



## 5. Financial Responsibility Plan

Estimates are based on prices incurred for similar work and reflect the current pricing environment. The cost summary presented in Section 5.6 applies both inflation and cost discounting assumptions based on the expected project timeline.

### 5.1 Area of Review and Corrective Action Cost Estimate

As outlined in Appendix B of the permit application, the area of review (AOR) refers to the maximum area extent of the effected injection reservoir in which Mt. Simon pressure will exceed a critical pressure and have the potential to hypothetically drive fluids upwards into the lowermost USDW (St. Peter formation) if a vertical pathway is present. The AOR is based on results from current numerical modeling and is subject to change if operational measurements deviate significantly from modeled predictions. However, no known deep penetrating wells were found to exist within the AOR. Based on this review, no cost has been assigned for corrective action since no pathways for leakage were found to exist.

### 5.2 Injection Well Plugging and Site Reclamation Estimate

Plugging costs for the three injection wells will be incurred at the end of their respective operational period. A series of cement plugs will be placed to seal the entire wellbore, and the well will be capped and covered below ground level. Table 5.2-1 presents an approximate breakdown of total estimated cost based on the procedures provided in Section 10.

**TABLE 5.2-1**

**COST SUMMARY FOR INJECTION WELL PLUGGING / SITE RECLAMATION**

Activity	No. Wells	Cost/Well	Subtotal
<b>Sensitive, Confidential, or Privileged Information</b>			
Total Estimated Cost for P&A / Site Reclamation:			\$2,325,000

### 5.3 Post-Injection Site Care Cost Estimate

Post-injection monitoring extends the use of the verification wells (VWs) and geophysical monitoring wells (MWs) by means of the operational testing and monitoring plan described in Section 9 of the permit

application. Monitoring activities, locations and frequencies are summarized in Table 5.3-1. Monitoring costs assume that VW #3 is installed as a single wellbore with multi-zone sampling capacity. In the event VW #3 is installed as a system of multiple, smaller-diameter wellbores, incremental sampling costs are expected to be negligible.

**TABLE 5.3-1**  
**COST SUMMARY FOR POST-INJECTION MONITORING**

Activity	Tested Wells	Frequency	Cost/Test	Total No. of Tests	Subtotal (10-yr)
Sensitive, Confidential, or Privileged Information					
Total Estimated Cost for Post-Injection Monitoring:					\$2,650,000

#### 5.4 Site Closure Cost Estimate

The site closure costs summarized in Table 5.4-1 include plugging and reclamation activities for all VWs and MWs (the procedure is identical to that described in Section 5.2 for injection wells). The VWs extend to the approximate depth of injection wells but have a smaller diameter, which significantly reduces the volume of cement and time required for plugging. The GWs are installed to the base of the St. Peter formation, which is approximately half the depth of injection and verification wells. Site closure estimates assume VW #3 existing as a single wellbore; multiple, smaller-diameter wellbores would likely incur the same total plugging cost.

**TABLE 5.4-1**  
**COST SUMMARY FOR SITE CLOSURE**

Activity	No. Wells	Cost/Well	Subtotal
<b>Sensitive, Confidential, or Privileged Information</b>			
Total Estimated Cost for Site Closure:			\$2,970,000

### 5.5 Emergency and Remedial Response Cost Estimate

The primary sources of risk evaluated in the current plan are similar to the risk categories utilized in the previously approved CCS#2 permit. For the current evaluation, additional consideration was given to surface equipment. In this site-wide financial risk assessment, Monte-Carlo analysis was used to calculate an expected net present value (NPV) of financial liability based on the probability and expected cost of risk events occurring over the 15-year operational and 10-year post operational periods. Probabilities for each event were assigned primarily based on a 2007 risk assessment report submitted as part of the FutureGen Environmental Impact Statement (FutureGen, Contract No. DE-AT26-06NT42921). Table 5.5-1 summarizes the range of probabilities estimated in the FutureGen report for each respective risk event and used as part of the input values for this evaluation.

**TABLE 5.5-1**  
**ANNUAL PROBABILITIES OF RELEVANT CCS RISK EVENTS**

Risk Event	Event Description	Annual Frequency of Failure (Single Item)	
		Low Estimate	High Estimate
1	Pipeline Rupture	Sensitive, Confidential, or Privileged Information	
2	Pipeline Puncture		
3	Wellhead Equipment Rupture		
4	Upward rapid leakage through CO <sub>2</sub> injection well		
5	Upward slow leakage through CO <sub>2</sub> injection well		
6	Upward rapid leakage through deep oil & gas wells		
7	Upward slow leakage through deep oil & gas wells		
8	Leaks due to undocumented deep wells, high rate		
9	Leaks due to undocumented deep wells, low rate		
10	Upward rapid leakage through caprock		
11	Upward slow leakage through caprock		
12	Release through existing faults		
13	Release through induced faults		

Each Monte-Carlo simulation observation assigns random event probabilities using uniform distributions based on the respective low and high estimates shown in this table. The resulting probabilities are then multiplied by the number of relevant items: events 1-5 apply to three CO<sub>2</sub> injection wells, events 6-7 are

applied to approximately 100 oil and gas wells within the project's area-of review (AOR), and the remaining events are interpreted as project-wide risks with a multiplier of 1.

If an event occurs in a particular Monte-Carlo realization based on the probability distribution and the multiplier for the potential number of events from the process described above, it is then randomly assigned a cost using triangular distributions, with most-likely estimates corresponding to the values provided in the previously approved CCS#2 Emergency and Remedial Response Plan (ERRP). The CCS#3 ERRP presented in Section 12 is modeled after the approved CCS#2 ERRP. In addition to the peak of the distribution, low and high-estimates for each of the triangular distributions are estimated (Appendix A provides additional information on the characteristics of triangular distributions). Table 5.5-2 summarizes the distribution parameters used for each risk event (low, most-likely, and high estimates).

**TABLE 5.5-2**  
**REMEDIATION COST PARAMETERS FOR RISK EVENTS**

Event	Event Description	Event Cost (Triangular Distribution)		
		Low	Most Likely	High
1	Pipeline Rupture	Sensitive, Confidential, or Privileged Information		
2	Pipeline Puncