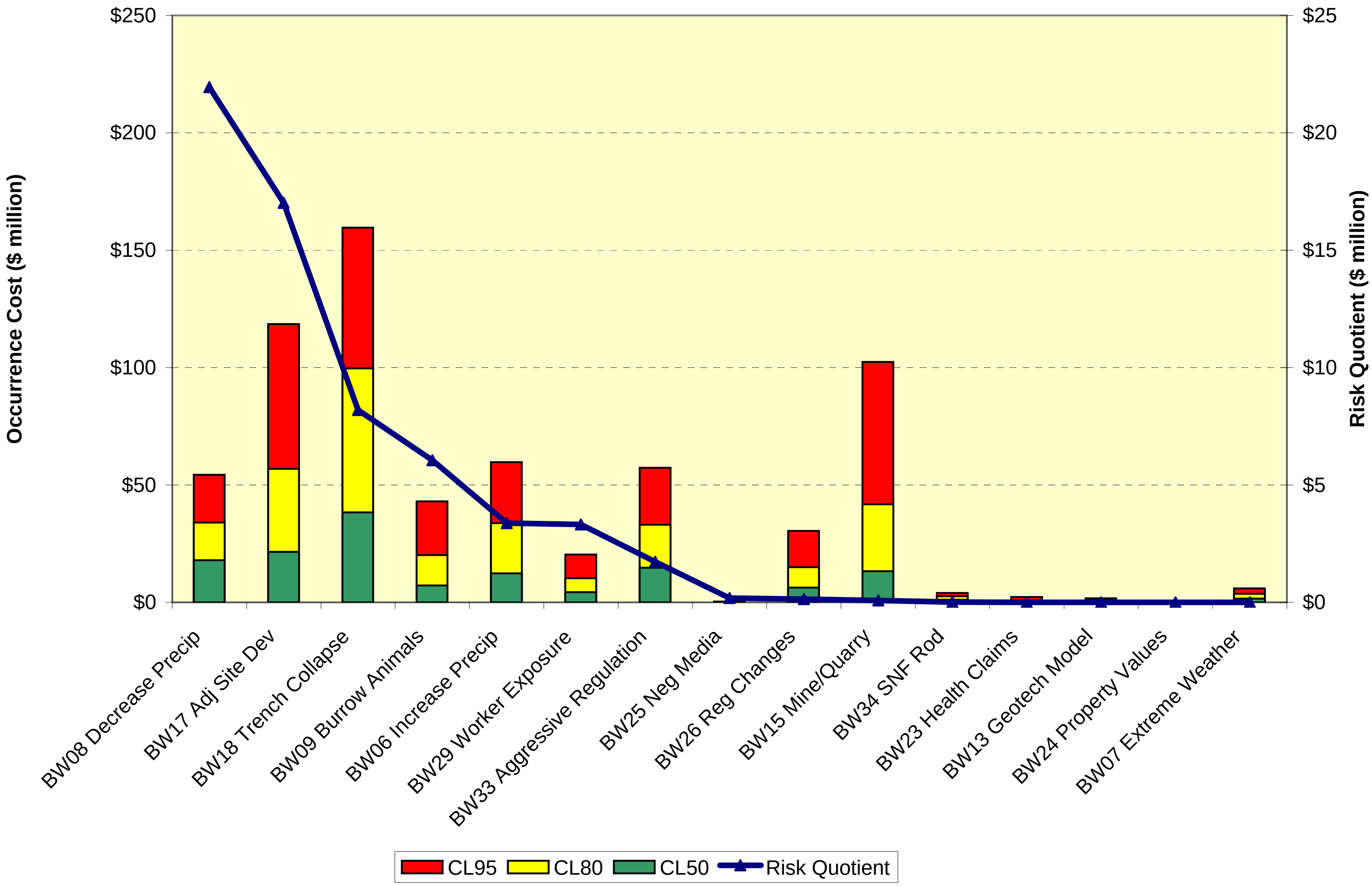
Risk Profile



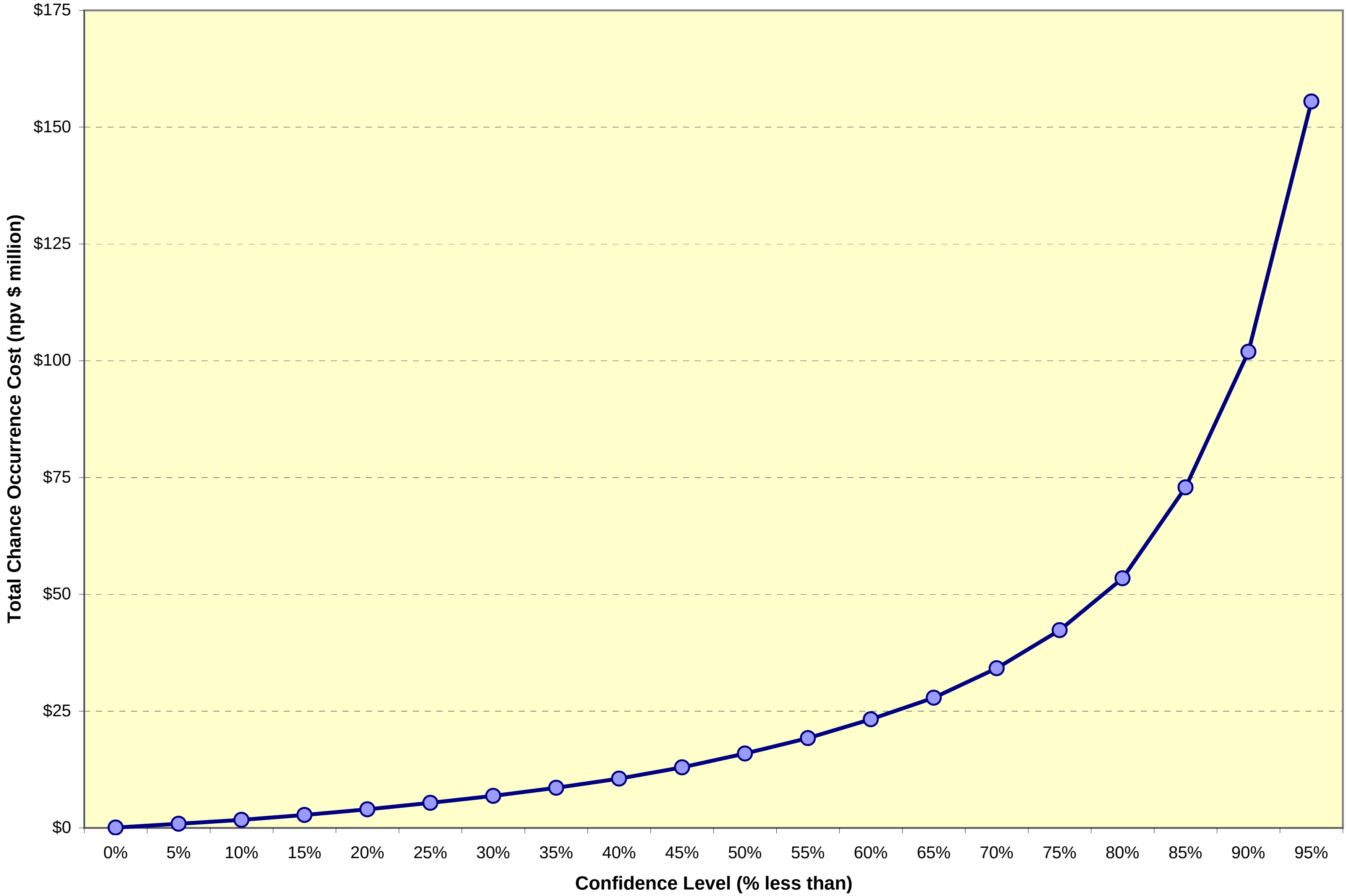
Risk Quotient (CL80 $ million)
$25
$20
$15
$10
$5
$0
BW08 Decrease Precip
BW17 Adj Site Dev
BW18 Trench Collapse
BW09 Burrow Animals
BW06 Increase Precip
BW29 Worker Exposure
BW33 Aggressive Regulation
BW25 Neg Media
BW26 Reg Changes
BW15 Mine/Quarry
BW34 SNF Rod
BW23 Health Claims
BW13 Geotech Model
BW24 Property Values
BW07 Extreme Weather

Occurrence Cost

Occurrence Cost



Risk Cost

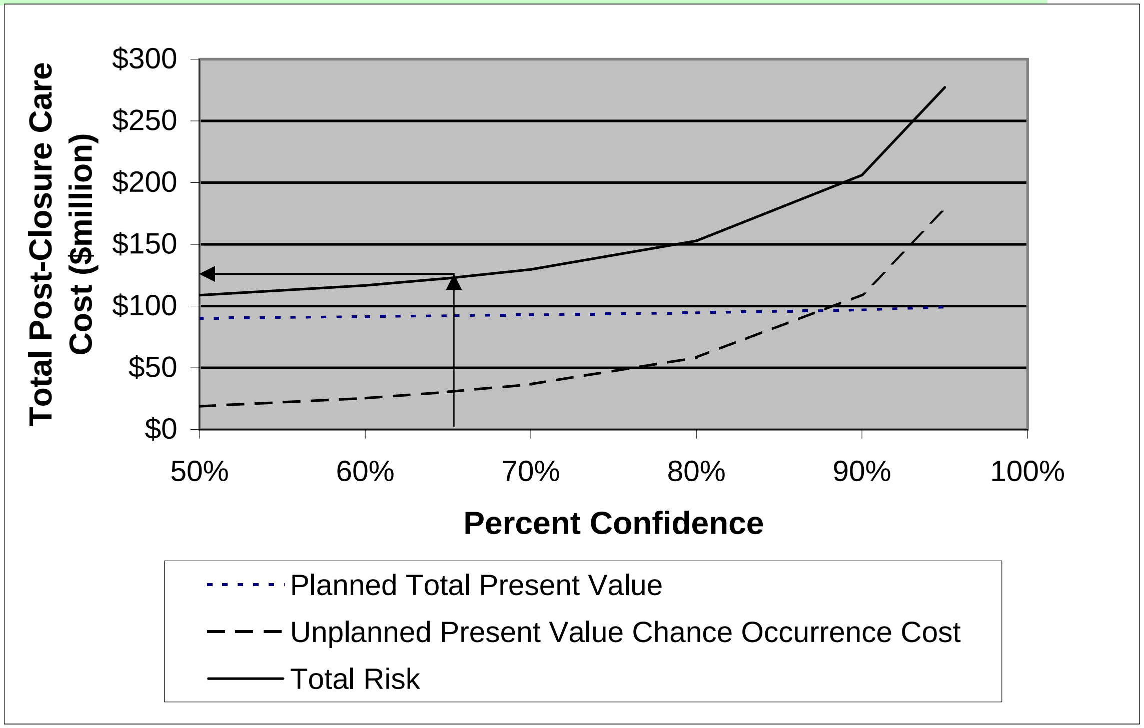


$175
$150
$125
$100
$75
$50
$25
$0
Total Chance Occurrence Cost (npv $ million)
0%
5%
10%
15%
20%
25%
30%
35%
40%
45%
50%
55%
60%
65%
70%
75%
80%
85%
90%
95%
Confidence Level (% less than)

Total Financial Risk vs. Confidence

Total Financial Risk vs Confidence

Percent Confidence	50%	60%	65%	70%	80%	90%	95%
Planned Total Present Value	$90.1	$91.4	$92.2	$92.9	$94.5	$96.9	$99.2
Unplanned Present Value Chance Occurrence Cost	$18.8	$25.4	$30.4	$36.7	$58.3	$109.2	$178.0
Total Risk	$108.9	$116.8	$122.6	$129.6	$152.8	$206.1	$277.2
80% Planned					$94.5		
62.5% Unplanned		$28.0					
Total		$123					



Forecasts

			Input Data		Extracted Data	CL50	CL80	CL95	
101	101BW01	Risk Quotient	BW01 Terror Attack	=SUM(Q5:Q15)	101BW01 Terror Attack				$0
102	102BW02		BW02 Sabotage	=SUM(Q20:Q32)	102BW02 Sabotage				
103	103BW04		BW04 Airplane Crash	=SUM(Q38:Q44)	103BW04 Airplane Crash				
104	104BW05		BW05 Attack in War	=SUM(Q47:Q52)	104BW05 Attack in War				
105	105BW06		BW06 Increase Precip	$5,362	105BW06 Increase Precip	$1,235	$3,376	$5,970	
106	106BW07		BW07 Extreme Weather	$0	106BW07 Extreme Weathe	$0	$0	$0	
107	107BW08		BW08 Decrease Precip	$37,711	107BW08 Decrease Precip	$7,601	$21,941	$43,478	
108	108BW09		BW09 Burrow Animals	$10,240	108BW09 Burrow Animals	$2,164	$6,053	$12,892	
109	109BW13		BW13 Geotech Model	$3	109BW13 Geotech Model	$1	$2	$3	
110	110BW14		BW14 GW/SW Contam	$0	110BW14 GW/SW Contam	$0	$0	$0	
111	111BW15		BW15 Mine/Quarry	$137	111BW15 Mine/Quarry	$27	$84	$205	
112	112BW17		BW17 Adj Site Dev	$27,987	112BW17 Adj Site Dev	$6,418	$17,014	$35,516	
113	113BW18		BW18 Trench Collapse	$13,863	113BW18 Trench Collapse	$3,031	$8,190	$13,637	
114	114BW23		BW23 Health Claims	$8	114BW23 Health Claims	$2	$6	$15	
115	115BW24		BW24 Property Values	$0	115BW24 Property Values	$0	$0	$0	
116	116BW25		BW25 Neg Media	$128	116BW25 Neg Media	$135	$184	$249	
117	117BW26		BW26 Reg Changes	$196	117BW26 Reg Changes	$59	$134	$244	
118	118BW29		BW29 Worker Exposure	$4,500	118BW29 Worker Exposur	$1,201	$3,322	$7,990	
119	119BW34		BW34 SNF Rod	$26	119BW34 SNF Rod	$7	$17	$27	
120	120BW33		BW33 Aggressive Regulatio	$2,601	120BW33 Aggressive Regu	$771	$1,729	$2,974	
201	201BW01	Occurrence Costs	BW01 Terror Attack	=SUM(O5:O15)	201BW01 Terror Attack	$2,801	$6,223	$10,386	
202	202BW02		BW02 Sabotage	=SUM(O20:O32)	202BW02 Sabotage	$707	$1,748	$3,557	
203	203BW04		BW04 Airplane Crash	=SUM(O39:O44)	203BW04 Airplane Crash	$8,296	$11,081	$15,136	
204	204BW05		BW05 Attack in War	=SUM(O47:O52)	204BW05 Attack in War	$8,296	$11,081	$15,136	
205	205BW06		BW06 Increase Precip	$53,617	205BW06 Increase Precip	$12,353	$33,757	$59,701	
206	206BW07		BW07 Extreme Weather	$6,000	206BW07 Extreme Weathe	$1,600	$3,607	$5,981	
207	207BW08		BW08 Decrease Precip	$58,935	207BW08 Decrease Precip	$17,947	$33,927	$54,353	
208	208BW09		BW09 Burrow Animals	$34,135	208BW09 Burrow Animals	$7,215	$20,176	$42,973	
209	209BW13		BW13 Geotech Model	$1,300	209BW13 Geotech Model	$361	$858	$1,699	
210	210BW14		BW14 GW/SW Contam	$0	210BW14 GW/SW Contam	$0	$0	$0	
211	211BW15		BW15 Mine/Quarry	$68,270	211BW15 Mine/Quarry	$13,281	$41,762	$102,370	
212	212BW17		BW17 Adj Site Dev	$93,440	212BW17 Adj Site Dev	$21,463	$56,812	$118,507	
213	213BW18		BW18 Trench Collapse	$166,910	213BW18 Trench Collapse	$38,293	$99,711	$159,608	
214	214BW23		BW23 Health Claims	$1,183	214BW23 Health Claims	$319	$858	$2,232	
215	215BW24		BW24 Property Values	$41	215BW24 Property Values	$13	$27	$46	
216	216BW25		BW25 Neg Media	$215	216BW25 Neg Media	$215	$289	$390	
217	217BW26		BW26 Reg Changes	$22,057	217BW26 Reg Changes	$6,298	$14,973	$30,400	
218	218BW29		BW29 Worker Exposure	$15,000	218BW29 Worker Exposur	$4,383	$10,315	$20,381	
219	219BW34		BW34 SNF Rod	$4,074	219BW34 SNF Rod	$1,164	$2,612	$3,986	
220	220BW33		BW33 Aggressive Regulatio	$49,956	220BW33 Aggressive Regu	$14,741	$33,050	$57,346	
301	301BW01	Chance Occurrenec Costs	BW01 Terror Attack	=SUM(R5:R15)	301BW01 Terror Attack	$0	$0	$0	
302	302BW02		BW02 Sabotage	=SUM(R20:R32)	302BW02 Sabotage	$0	$0	$0	
303	303BW04		BW04 Airplane Crash	=SUM(R38:R44)	303BW04 Airplane Crash	$0	$0	$0	
304	304BW05		BW05 Attack in War	=SUM(R47:R52)	304BW05 Attack in War	$0	$0	$0	
305	305BW06		BW06 Increase Precip	$53,617	305BW06 Increase Precip	$0	$0	$12,090	
306	306BW07		BW07 Extreme Weather	$0	306BW07 Extreme Weathe	$0	$0	$0	
307	307BW08		BW08 Decrease Precip	$58,935	307BW08 Decrease Precip	$6,949	$20,012	$39,533	
308	308BW09		BW09 Burrow Animals	$34,135	308BW09 Burrow Animals	$0	$4,287	$22,679	
309	309BW13		BW13 Geotech Model	$1,300	309BW13 Geotech Model	$0	$0	$0	
310	310BW14		BW14 GW/SW Contam	$0	310BW14 GW/SW Contam	$0	$0	$0	
311	311BW15		BW15 Mine/Quarry	$68,270	311BW15 Mine/Quarry	$0	$0	$0	
312	312BW17		BW17 Adj Site Dev	$93,440	312BW17 Adj Site Dev	$0	$10,994	$65,334	
313	313BW18		BW18 Trench Collapse	$166,910	313BW18 Trench Collapse	$0	$0	$31,299	
314	314BW23		BW23 Health Claims	$1,183	314BW23 Health Claims	$0	$0	$0	
315	315BW24		BW24 Property Values	$41	315BW24 Property Values	$0	$0	$0	
316	316BW25		BW25 Neg Media	$215	316BW25 Neg Media	$130	$218	$318	
317	317BW26		BW26 Reg Changes	$21,513	317BW26 Reg Changes	$0	$0	$0	
318	318BW29		BW29 Worker Exposure	$15,000	318BW29 Worker Exposur	$260	$3,323	$11,099	
319	319BW34		BW34 SNF Rod	$4,074	319BW34 SNF Rod	$0	$0	$0	
320	320BW33		BW33 Aggressive Regulatio	$49,956	320BW33 Aggressive Regu	$1	$2	$2,301	
401	401Total C	Chance Costs	Total Chance Costs	$568,588	401Total Chance Costs	$15,927	$56,007	$151,315	
				$568,588			$393,918		

Live

	Risk Quotient ($ million)	Occurrence Cost ($ million)		
Risk ID	CL80	CL50	CL80	CL95
BW06 Increase Precip	$3	$12	$34	$60
BW07 Extreme Weather	$0	$2	$4	$6
BW08 Decrease Precip	$22	$18	$34	$54
BW09 Burrow Animals	$6	$7	$20	$43
BW13 Geotech Model	$0	$0	$1	$2
BW14 GW/SW Contam	$0	$0	$0	$0
BW15 Mine/Quarry	$0	$13	$42	$102
BW17 Adj Site Dev	$17	$21	$57	$119
BW18 Trench Collapse	$8	$38	$100	$160
BW23 Health Claims	$0	$0	$1	$2
BW24 Property Values	$0	$0	$0	$0
BW25 Neg Media	$0	$0	$0	$0
BW26 Reg Changes	$0	$6	$15	$30
BW29 Worker Exposure	$3	$4	$10	$20
BW34 SNF Rod	$0	$1	$3	$4
BW33 Aggressive Regulatio	$2	$15	$33	$57

Values Only Sorted by CL80

	Risk Quotient	Occurrence Cost ($ million)		
Risk ID	CL80	CL50	CL80	CL95
BW08 Decrease Precip	$22	$18	$34	$54
BW17 Adj Site Dev	$17	$21	$57	$119
BW18 Trench Collapse	$8	$38	$100	$160
BW09 Burrow Animals	$6	$7	$20	$43
BW06 Increase Precip	$3	$12	$34	$60
BW29 Worker Exposure	$3	$4	$10	$20
BW33 Aggressive Regulatio	$2	$15	$33	$57
BW25 Neg Media	$0	$0	$0	$0
BW26 Reg Changes	$0	$6	$15	$30
BW15 Mine/Quarry	$0	$13	$42	$102
BW34 SNF Rod	$0	$1	$3	$4
BW23 Health Claims	$0	$0	$1	$2
BW13 Geotech Model	$0	$0	$1	$2
BW24 Property Values	$0	$0	$0	$0
BW07 Extreme Weather	$0	$2	$4	$6
BW14 GW/SW Contam	$0	$0	$0	$0

Percentiles	**401Total Chance Costs**	**Total Chance Costs ($million)**
0%	$81	$0
5%	$903	$1
10%	$1,722	$2
15%	$2,771	$3
20%	$3,985	$4
25%	$5,379	$5
30%	$6,866	$7
35%	$8,593	$9
40%	$10,560	$11
45%	$12,969	$13
50%	$15,919	$16
55%	$19,238	$19
60%	$23,271	$23
65%	$27,857	$28
70%	$34,196	$34
75%	$42,317	$42
80%	$53,429	$53
85%	$72,886	$73
90%	$101,907	$102
95%	$155,491	$155
100%	$704,181	$704

CB Data BW14 @ 0%

Percentiles	105BW06 Increase Precip	106BW07 Extreme Weather	107BW08 Decrease Precip	108BW09 Burrow Animals	109BW13 Geotech Model	110BW14 GW/SW Contam	111BW15 Mine/Quarry	112BW17 Adj Site Dev	113BW18 Trench Collapse	114BW23 Health Claims	115BW24 Property Values	116BW25 Neg Media	117BW26 Reg Changes	118BW29 Worker Exposure
0%	$45	$0	$78	$6	$0	$0	$0	$45	$35	$0	$0	$40	$5	$10
5%	$149	$0	$516	$126	$0	$0	$1	$387	$213	$0	$0	$76	$15	$201
10%	$229	$0	$956	$239	$0	$0	$3	$754	$374	$0	$0	$87	$19	$288
15%	$313	$0	$1,483	$373	$0	$0	$5	$1,162	$568	$0	$0	$95	$22	$365
20%	$402	$0	$2,039	$525	$0	$0	$6	$1,672	$799	$1	$0	$101	$26	$453
25%	$512	$0	$2,796	$711	$0	$0	$9	$2,202	$1,053	$1	$0	$108	$30	$555
30%	$623	$0	$3,456	$922	$0	$0	$12	$2,794	$1,320	$1	$0	$114	$34	$666
35%	$749	$0	$4,355	$1,150	$0	$0	$15	$3,502	$1,690	$1	$0	$119	$39	$786
40%	$908	$0	$5,319	$1,450	$1	$0	$18	$4,284	$2,101	$1	$0	$124	$44	$907
45%	$1,089	$0	$6,381	$1,766	$1	$0	$22	$5,236	$2,563	$2	$0	$130	$51	$1,070
50%	$1,306	$0	$7,811	$2,148	$1	$0	$28	$6,276	$3,060	$2	$0	$136	$57	$1,244
55%	$1,556	$0	$9,227	$2,573	$1	$0	$33	$7,484	$3,647	$2	$0	$142	$66	$1,434
60%	$1,801	$0	$10,985	$3,109	$1	$0	$40	$8,850	$4,249	$3	$0	$149	$74	$1,654
65%	$2,122	$0	$13,384	$3,696	$1	$0	$49	$10,457	$5,067	$3	$0	$156	$84	$1,921
70%	$2,506	$0	$15,865	$4,464	$1	$0	$59	$12,388	$6,036	$4	$0	$165	$98	$2,287
75%	$2,894	$0	$18,929	$5,374	$1	$0	$72	$14,772	$7,059	$5	$0	$175	$113	$2,665
80%	$3,390	$0	$22,258	$6,383	$2	$0	$89	$17,590	$8,130	$6	$0	$185	$131	$3,145
85%	$3,982	$0	$26,847	$7,801	$2	$0	$111	$21,276	$9,357	$8	$0	$198	$156	$3,822
90%	$4,807	$0	$33,021	$9,432	$3	$0	$143	$26,809	$10,995	$10	$0	$218	$186	$4,984
95%	$6,048	$0	$45,189	$12,712	$3	$0	$213	$38,159	$13,315	$15	$0	$255	$244	$7,104
100%	$18,665	$0	$182,843	$50,104	$14	$0	$1,042	$304,315	$29,809	$169	$1	$759	$788	$52,630

Percentiles	119BW34 SNF Rod	120BW33 Aggressive Regulation	205BW06 Increase Precip	206BW07 Extreme Weather	207BW08 Decrease Precip	208BW09 Burrow Animals	209BW13 Geotech Model	210BW14 GW/SW Contam	211BW15 Mine/Quarry	212BW17 Adj Site Dev	213BW18 Trench Collapse	214BW23 Health Claims	215BW24 Property Values	216BW25 Neg Media
0%	$1	$88	$454	$218	$1,097	$21	$18	$0	$49	$157	$971	$4	$1	$69
5%	$2	$207	$1,486	$443	$4,060	$420	$72	$0	$732	$1,296	$3,579	$25	$3	$124
10%	$2	$258	$2,289	$539	$5,597	$797	$99	$0	$1,422	$2,524	$6,022	$45	$4	$141
15%	$3	$305	$3,127	$629	$7,023	$1,242	$122	$0	$2,254	$3,896	$8,733	$66	$5	$153
20%	$3	$355	$4,019	$732	$8,412	$1,751	$145	$0	$3,227	$5,603	$11,513	$92	$5	$164
25%	$4	$411	$5,125	$857	$9,577	$2,370	$174	$0	$4,387	$7,362	$14,510	$116	$6	$173
30%	$4	$468	$6,229	$983	$11,125	$3,072	$201	$0	$5,753	$9,336	$17,853	$147	$7	$182
35%	$5	$535	$7,490	$1,128	$12,592	$3,833	$236	$0	$7,348	$11,732	$22,212	$180	$8	$190
40%	$6	$609	$9,083	$1,287	$14,262	$4,832	$272	$0	$9,015	$14,309	$27,145	$216	$9	$198
45%	$6	$697	$10,887	$1,466	$15,888	$5,886	$311	$0	$11,120	$17,505	$32,803	$255	$11	$207
50%	$7	$784	$13,062	$1,650	$17,754	$7,161	$351	$0	$13,769	$20,953	$38,700	$305	$12	$215
55%	$8	$899	$15,560	$1,905	$19,733	$8,578	$405	$0	$16,736	$24,970	$45,496	$362	$14	$225
60%	$9	$1,017	$18,010	$2,147	$21,933	$10,364	$476	$0	$20,136	$29,560	$53,036	$426	$16	$235
65%	$11	$1,174	$21,225	$2,422	$23,884	$12,320	$543	$0	$24,268	$34,970	$62,913	$497	$18	$247
70%	$12	$1,334	$25,059	$2,779	$26,558	$14,881	$631	$0	$29,375	$41,336	$74,085	$590	$21	$260
75%	$14	$1,520	$28,941	$3,153	$29,658	$17,913	$725	$0	$35,913	$49,347	$86,068	$714	$24	$273
80%	$16	$1,738	$33,900	$3,636	$33,563	$21,276	$866	$0	$44,560	$58,713	$98,808	$886	$28	$290
85%	$18	$2,004	$39,820	$4,267	$38,371	$26,003	$1,039	$0	$55,534	$70,995	$114,296	$1,130	$32	$309
90%	$22	$2,371	$48,067	$4,960	$45,111	$31,441	$1,273	$0	$71,289	$89,458	$132,325	$1,500	$37	$343
95%	$26	$2,905	$60,476	$6,046	$56,229	$42,374	$1,707	$0	$106,613	$127,272	$156,377	$2,230	$46	$390
100%	$55	$10,463	$186,653	$15,504	$195,676	$167,014	$7,227	$0	$520,886	$1,014,653	$330,189	$25,307	$131	$1,036

Percentiles	217BW26 Reg Changes	218BW29 Worker Exposure	219BW34 SNF Rod	220BW33 Aggressive Regulation	305BW06 Increase Precip	306BW07 Extreme Weather	307BW08 Decrease Precip	308BW09 Burrow Animals	309BW13 Geotech Model	310BW14 GW/SW Contam	311BW15 Mine/Quarry	312BW17 Adj Site Dev	313BW18 Trench Collapse	314BW23 Health Claims
0%	$454	$312	$178	$1,627	$0	$0	$36	$0	$0	$0	$0	$0	$0	$0
5%	$1,440	$1,013	$291	$3,905	$0	$0	$430	$0	$0	$0	$0	$0	$0	$0
10%	$1,928	$1,286	$376	$4,897	$0	$0	$824	$0	$0	$0	$0	$0	$0	$0
15%	$2,324	$1,598	$451	$5,762	$0	$0	$1,315	$0	$0	$0	$0	$0	$0	$0
20%	$2,741	$1,857	$530	$6,742	$0	$0	$1,820	$0	$0	$0	$0	$0	$0	$0
25%	$3,246	$2,179	$609	$7,810	$0	$0	$2,498	$0	$0	$0	$0	$0	$0	$0
30%	$3,710	$2,508	$689	$8,864	$0	$0	$3,111	$0	$0	$0	$0	$0	$0	$0
35%	$4,246	$2,902	$781	$10,183	$0	$0	$3,944	$0	$0	$0	$0	$0	$0	$0
40%	$4,774	$3,367	$885	$11,667	$0	$0	$4,838	$0	$0	$0	$0	$0	$0	$0
45%	$5,513	$3,849	$990	$13,230	$0	$0	$5,783	$0	$0	$0	$0	$0	$0	$0
50%	$6,338	$4,451	$1,121	$14,963	$0	$0	$7,135	$0	$0	$0	$0	$0	$0	$0
55%	$7,266	$5,084	$1,275	$17,051	$0	$0	$8,446	$0	$0	$0	$0	$0	$0	$0
60%	$8,239	$5,839	$1,469	$19,387	$0	$0	$10,008	$0	$0	$0	$0	$0	$0	$0
65%	$9,361	$6,710	$1,651	$22,284	$0	$0	$12,229	$0	$0	$0	$0	$0	$0	$0
70%	$10,740	$7,576	$1,875	$25,388	$0	$0	$14,451	$203	$0	$0	$0	$695	$0	$0
75%	$12,317	$8,551	$2,171	$29,070	$0	$0	$17,243	$1,646	$0	$0	$0	$4,940	$0	$0
80%	$14,644	$9,716	$2,518	$33,242	$0	$0	$20,312	$3,616	$0	$0	$0	$12,174	$0	$0
85%	$17,672	$11,592	$2,882	$38,313	$0	$0	$24,487	$7,128	$0	$0	$0	$23,063	$0	$0
90%	$22,231	$14,182	$3,330	$45,467	$0	$0	$30,079	$12,915	$0	$0	$0	$38,208	$0	$0
95%	$30,953	$18,972	$3,931	$56,175	$10,676	$0	$40,973	$23,794	$0	$0	$0	$65,893	$28,646	$0
100%	$143,719	$110,973	$7,988	$208,013	$186,653	$0	$166,641	$117,627	$1,531	$0	$144,716	$561,904	$297,600	$25,307

Percentiles	315BW24 Property Values	316BW25 Neg Media	317BW26 Reg Changes	318BW29 Worker Exposure	319BW34 SNF Rod	320BW33 Aggressive Regulation	401Total Chance Costs	Sum of ChOcc Cost							
0%	$0	$15	$0	$0	$0	$0	$81	$51							
5%	$0	$36	$0	$0	$0	$0	$903	$466							
10%	$0	$45	$0	$0	$0	$0	$1,722	$869							
15%	$0	$54	$0	$0	$0	$0	$2,771	$1,369							
20%	$0	$62	$0	$0	$0	$0	$3,985	$1,882							
25%	$0	$71	$0	$0	$0	$0	$5,379	$2,569							
30%	$0	$81	$0	$0	$0	$0	$6,866	$3,192							
35%	$0	$91	$0	$0	$0	$0	$8,593	$4,035							
40%	$0	$103	$0	$0	$0	$1	$10,560	$4,941							
45%	$0	$116	$0	$0	$0	$1	$12,969	$5,900							
50%	$0	$130	$0	$255	$0	$1	$15,919	$7,520							
55%	$0	$142	$0	$617	$0	$1	$19,238	$9,206							
60%	$0	$156	$0	$934	$0	$1	$23,271	$11,099							
65%	$0	$172	$0	$1,342	$0	$1	$27,857	$13,744							
70%	$0	$186	$0	$1,834	$0	$1	$34,196	$17,370							
75%	$0	$201	$0	$2,514	$0	$2	$42,317	$26,545	BW08	BW17	BW09	BW29			
80%	$0	$217	$0	$3,336	$0	$2	$53,429	$39,658	$20,312	$12,174	$3,616	$3,336	$217	$2	$39,658
85%	$0	$240	$0	$4,594	$0	$3	$72,886	$59,514	51%	31%	9%	8%	1%	0%	
90%	$0	$272	$0	$6,279	$0	$9	$101,907	$87,763							
95%	$0	$322	$0	$9,956	$0	$2,946	$155,491	$183,206							
100%	$57	$1,036	$92,815	$70,131	$3,978	$97,341	$704,181	$1,767,336							

CB Data BW14 @ 100%

Percentiles	105BW06 Increase Precip	106BW07 Extreme Weather	107BW08 Decrease Precip	108BW09 Burrow Animals	109BW13 Geotech Model	110BW14 GW/SW Contam	111BW15 Mine/Quarry	112BW17 Adj Site Dev	113BW18 Trench Collapse	114BW23 Health Claims	115BW24 Property Values
0%		$0	$48	$10	$0	$41,742	$0	$51	$33	$0	$0
5%	$143	$0	$497	$110	$0	$47,809	$1	$397	$196	$0	$0
10%	$217	$0	$882	$219	$0	$49,795	$3	$785	$375	$0	$0
15%	$295	$0	$1,391	$345	$0	$51,329	$5	$1,140	$545	$0	$0
20%	$383	$0	$1,926	$487	$0	$52,523	$7	$1,648	$758	$1	$0
25%	$487	$0	$2,615	$656	$0	$53,724	$9	$2,224	$1,001	$1	$0
30%	$609	$0	$3,328	$861	$0	$54,828	$11	$2,842	$1,294	$1	$0
35%	$743	$0	$4,160	$1,095	$0	$56,010	$15	$3,571	$1,599	$1	$0
40%	$884	$0	$5,166	$1,365	$1	$57,048	$18	$4,348	$1,969	$1	$0
45%	$1,061	$0	$6,315	$1,641	$1	$58,076	$22	$5,318	$2,402	$2	$0
50%	$1,279	$0	$7,738	$2,015	$1	$59,268	$27	$6,277	$2,935	$2	$0
55%	$1,530	$0	$9,174	$2,398	$1	$60,458	$33	$7,533	$3,493	$2	$0
60%	$1,785	$0	$10,975	$2,871	$1	$61,790	$40	$8,951	$4,079	$3	$0
65%	$2,083	$0	$12,908	$3,443	$1	$62,982	$48	$10,653	$4,852	$3	$0
70%	$2,412	$0	$15,359	$4,066	$1	$64,100	$59	$12,439	$5,704	$4	$0
75%	$2,824	$0	$18,303	$4,928	$1	$65,610	$71	$14,600	$6,665	$5	$0
80%	$3,310	$0	$21,469	$5,898	$2	$67,063	$87	$17,253	$7,787	$6	$0
85%	$3,886	$0	$25,910	$7,134	$2	$68,626	$106	$20,604	$9,005	$7	$0
90%	$4,672	$0	$32,067	$9,205	$2	$70,671	$142	$25,977	$10,773	$9	$0
95%	$6,017	$0	$44,358	$12,688	$3	$73,691	$209	$37,208	$13,073	$14	$0
100%	$17,254	$0	$173,407	$67,072	$25	$88,520	$1,158	$208,677	$36,030	$107	$1

Percentiles	116BW25 Neg Media	117BW26 Reg Changes	118BW29 Worker Exposure	119BW34 SNF Rod	120BW33 Aggressive Regulation	205BW06 Increase Precip	206BW07 Extreme Weather	207BW08 Decrease Precip	208BW09 Burrow Animals	209BW13 Geotech Model	210BW14 GW/SW Contam
0%	$38	$5	$40	$1	$86	$338	$168	$707	$32	$15	$142,919
5%	$77	$14	$198	$2	$205	$1,430	$440	$4,008	$368	$72	$176,378
10%	$88	$18	$284	$2	$255	$2,167	$535	$5,373	$729	$99	$183,651
15%	$96	$22	$377	$3	$302	$2,947	$638	$6,813	$1,150	$126	$189,758
20%	$102	$26	$469	$3	$351	$3,833	$742	$8,263	$1,624	$149	$194,876
25%	$108	$30	$556	$4	$398	$4,870	$851	$9,581	$2,188	$178	$199,485
30%	$114	$35	$662	$4	$455	$6,090	$973	$11,048	$2,871	$206	$203,799
35%	$120	$39	$773	$5	$522	$7,429	$1,107	$12,394	$3,651	$234	$208,231
40%	$126	$45	$898	$6	$599	$8,835	$1,266	$13,885	$4,550	$274	$212,667
45%	$131	$52	$1,050	$6	$679	$10,606	$1,450	$15,503	$5,469	$312	$216,863
50%	$137	$59	$1,203	$7	$776	$12,787	$1,631	$17,374	$6,716	$349	$221,181
55%	$143	$68	$1,395	$9	$876	$15,301	$1,873	$19,113	$7,992	$401	$225,554
60%	$150	$77	$1,625	$10	$990	$17,849	$2,127	$21,232	$9,571	$450	$230,169
65%	$157	$88	$1,904	$11	$1,130	$20,827	$2,458	$23,490	$11,475	$515	$234,465
70%	$165	$100	$2,229	$13	$1,302	$24,118	$2,779	$25,956	$13,552	$591	$240,089
75%	$175	$115	$2,621	$15	$1,485	$28,243	$3,151	$28,957	$16,425	$691	$244,883
80%	$186	$134	$3,138	$17	$1,707	$33,099	$3,593	$32,480	$19,659	$816	$251,232
85%	$201	$157	$3,866	$19	$1,996	$38,863	$4,207	$37,209	$23,781	$974	$257,811
90%	$222	$191	$4,945	$22	$2,372	$46,722	$4,897	$43,485	$30,683	$1,220	$265,561
95%	$255	$240	$7,237	$27	$3,028	$60,170	$5,975	$54,144	$42,294	$1,687	$278,572
100%	$586	$886	$54,886	$88	$7,940	$172,537	$13,354	$178,486	$223,574	$12,257	$349,759

Percentiles	211BW15 Mine/Quarry	212BW17 Adj Site Dev	213BW18 Trench Collapse	214BW23 Health Claims	215BW24 Property Values	216BW25 Neg Media	217BW26 Reg Changes	218BW29 Worker Exposure	219BW34 SNF Rod	220BW33 Aggressive Regulation	305BW06 Increase Precip
0%	$27	$177	$903	$3	$1	$62	$521	$367	$169	$1,528	$0
5%	$681	$1,340	$3,389	$26	$3	$126	$1,376	$1,026	$287	$3,861	$0
10%	$1,442	$2,634	$6,066	$49	$4	$141	$1,865	$1,315	$377	$4,828	$0
15%	$2,263	$3,831	$8,386	$72	$5	$153	$2,297	$1,600	$448	$5,735	$0
20%	$3,289	$5,528	$11,073	$95	$6	$164	$2,730	$1,866	$524	$6,644	$0
25%	$4,400	$7,443	$13,992	$123	$6	$173	$3,221	$2,192	$597	$7,594	$0
30%	$5,732	$9,516	$17,530	$152	$7	$183	$3,752	$2,517	$679	$8,619	$0
35%	$7,256	$11,952	$21,297	$184	$8	$192	$4,287	$2,927	$775	$9,886	$0
40%	$9,052	$14,528	$25,437	$217	$10	$200	$4,897	$3,348	$890	$11,455	$0
45%	$11,235	$17,787	$30,359	$263	$11	$208	$5,676	$3,827	$1,009	$12,992	$0
50%	$13,684	$20,991	$36,859	$307	$12	$217	$6,389	$4,353	$1,166	$14,738	$0
55%	$16,644	$25,174	$43,645	$358	$14	$226	$7,362	$4,993	$1,351	$16,739	$0
60%	$20,125	$29,942	$50,596	$422	$16	$236	$8,482	$5,679	$1,549	$18,771	$0
65%	$23,967	$35,588	$60,303	$500	$18	$247	$9,753	$6,495	$1,774	$21,466	$0
70%	$29,334	$41,551	$70,387	$593	$21	$260	$11,244	$7,492	$2,056	$24,696	$0
75%	$35,627	$48,750	$82,432	$705	$23	$275	$13,020	$8,546	$2,324	$28,272	$0
80%	$43,297	$57,568	$94,493	$844	$27	$291	$15,096	$9,806	$2,630	$32,549	$0
85%	$53,246	$68,843	$109,654	$1,065	$31	$313	$18,169	$11,648	$3,007	$38,065	$0
90%	$70,955	$86,671	$130,053	$1,423	$36	$345	$22,720	$14,213	$3,441	$45,441	$1,317
95%	$104,465	$124,231	$154,127	$2,122	$46	$395	$29,823	$18,690	$4,009	$58,167	$13,499
100%	$579,018	$695,689	$387,551	$16,117	$183	$896	$104,118	$116,422	$12,200	$153,355	$169,804

Percentiles	306BW07 Extreme Weather	307BW08 Decrease Precip	308BW09 Burrow Animals	309BW13 Geotech Model	310BW14 GW/SW Contam	311BW15 Mine/Quarry	312BW17 Adj Site Dev	313BW18 Trench Collapse	314BW23 Health Claims	315BW24 Property Values	316BW25 Neg Media
0%	$0	$16	$0	$0	$66	$0	$0	$0	$0	$0	$13
5%	$0	$410	$0	$0	$237	$0	$0	$0	$0	$0	$38
10%	$0	$761	$0	$0	$324	$0	$0	$0	$0	$0	$46
15%	$0	$1,235	$0	$0	$419	$0	$0	$0	$0	$0	$54
20%	$0	$1,730	$0	$0	$514	$0	$0	$0	$0	$0	$62
25%	$0	$2,367	$0	$0	$650	$0	$0	$0	$0	$0	$71
30%	$0	$3,007	$0	$0	$856	$0	$0	$0	$0	$0	$81
35%	$0	$3,783	$0	$0	$1,269	$0	$0	$0	$0	$0	$91
40%	$0	$4,685	$0	$0	$27,500	$0	$0	$0	$0	$0	$104
45%	$0	$5,742	$0	$0	$31,074	$0	$0	$0	$0	$0	$115
50%	$0	$7,027	$0	$0	$33,217	$0	$0	$0	$0	$0	$128
55%	$0	$8,378	$0	$0	$35,083	$0	$0	$0	$0	$0	$140
60%	$0	$9,982	$0	$0	$36,891	$0	$0	$0	$0	$0	$153
65%	$0	$11,810	$0	$0	$38,865	$0	$0	$0	$0	$0	$166
70%	$0	$14,002	$65	$0	$41,085	$0	$291	$0	$0	$0	$182
75%	$0	$16,668	$1,339	$0	$43,948	$0	$4,448	$0	$0	$0	$200
80%	$0	$19,604	$3,497	$0	$50,260	$0	$11,056	$0	$0	$0	$218
85%	$0	$23,823	$7,016	$0	$197,858	$0	$22,277	$0	$0	$0	$240
90%	$0	$29,290	$11,994	$0	$219,284	$0	$40,444	$932	$0	$0	$275
95%	$0	$40,230	$22,219	$0	$243,947	$0	$66,649	$30,953	$0	$0	$325
100%	$0	$157,516	$145,612	$467	$349,759	$88,673	$521,731	$254,500	$1,773	$58	$881

Percentiles	317BW26 Reg Changes	318BW29 Worker Exposure	319BW34 SNF Rod	320BW33 Aggressive Regulation	401Total Chance Costs
0%	$0	$0	$0	$0	$231
5%	$0	$0	$0	$0	$1,807
10%	$0	$0	$0	$0	$3,239
15%	$0	$0	$0	$0	$5,205
20%	$0	$0	$0	$0	$8,199
25%	$0	$0	$0	$0	$12,212
30%	$0	$0	$0	$0	$18,426
35%	$0	$0	$0	$0	$28,868
40%	$0	$0	$0	$0	$36,913
45%	$0	$0	$0	$1	$41,479
50%	$0	$0	$0	$1	$45,518
55%	$0	$585	$0	$1	$49,421
60%	$0	$944	$0	$1	$54,388
65%	$0	$1,295	$0	$1	$61,430
70%	$0	$1,768	$0	$1	$72,036
75%	$0	$2,328	$0	$2	$94,914
80%	$0	$3,212	$0	$2	$193,094
85%	$0	$4,444	$0	$3	$266,078
90%	$0	$6,210	$0	$153	$314,318
95%	$78	$9,724	$0	$4,199	$373,672
100%	$42,061	$109,773	$3,387	$112,979	$874,826

APPENDIX F

CRYSTAL BALL REPORT FOR UNPLANNED EVENTS

Report

Crystal Ball Report - Full; Barnwell Unplanned Events
Simulation started on 6/18/2008 at 11:55:19
Simulation stopped on 6/18/2008 at 11:55:32

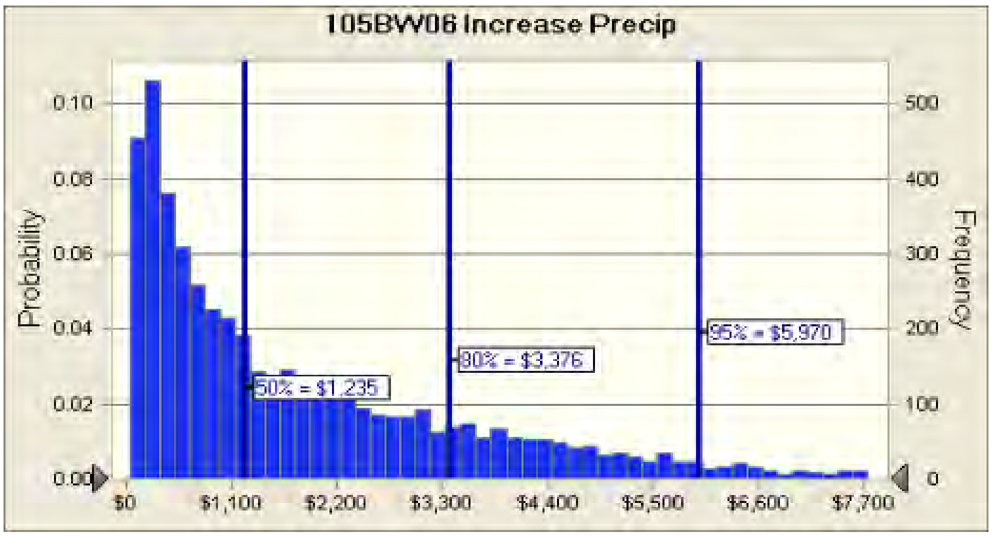
Run preferences:	
Number of trials run	5,000
Extreme speed	
Monte Carlo	
Random seed	
Precision control on	
Confidence level	95.00%
Run statistics:	
Total running time (sec)	13.20
Trials/second (average)	379
Random numbers per sec	45,447
Crystal Ball data:	
Assumptions	120
Correlations	0
Correlated groups	0
Decision variables	0
Forecasts	49

Forecasts

Worksheet: [Appendix E 080618.xls]Forecasts

Forecast: 105BW06 Increase Precip **Cell: E8**

Summary:
Entire range is from $42 to $23,992
Base case is $5,362
After 5,000 trials, the std. error of the mean is $29



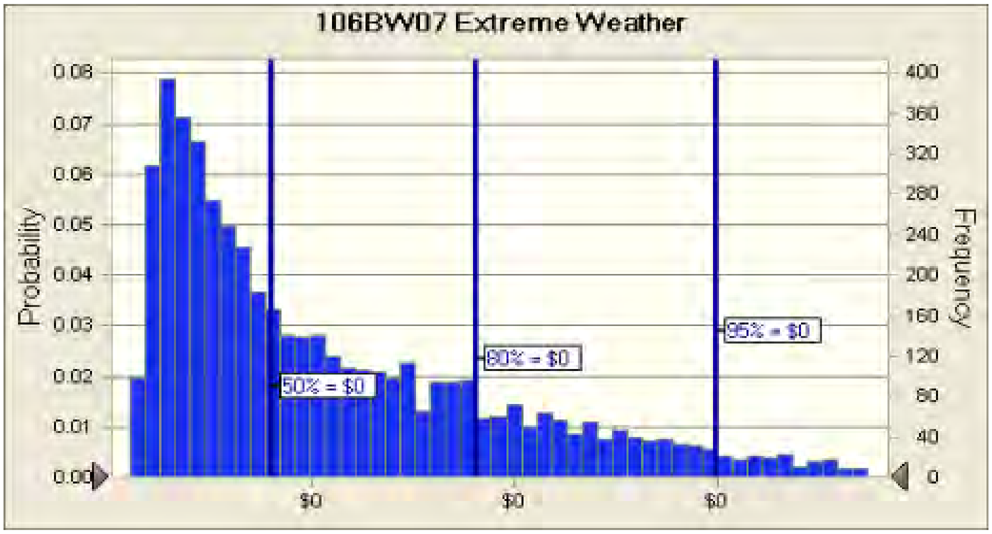
Statistics:	Forecast values
Trials	5,000
Mean	$1,972
Median	$1,235
Mode	---
Standard Deviation	$2,058
Variance	$4,234,326
Skewness	2.06
Kurtosis	10.32
Coeff. of Variability	1.04
Minimum	$42
Maximum	$23,992
Range Width	$23,950
Mean Std. Error	$29

Forecast: 105BW06 Increase Precip (cont'd) **Cell: E8**

Percentiles:	Forecast values
0%	$42
10%	$211
20%	$362
30%	$576
40%	$875
50%	$1,235
60%	$1,781
70%	$2,405
80%	$3,376
90%	$4,699
100%	$23,992

Forecast: 106BW07 Extreme Weather **Cell: E9**

Summary:
Entire range is from $0 to $0
Base case is $0
After 5,000 trials, the std. error of the mean is $0



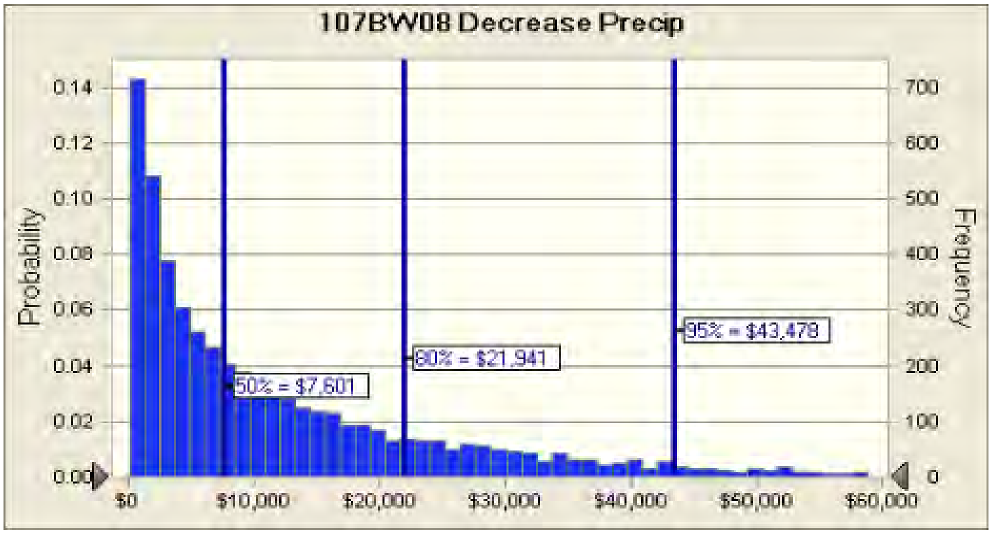
Statistics:	Forecast values
Trials	5,000
Mean	$0
Median	$0
Mode	---
Standard Deviation	$0
Variance	$0
Skewness	1.51
Kurtosis	5.83
Coeff. of Variability	0.8259
Minimum	$0
Maximum	$0
Range Width	$0
Mean Std. Error	$0

Forecast: 106BW07 Extreme Weather (cont'd) **Cell: E9**

Percentiles:	Forecast values
0%	$0
10%	$0
20%	$0
30%	$0
40%	$0
50%	$0
60%	$0
70%	$0
80%	$0
90%	$0
100%	$0

Forecast: 107BW08 Decrease Precip **Cell: E10**

Summary:
Entire range is from $75 to $233,558
Base case is $37,711
After 5,000 trials, the std. error of the mean is $230



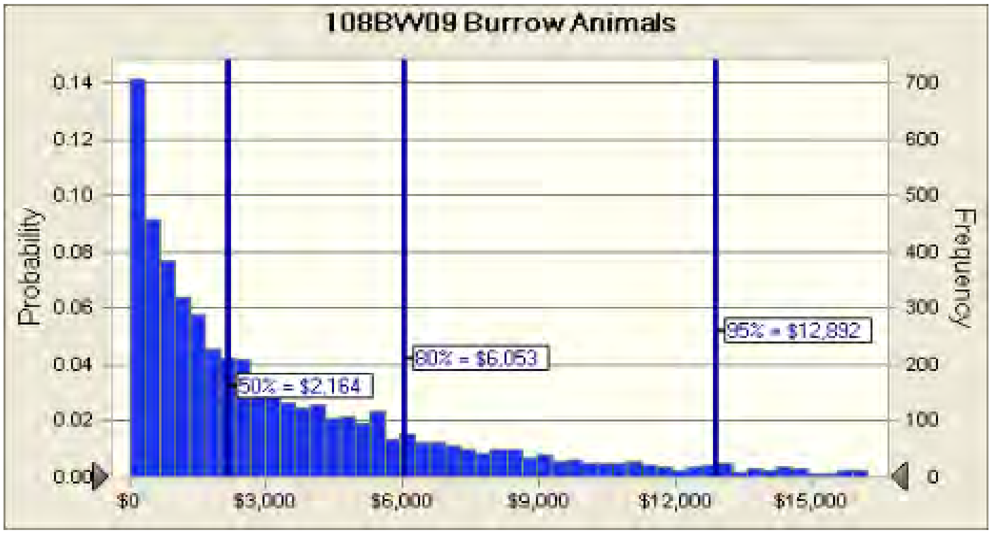
Statistics:	Forecast values
Trials	5,000
Mean	$13,271
Median	$7,605
Mode	---
Standard Deviation	$16,274
Variance	$264,852,805
Skewness	3.00
Kurtosis	20.22
Coeff. of Variability	1.23
Minimum	$75
Maximum	$233,558
Range Width	$233,483
Mean Std. Error	$230

Forecast: 107BW08 Decrease Precip (cont'd) **Cell: E10**

Percentiles:	Forecast values
0%	$75
10%	$833
20%	$1,842
30%	$3,183
40%	$5,139
50%	$7,601
60%	$10,871
70%	$15,300
80%	$21,941
90%	$32,947
100%	$233,558

Forecast: 108BW09 Burrow Animals **Cell: E11**

Summary:
Entire range is from $9 to $50,267
Base case is $10,240
After 5,000 trials, the std. error of the mean is $63



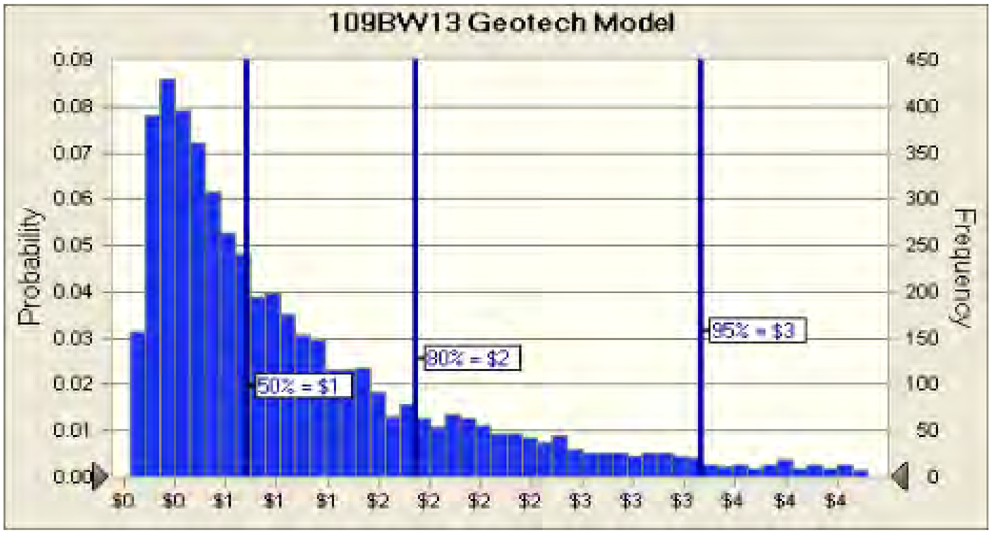
Statistics:	Forecast values
Trials	5,000
Mean	$3,744
Median	$2,166
Mode	---
Standard Deviation	$4,459
Variance	$19,883,621
Skewness	2.49
Kurtosis	12.82
Coeff. of Variability	1.19
Minimum	$9
Maximum	$50,267
Range Width	$50,258
Mean Std. Error	$63

Forecast: 108BW09 Burrow Animals (cont'd) **Cell: E11**

Percentiles:	Forecast values
0%	$9
10%	$225
20%	$550
30%	$951
40%	$1,472
50%	$2,164
60%	$3,115
70%	$4,340
80%	$6,053
90%	$9,246
100%	$50,267

Forecast: 109BW13 Geotech Model **Cell: E12**

Summary:
Entire range is from $0 to $16
Base case is $3
After 5,000 trials, the std. error of the mean is $0



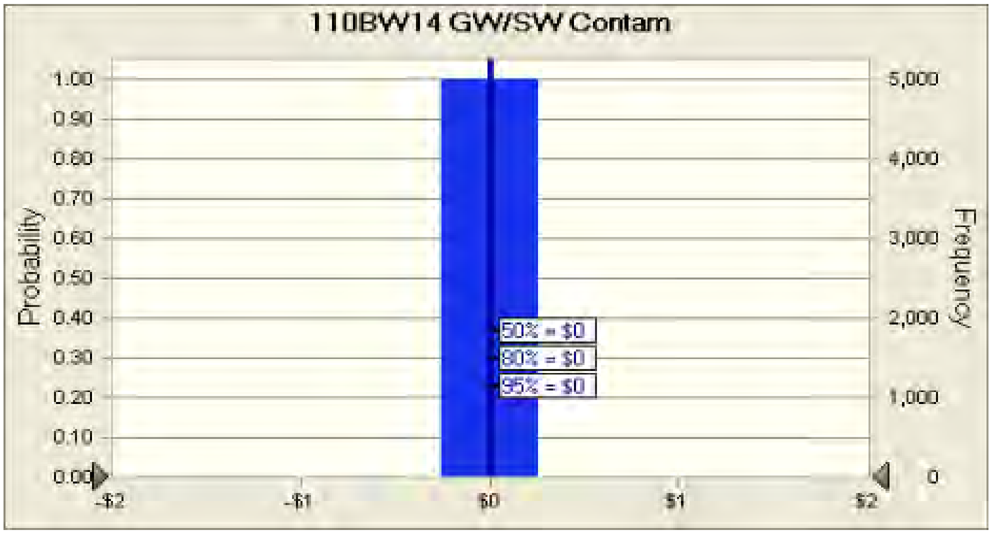
Statistics:	Forecast values
Trials	5,000
Mean	$1
Median	$1
Mode	---
Standard Deviation	$1
Variance	$1
Skewness	2.85
Kurtosis	18.94
Coeff. of Variability	1.04
Minimum	$0
Maximum	$16
Range Width	$16
Mean Std. Error	$0

Forecast: 109BW13 Geotech Model (cont'd) **Cell: E12**

Percentiles:	Forecast values
0%	$0
10%	$0
20%	$0
30%	$0
40%	$1
50%	$1
60%	$1
70%	$1
80%	$2
90%	$3
100%	$16

Forecast: 110BW14 GW/SW Contam **Cell: E13**

Summary:
Entire range is from $0 to $0
Base case is $0
After 5,000 trials, the std. error of the mean is $0



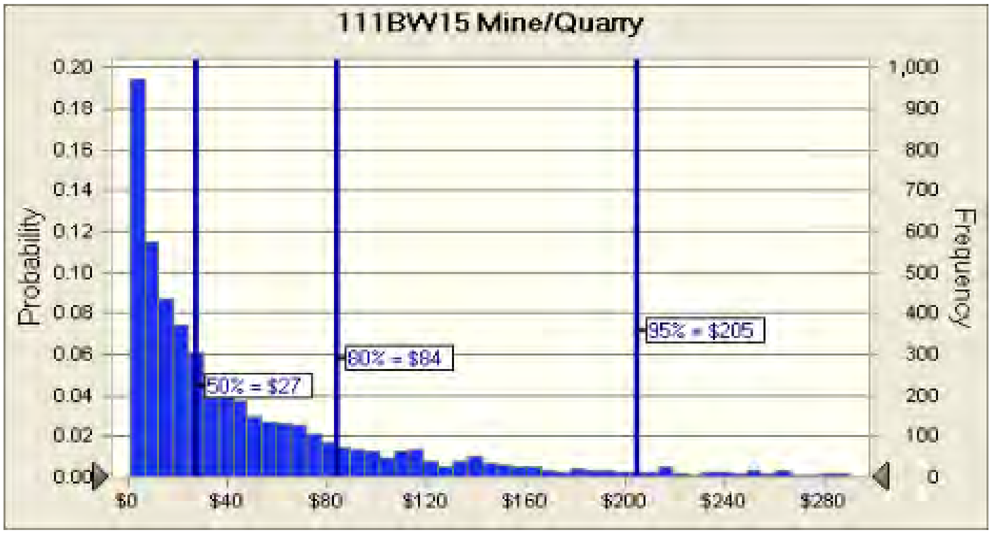
Statistics:	Forecast values
Trials	5,000
Mean	$0
Median	$0
Mode	$0
Standard Deviation	$0
Variance	$0
Skewness	---
Kurtosis	---
Coeff. of Variability	---
Minimum	$0
Maximum	$0
Range Width	$0
Mean Std. Error	$0

Forecast: 110BW14 GW/SW Contam (cont'd) **Cell: E13**

Percentiles:	Forecast values
0%	$0
10%	$0
20%	$0
30%	$0
40%	$0
50%	$0
60%	$0
70%	$0
80%	$0
90%	$0
100%	$0

Forecast: 111BW15 Mine/Quarry **Cell: E14**

Summary:
Entire range is from $0 to $2,092
Base case is $137
After 5,000 trials, the std. error of the mean is $1



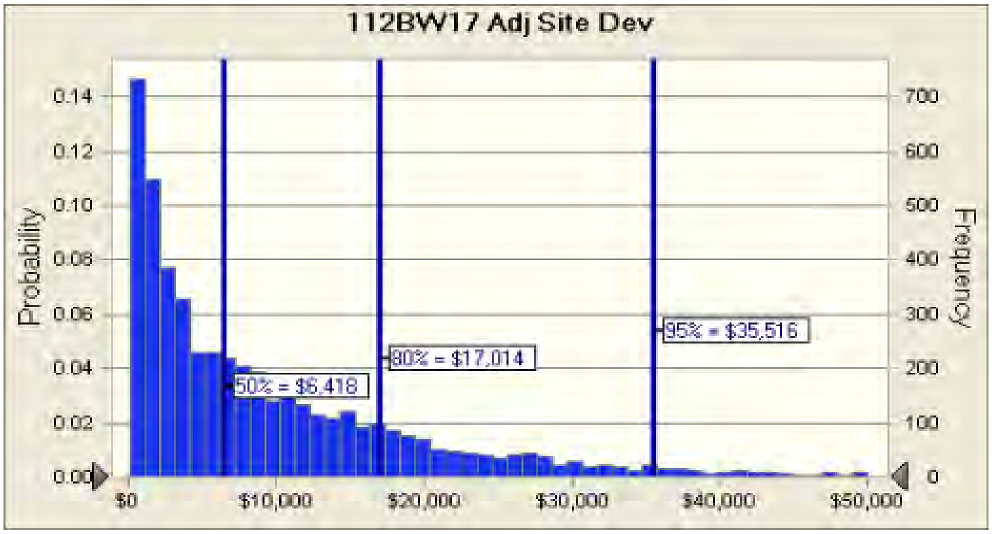
Statistics:	Forecast values
Trials	5,000
Mean	$55
Median	$27
Mode	---
Standard Deviation	$84
Variance	$7,037
Skewness	5.67
Kurtosis	84.69
Coeff. of Variability	1.52
Minimum	$0
Maximum	$2,092
Range Width	$2,091
Mean Std. Error	$1

Forecast: 111BW15 Mine/Quarry (cont'd) **Cell: E14**

Percentiles:	Forecast values
0%	$0
10%	$3
20%	$6
30%	$11
40%	$18
50%	$27
60%	$39
70%	$57
80%	$84
90%	$138
100%	$2,092

Forecast: 112BW17 Adj Site Dev **Cell: E15**

Summary:
Entire range is from $52 to $186,111
Base case is $27,987
After 5,000 trials, the std. error of the mean is $198



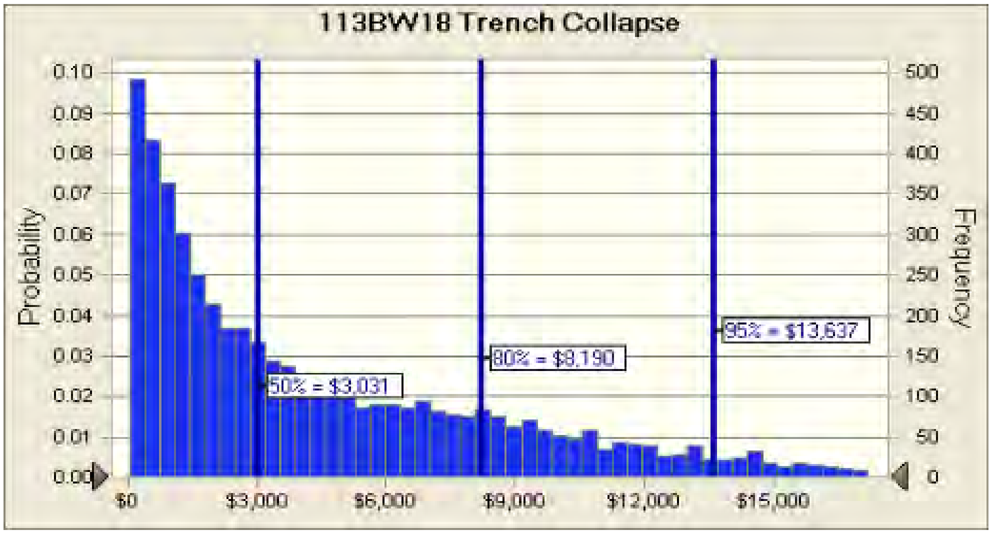
Statistics:	Forecast values
Trials	5,000
Mean	$10,826
Median	$6,418
Mode	---
Standard Deviation	$13,992
Variance	$195,773,302
Skewness	3.64
Kurtosis	26.56
Coeff. of Variability	1.29
Minimum	$52
Maximum	$186,111
Range Width	$186,059
Mean Std. Error	$198

Forecast: 112BW17 Adj Site Dev (cont'd) **Cell: E15**

Percentiles:	Forecast values
0%	$52
10%	$743
20%	$1,529
30%	$2,625
40%	$4,163
50%	$6,418
60%	$8,848
70%	$12,280
80%	$17,014
90%	$25,866
100%	$186,111

Forecast: 113BW18 Trench Collapse **Cell: E16**

Summary:
Entire range is from $36 to $32,193
Base case is $13,863
After 5,000 trials, the std. error of the mean is $64



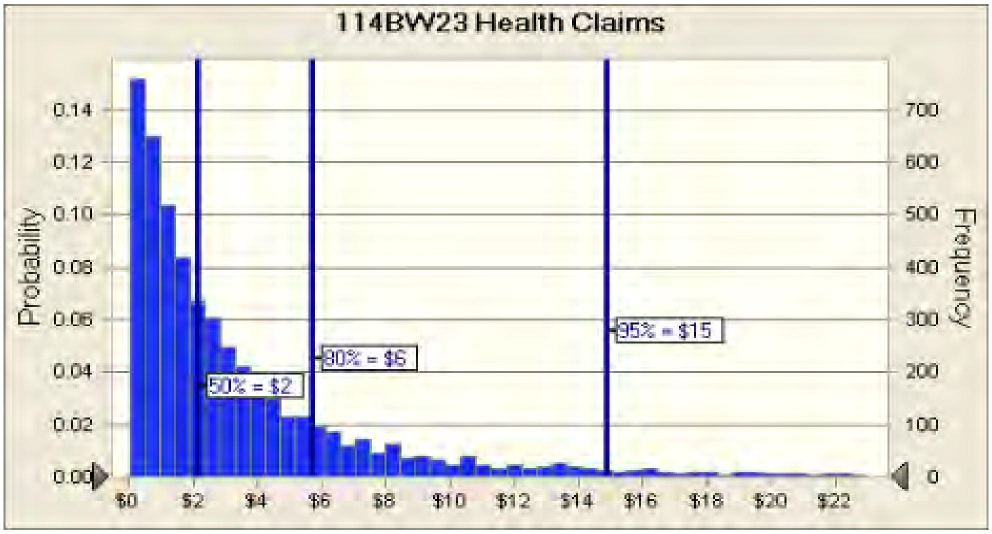
Statistics:	Forecast values
Trials	5,000
Mean	$4,601
Median	$3,034
Mode	---
Standard Deviation	$4,503
Variance	$20,273,673
Skewness	1.40
Kurtosis	5.17
Coeff. of Variability	0.9787
Minimum	$36
Maximum	$32,193
Range Width	$32,157
Mean Std. Error	$64

Forecast: 113BW18 Trench Collapse (cont'd) **Cell: E16**

Percentiles:	Forecast values
0%	$36
10%	$395
20%	$817
30%	$1,333
40%	$2,066
50%	$3,031
60%	$4,366
70%	$6,079
80%	$8,190
90%	$11,094
100%	$32,193

Forecast: 114BW23 Health Claims **Cell: E17**

Summary:
Entire range is from \$0 to \$127
Base case is \$8
After 5,000 trials, the std. error of the mean is \$0



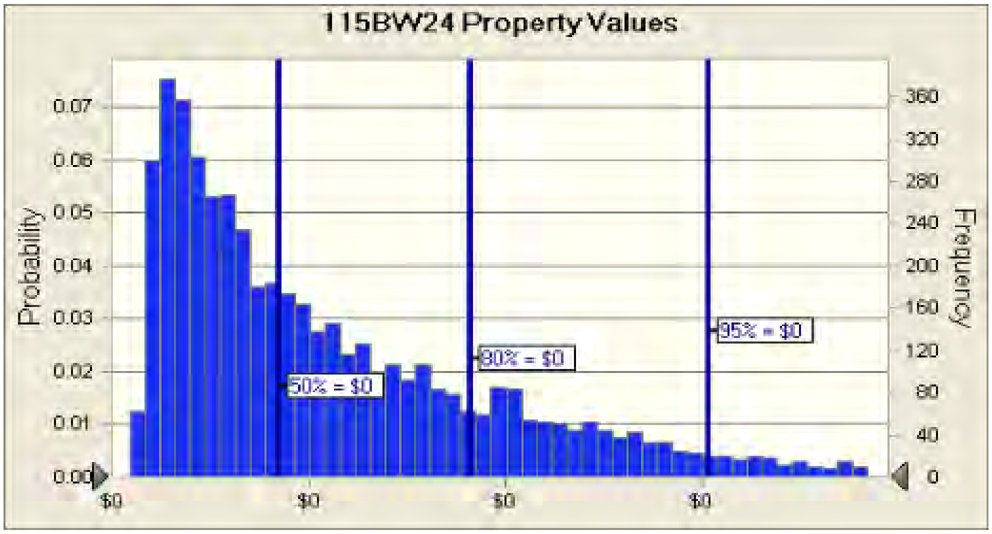
Statistics:	Forecast values
Trials	5,000
Mean	\$4
Median	\$2
Mode	---
Standard Deviation	\$7
Variance	\$45
Skewness	5.41
Kurtosis	53.28
Coeff. of Variability	1.61
Minimum	\$0
Maximum	\$127
Range Width	\$127
Mean Std. Error	\$0

Forecast: 114BW23 Health Claims (cont'd) **Cell: E17**

Percentiles:	Forecast values
0%	$0
10%	$0
20%	$1
30%	$1
40%	$2
50%	$2
60%	$3
70%	$4
80%	$6
90%	$10
100%	$127

Forecast: 115BW24 Property Values **Cell: E18**

Summary:
Entire range is from $0 to $1
Base case is $0
After 5,000 trials, the std. error of the mean is $0



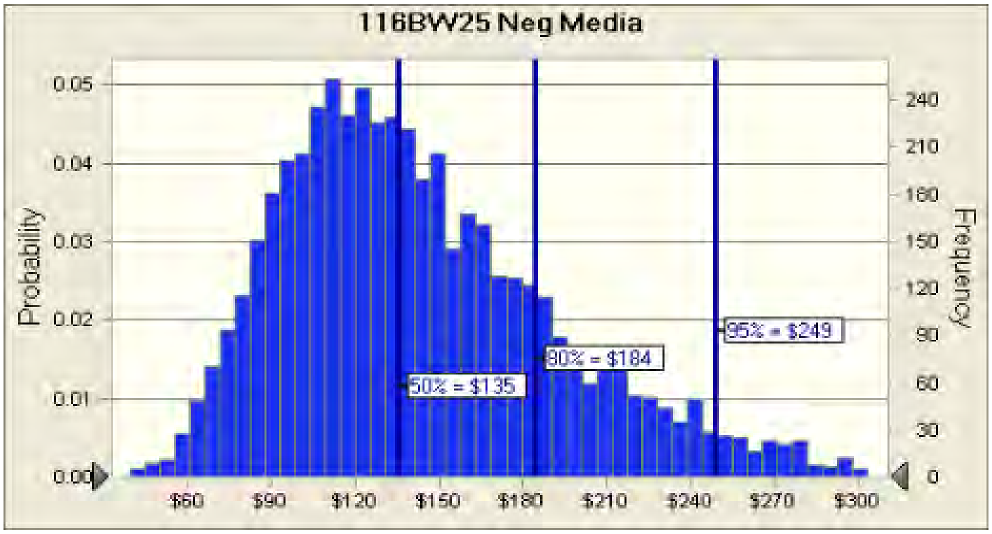
Statistics:	Forecast values
Trials	5,000
Mean	$0
Median	$0
Mode	---
Standard Deviation	$0
Variance	$0
Skewness	1.70
Kurtosis	6.92
Coeff. of Variability	0.8419
Minimum	$0
Maximum	$1
Range Width	$1
Mean Std. Error	$0

Forecast: 115BW24 Property Values (cont'd) **Cell: E18**

Percentiles:	Forecast values
0%	$0
10%	$0
20%	$0
30%	$0
40%	$0
50%	$0
60%	$0
70%	$0
80%	$0
90%	$0
100%	$1

Forecast: 116BW25 Neg Media **Cell: E19**

Summary:
Entire range is from $39 to $578
Base case is $128
After 5,000 trials, the std. error of the mean is $1



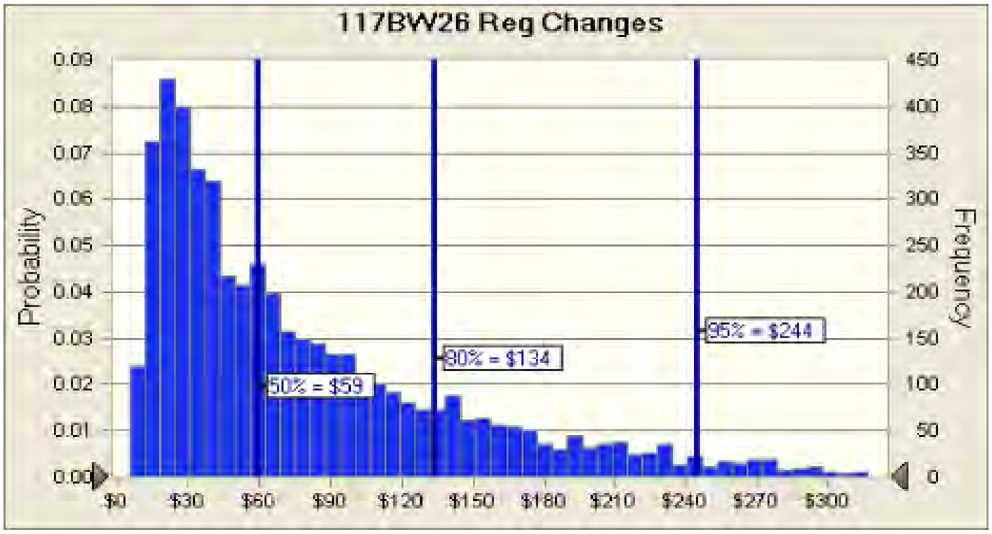
Statistics:	Forecast values
Trials	5,000
Mean	$146
Median	$135
Mode	---
Standard Deviation	$56
Variance	$3,169
Skewness	1.49
Kurtosis	7.40
Coeff. of Variability	0.3857
Minimum	$39
Maximum	$578
Range Width	$539
Mean Std. Error	$1

Forecast: 116BW25 Neg Media (cont'd) **Cell: E19**

Percentiles:	Forecast values
0%	$39
10%	$87
20%	$101
30%	$113
40%	$124
50%	$135
60%	$148
70%	$164
80%	$184
90%	$218
100%	$578

Forecast: 117BW26 Reg Changes **Cell: E20**

Summary:
Entire range is from $5 to $832
Base case is $196
After 5,000 trials, the std. error of the mean is $1



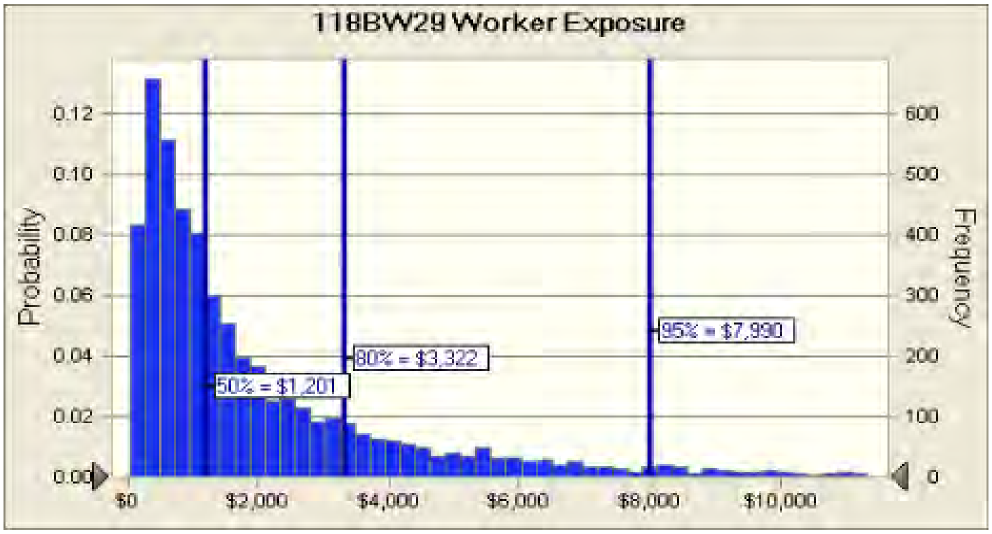
Statistics:	Forecast values
Trials	5,000
Mean	$86
Median	$59
Mode	---
Standard Deviation	$82
Variance	$6,791
Skewness	2.38
Kurtosis	11.86
Coeff. of Variability	0.9580
Minimum	$5
Maximum	$832
Range Width	$826
Mean Std. Error	$1

Forecast: 117BW26 Reg Changes (cont'd) **Cell: E20**

Percentiles:	Forecast values
0%	$5
10%	$18
20%	$25
30%	$34
40%	$44
50%	$59
60%	$76
70%	$98
80%	$134
90%	$191
100%	$832

Forecast: 118BW29 Worker Exposure **Cell: E21**

Summary:
Entire range is from $35 to $63,663
Base case is $4,500
After 5,000 trials, the std. error of the mean is $46



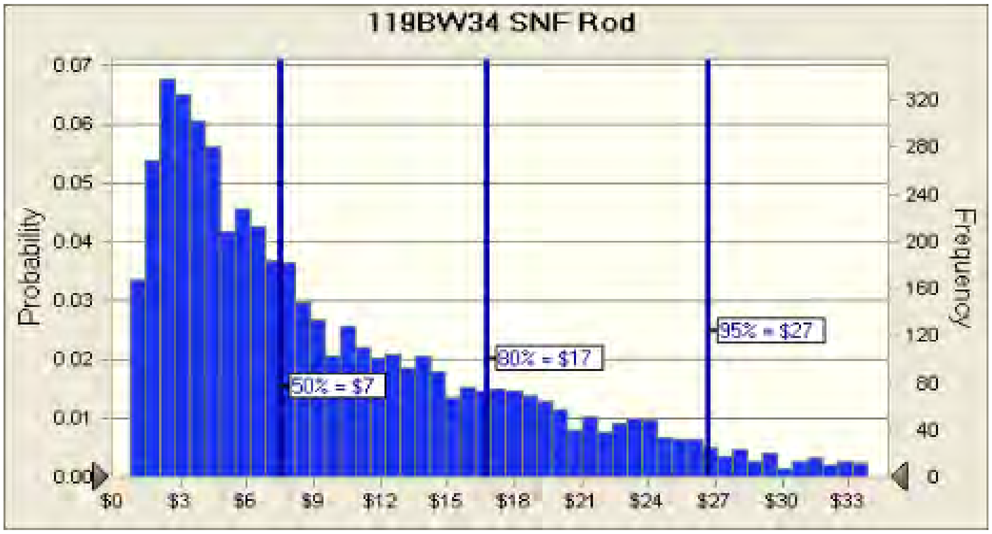
Statistics:	Forecast values
Trials	5,000
Mean	$2,293
Median	$1,201
Mode	---
Standard Deviation	$3,231
Variance	$10,438,307
Skewness	4.83
Kurtosis	48.17
Coeff. of Variability	1.41
Minimum	$35
Maximum	$63,663
Range Width	$63,628
Mean Std. Error	$46

Forecast: 118BW29 Worker Exposure (cont'd) **Cell: E21**

Percentiles:	Forecast values
0%	$35
10%	$290
20%	$465
30%	$669
40%	$915
50%	$1,201
60%	$1,608
70%	$2,256
80%	$3,322
90%	$5,482
100%	$63,663

Forecast: 119BW34 SNF Rod **Cell: E22**

Summary:
Entire range is from $1 to $59
Base case is $26
After 5,000 trials, the std. error of the mean is $0



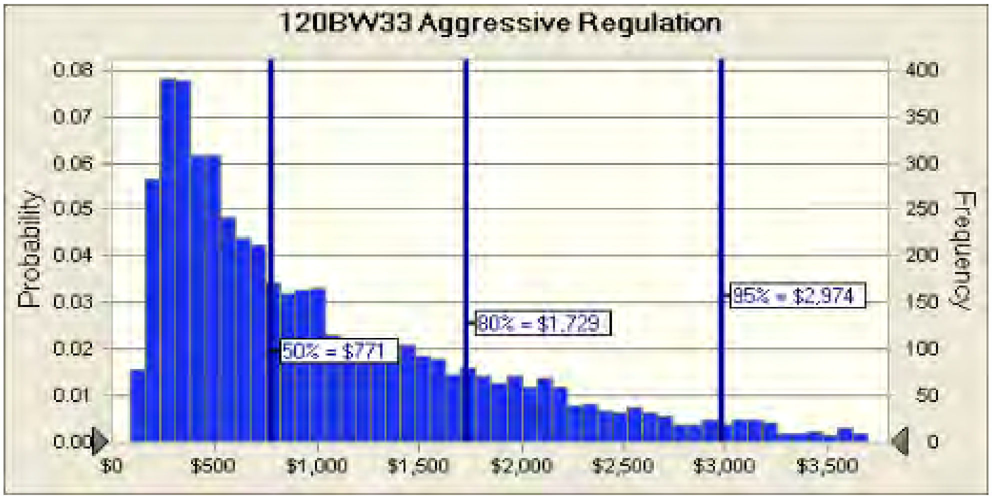
Statistics:	Forecast values
Trials	5,000
Mean	$10
Median	$7
Mode	---
Standard Deviation	$8
Variance	$71
Skewness	1.43
Kurtosis	5.30
Coeff. of Variability	0.8262
Minimum	$1
Maximum	$59
Range Width	$58
Mean Std. Error	$0

Forecast: 119BW34 SNF Rod (cont'd) **Cell: E22**

Percentiles:	Forecast values
0%	$1
10%	$2
20%	$3
30%	$4
40%	$6
50%	$7
60%	$10
70%	$13
80%	$17
90%	$22
100%	$59

Forecast: 120BW33 Aggressive Regulation **Cell: E23**

Summary:
Entire range is from $84 to $6,892
Base case is $2,601
After 5,000 trials, the std. error of the mean is $13



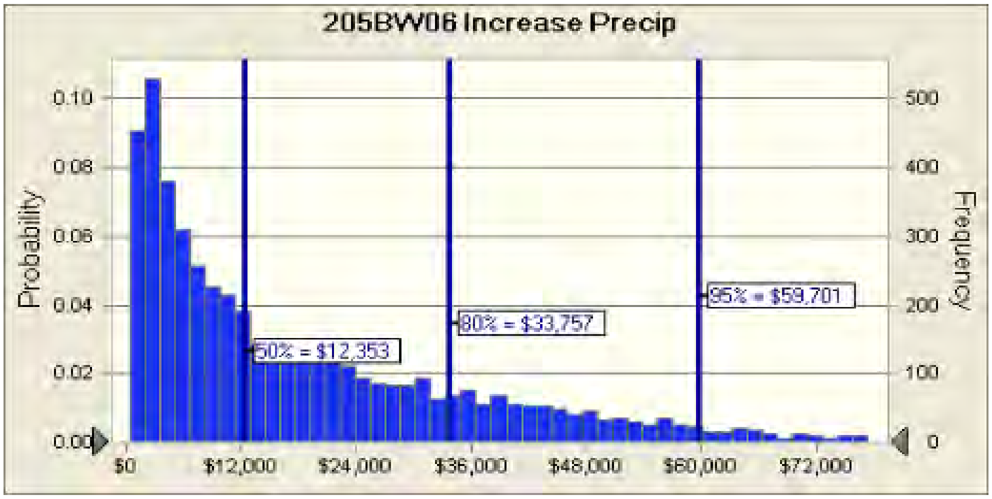
Statistics:	Forecast values
Trials	5,000
Mean	$1,090
Median	$771
Mode	---
Standard Deviation	$930
Variance	$865,810
Skewness	1.74
Kurtosis	6.96
Coeff. of Variability	0.8540
Minimum	$84
Maximum	$6,892
Range Width	$6,808
Mean Std. Error	$13

Forecast: 120BW33 Aggressive Regulation (cont'd) **Cell: E23**

Percentiles:	Forecast values
0%	$84
10%	$260
20%	$349
30%	$463
40%	$601
50%	$771
60%	$1,002
70%	$1,322
80%	$1,729
90%	$2,321
100%	$6,892

Forecast: 205BW06 Increase Precip **Cell: E28**

Summary:
Entire range is from $416 to $239,921
Base case is $53,617
After 5,000 trials, the std. error of the mean is $291



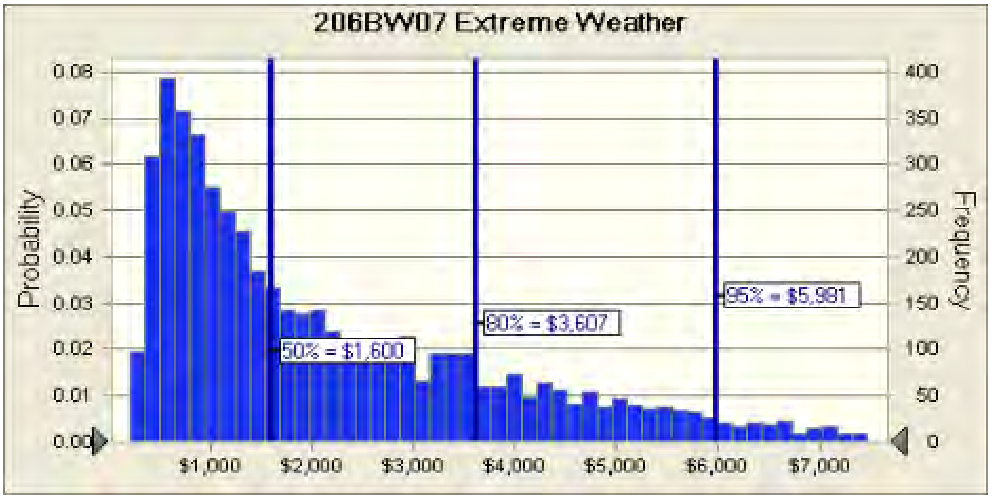
Statistics:	Forecast values
Trials	5,000
Mean	$19,724
Median	$12,353
Mode	---
Standard Deviation	$20,577
Variance	$423,432,584
Skewness	2.06
Kurtosis	10.32
Coeff. of Variability	1.04
Minimum	$416
Maximum	$239,921
Range Width	$239,505
Mean Std. Error	$291

Forecast: 205BW06 Increase Precip (cont'd) **Cell: E28**

Percentiles:	Forecast values
0%	$416
10%	$2,110
20%	$3,621
30%	$5,757
40%	$8,748
50%	$12,353
60%	$17,807
70%	$24,046
80%	$33,757
90%	$46,987
100%	$239,921

Forecast: 206BW07 Extreme Weather **Cell: E29**

Summary:
Entire range is from $205 to $16,292
Base case is $6,000
After 5,000 trials, the std. error of the mean is $26



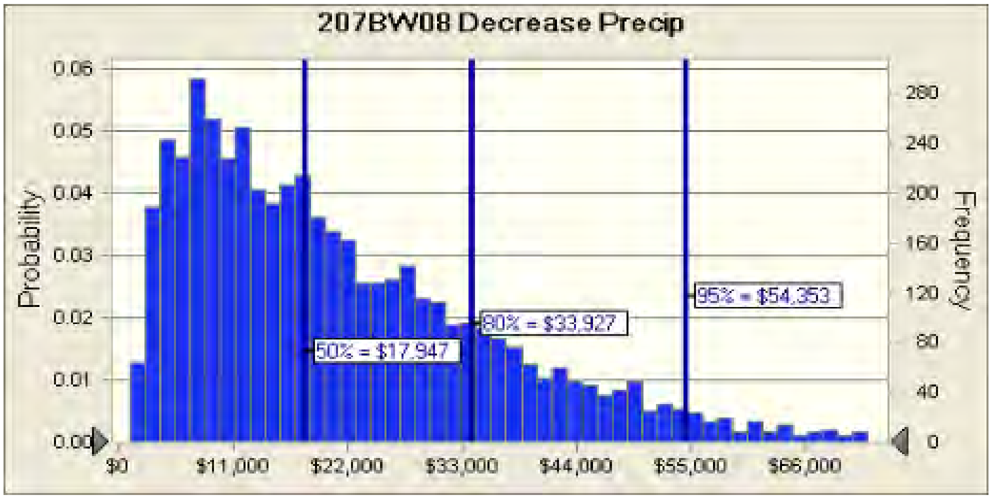
Statistics:	Forecast values
Trials	5,000
Mean	$2,256
Median	$1,602
Mode	---
Standard Deviation	$1,863
Variance	$3,472,318
Skewness	1.51
Kurtosis	5.83
Coeff. of Variability	0.8259
Minimum	$205
Maximum	$16,292
Range Width	$16,088
Mean Std. Error	$26

Forecast: 206BW07 Extreme Weather (cont'd) **Cell: E29**

Percentiles:	Forecast values
0%	$205
10%	$537
20%	$738
30%	$953
40%	$1,233
50%	$1,600
60%	$2,126
70%	$2,808
80%	$3,607
90%	$4,941
100%	$16,292

Forecast: 207BW08 Decrease Precip **Cell: E30**

Summary:
Entire range is from $1,076 to $217,123
Base case is $58,935
After 5,000 trials, the std. error of the mean is $250



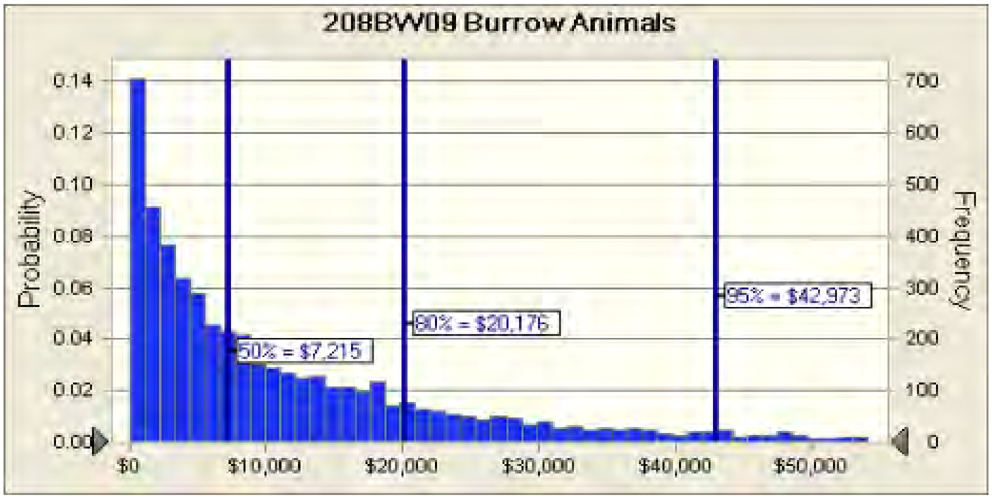
Statistics:	Forecast values
Trials	5,000
Mean	$22,392
Median	$17,962
Mode	---
Standard Deviation	$17,689
Variance	$312,914,655
Skewness	2.10
Kurtosis	11.76
Coeff. of Variability	0.7900
Minimum	$1,076
Maximum	$217,123
Range Width	$216,047
Mean Std. Error	$250

Forecast: 207BW08 Decrease Precip (cont'd) **Cell: E30**

Percentiles:	Forecast values
0%	$1,076
10%	$5,440
20%	$8,221
30%	$11,160
40%	$14,369
50%	$17,947
60%	$21,909
70%	$27,361
80%	$33,927
90%	$44,430
100%	$217,123

Forecast: 208BW09 Burrow Animals **Cell: E31**

Summary:
Entire range is from $30 to $167,555
Base case is $34,135
After 5,000 trials, the std. error of the mean is $210



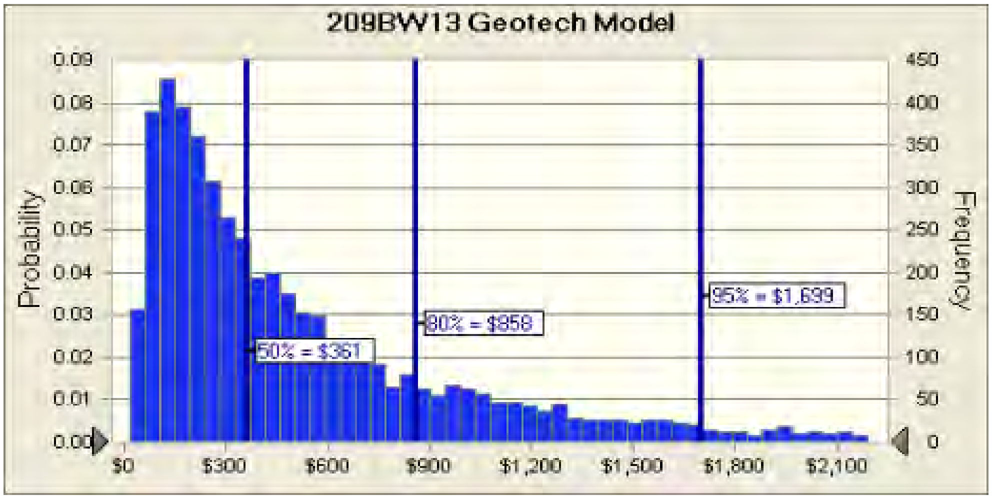
Statistics:	Forecast values
Trials	5,000
Mean	$12,481
Median	$7,219
Mode	---
Standard Deviation	$14,864
Variance	$220,929,117
Skewness	2.49
Kurtosis	12.82
Coeff. of Variability	1.19
Minimum	$30
Maximum	$167,555
Range Width	$167,526
Mean Std. Error	$210

Forecast: 208BW09 Burrow Animals (cont'd) **Cell: E31**

Percentiles:	Forecast values
0%	$30
10%	$749
20%	$1,834
30%	$3,170
40%	$4,907
50%	$7,215
60%	$10,383
70%	$14,466
80%	$20,176
90%	$30,819
100%	$167,555

Forecast: 209BW13 Geotech Model **Cell: E32**

Summary:
Entire range is from $15 to $7,867
Base case is $1,300
After 5,000 trials, the std. error of the mean is $8



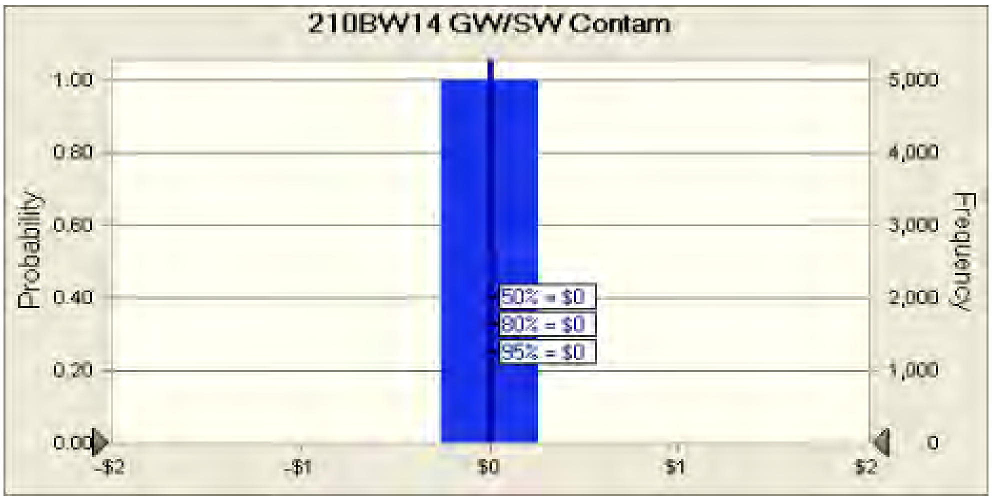
Statistics:	Forecast values
Trials	5,000
Mean	$559
Median	$361
Mode	---
Standard Deviation	$583
Variance	$339,767
Skewness	2.85
Kurtosis	18.94
Coeff. of Variability	1.04
Minimum	$15
Maximum	$7,867
Range Width	$7,852
Mean Std. Error	$8

Forecast: 209BW13 Geotech Model (cont'd) **Cell: E32**

Percentiles:	Forecast values
0%	$15
10%	$99
20%	$151
30%	$206
40%	$274
50%	$361
60%	$472
70%	$626
80%	$858
90%	$1,280
100%	$7,867

Forecast: 210BW14 GW/SW Contam **Cell: E33**

Summary:
Entire range is from $0 to $0
Base case is $0
After 5,000 trials, the std. error of the mean is $0



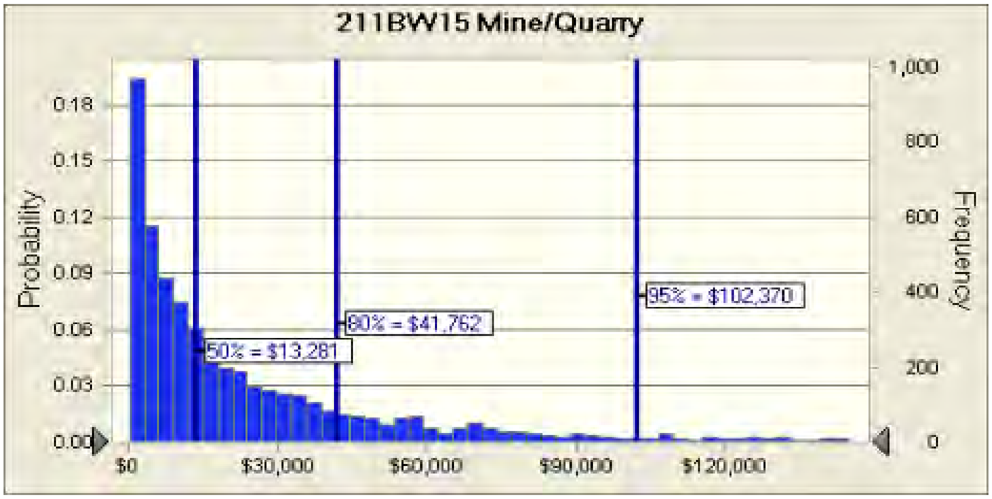
Statistics:	Forecast values
Trials	5,000
Mean	$0
Median	$0
Mode	$0
Standard Deviation	$0
Variance	$0
Skewness	---
Kurtosis	---
Coeff. of Variability	---
Minimum	$0
Maximum	$0
Range Width	$0
Mean Std. Error	$0

Forecast: 210BW14 GW/SW Contam (cont'd) **Cell: E33**

Percentiles:	Forecast values
0%	$0
10%	$0
20%	$0
30%	$0
40%	$0
50%	$0
60%	$0
70%	$0
80%	$0
90%	$0
100%	$0

Forecast: 211BW15 Mine/Quarry **Cell: E34**

Summary:
Entire range is from $45 to $1,045,761
Base case is $68,270
After 5,000 trials, the std. error of the mean is $593



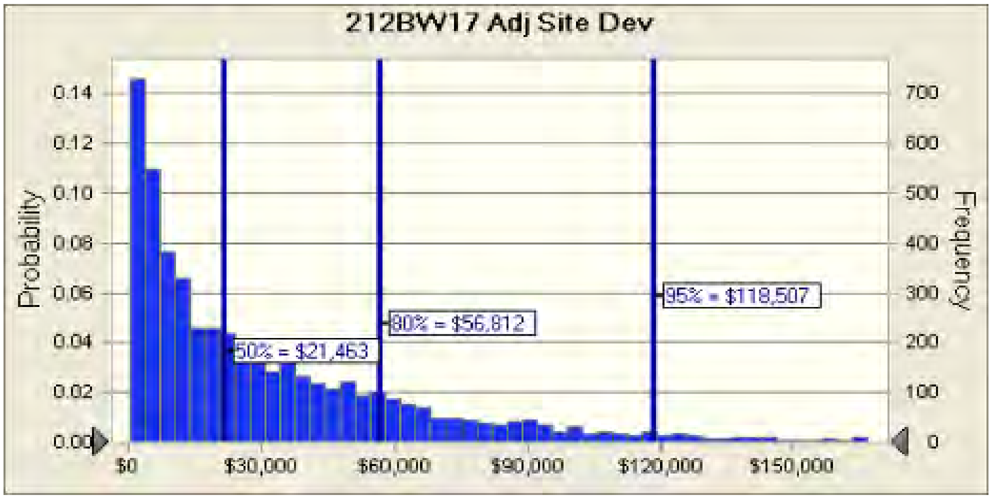
Statistics:	Forecast values
Trials	5,000
Mean	$27,606
Median	$13,283
Mode	---
Standard Deviation	$41,943
Variance	$1,759,203,216
Skewness	5.67
Kurtosis	84.69
Coeff. of Variability	1.52
Minimum	$45
Maximum	$1,045,761
Range Width	$1,045,716
Mean Std. Error	$593

Forecast: 211BW15 Mine/Quarry (cont'd) **Cell: E34**

Percentiles:	Forecast values
0%	$45
10%	$1,387
20%	$3,104
30%	$5,660
40%	$9,018
50%	$13,281
60%	$19,525
70%	$28,491
80%	$41,762
90%	$68,938
100%	$1,045,761

Forecast: 212BW17 Adj Site Dev **Cell: E35**

Summary:
Entire range is from $180 to $620,412
Base case is $93,440
After 5,000 trials, the std. error of the mean is $660



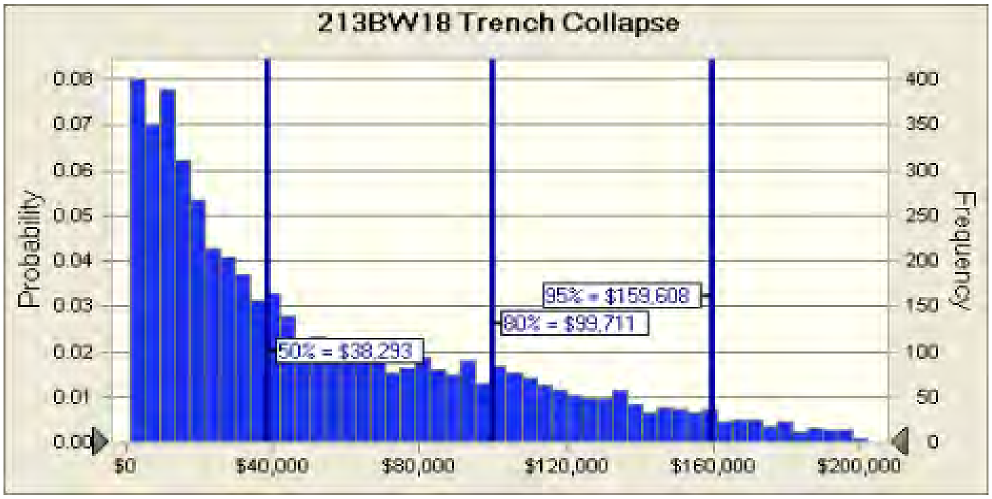
Statistics:	Forecast values
Trials	5,000
Mean	$36,153
Median	$21,463
Mode	---
Standard Deviation	$46,672
Variance	$2,178,270,592
Skewness	3.63
Kurtosis	26.52
Coeff. of Variability	1.29
Minimum	$180
Maximum	$620,412
Range Width	$620,231
Mean Std. Error	$660

Forecast: 212BW17 Adj Site Dev (cont'd) **Cell: E35**

Percentiles:	Forecast values
0%	$180
10%	$2,498
20%	$5,113
30%	$8,775
40%	$13,930
50%	$21,463
60%	$29,555
70%	$41,049
80%	$56,812
90%	$86,331
100%	$620,412

Forecast: 213BW18 Trench Collapse **Cell: E36**

Summary:
Entire range is from $957 to $345,696
Base case is $166,910
After 5,000 trials, the std. error of the mean is $737



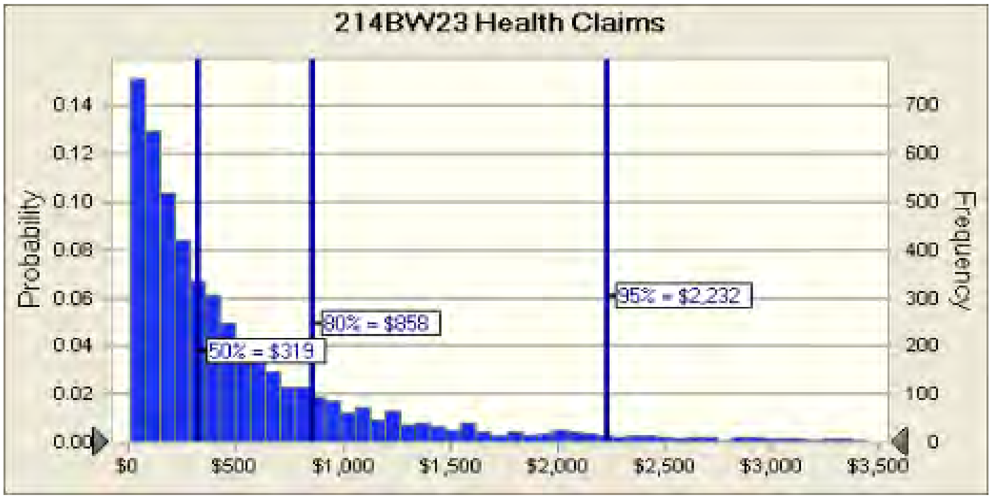
Statistics:	Forecast values
Trials	5,000
Mean	$56,161
Median	$38,303
Mode	---
Standard Deviation	$52,082
Variance	$2,712,484,724
Skewness	1.26
Kurtosis	4.42
Coeff. of Variability	0.9274
Minimum	$957
Maximum	$345,696
Range Width	$344,740
Mean Std. Error	$737

Forecast: 213BW18 Trench Collapse (cont'd) **Cell: E36**

Percentiles:	Forecast values
0%	$957
10%	$6,319
20%	$11,751
30%	$18,232
40%	$26,764
50%	$38,293
60%	$53,943
70%	$74,287
80%	$99,711
90%	$133,497
100%	$345,696

Forecast: 214BW23 Health Claims **Cell: E37**

Summary:
Entire range is from $4 to $18,981
Base case is $1,183
After 5,000 trials, the std. error of the mean is $14



Statistics:	Forecast values
Trials	5,000
Mean	$626
Median	$320
Mode	---
Standard Deviation	$1,009
Variance	$1,017,105
Skewness	5.41
Kurtosis	53.28
Coeff. of Variability	1.61
Minimum	$4
Maximum	$18,981
Range Width	$18,977
Mean Std. Error	$14

Forecast: 214BW23 Health Claims (cont'd) **Cell: E37**

Percentiles:	Forecast values
0%	$4
10%	$50
20%	$99
30%	$157
40%	$227
50%	$319
60%	$431
70%	$587
80%	$858
90%	$1,446
100%	$18,981

Forecast: 215BW24 Property Values **Cell: E38**

Summary:
Entire range is from $1 to $116
Base case is $41
After 5,000 trials, the std. error of the mean is $0

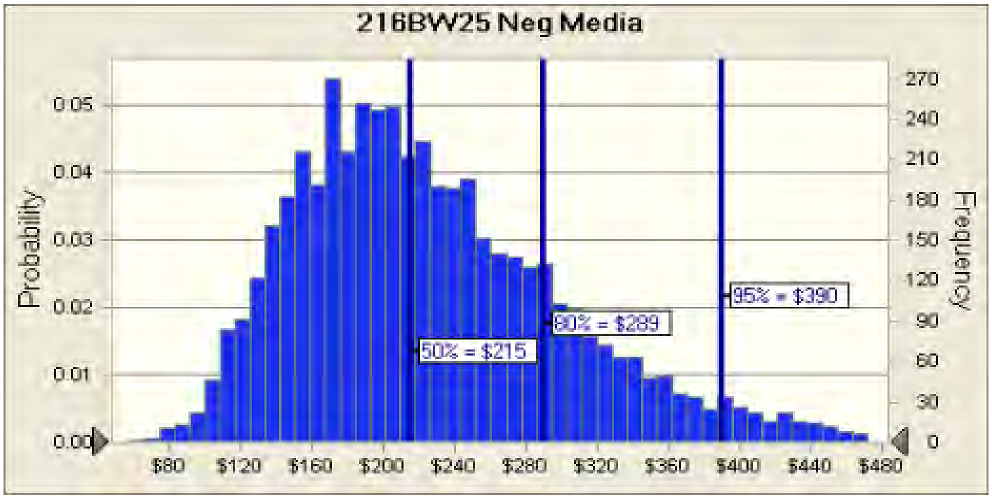
Statistics:	Forecast values
Trials	5,000
Mean	$17
Median	$13
Mode	---
Standard Deviation	$14
Variance	$209
Skewness	1.70
Kurtosis	6.92
Coeff. of Variability	0.8419
Minimum	$1
Maximum	$116
Range Width	$115
Mean Std. Error	$0

Forecast: 215BW24 Property Values (cont'd) **Cell: E38**

Percentiles:	Forecast values
0%	$1
10%	$4
20%	$6
30%	$7
40%	$10
50%	$13
60%	$16
70%	$21
80%	$27
90%	$37
100%	$116

Forecast: 216BW25 Neg Media **Cell: E39**

Summary:
Entire range is from $58 to $824
Base case is $215
After 5,000 trials, the std. error of the mean is $1



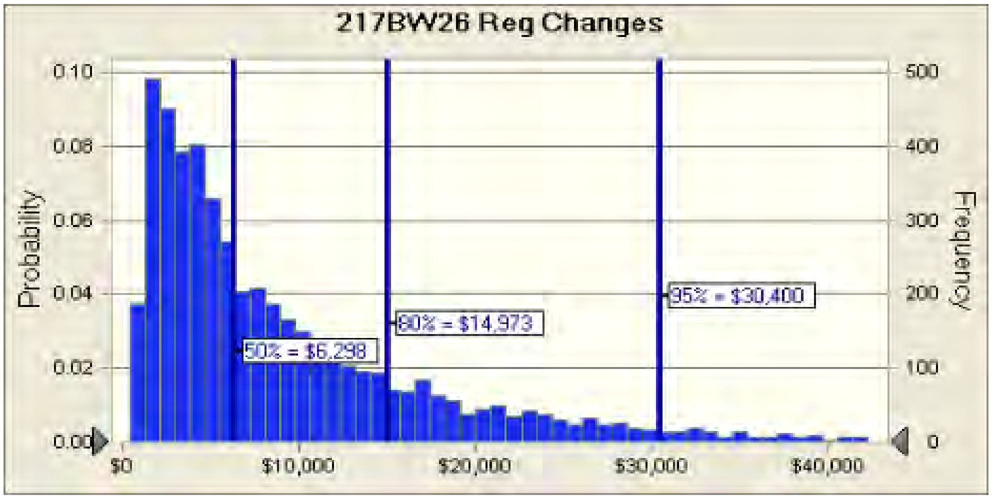
Statistics:	Forecast values
Trials	5,000
Mean	$231
Median	$215
Mode	---
Standard Deviation	$86
Variance	$7,420
Skewness	1.46
Kurtosis	6.97
Coeff. of Variability	0.3733
Minimum	$58
Maximum	$824
Range Width	$767
Mean Std. Error	$1

Forecast: 216BW25 Neg Media (cont'd) **Cell: E39**

Percentiles:	Forecast values
0%	$58
10%	$140
20%	$161
30%	$179
40%	$197
50%	$215
60%	$236
70%	$258
80%	$289
90%	$339
100%	$824

Forecast: 217BW26 Reg Changes **Cell: E40**

Summary:
Entire range is from $405 to $138,104
Base case is $22,057
After 5,000 trials, the std. error of the mean is $162



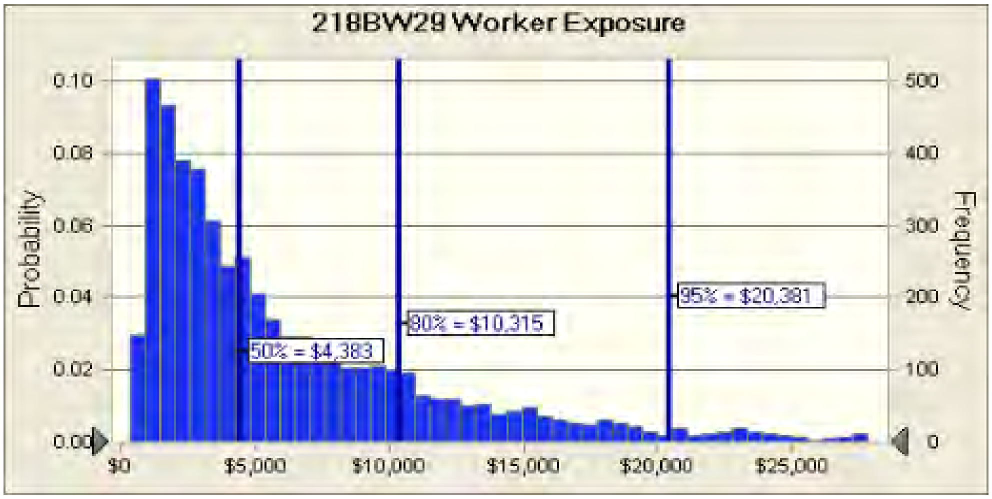
Statistics:	Forecast values
Trials	5,000
Mean	$10,134
Median	$6,300
Mode	---
Standard Deviation	$11,479
Variance	$131,775,812
Skewness	3.49
Kurtosis	22.84
Coeff. of Variability	1.13
Minimum	$405
Maximum	$138,104
Range Width	$137,699
Mean Std. Error	$162

Forecast: 217BW26 Reg Changes (cont'd) **Cell: E40**

Percentiles:	Forecast values
0%	$405
10%	$1,809
20%	$2,724
30%	$3,766
40%	$4,851
50%	$6,298
60%	$8,444
70%	$11,116
80%	$14,973
90%	$22,625
100%	$138,104

Forecast: 218BW29 Worker Exposure **Cell: E41**

Summary:
Entire range is from $342 to $132,528
Base case is $15,000
After 5,000 trials, the std. error of the mean is $106



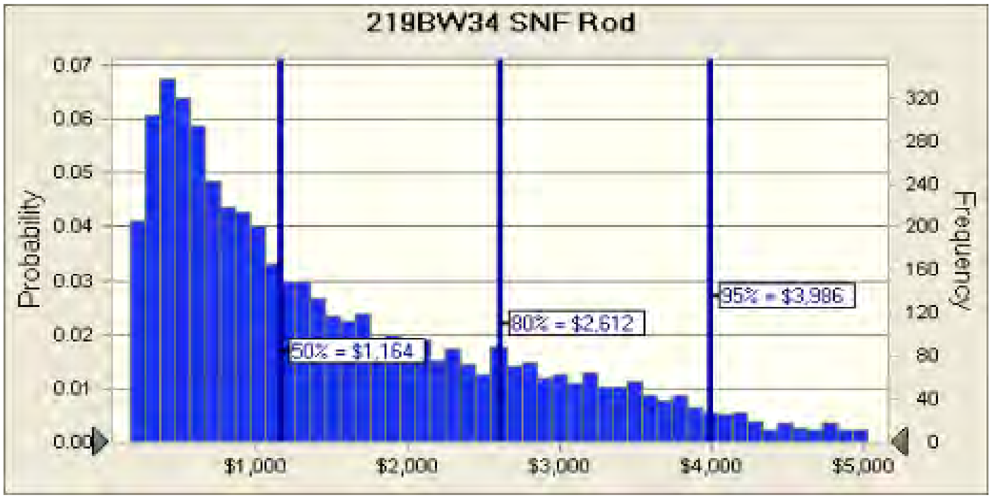
Statistics:	Forecast values
Trials	5,000
Mean	$6,838
Median	$4,383
Mode	---
Standard Deviation	$7,495
Variance	$56,167,872
Skewness	3.73
Kurtosis	31.83
Coeff. of Variability	1.10
Minimum	$342
Maximum	$132,528
Range Width	$132,186
Mean Std. Error	$106

Forecast: 218BW29 Worker Exposure (cont'd) **Cell: E41**

Percentiles:	Forecast values
0%	$342
10%	$1,297
20%	$1,865
30%	$2,572
40%	$3,337
50%	$4,383
60%	$5,689
70%	$7,686
80%	$10,315
90%	$15,167
100%	$132,528

Forecast: 219BW34 SNF Rod **Cell: E42**

Summary:
Entire range is from $177 to $8,179
Base case is $4,074
After 5,000 trials, the std. error of the mean is $17



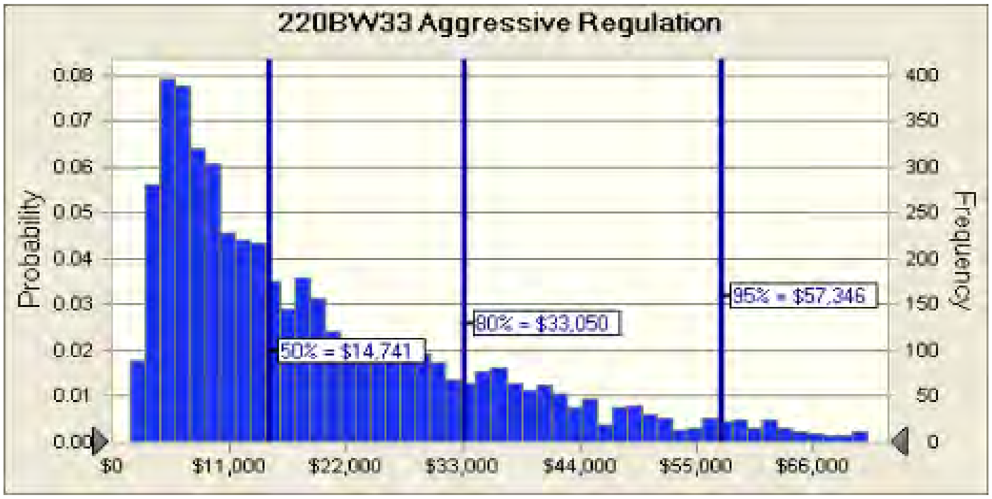
Statistics:	Forecast values
Trials	5,000
Mean	$1,573
Median	$1,164
Mode	---
Standard Deviation	$1,232
Variance	$1,518,666
Skewness	1.23
Kurtosis	4.30
Coeff. of Variability	0.7836
Minimum	$177
Maximum	$8,179
Range Width	$8,002
Mean Std. Error	$17

Forecast: 219BW34 SNF Rod (cont'd) **Cell: E42**

Percentiles:	Forecast values
0%	$177
10%	$373
20%	$515
30%	$688
40%	$908
50%	$1,164
60%	$1,516
70%	$1,981
80%	$2,612
90%	$3,404
100%	$8,179

Forecast: 220BW33 Aggressive Regulation **Cell: E43**

Summary:
Entire range is from $1,576 to $135,835
Base case is $49,956
After 5,000 trials, the std. error of the mean is $254



Statistics:	Forecast values
Trials	5,000
Mean	$20,838
Median	$14,754
Mode	---
Standard Deviation	$17,986
Variance	$323,490,855
Skewness	1.79
Kurtosis	7.22
Coeff. of Variability	0.8631
Minimum	$1,576
Maximum	$135,835
Range Width	$134,259
Mean Std. Error	$254

Forecast: 220BW33 Aggressive Regulation (cont'd) **Cell: E43**

Percentiles:	Forecast values
0%	$1,576
10%	$4,930
20%	$6,602
30%	$8,824
40%	$11,490
50%	$14,741
60%	$19,051
70%	$25,314
80%	$33,050
90%	$44,686
100%	$135,835

Forecast: 305BW06 Increase Precip **Cell: E48**

Summary:
Entire range is from $0 to $239,921
Base case is $53,617
After 5,000 trials, the std. error of the mean is $133

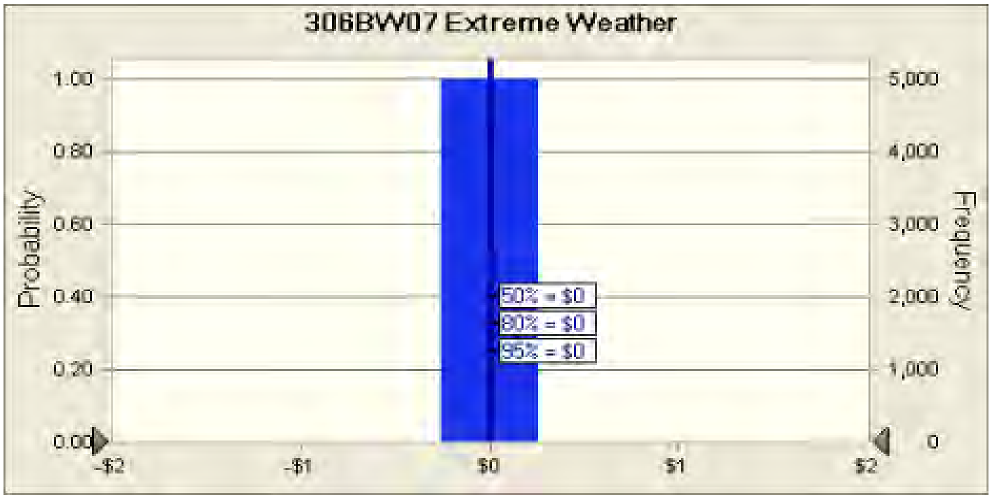
Statistics:	Forecast values
Trials	5,000
Mean	$2,026
Median	$0
Mode	$0
Standard Deviation	$9,414
Variance	$88,617,208
Skewness	8.72
Kurtosis	128.87
Coeff. of Variability	4.65
Minimum	$0
Maximum	$239,921
Range Width	$239,921
Mean Std. Error	$133

Forecast: 305BW06 Increase Precip (cont'd) **Cell: E48**

Percentiles:	Forecast values
0%	$0
10%	$0
20%	$0
30%	$0
40%	$0
50%	$0
60%	$0
70%	$0
80%	$0
90%	$1,063
100%	$239,921

Forecast: 306BW07 Extreme Weather **Cell: E49**

Summary:
Entire range is from $0 to $0
Base case is $0
After 5,000 trials, the std. error of the mean is $0



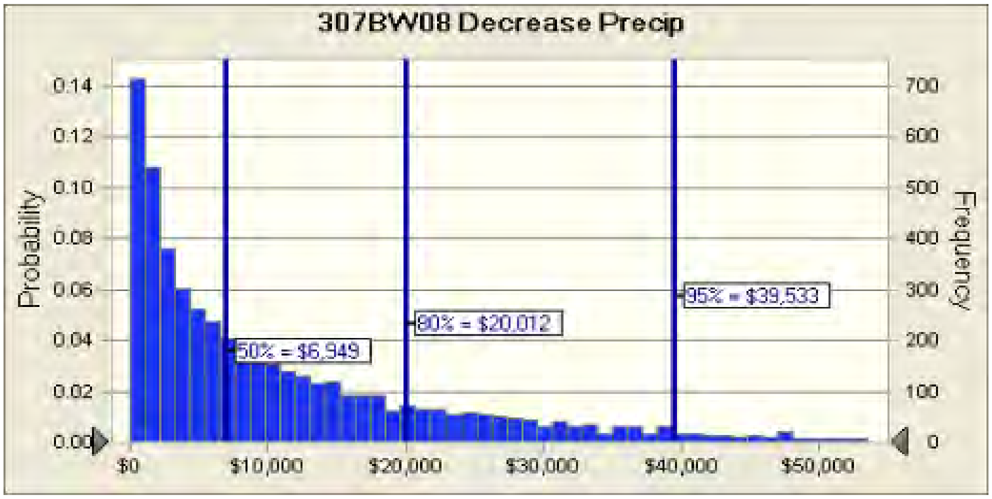
Statistics:	Forecast values
Trials	5,000
Mean	$0
Median	$0
Mode	$0
Standard Deviation	$0
Variance	$0
Skewness	---
Kurtosis	---
Coeff. of Variability	---
Minimum	$0
Maximum	$0
Range Width	$0
Mean Std. Error	$0

Forecast: 306BW07 Extreme Weather (cont'd) **Cell: E49**

Percentiles:	Forecast values
0%	$0
10%	$0
20%	$0
30%	$0
40%	$0
50%	$0
60%	$0
70%	$0
80%	$0
90%	$0
100%	$0

Forecast: 307BW08 Decrease Precip **Cell: E50**

Summary:
Entire range is from $21 to $212,346
Base case is $58,935
After 5,000 trials, the std. error of the mean is $209



Statistics:	Forecast values
Trials	5,000
Mean	$12,055
Median	$6,954
Mode	---
Standard Deviation	$14,810
Variance	$219,335,434
Skewness	2.99
Kurtosis	20.13
Coeff. of Variability	1.23
Minimum	$21
Maximum	$212,346
Range Width	$212,325
Mean Std. Error	$209

Forecast: 307BW08 Decrease Precip (cont'd) **Cell: E50**

Percentiles:	Forecast values
0%	$21
10%	$722
20%	$1,642
30%	$2,860
40%	$4,660
50%	$6,949
60%	$9,871
70%	$13,903
80%	$20,012
90%	$29,904
100%	$212,346

Forecast: 308BW09 Burrow Animals **Cell: E51**

Summary:
Entire range is from $0 to $167,555
Base case is $34,135
After 5,000 trials, the std. error of the mean is $146

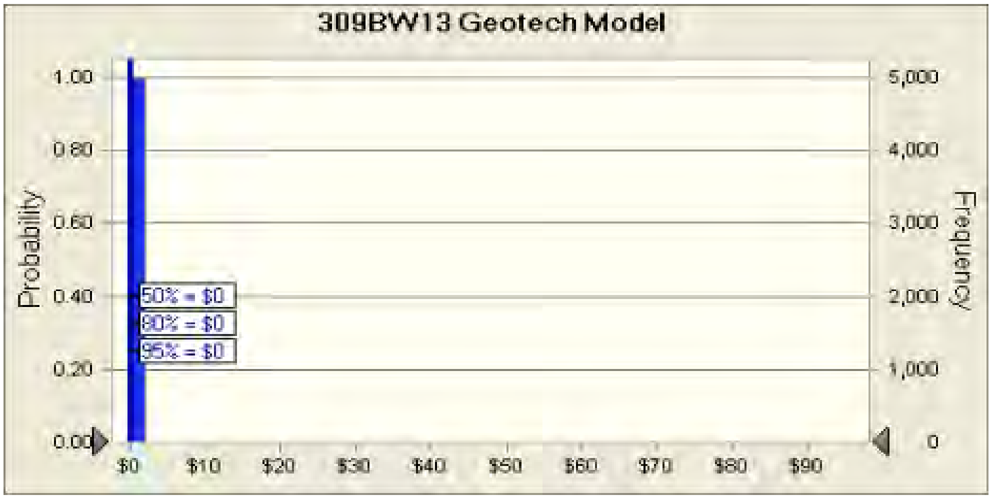
Statistics:	Forecast values
Trials	5,000
Mean	$3,919
Median	$0
Mode	$0
Standard Deviation	$10,324
Variance	$106,590,413
Skewness	4.64
Kurtosis	35.87
Coeff. of Variability	2.63
Minimum	$0
Maximum	$167,555
Range Width	$167,555
Mean Std. Error	$146

Forecast: 308BW09 Burrow Animals (cont'd) **Cell: E51**

Percentiles:	Forecast values
0%	$0
10%	$0
20%	$0
30%	$0
40%	$0
50%	$0
60%	$0
70%	$296
80%	$4,287
90%	$13,784
100%	$167,555

Forecast: 309BW13 Geotech Model **Cell: E52**

Summary:
Entire range is from $0 to $1,431
Base case is $1,300
After 5,000 trials, the std. error of the mean is $0



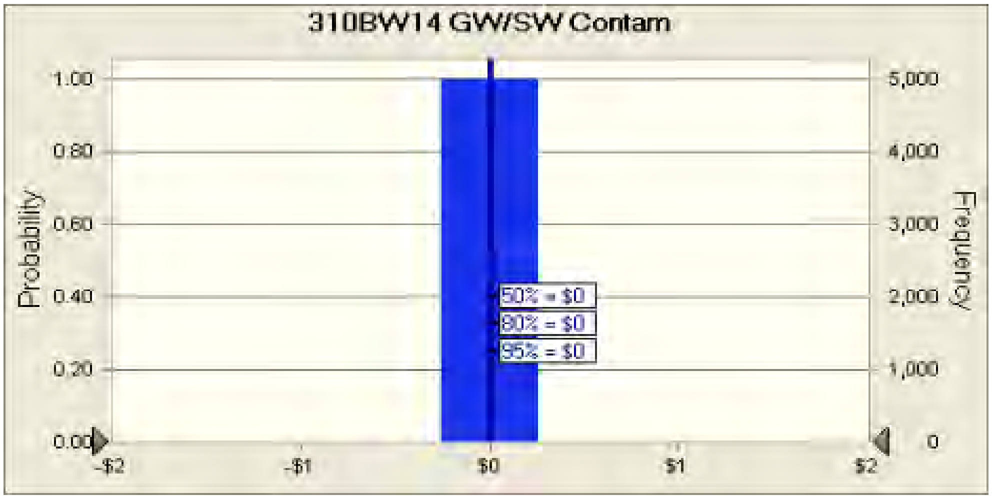
Statistics:	Forecast values
Trials	5,000
Mean	$1
Median	$0
Mode	$0
Standard Deviation	$34
Variance	$1,135
Skewness	34.56
Kurtosis	1,322.14
Coeff. of Variability	28.02
Minimum	$0
Maximum	$1,431
Range Width	$1,431
Mean Std. Error	$0

Forecast: 309BW13 Geotech Model (cont'd) **Cell: E52**

Percentiles:	Forecast values
0%	$0
10%	$0
20%	$0
30%	$0
40%	$0
50%	$0
60%	$0
70%	$0
80%	$0
90%	$0
100%	$1,431

Forecast: 310BW14 GW/SW Contam **Cell: E53**

Summary:
Entire range is from $0 to $0
Base case is $0
After 5,000 trials, the std. error of the mean is $0



Statistics:	Forecast values
Trials	5,000
Mean	$0
Median	$0
Mode	$0
Standard Deviation	$0
Variance	$0
Skewness	---
Kurtosis	---
Coeff. of Variability	---
Minimum	$0
Maximum	$0
Range Width	$0
Mean Std. Error	$0

Forecast: 310BW14 GW/SW Contam (cont'd) **Cell: E53**

Percentiles:	Forecast values
0%	$0
10%	$0
20%	$0
30%	$0
40%	$0
50%	$0
60%	$0
70%	$0
80%	$0
90%	$0
100%	$0

Forecast: 311BW15 Mine/Quarry **Cell: E54**

Summary:
Entire range is from $0 to $81,257
Base case is $68,270
After 5,000 trials, the std. error of the mean is $29

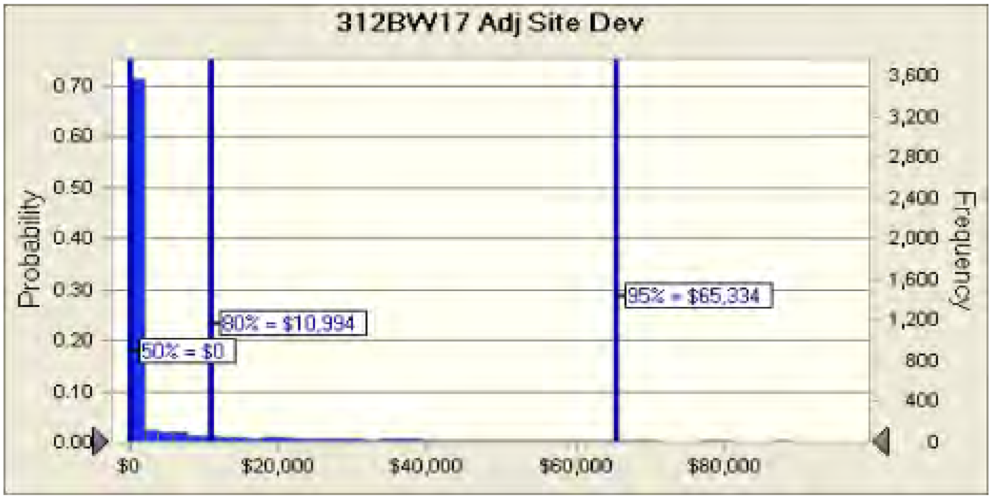
Statistics:	Forecast values
Trials	5,000
Mean	$70
Median	$0
Mode	$0
Standard Deviation	$2,047
Variance	$4,189,531
Skewness	33.92
Kurtosis	1,225.35
Coeff. of Variability	29.24
Minimum	$0
Maximum	$81,257
Range Width	$81,257
Mean Std. Error	$29

Forecast: 311BW15 Mine/Quarry (cont'd) **Cell: E54**

Percentiles:	Forecast values
0%	$0
10%	$0
20%	$0
30%	$0
40%	$0
50%	$0
60%	$0
70%	$0
80%	$0
90%	$0
100%	$81,257

Forecast: 312BW17 Adj Site Dev **Cell: E55**

Summary:
Entire range is from $0 to $517,607
Base case is $93,440
After 5,000 trials, the std. error of the mean is $433



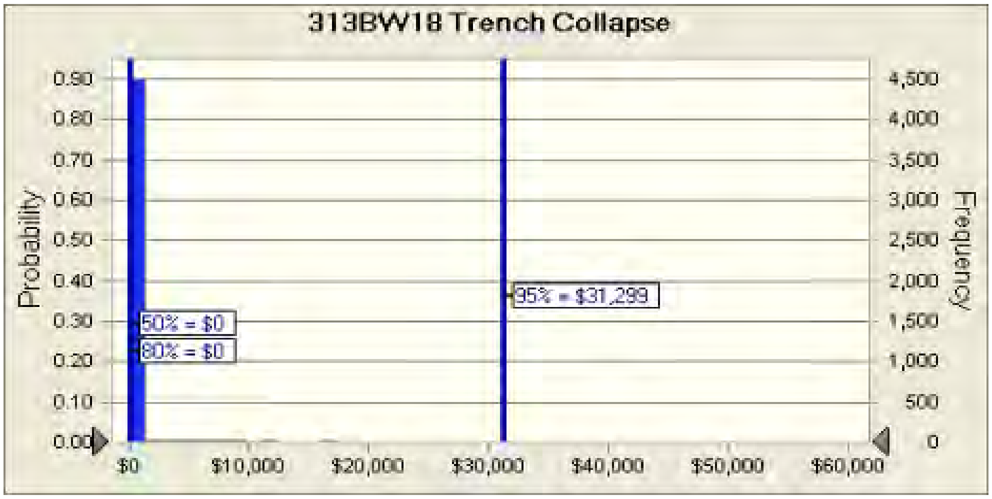
Statistics:	Forecast values
Trials	5,000
Mean	$11,154
Median	$0
Mode	$0
Standard Deviation	$30,584
Variance	$935,370,934
Skewness	5.24
Kurtosis	45.87
Coeff. of Variability	2.74
Minimum	$0
Maximum	$517,607
Range Width	$517,607
Mean Std. Error	$433

Forecast: 312BW17 Adj Site Dev (cont'd) **Cell: E55**

Percentiles:	Forecast values
0%	$0
10%	$0
20%	$0
30%	$0
40%	$0
50%	$0
60%	$0
70%	$860
80%	$10,994
90%	$37,051
100%	$517,607

Forecast: 313BW18 Trench Collapse **Cell: E56**

Summary:
Entire range is from $0 to $253,449
Base case is $166,910
After 5,000 trials, the std. error of the mean is $280



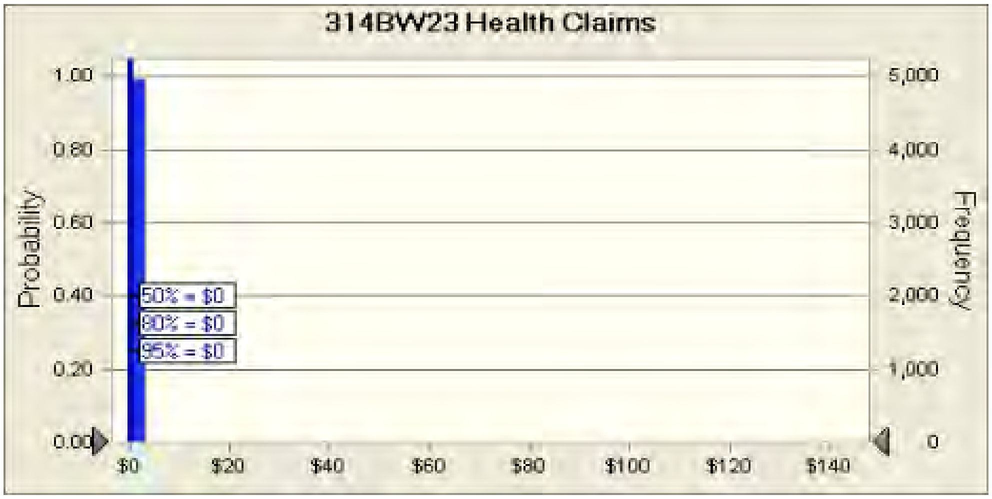
Statistics:	Forecast values
Trials	5,000
Mean	$4,677
Median	$0
Mode	$0
Standard Deviation	$19,802
Variance	$392,110,469
Skewness	5.53
Kurtosis	38.60
Coeff. of Variability	4.23
Minimum	$0
Maximum	$253,449
Range Width	$253,449
Mean Std. Error	$280

Forecast: 313BW18 Trench Collapse (cont'd) **Cell: E56**

Percentiles:	Forecast values
0%	$0
10%	$0
20%	$0
30%	$0
40%	$0
50%	$0
60%	$0
70%	$0
80%	$0
90%	$957
100%	$253,449

Forecast: 314BW23 Health Claims **Cell: E57**

Summary:
Entire range is from $0 to $2,795
Base case is $1,183
After 5,000 trials, the std. error of the mean is $1



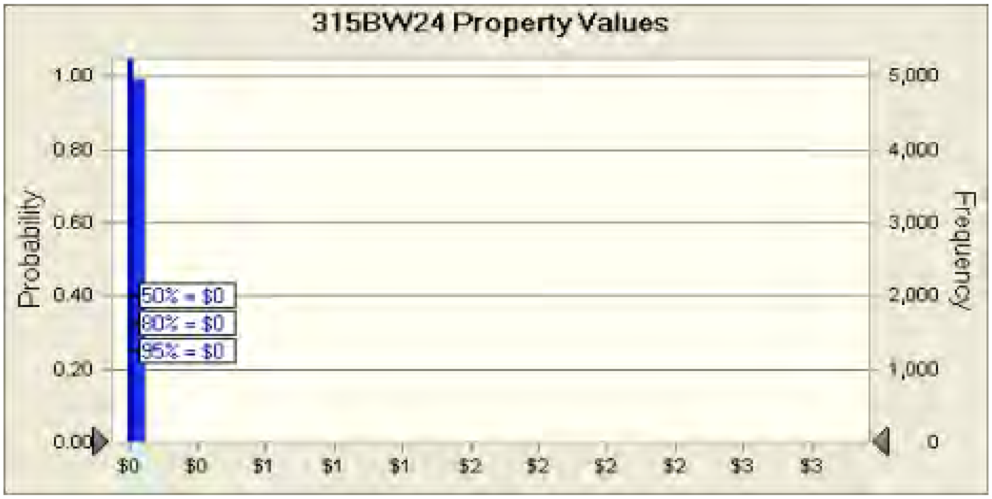
Statistics:	Forecast values
Trials	5,000
Mean	$2
Median	$0
Mode	$0
Standard Deviation	$51
Variance	$2,573
Skewness	42.12
Kurtosis	2,065.18
Coeff. of Variability	26.68
Minimum	$0
Maximum	$2,795
Range Width	$2,795
Mean Std. Error	$1

Forecast: 314BW23 Health Claims (cont'd) **Cell: E57**

Percentiles:	Forecast values
0%	$0
10%	$0
20%	$0
30%	$0
40%	$0
50%	$0
60%	$0
70%	$0
80%	$0
90%	$0
100%	$2,795

Forecast: 315BW24 Property Values **Cell: E58**

Summary:
Entire range is from $0 to $45
Base case is $41
After 5,000 trials, the std. error of the mean is $0



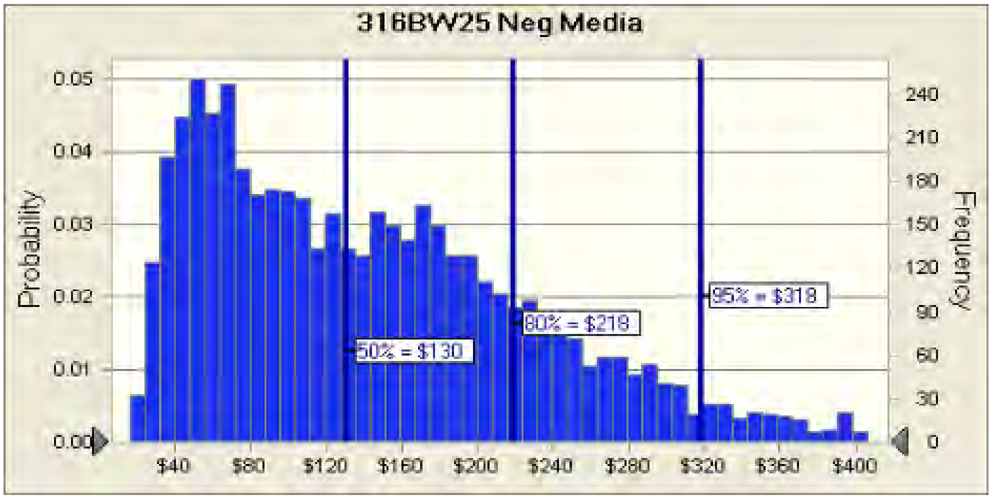
Statistics:	Forecast values
Trials	5,000
Mean	$0
Median	$0
Mode	$0
Standard Deviation	$1
Variance	$1
Skewness	25.63
Kurtosis	795.68
Coeff. of Variability	18.33
Minimum	$0
Maximum	$45
Range Width	$45
Mean Std. Error	$0

Forecast: 315BW24 Property Values (cont'd) **Cell: E58**

Percentiles:	Forecast values
0%	$0
10%	$0
20%	$0
30%	$0
40%	$0
50%	$0
60%	$0
70%	$0
80%	$0
90%	$0
100%	$45

Forecast: 316BW25 Neg Media **Cell: E59**

Summary:
Entire range is from $16 to $719
Base case is $215
After 5,000 trials, the std. error of the mean is $1



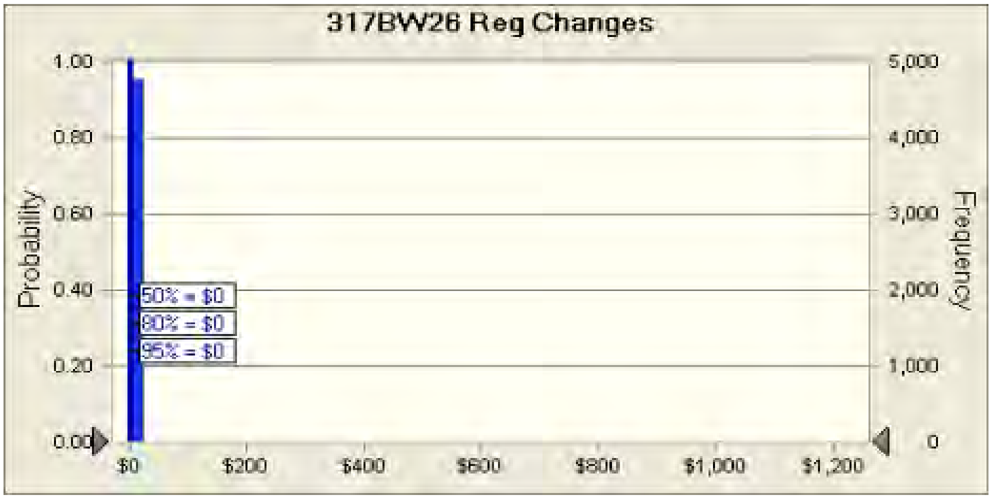
Statistics:	Forecast values
Trials	5,000
Mean	$146
Median	$130
Mode	---
Standard Deviation	$93
Variance	$8,628
Skewness	1.13
Kurtosis	4.87
Coeff. of Variability	0.6346
Minimum	$16
Maximum	$719
Range Width	$703
Mean Std. Error	$1

Forecast: 316BW25 Neg Media (cont'd) **Cell: E59**

Percentiles:	Forecast values
0%	$16
10%	$46
20%	$61
30%	$80
40%	$103
50%	$130
60%	$157
70%	$184
80%	$218
90%	$271
100%	$719

Forecast: 317BW26 Reg Changes **Cell: E60**

Summary:
Entire range is from $0 to $10,743
Base case is $21,513
After 5,000 trials, the std. error of the mean is $6



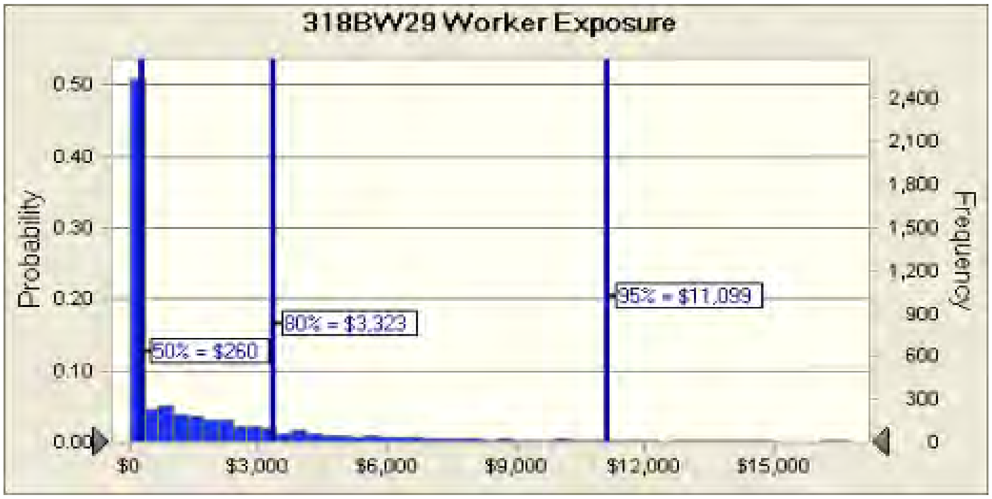
Statistics:	Forecast values
Trials	5,000
Mean	$52
Median	$0
Mode	$0
Standard Deviation	$420
Variance	$176,257
Skewness	15.20
Kurtosis	305.29
Coeff. of Variability	8.03
Minimum	$0
Maximum	$10,743
Range Width	$10,743
Mean Std. Error	$6

Forecast: 317BW26 Reg Changes (cont'd) **Cell: E60**

Percentiles:	Forecast values
0%	$0
10%	$0
20%	$0
30%	$0
40%	$0
50%	$0
60%	$0
70%	$0
80%	$0
90%	$0
100%	$10,743

Forecast: 318BW29 Worker Exposure **Cell: E61**

Summary:
Entire range is from \$0 to \$71,450
Base case is \$15,000
After 5,000 trials, the std. error of the mean is \$73



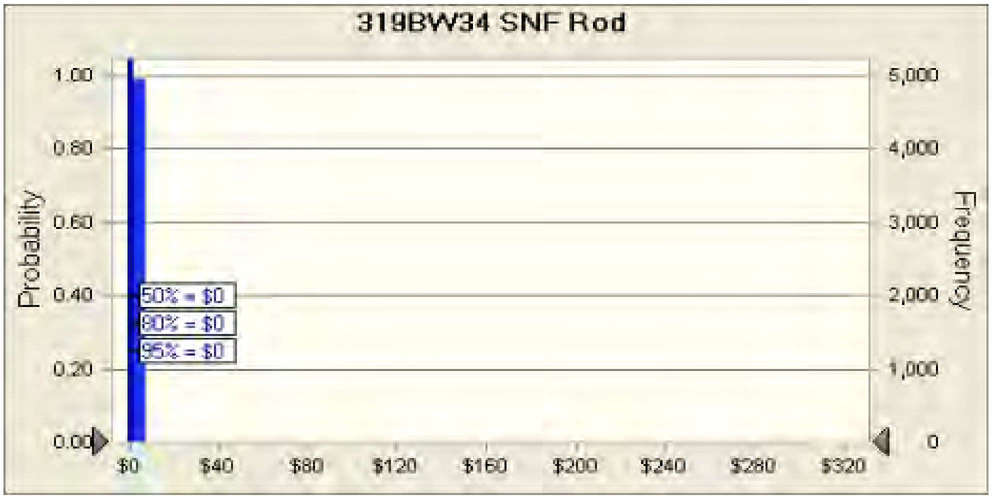
Statistics:	Forecast values
Trials	5,000
Mean	\$2,363
Median	\$261
Mode	\$0
Standard Deviation	\$5,146
Variance	\$26,481,953
Skewness	4.99
Kurtosis	40.20
Coeff. of Variability	2.18
Minimum	\$0
Maximum	\$71,450
Range Width	\$71,450
Mean Std. Error	\$73

Forecast: 318BW29 Worker Exposure (cont'd) **Cell: E61**

Percentiles:	Forecast values
0%	$0
10%	$0
20%	$0
30%	$0
40%	$0
50%	$260
60%	$972
70%	$1,908
80%	$3,323
90%	$6,790
100%	$71,450

Forecast: 319BW34 SNF Rod **Cell: E62**

Summary:
Entire range is from $0 to $3,109
Base case is $4,074
After 5,000 trials, the std. error of the mean is $2



Statistics:	Forecast values
Trials	5,000
Mean	$8
Median	$0
Mode	$0
Standard Deviation	$112
Variance	$12,613
Skewness	18.31
Kurtosis	388.82
Coeff. of Variability	14.20
Minimum	$0
Maximum	$3,109
Range Width	$3,109
Mean Std. Error	$2

Forecast: 319BW34 SNF Rod (cont'd) **Cell: E62**

Percentiles:	Forecast values
0%	$0
10%	$0
20%	$0
30%	$0
40%	$0
50%	$0
60%	$0
70%	$0
80%	$0
90%	$0
100%	$3,109

Forecast: 320BW33 Aggressive Regulation **Cell: E63**

Summary:
Entire range is from $0 to $85,572
Base case is $49,956
After 5,000 trials, the std. error of the mean is $74

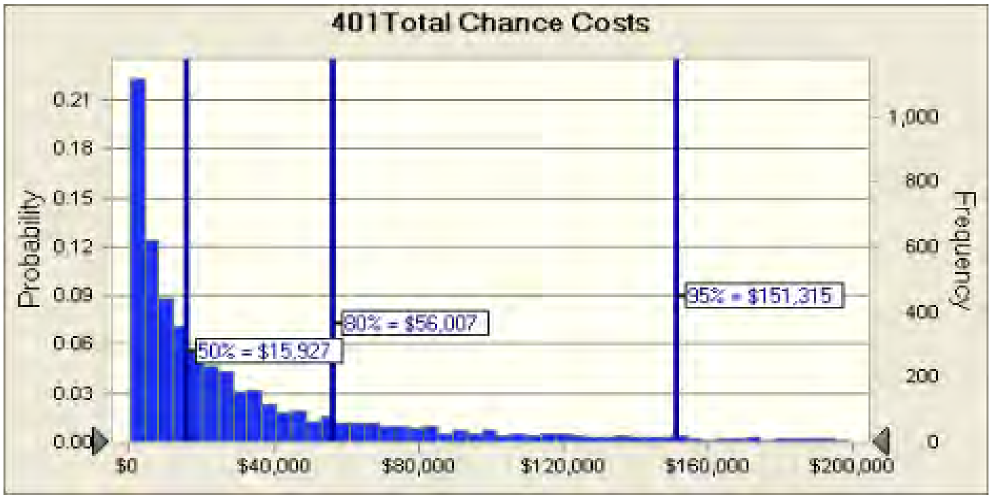
Statistics:	Forecast values
Trials	5,000
Mean	$910
Median	$1
Mode	---
Standard Deviation	$5,236
Variance	$27,413,643
Skewness	8.59
Kurtosis	92.99
Coeff. of Variability	5.75
Minimum	$0
Maximum	$85,572
Range Width	$85,572
Mean Std. Error	$74

Forecast: 320BW33 Aggressive Regulation (cont'd) **Cell: E63**

Percentiles:	Forecast values
0%	$0
10%	$0
20%	$0
30%	$0
40%	$0
50%	$1
60%	$1
70%	$1
80%	$2
90%	$110
100%	$85,572

Forecast: 401Total Chance Costs **Cell: E64**

Summary:
Entire range is from $95 to $960,393
Base case is $568,588
After 5,000 trials, the std. error of the mean is $816



Statistics:	Forecast values
Trials	5,000
Mean	$37,385
Median	$15,932
Mode	---
Standard Deviation	$57,705
Variance	$3,329,814,967
Skewness	3.85
Kurtosis	30.58
Coeff. of Variability	1.54
Minimum	$95
Maximum	$960,393
Range Width	$960,298
Mean Std. Error	$816

Forecast: 401Total Chance Costs (cont'd) **Cell: E64**

Percentiles:	Forecast values
0%	$95
10%	$1,580
20%	$3,648
30%	$6,495
40%	$10,422
50%	$15,927
60%	$23,608
70%	$34,831
80%	$56,007
90%	$102,329
100%	$960,393

End of Forecasts

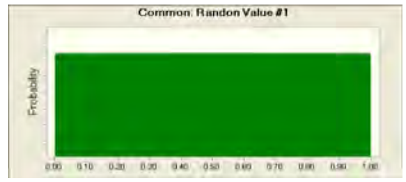
Assumptions

Worksheet: [Appendix E 080618.xls]Common Data

Assumption: Common: Randon Value #1 **Cell: C40**

Uniform distribution with parameters:

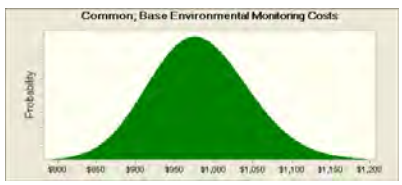
Minimum	0.00
Maximum	1.00



Assumption: Common; Base Environmental Monitoring Costs **Cell: D54**

Lognormal distribution with parameters:

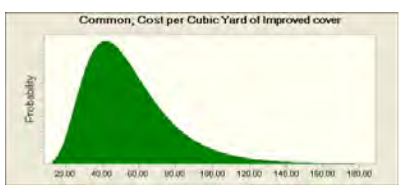
50%	$980	(=D54)
95%	$1,090	(=E54)



Assumption: Common; Cost per Cubic Yard of Improved cover **Cell: C31**

Lognormal distribution with parameters:

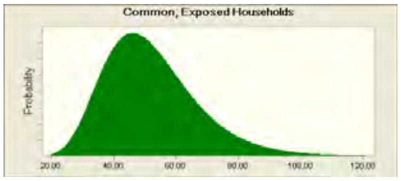
50%	50.00	(=C31)
95%	100.00	(=D31)



Assumption: Common; Exposed Households **Cell: C7**

Lognormal distribution with parameters:

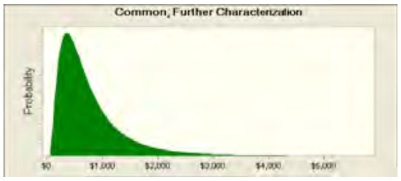
50%	50.00	(=C7)
95%	80.00	(=D7)



Assumption: Common; Further Characterization **Cell: D51**

Lognormal distribution with parameters:

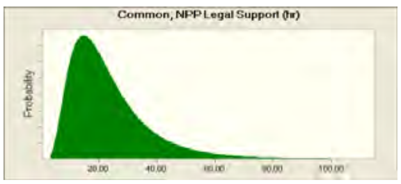
50%	$600	(=D51)
95%	$2,000	(=E51)



Assumption: Common; NPP Legal Support (hr) **Cell: C23**

Lognormal distribution with parameters:

50%	20.00	(=C23)
95%	50.00	(=D23)

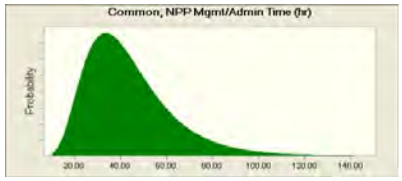


Assumption: Common; NPP Mgmt/Admin Time (hr) **Cell: C19**

Lognormal distribution with parameters:

50%	40.00	(=C19)
95%	80.00	(=D19)

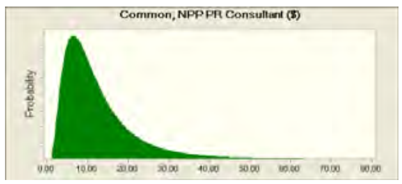
Assumption: Common; NPP Mgmt/Admin Time (hr) (cont'd) **Cell: C19**



Assumption: Common; NPP PR Consultant ($) **Cell: C22**

Lognormal distribution with parameters:

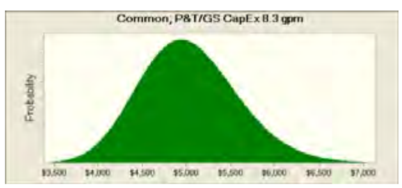
50%	10.00	(=C22)
95%	30.00	(=D22)



Assumption: Common; P&T/GS CapEx 8.3 gpm **Cell: D43**

Lognormal distribution with parameters:

50%	$5,000	(=D43)
95%	$6,000	(=E43)



Assumption: Common; P&T/GS CapEx Entire Zone 2 **Cell: D47**

Lognormal distribution with parameters:

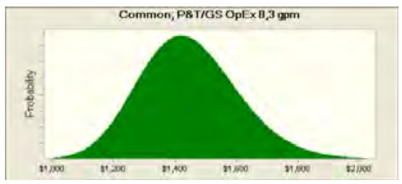
50%	13,500.00	(=D47)
95%	15,200.00	(=E47)

Assumption: Common; P&T/GS CapEx Entire Zone 2 (cont'd) **Cell: D47**

Assumption: Common; P&T/GS OpEx 8,3 gpm **Cell: D45**

Lognormal distribution with parameters:

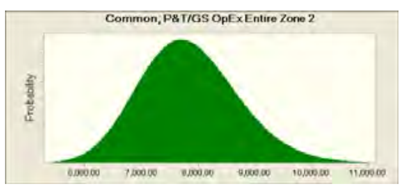
50%	$1,438	(=D45)
95%	$1,726	(=E45)



Assumption: Common; P&T/GS OpEx Entire Zone 2 **Cell: D49**

Lognormal distribution with parameters:

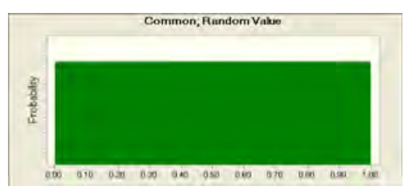
50%	7,796.00	(=D49)
95%	9,355.00	(=E49)



Assumption: Common; Random Value **Cell: C13**

Uniform distribution with parameters:

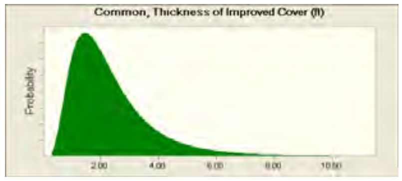
Minimum	0.00
Maximum	1.00



Assumption: Common; Thickness of Improved Cover (ft) **Cell: C32**

Lognormal distribution with parameters:

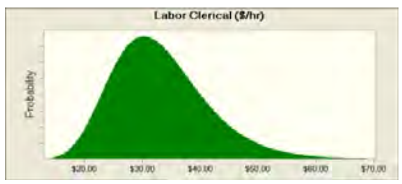
50%	2.00	(=C32)
95%	5.00	(=D32)



Assumption: Labor Clerical ($/hr) **Cell: F77**

Lognormal distribution with parameters:

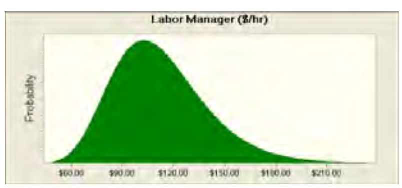
50%	$32.13	(=I77)
95%	$48.20	(=J77)



Assumption: Labor Manager ($/hr) **Cell: F78**

Lognormal distribution with parameters:

50%	$109.05	(=I78)
95%	$163.58	(=J78)



Assumption: Labor Operator ($/hr) **Cell: F79**

Lognormal distribution with parameters:

50%	$66.15	(=I79)
95%	$99.23	(=J79)

Assumption: Labor Operator ($/hr) (cont'd) **Cell: F79**

Assumption: Labor Professional ($/hr) **Cell: F80**

Lognormal distribution with parameters:

50%	$101.80	(=I80)
95%	$152.69	(=J80)

Assumption: Labor Semi-Skilled ($/hr) **Cell: F81**

Lognormal distribution with parameters:

50%	$34.02	(=I81)
95%	$51.03	(=J81)

Assumption: Labor Supervisor ($/hr) **Cell: F82**

Lognormal distribution with parameters:

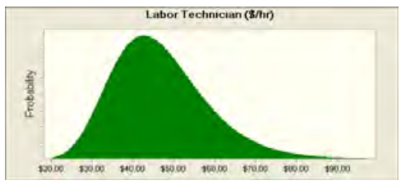
50%	$75.34	(=I82)
95%	$113.00	(=J82)

Assumption: Labor Supervisor ($/hr) (cont'd) **Cell: F82**

Assumption: Labor Technician ($/hr) **Cell: F83**

Lognormal distribution with parameters:

50%	$45.36	(=I83)
95%	$68.04	(=J83)

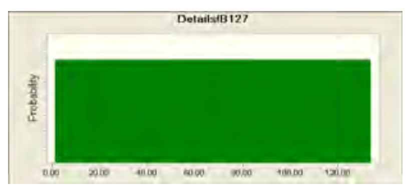


Worksheet: [Appendix E 080618.xls]Details

Assumption: B127 **Cell: B127**

Uniform distribution with parameters:

Minimum	1.00
Maximum	134.00

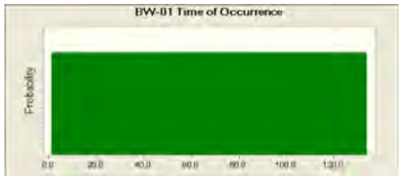


Assumption: BW-01 Time of Occurrence **Cell: U4**

Uniform distribution with parameters:

Minimum	1.0	(=S4)
Maximum	134.0	(=T4)

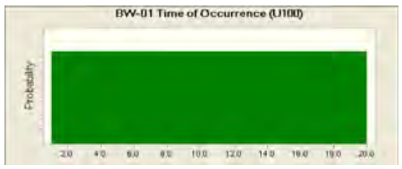
Assumption: BW-01 Time of Occurrence (cont'd) **Cell: U4**



Assumption: BW-01 Time of Occurrence (U100) **Cell: U100**

Uniform distribution with parameters:

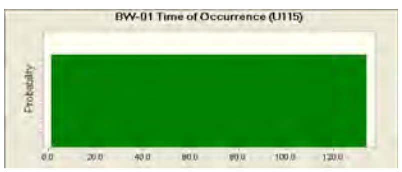
Minimum	1.0	(=S100)
Maximum	20.0	(=T100)



Assumption: BW-01 Time of Occurrence (U115) **Cell: U115**

Uniform distribution with parameters:

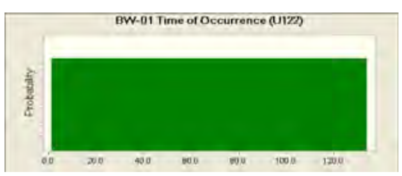
Minimum	1.0	(=S115)
Maximum	134.0	(=T115)



Assumption: BW-01 Time of Occurrence (U122) **Cell: U122**

Uniform distribution with parameters:

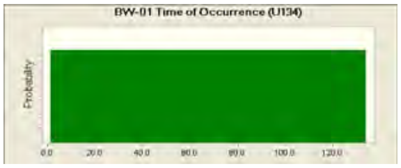
Minimum	1.0	(=S122)
Maximum	134.0	(=T122)



Assumption: BW-01 Time of Occurrence (U134) **Cell: U134**

Uniform distribution with parameters:

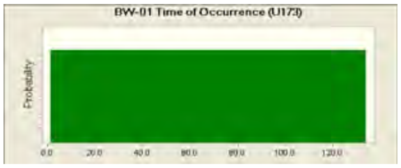
Minimum	1.0	(=S134)
Maximum	134.0	(=T134)



Assumption: BW-01 Time of Occurrence (U173) **Cell: U173**

Uniform distribution with parameters:

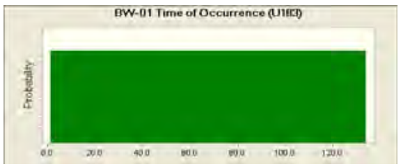
Minimum	1.0	(=S173)
Maximum	134.0	(=T173)



Assumption: BW-01 Time of Occurrence (U183) **Cell: U183**

Uniform distribution with parameters:

Minimum	1.0	(=S183)
Maximum	134.0	(=T183)

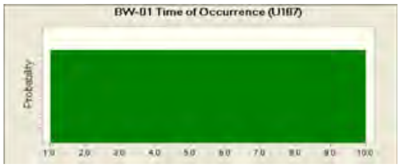


Assumption: BW-01 Time of Occurrence (U187) **Cell: U187**

Uniform distribution with parameters:

Minimum	1.0	(=S187)
Maximum	10.0	(=T187)

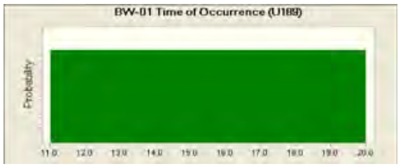
Assumption: BW-01 Time of Occurrence (U187) (cont'd) **Cell: U187**



Assumption: BW-01 Time of Occurrence (U189) **Cell: U189**

Uniform distribution with parameters:

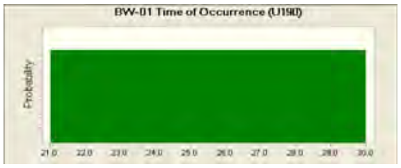
Minimum	11.0	(=S189)
Maximum	20.0	(=T189)



Assumption: BW-01 Time of Occurrence (U190) **Cell: U190**

Uniform distribution with parameters:

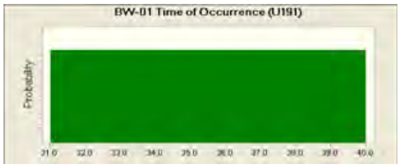
Minimum	21.0	(=S190)
Maximum	30.0	(=T190)



Assumption: BW-01 Time of Occurrence (U191) **Cell: U191**

Uniform distribution with parameters:

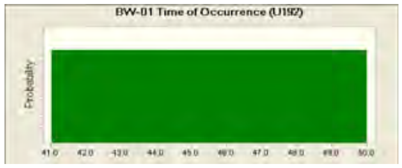
Minimum	31.0	(=S191)
Maximum	40.0	(=T191)



Assumption: BW-01 Time of Occurrence (U192) **Cell: U192**

Uniform distribution with parameters:

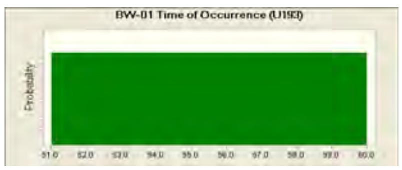
Minimum	41.0	(=S192)
Maximum	50.0	(=T192)



Assumption: BW-01 Time of Occurrence (U193) **Cell: U193**

Uniform distribution with parameters:

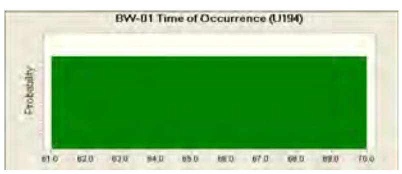
Minimum	51.0	(=S193)
Maximum	60.0	(=T193)



Assumption: BW-01 Time of Occurrence (U194) **Cell: U194**

Uniform distribution with parameters:

Minimum	61.0	(=S194)
Maximum	70.0	(=T194)

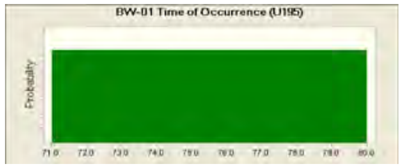


Assumption: BW-01 Time of Occurrence (U195) **Cell: U195**

Uniform distribution with parameters:

Minimum	71.0	(=S195)
Maximum	80.0	(=T195)

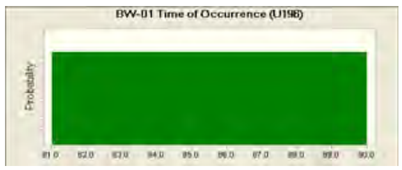
Assumption: BW-01 Time of Occurrence (U195) (cont'd) **Cell: U195**



Assumption: BW-01 Time of Occurrence (U196) **Cell: U196**

Uniform distribution with parameters:

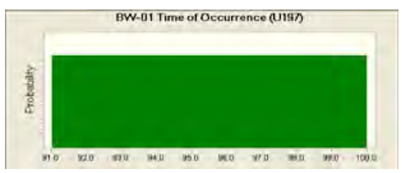
Minimum	81.0	(=S196)
Maximum	90.0	(=T196)



Assumption: BW-01 Time of Occurrence (U197) **Cell: U197**

Uniform distribution with parameters:

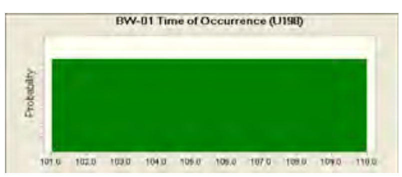
Minimum	91.0	(=S197)
Maximum	100.0	(=T197)



Assumption: BW-01 Time of Occurrence (U198) **Cell: U198**

Uniform distribution with parameters:

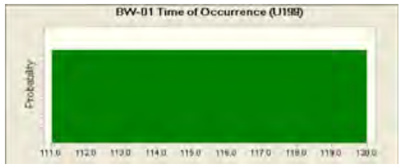
Minimum	101.0	(=S198)
Maximum	110.0	(=T198)



Assumption: BW-01 Time of Occurrence (U199) **Cell: U199**

Uniform distribution with parameters:

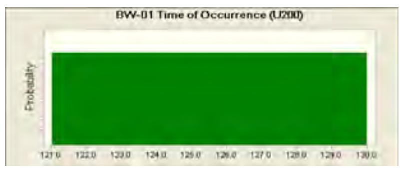
Minimum	111.0	(=S199)
Maximum	120.0	(=T199)



Assumption: BW-01 Time of Occurrence (U200) **Cell: U200**

Uniform distribution with parameters:

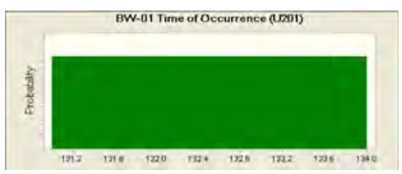
Minimum	121.0	(=S200)
Maximum	130.0	(=T200)



Assumption: BW-01 Time of Occurrence (U201) **Cell: U201**

Uniform distribution with parameters:

Minimum	131.0	(=S201)
Maximum	134.0	(=T201)

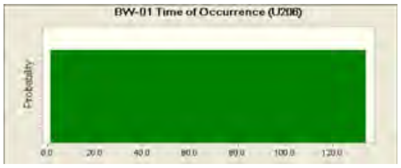


Assumption: BW-01 Time of Occurrence (U206) **Cell: U206**

Uniform distribution with parameters:

Minimum	1.0	(=S206)
Maximum	134.0	(=T206)

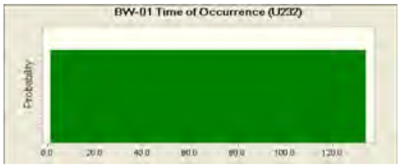
Assumption: BW-01 Time of Occurrence (U206) (cont'd) **Cell: U206**



Assumption: BW-01 Time of Occurrence (U232) **Cell: U232**

Uniform distribution with parameters:

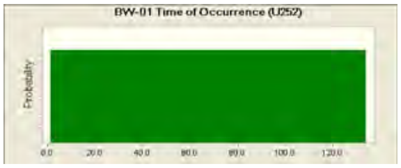
Minimum	1.0	(=S232)
Maximum	134.0	(=T232)



Assumption: BW-01 Time of Occurrence (U252) **Cell: U252**

Uniform distribution with parameters:

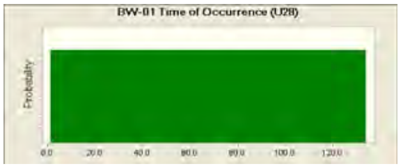
Minimum	1.0	(=S252)
Maximum	134.0	(=T252)



Assumption: BW-01 Time of Occurrence (U28) **Cell: U28**

Uniform distribution with parameters:

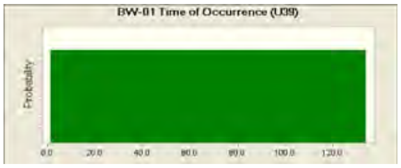
Minimum	1.0	(=S28)
Maximum	134.0	(=T28)



Assumption: BW-01 Time of Occurrence (U39) **Cell: U39**

Uniform distribution with parameters:

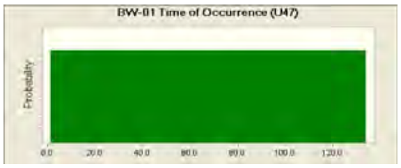
Minimum	1.0	(=S39)
Maximum	134.0	(=T39)



Assumption: BW-01 Time of Occurrence (U47) **Cell: U47**

Uniform distribution with parameters:

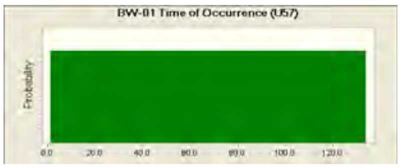
Minimum	1.0	(=S47)
Maximum	134.0	(=T47)



Assumption: BW-01 Time of Occurrence (U57) **Cell: U57**

Uniform distribution with parameters:

Minimum	1.0	(=S57)
Maximum	134.0	(=T57)

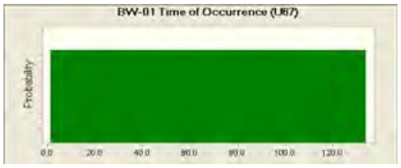


Assumption: BW-01 Time of Occurrence (U67) **Cell: U67**

Uniform distribution with parameters:

Minimum	1.0	(=S67)
Maximum	134.0	(=T67)

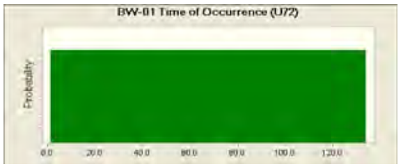
Assumption: BW-01 Time of Occurrence (U67) (cont'd) **Cell: U67**



Assumption: BW-01 Time of Occurrence (U72) **Cell: U72**

Uniform distribution with parameters:

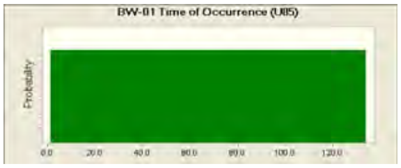
Minimum	1.0	(=S72)
Maximum	134.0	(=T72)



Assumption: BW-01 Time of Occurrence (U85) **Cell: U85**

Uniform distribution with parameters:

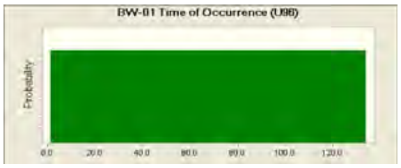
Minimum	1.0	(=S85)
Maximum	134.0	(=T85)



Assumption: BW-01 Time of Occurrence (U96) **Cell: U96**

Uniform distribution with parameters:

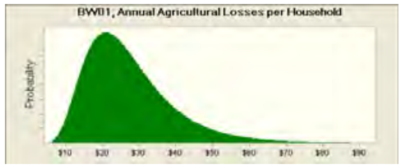
Minimum	1.0	(=S96)
Maximum	134.0	(=T96)



Assumption: BW01; Annual Agricultural Losses per Household **Cell: K11**

Lognormal distribution with parameters:

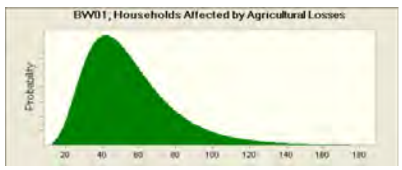
50%	$25	(=K11)
95%	$50	(=L11)



Assumption: BW01; Households Affected by Agricultural Losses **Cell: K10**

Lognormal distribution with parameters:

50%	50	(=K10)
95%	100	(=L10)



Assumption: BW01; Legal Claims **Cell: K6**

Lognormal distribution with parameters:

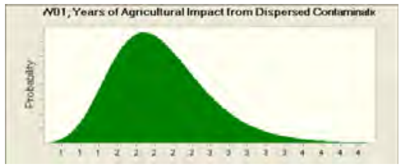
50%	$3,000	(=K6)
95%	$5,000	(=L6)

Assumption: BW01; Years of Agricultural Impact from Dispersed Contamination **Cell: K9**

Lognormal distribution with parameters:

50%	2	(=K9)
95%	3	(=L9)

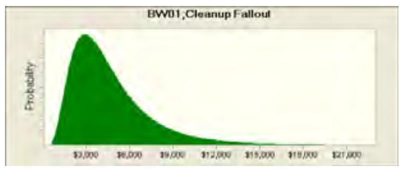
Assumption: BW01; Years of Agricultural Impact from Dispersed Contamination (cont'd) **Cell: K9**



Assumption: BW01;Cleanup Fallout **Cell: K4**

Lognormal distribution with parameters:

50%	$4,000	(=K4)
95%	$10,000	(=L4)



Assumption: BW02; Cost per 10,000 Gallons **Cell: K27**

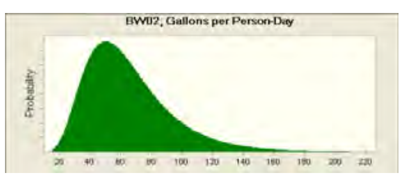
Lognormal distribution with parameters:

50%	$10	(=K27)
95%	$20	(=L27)

Assumption: BW02; Gallons per Person-Day **Cell: K25**

Lognormal distribution with parameters:

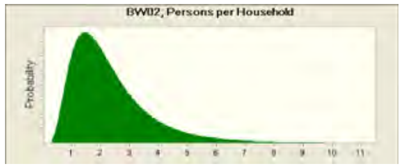
50%	60	(=K25)
95%	120	(=L25)



Assumption: BW02; Persons per Household **Cell: K23**

Lognormal distribution with parameters:

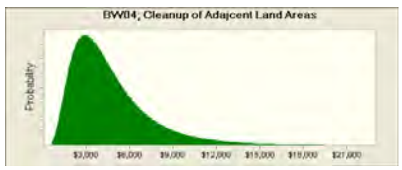
50%	2	(=K23)
95%	5	(=L23)



Assumption: BW04; Cleanup of Adajcent Land Areas **Cell: K39**

Lognormal distribution with parameters:

50%	$4,000	(=K39)
95%	$10,000	(=L39)



Assumption: BW04; Legal Claims **Cell: K40**

Lognormal distribution with parameters:

50%	$3,000	(=K40)
95%	$5,000	(=L40)

Assumption: BW06; Base Cover Mon/Maint Costs **Cell: K56**

Lognormal distribution with parameters:

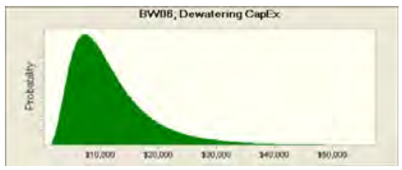
50%	$360	(=K56)
95%	$400	(=L56)

Assumption: BW06; Base Cover Mon/Maint Costs (cont'd) **Cell: K56**

Assumption: BW06; Dewatering CapEx **Cell: K60**

Lognormal distribution with parameters:

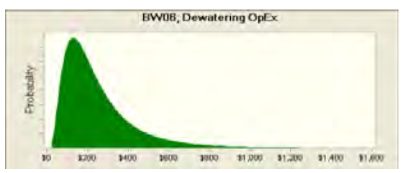
50%	$10,000	(=K60)
95%	$25,000	(=L60)



Assumption: BW06; Dewatering OpEx **Cell: K62**

Lognormal distribution with parameters:

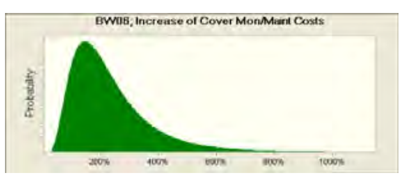
50%	$200	(=K62)
95%	$600	(=L62)



Assumption: BW06; Increase of Cover Mon/Maint Costs **Cell: K55**

Lognormal distribution with parameters:

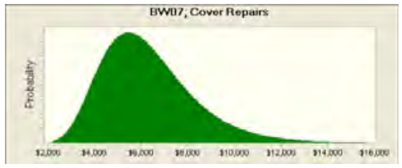
50%	200%	(=K55)
95%	500%	(=L55)



Assumption: BW07; Cover Repairs **Cell: K67**

Lognormal distribution with parameters:

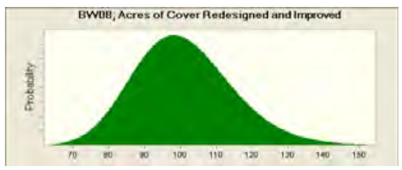
50%	$6,000	(=K67)
95%	$10,000	(=L67)



Assumption: BW08; Acres of Cover Redesigned and Improved **Cell: K74**

Lognormal distribution with parameters:

50%	100	(=K74)
95%	125	(=L74)



Assumption: BW08; Cost per Acre to Revegetate Cover **Cell: K79**

Lognormal distribution with parameters:

50%	$6,000	(=K79)
95%	$12,000	(=L79)

Assumption: BW08; Cost per Cubic Yard of Improved Cover **Cell: K76**

Lognormal distribution with parameters:

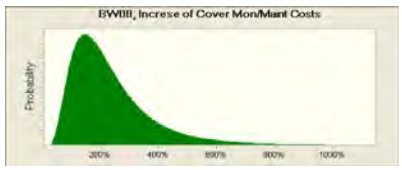
50%	$100	(=K76)
95%	$125	(=L76)

Assumption: BW08; Cost per Cubic Yard of Improved Cover (cont'd) **Cell: K76**

Assumption: BW08; Increse of Cover Mon/Maint Costs **Cell: K71**

Lognormal distribution with parameters:

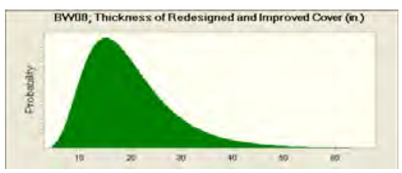
50%	200%	(=K71)
95%	500%	(=L71)



Assumption: BW08; Thickness of Redesigned and Improved Cover (in.) **Cell: K75**

Lognormal distribution with parameters:

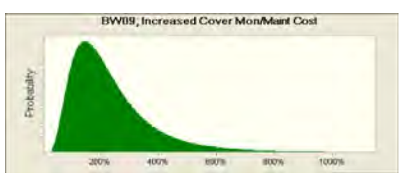
50%	18	(=K75)
95%	36	(=L75)



Assumption: BW09; Increased Cover Mon/Maint Cost **Cell: K84**

Lognormal distribution with parameters:

50%	200%	(=K84)
95%	500%	(=L84)



Assumption: BW13; Cover Repairs **Cell: K96**

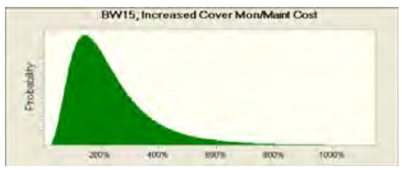
Lognormal distribution with parameters:

50%	$1,300	(=K96)
95%	$3,500	(=L96)

Assumption: BW15; Increased Cover Mon/Maint Cost **Cell: K114**

Lognormal distribution with parameters:

50%	200%	(=K114)
95%	500%	(=L114)



Assumption: BW17; Base Cover Mon/Maint Costs **Cell: K121**

Lognormal distribution with parameters:

50%	$360	(=K121)
95%	$400	(=L121)

Assumption: BW17; Increased Env Mon Costs **Cell: K136**

Lognormal distribution with parameters:

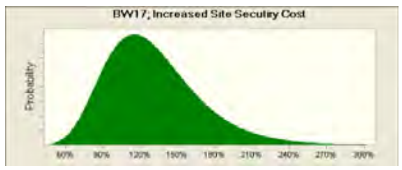
50%	10%	(=K136)
95%	20%	(=L136)

Assumption: BW17; Increased Env Mon Costs (cont'd) **Cell: K136**

Assumption: BW17; Increased Site Secutiry Cost **Cell: K120**

Lognormal distribution with parameters:

50%	125%	(=K120)
95%	200%	(=L120)



Assumption: BW17; Stakeholder Management Program **Cell: K129**

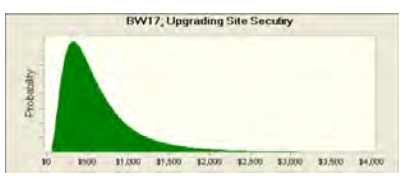
Lognormal distribution with parameters:

50%	$200	(=K129)
95%	$300	(=L129)

Assumption: BW17; Upgrading Site Secutiry **Cell: K127**

Lognormal distribution with parameters:

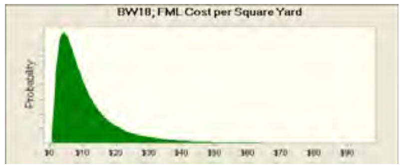
50%	$500	(=K127)
95%	$1,500	(=L127)



Assumption: BW18; FML Cost per Square Yard **Cell: K144**

Lognormal distribution with parameters:

50%	$8	(=K144)
95%	$30	(=L144)



Assumption: BW18; GCL Cost per Square Yard **Cell: K146**

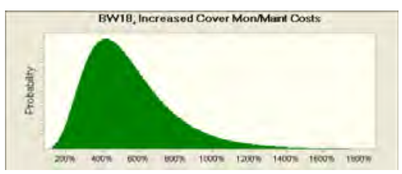
Lognormal distribution with parameters:

50%	$32	(=K146)
95%	$90	(=L146)

Assumption: BW18; Increased Cover Mon/Maint Costs **Cell: K133**

Lognormal distribution with parameters:

50%	500%	(=K133)
95%	1000%	(=L133)

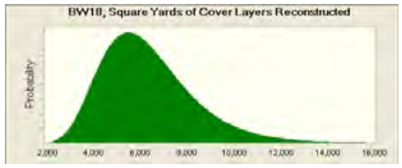


Assumption: BW18; Square Yards of Cover Layers Reconstructed **Cell: K141**

Lognormal distribution with parameters:

50%	6,000	(=K141)
95%	10,000	(=L141)

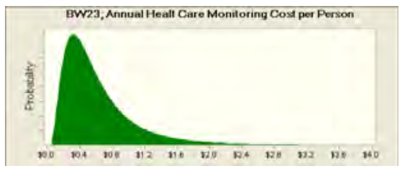
Assumption: BW18; Square Yards of Cover Layers Reconstructed (cont'd) **Cell: K141**



Assumption: BW23; Annual Healt Care Monitoring Cost per Person **Cell: K176**

Lognormal distribution with parameters:

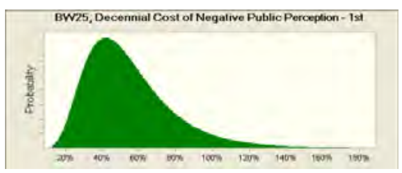
50%	$0.5	(=K176)
95%	$1.5	(=L176)



Assumption: BW25; Decennial Cost of Negative Public Perception - 1st **Cell: K189**

Lognormal distribution with parameters:

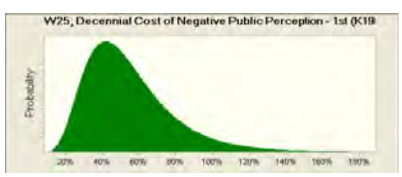
50%	50%	(=K189)
95%	100%	(=L189)



Assumption: BW25; Decennial Cost of Negative Public Perception - 1st (K190) **Cell: K190**

Lognormal distribution with parameters:

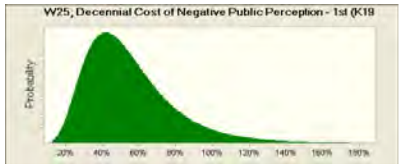
50%	50%	(=K190)
95%	100%	(=L190)



Assumption: BW25; Decennial Cost of Negative Public Perception - 1st (K191) **Cell: K191**

Lognormal distribution with parameters:

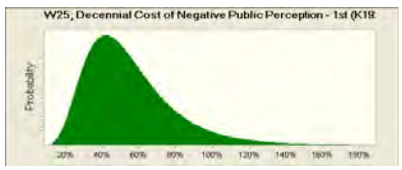
50%	50%	(=K191)
95%	100%	(=L191)



Assumption: BW25; Decennial Cost of Negative Public Perception - 1st (K192) **Cell: K192**

Lognormal distribution with parameters:

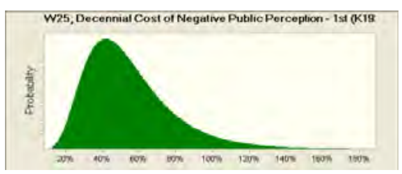
50%	50%	(=K192)
95%	100%	(=L192)



Assumption: BW25; Decennial Cost of Negative Public Perception - 1st (K193) **Cell: K193**

Lognormal distribution with parameters:

50%	50%	(=K193)
95%	100%	(=L193)

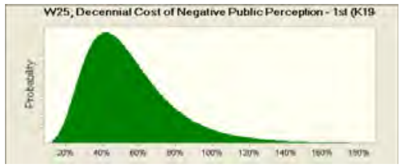


Assumption: BW25; Decennial Cost of Negative Public Perception - 1st (K194) **Cell: K194**

Lognormal distribution with parameters:

50%	50%	(=K194)
95%	100%	(=L194)

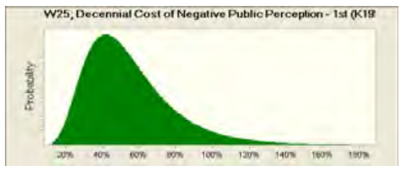
Assumption: BW25; Decennial Cost of Negative Public Perception - 1st (K194) (cont'd) **Cell: K194**



Assumption: BW25; Decennial Cost of Negative Public Perception - 1st (K195) **Cell: K195**

Lognormal distribution with parameters:

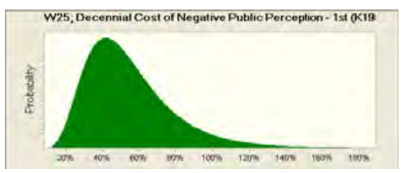
50%	50%	(=K195)
95%	100%	(=L195)



Assumption: BW25; Decennial Cost of Negative Public Perception - 1st (K196) **Cell: K196**

Lognormal distribution with parameters:

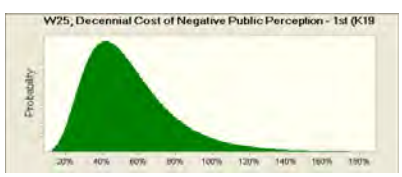
50%	50%	(=K196)
95%	100%	(=L196)



Assumption: BW25; Decennial Cost of Negative Public Perception - 1st (K197) **Cell: K197**

Lognormal distribution with parameters:

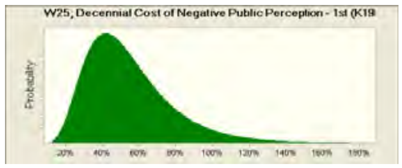
50%	50%	(=K197)
95%	100%	(=L197)



Assumption: BW25; Decennial Cost of Negative Public Perception - 1st (K198) **Cell: K198**

Lognormal distribution with parameters:

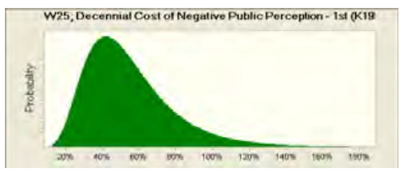
50%	50%	(=K198)
95%	100%	(=L198)



Assumption: BW25; Decennial Cost of Negative Public Perception - 1st (K199) **Cell: K199**

Lognormal distribution with parameters:

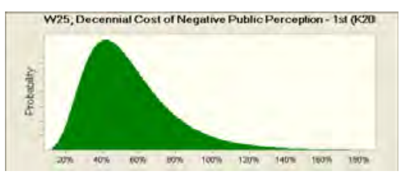
50%	50%	(=K199)
95%	100%	(=L199)



Assumption: BW25; Decennial Cost of Negative Public Perception - 1st (K200) **Cell: K200**

Lognormal distribution with parameters:

50%	50%	(=K200)
95%	100%	(=L200)

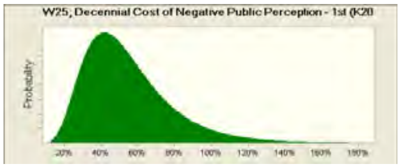


Assumption: BW25; Decennial Cost of Negative Public Perception - 1st (K201) **Cell: K201**

Lognormal distribution with parameters:

50%	50%	(=K201)
95%	100%	(=L201)

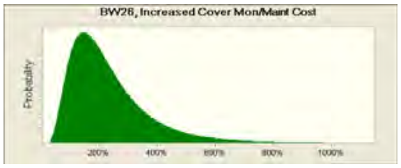
Assumption: BW25; Decennial Cost of Negative Public Perception - 1st (K201) (cont'd) **Cell: K201**



Assumption: BW26, Increased Cover Mon/Maint Cost **Cell: K214**

Lognormal distribution with parameters:

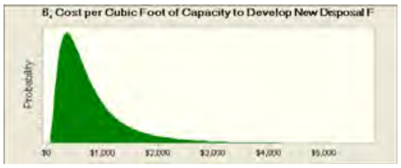
50%	200%	(=K214)
95%	500%	(=L214)



Assumption: BW26; Cost per Cubic Foot of Capacity to Develop New Disposal Facility **Cell: K223**

Lognormal distribution with parameters:

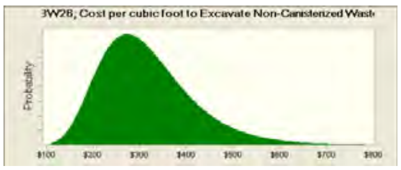
50%	$600	(=K223)
95%	$2,000	(=L223)



Assumption: BW26; Cost per cubic foot to Excavate Non-Canisterized Waste **Cell: K220**

Lognormal distribution with parameters:

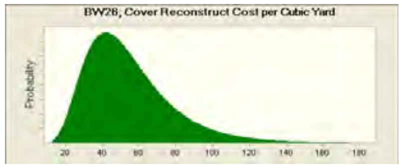
50%	$300	(=K220)
95%	$500	(=L220)



Assumption: BW26; Cover Reconstruct Cost per Cubic Yard **Cell: K209**

Lognormal distribution with parameters:

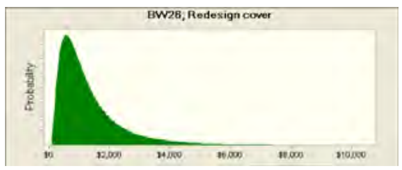
50%	50	(=K209)
95%	100	(=L209)



Assumption: BW26; Redesign cover **Cell: K206**

Lognormal distribution with parameters:

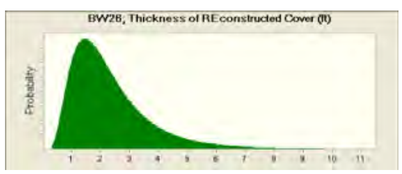
50%	$1,000	(=K206)
95%	$3,500	(=L206)



Assumption: BW26; Thickness of REconstructed Cover (ft) **Cell: K210**

Lognormal distribution with parameters:

50%	2	(=K210)
95%	5	(=L210)

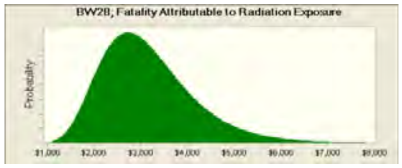


Assumption: BW28; Fatality Attributable to Radiation Exposure **Cell: K232**

Lognormal distribution with parameters:

50%	$3,000	(=K232)
95%	$5,000	(=L232)

Assumption: BW28; Fatality Attributable to Radiation Exposure (cont'd) **Cell: K232**



Assumption: BW28; Volume Non-Canisterized Waste Excavated (cubic feet) **Cell: K218**

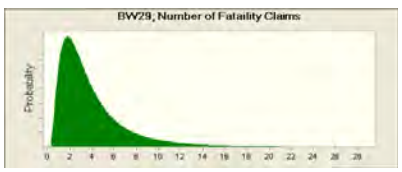
Lognormal distribution with parameters:

50%	1	(=K218)
95%	2	(=L218)

Assumption: BW29; Number of Fataility Claims **Cell: K235**

Lognormal distribution with parameters:

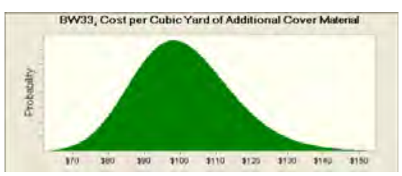
50%	3	(=K235)
95%	10	(=L235)



Assumption: BW33; Cost per Cubic Yard of Additional Cover Material **Cell: K272**

Lognormal distribution with parameters:

50%	$100	(=K272)
95%	$125	(=L272)



Assumption: BW33; Cost per Cubic Yard to Construct Improved Cover **Cell: K279**

Lognormal distribution with parameters:

50%	50	(=K279)
95%	100	(=L279)

Assumption: BW33; Cost to Redesign Cover System **Cell: K276**

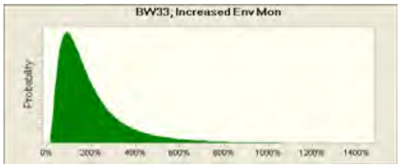
Lognormal distribution with parameters:

50%	$1,500	(=K276)
95%	$4,000	(=L276)

Assumption: BW33; Increased Env Mon **Cell: K285**

Lognormal distribution with parameters:

50%	150%	(=K285)
95%	500%	(=L285)

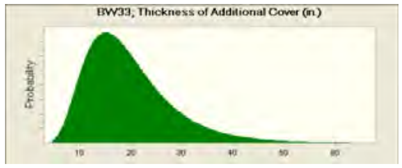


Assumption: BW33; Thickness of Additional Cover (in.) **Cell: K271**

Lognormal distribution with parameters:

50%	18	(=K271)
95%	36	(=L271)

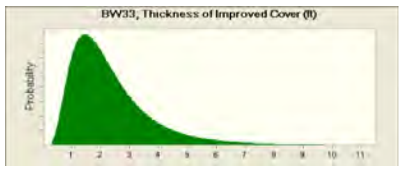
Assumption: BW33; Thickness of Additional Cover (in.) (cont'd) **Cell: K271**



Assumption: BW33; Thickness of Improved Cover (ft) **Cell: K280**

Lognormal distribution with parameters:

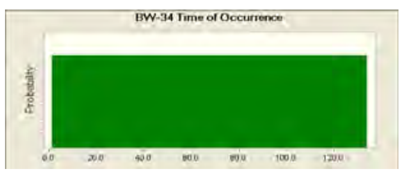
50%	2	(=K280)
95%	5	(=L280)



Assumption: BW-34 Time of Occurrence **Cell: U291**

Uniform distribution with parameters:

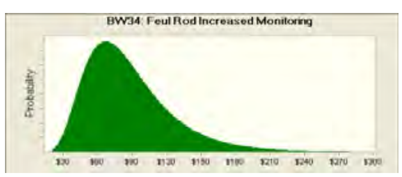
Minimum	1.0	(=S291)
Maximum	134.0	(=T291)



Assumption: BW34: Feul Rod Increased Monitoring **Cell: K291**

Lognormal distribution with parameters:

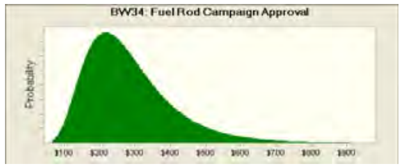
50%	$80	(=K290)
95%	$160	(=L290)



Assumption: BW34: Fuel Rod Campaign Approval **Cell: K295**

Lognormal distribution with parameters:

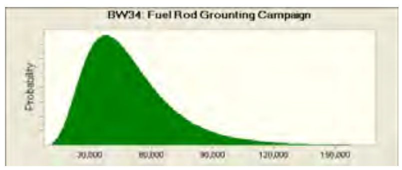
50%	$260	(=K294)
95%	$520	(=L294)



Assumption: BW34: Fuel Rod Grounting Campaign **Cell: K308**

Lognormal distribution with parameters:

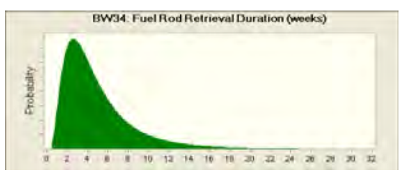
50%	45,000	(=K307)
95%	90,000	(=L307)



Assumption: BW34: Fuel Rod Retrieval Duration (weeks) **Cell: K298**

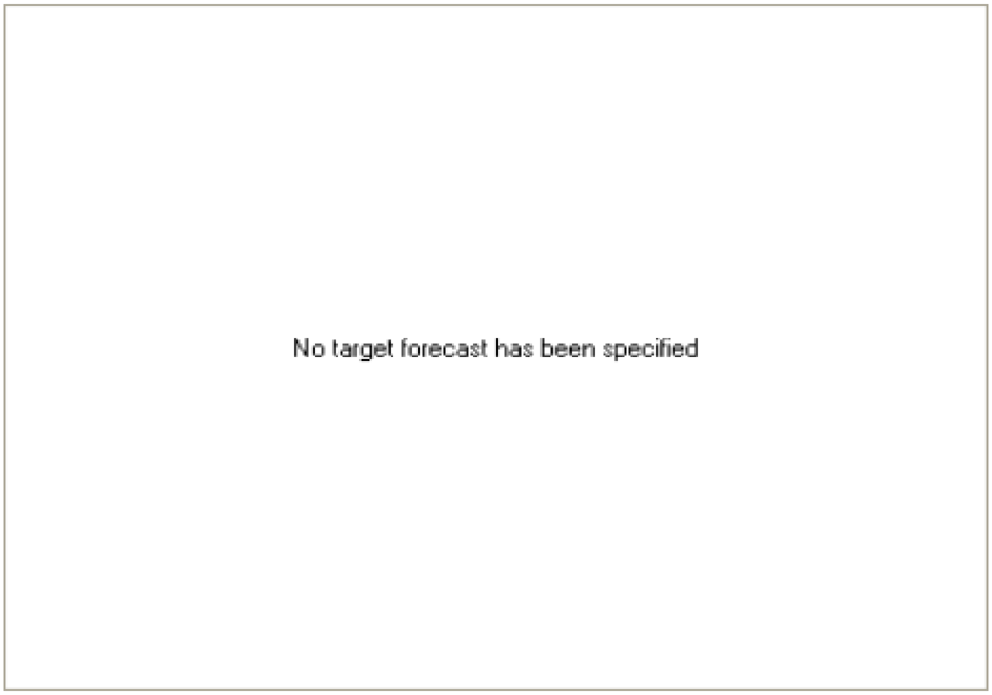
Lognormal distribution with parameters:

50%	4	(=K298)
95%	12	(=L298)



End of Assumptions

Sensitivity Charts



End of Sensitivity Charts

Index

Forecasts; Barnwell Unplanned Events

Worksheet: [Appendix E 080618.xls]Forecasts

Forecast: 105BW06 Increase Precip	**Cell: E8**
Forecast: 106BW07 Extreme Weather	**Cell: E9**
Forecast: 107BW08 Decrease Precip	**Cell: E10**
Forecast: 108BW09 Burrow Animals	**Cell: E11**
Forecast: 109BW13 Geotech Model	**Cell: E12**
Forecast: 110BW14 GW/SW Contam	**Cell: E13**
Forecast: 111BW15 Mine/Quarry	**Cell: E14**
Forecast: 112BW17 Adj Site Dev	**Cell: E15**
Forecast: 113BW18 Trench Collapse	**Cell: E16**
Forecast: 114BW23 Health Claims	**Cell: E17**
Forecast: 115BW24 Property Values	**Cell: E18**
Forecast: 116BW25 Neg Media	**Cell: E19**
Forecast: 117BW26 Reg Changes	**Cell: E20**
Forecast: 118BW29 Worker Exposure	**Cell: E21**
Forecast: 119BW34 SNF Rod	**Cell: E22**
Forecast: 120BW33 Aggressive Regulation	**Cell: E23**
Forecast: 205BW06 Increase Precip	**Cell: E28**
Forecast: 206BW07 Extreme Weather	**Cell: E29**
Forecast: 207BW08 Decrease Precip	**Cell: E30**
Forecast: 208BW09 Burrow Animals	**Cell: E31**
Forecast: 209BW13 Geotech Model	**Cell: E32**
Forecast: 210BW14 GW/SW Contam	**Cell: E33**
Forecast: 211BW15 Mine/Quarry	**Cell: E34**
Forecast: 212BW17 Adj Site Dev	**Cell: E35**
Forecast: 213BW18 Trench Collapse	**Cell: E36**
Forecast: 214BW23 Health Claims	**Cell: E37**
Forecast: 215BW24 Property Values	**Cell: E38**
Forecast: 216BW25 Neg Media	**Cell: E39**
Forecast: 217BW26 Reg Changes	**Cell: E40**
Forecast: 218BW29 Worker Exposure	**Cell: E41**
Forecast: 219BW34 SNF Rod	**Cell: E42**
Forecast: 220BW33 Aggressive Regulation	**Cell: E43**
Forecast: 305BW06 Increase Precip	**Cell: E48**
Forecast: 306BW07 Extreme Weather	**Cell: E49**
Forecast: 307BW08 Decrease Precip	**Cell: E50**
Forecast: 308BW09 Burrow Animals	**Cell: E51**
Forecast: 309BW13 Geotech Model	**Cell: E52**
Forecast: 310BW14 GW/SW Contam	**Cell: E53**
Forecast: 311BW15 Mine/Quarry	**Cell: E54**
Forecast: 312BW17 Adj Site Dev	**Cell: E55**
Forecast: 313BW18 Trench Collapse	**Cell: E56**

Forecast: 314BW23 Health Claims	**Cell: E57**
Forecast: 315BW24 Property Values	**Cell: E58**
Forecast: 316BW25 Neg Media	**Cell: E59**
Forecast: 317BW26 Reg Changes	**Cell: E60**
Forecast: 318BW29 Worker Exposure	**Cell: E61**
Forecast: 319BW34 SNF Rod	**Cell: E62**
Forecast: 320BW33 Aggressive Regulation	**Cell: E63**
Forecast: 401Total Chance Costs	**Cell: E64**

End of Forecasts

Assumptions

Worksheet: [Appendix E 080618.xls]Common Data

Assumption: Common: Randon Value #1	**Cell: C40**
Assumption: Common; Base Environmental Monitoring Costs	**Cell: D54**
Assumption: Common; Cost per Cubic Yard of Improved cover	**Cell: C31**
Assumption: Common; Exposed Households	**Cell: C7**
Assumption: Common; Further Characterization	**Cell: D51**
Assumption: Common; NPP Legal Support (hr)	**Cell: C23**
Assumption: Common; NPP Mgmt/Admin Time (hr)	**Cell: C19**
Assumption: Common; NPP PR Consultant ($)	**Cell: C22**
Assumption: Common; P&T/GS CapEx 8.3 gpm	**Cell: D43**
Assumption: Common; P&T/GS CapEx Entire Zone 2	**Cell: D47**
Assumption: Common; P&T/GS OpEx 8,3 gpm	**Cell: D45**
Assumption: Common; P&T/GS OpEx Entire Zone 2	**Cell: D49**
Assumption: Common; Random Value	**Cell: C13**
Assumption: Common; Thickness of Improved Cover (ft)	**Cell: C32**
Assumption: Labor Clerical ($/hr)	**Cell: F77**
Assumption: Labor Manager ($/hr)	**Cell: F78**
Assumption: Labor Operator ($/hr)	**Cell: F79**
Assumption: Labor Professional ($/hr)	**Cell: F80**
Assumption: Labor Semi-Skilled ($/hr)	**Cell: F81**
Assumption: Labor Supervisor ($/hr)	**Cell: F82**
Assumption: Labor Technician ($/hr)	**Cell: F83**

Worksheet: [Appendix E 080618.xls]Details

Assumption: B127	**Cell: B127**
Assumption: BW-01 Time of Occurrence	**Cell: U4**
Assumption: BW-01 Time of Occurrence (U100)	**Cell: U100**
Assumption: BW-01 Time of Occurrence (U115)	**Cell: U115**
Assumption: BW-01 Time of Occurrence (U122)	**Cell: U122**
Assumption: BW-01 Time of Occurrence (U134)	**Cell: U134**
Assumption: BW-01 Time of Occurrence (U173)	**Cell: U173**
Assumption: BW-01 Time of Occurrence (U183)	**Cell: U183**
Assumption: BW-01 Time of Occurrence (U187)	**Cell: U187**
Assumption: BW-01 Time of Occurrence (U189)	**Cell: U189**
Assumption: BW-01 Time of Occurrence (U190)	**Cell: U190**
Assumption: BW-01 Time of Occurrence (U191)	**Cell: U191**
Assumption: BW-01 Time of Occurrence (U192)	**Cell: U192**
Assumption: BW-01 Time of Occurrence (U193)	**Cell: U193**
Assumption: BW-01 Time of Occurrence (U194)	**Cell: U194**
Assumption: BW-01 Time of Occurrence (U195)	**Cell: U195**
Assumption: BW-01 Time of Occurrence (U196)	**Cell: U196**
Assumption: BW-01 Time of Occurrence (U197)	**Cell: U197**
Assumption: BW-01 Time of Occurrence (U198)	**Cell: U198**

Assumption: BW-01 Time of Occurrence (U199)	**Cell: U199**
Assumption: BW-01 Time of Occurrence (U200)	**Cell: U200**
Assumption: BW-01 Time of Occurrence (U201)	**Cell: U201**
Assumption: BW-01 Time of Occurrence (U206)	**Cell: U206**
Assumption: BW-01 Time of Occurrence (U232)	**Cell: U232**
Assumption: BW-01 Time of Occurrence (U252)	**Cell: U252**
Assumption: BW-01 Time of Occurrence (U28)	**Cell: U28**
Assumption: BW-01 Time of Occurrence (U39)	**Cell: U39**
Assumption: BW-01 Time of Occurrence (U47)	**Cell: U47**
Assumption: BW-01 Time of Occurrence (U57)	**Cell: U57**
Assumption: BW-01 Time of Occurrence (U67)	**Cell: U67**
Assumption: BW-01 Time of Occurrence (U72)	**Cell: U72**
Assumption: BW-01 Time of Occurrence (U85)	**Cell: U85**
Assumption: BW-01 Time of Occurrence (U96)	**Cell: U96**
Assumption: BW01; Annual Agricultural Losses per Household	**Cell: K11**
Assumption: BW01; Households Affected by Agricultural Losses	**Cell: K10**
Assumption: BW01; Legal Claims	**Cell: K6**
Assumption: BW01; Years of Agricultural Impact from Dispersed Contamination	**Cell: K9**
Assumption: BW01;Cleanup Fallout	**Cell: K4**
Assumption: BW02; Cost per 10,000 Gallons	**Cell: K27**
Assumption: BW02; Gallons per Person-Day	**Cell: K25**
Assumption: BW02; Persons per Household	**Cell: K23**
Assumption: BW04; Cleanup of Adajcent Land Areas	**Cell: K39**
Assumption: BW04; Legal Claims	**Cell: K40**
Assumption: BW06; Base Cover Mon/Maint Costs	**Cell: K56**
Assumption: BW06; Dewatering CapEx	**Cell: K60**
Assumption: BW06; Dewatering OpEx	**Cell: K62**
Assumption: BW06; Increase of Cover Mon/Maint Costs	**Cell: K55**
Assumption: BW07; Cover Repairs	**Cell: K67**
Assumption: BW08; Acres of Cover Redesigned and Improved	**Cell: K74**
Assumption: BW08; Cost per Acre to Revegetate Cover	**Cell: K79**
Assumption: BW08; Cost per Cubic Yard of Improved Cover	**Cell: K76**
Assumption: BW08; Increse of Cover Mon/Maint Costs	**Cell: K71**
Assumption: BW08; Thickness of Redesigned and Improved Cover (in.)	**Cell: K75**
Assumption: BW09; Increased Cover Mon/Maint Cost	**Cell: K84**
Assumption: BW13; Cover Repairs	**Cell: K96**
Assumption: BW15; Increased Cover Mon/Maint Cost	**Cell: K114**
Assumption: BW17; Base Cover Mon/Maint Costs	**Cell: K121**
Assumption: BW17; Increased Env Mon Costs	**Cell: K136**
Assumption: BW17; Increased Site Secutiry Cost	**Cell: K120**
Assumption: BW17; Stakeholder Management Program	**Cell: K129**
Assumption: BW17; Upgrading Site Secutiry	**Cell: K127**
Assumption: BW18; FML Cost per Square Yard	**Cell: K144**
Assumption: BW18; GCL Cost per Square Yard	**Cell: K146**
Assumption: BW18; Increased Cover Mon/Maint Costs	**Cell: K133**
Assumption: BW18; Square Yards of Cover Layers Reconstructed	**Cell: K141**
Assumption: BW23; Annual Healt Care Monitoring Cost per Person	**Cell: K176**

Assumption: BW25; Decennial Cost of Negative Public Perception - 1st	**Cell: K189**
Assumption: BW25; Decennial Cost of Negative Public Perception - 1st (K190)	**Cell: K190**
Assumption: BW25; Decennial Cost of Negative Public Perception - 1st (K191)	**Cell: K191**
Assumption: BW25; Decennial Cost of Negative Public Perception - 1st (K192)	**Cell: K192**
Assumption: BW25; Decennial Cost of Negative Public Perception - 1st (K193)	**Cell: K193**
Assumption: BW25; Decennial Cost of Negative Public Perception - 1st (K194)	**Cell: K194**
Assumption: BW25; Decennial Cost of Negative Public Perception - 1st (K195)	**Cell: K195**
Assumption: BW25; Decennial Cost of Negative Public Perception - 1st (K196)	**Cell: K196**
Assumption: BW25; Decennial Cost of Negative Public Perception - 1st (K197)	**Cell: K197**
Assumption: BW25; Decennial Cost of Negative Public Perception - 1st (K198)	**Cell: K198**
Assumption: BW25; Decennial Cost of Negative Public Perception - 1st (K199)	**Cell: K199**
Assumption: BW25; Decennial Cost of Negative Public Perception - 1st (K200)	**Cell: K200**
Assumption: BW25; Decennial Cost of Negative Public Perception - 1st (K201)	**Cell: K201**
Assumption: BW26, Increased Cover Mon/Maint Cost	**Cell: K214**
Assumption: BW26; Cost per Cubic Foot of Capacity to Develop New Disposal Facility	**Cell: K223**
Assumption: BW26; Cost per cubic foot to Excavate Non-Canisterized Waste	**Cell: K220**
Assumption: BW26; Cover Reconstruct Cost per Cubic Yard	**Cell: K209**
Assumption: BW26; Redesign cover	**Cell: K206**
Assumption: BW26; Thickness of REconstructed Cover (ft)	**Cell: K210**
Assumption: BW28; Fatality Attributable to Radiation Exposure	**Cell: K232**
Assumption: BW28; Volume Non-Canisterized Waste Excavated (cubic feet)	**Cell: K218**
Assumption: BW29; Number of Fataility Claims	**Cell: K235**
Assumption: BW33; Cost per Cubic Yard of Additional Cover Material	**Cell: K272**
Assumption: BW33; Cost per Cubic Yard to Construct Improved Cover	**Cell: K279**
Assumption: BW33; Cost to Redesign Cover System	**Cell: K276**
Assumption: BW33; Increased Env Mon	**Cell: K285**
Assumption: BW33; Thickness of Additional Cover (in.)	**Cell: K271**
Assumption: BW33; Thickness of Improved Cover (ft)	**Cell: K280**
Assumption: BW-34 Time of Occurrence	**Cell: U291**
Assumption: BW34: Feul Rod Increased Monitoring	**Cell: K291**
Assumption: BW34: Fuel Rod Campaign Approval	**Cell: K295**
Assumption: BW34: Fuel Rod Grounting Campaign	**Cell: K308**
Assumption: BW34: Fuel Rod Retrieval Duration (weeks)	**Cell: K298**

End of Assumptions

APPENDIX G

TRITIUM PLUME TREATMENT COSTS AND ANALYSES

Pump and Treat Costs;
Reference Case

PUMP AND TREAT COSTS; Reference Case

Source: Fulbright 1996; "Status and Practicality of Detritiation and Tritium Reduction Strategies for Environmental Remediation", WSRC-RP-96-0075

int (%/yr)	2.0%		**Ref gpm**	**25.0**
Term (yr)	20			
Esc 96-08 (Means 2008, "Historical Cost Indixes")	1.57			

Girdler-Sulfide Low Volume-High Concentration Scenario (Fulbright 1996; Page A-072)

											YEAR OF P&T LIFE										
	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 11	Year 12	Year 13	Year 14	Year 15	Year 16	Year 17	Year 18	Year 19	Year 20
Capital Cost ($000, 1996)	$6,093																				
Annual Operating Cost ($000/yr, 1996)		$2,759	$2,630	$2,507	$2,390	$2,278	$2,172	$2,070	$1,974	$1,882	$1,794	$1,710	$1,630	$1,554	$1,481	$1,412	$1,346	$1,283	$1,223	$1,166	$1,112
		Yr to Yr Decrease	0.9533																		
Capital Cost ($000, 2008)	$9,565																				
Annual Operating Cost ($000/yr, 2008)		$4,331	$4,129	$3,936	$3,752	$3,577	$3,410	$3,250	$3,098	$2,954	$2,816	$2,684	$2,559	$2,439	$2,325	$2,217	$2,113	$2,014	$1,920	$1,831	$1,745
Present Value (2008$)	**$57,702**																				

Direct Heat Evap Low Volume-High Concentration Scenario (Fulbright 1996; Page A-012)

											YEAR OF P&T LIFE										
	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 11	Year 12	Year 13	Year 14	Year 15	Year 16	Year 17	Year 18	Year 19	Year 20
Capital Cost ($000, 1996)	$1,465																				
Annual Operating Cost ($000/yr, 1996)		$1,198	$1,142	$1,088	$1,037	$989	$943	$899	$857	$817	$779	$742	$708	$675	$643	$613	$584	$557	$531	$506	$483
		Yr to Yr Decrease	0.9533																		
Capital Cost ($000, 2008)	$2,300																				
Annual Operating Cost ($000/yr, 2008)		$1,880	$1,792	$1,708	$1,629	$1,553	$1,480	$1,411	$1,345	$1,282	$1,222	$1,165	$1,111	$1,059	$1,009	$962	$917	$874	$834	$795	$758
Present Value (2008$)	**$23,195**																				
Ratio of GS to Evap NPV 25 gpm	2.4877																				
NPV Evap in Constant 1996$ -- Discounted at 0%	$17,254																				

Source:WSRC-RP-96-0075		GS LoVol	GS HiVol		
	GPM	25.0	250.0	10.0	0.60
	CAP$	$6,093	$24,113	4.0	$24,257
	OPS$	$2,759	$10,401	3.8	$10,984

Pump And Treat Costs;
Barnwell Optimistic and Entire Zone 2

PUMP AND TREAT COSTS; Barnwell Optimistic and Entire Zone 2

Source: Fulbright 1996; "Status and Practicality of Detritiation and Tritium Reduction Strategies for Environmental Remediation", WSRC-RP-96-0075

				OpsRat	CpaRatio	
int (%/yr)	2.0%	Ref gpm	25			
Term (yr)	20	Opt gpm	8.3	0.33	0.52	
)8 (Means 2008, "Historical Cost Indixes")	1.57	Entire Zone 2 gpm	51	2.04	1.53	AqDischRate: 50% @ 51 gpm & 95% at 90 gpm
			90			

Ratio of GS to Evap NPV 8.3 gpm	2.5747
Ratio of GS to Evap NPV Entire Zone 2	2.4455

Barnwell **8.3 gpm; Girdler-Sulfide** Low Volume-High Concentration Scenario (Fulbright 1996; Page A-072)

YEAR OF P&T LIFE

	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 11	Year 12	Year 13	Year 14	Year 15	Year 16	Year 17	Year 18	Year 19	Year 20
Capital Cost ($000, 2008)	$4,936																				
Annual Operating Cost ($000/yr, 2008)		$1,438	$1,371	$1,307	$1,246	$1,187	$1,132	$1,079	$1,029	$981	$935	$891	$850	$810	$772	$736	$702	$669	$638	$608	$579
Net Present Value	**$20,917**																				
	$23,893																				

Barnwell **Entire Zone 2; Girdler-Sulfide** Low Volume-High Concentration Scenario (Fulbright 1996; Page A-072)

YEAR OF P&T LIFE

	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 11	Year 12	Year 13	Year 14	Year 15	Year 16	Year 17	Year 18	Year 19	Year 20
Capital Cost ($000, 2008)	$14,671																				
Annual Operating Cost ($000/yr, 2008)		$8,835	$8,422	$8,029	$7,654	$7,296	$6,955	$6,631	$6,321	$6,026	$5,744	$5,476	$5,220	$4,976	$4,744	$4,522	$4,311	$4,110	$3,918	$3,735	$3,560
Net Present Value	**$112,871**																				
	$131,155																				

Barnwell **8.3 gpm; Direct Heat Evap** Low Volume-High Concentration Scenario (Fulbright 1996; Page A-012)

YEAR OF P&T LIFE

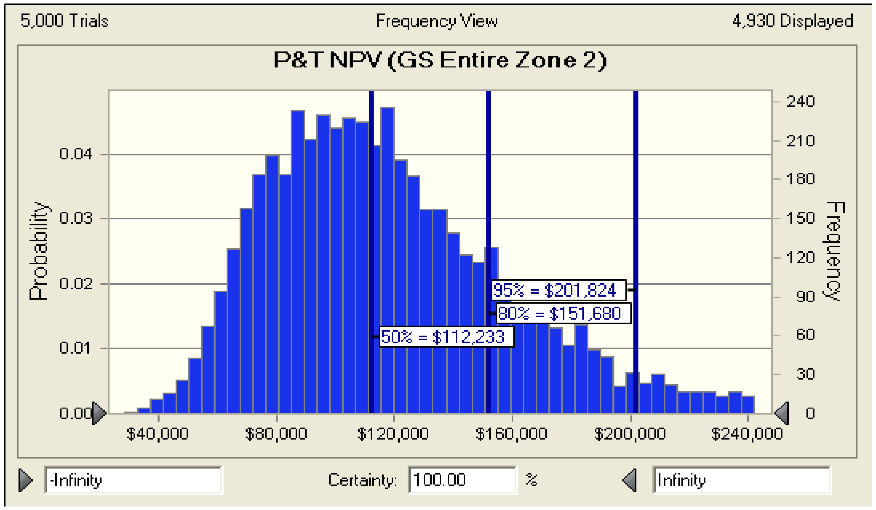
	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 11	Year 12	Year 13	Year 14	Year 15	Year 16	Year 17	Year 18	Year 19	Year 20
Capital Cost ($000, 2008)	$1,187																				
Annual Operating Cost ($000/yr, 2008)		$624	$595	$567	$541	$515	$491	$468	$447	$426	$406	$387	$369	$352	$335	$319	$305	$290	$277	$264	$252
Net Present Value	**$8,124**																				

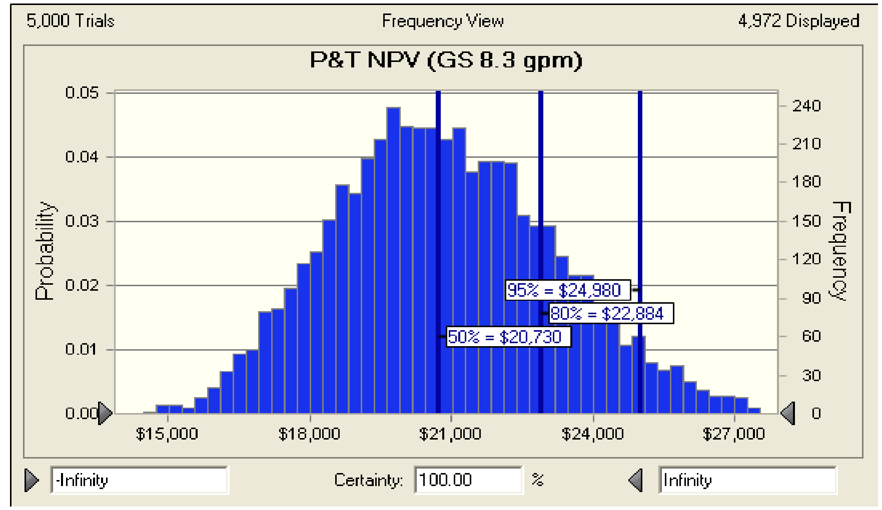
Barnwell **Entire Zone 2; Direct Heat Evap** Low Volume-High Concentration Scenario (Fulbright 1996; Page A-012)

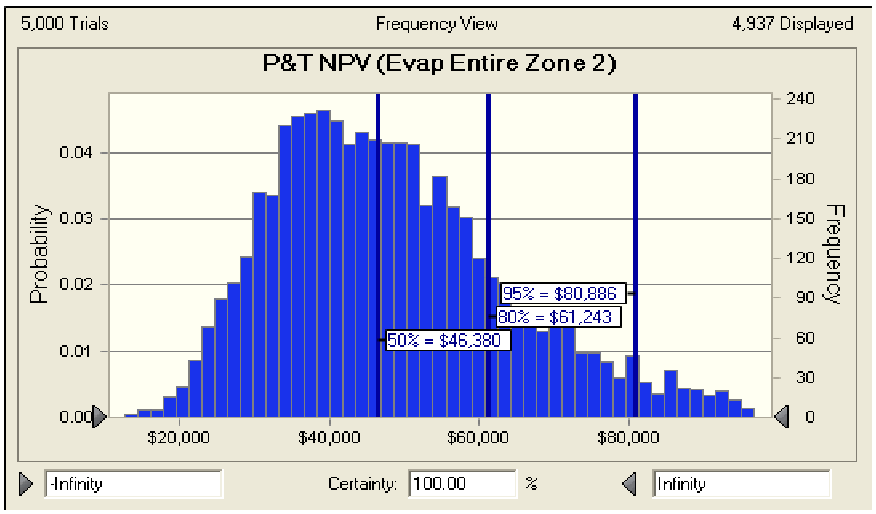
YEAR OF P&T LIFE

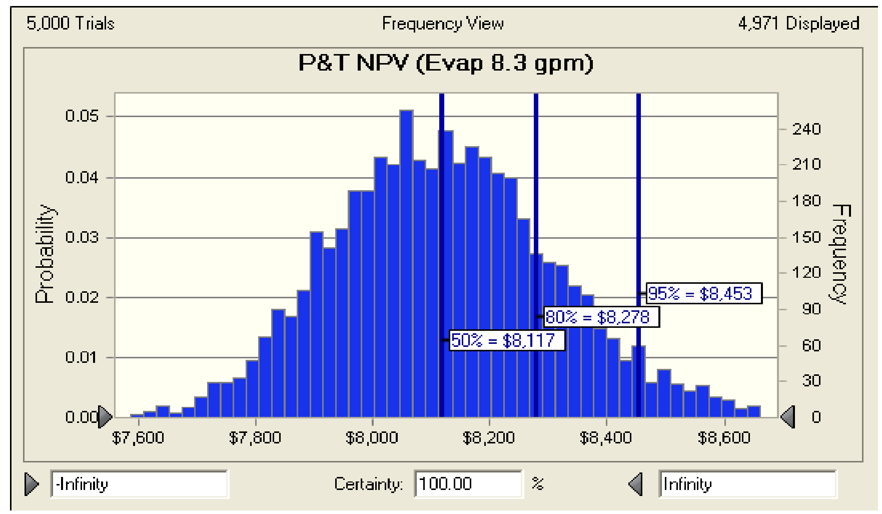
	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 11	Year 12	Year 13	Year 14	Year 15	Year 16	Year 17	Year 18	Year 19	Year 20
Capital Cost ($000, 2008)	$3,527																				
Annual Operating Cost ($000/yr, 2008)		$3,835	$3,656	$3,485	$3,322	$3,167	$3,019	$2,878	$2,744	$2,616	$2,493	$2,377	$2,266	$2,160	$2,059	$1,963	$1,871	$1,784	$1,701	$1,621	$1,545
Net Present Value	**$46,155**																				

Charts


5,000 Trials
Frequency View
4,930 Displayed
P&T NPV (GS Entire Zone 2)
Probability
Frequency
95% = $201,824
80% = $151,680
50% = $112,233
$40,000
$80,000
$120,000
$160,000
$200,000
$240,000
-Infinity
Certainty: 100.00 %
Infinity


5,000 Trials
Frequency View
4,972 Displayed
P&T NPV (GS 8.3 gpm)
Probability
Frequency
95% = $24,980
80% = $22,884
50% = $20,730
$15,000
$18,000
$21,000
$24,000
$27,000
-Infinity
Certainty: 100.00 %
Infinity


5,000 Trials
Frequency View
4,937 Displayed
P&T NPV (Evap Entire Zone 2)
Probability
Frequency
95% = $80,886
80% = $61,243
50% = $46,380
$20,000
$40,000
$60,000
$80,000
-Infinity
Certainty: 100.00 %
Infinity


5,000 Trials
Frequency View
4,971 Displayed
P&T NPV (Evap 8.3 gpm)
Probability
Frequency
95% = $8,453
80% = $8,278
50% = $8,117
$7,600
$7,800
$8,000
$8,200
$8,400
$8,600
-Infinity
Certainty: 100.00 %
Infinity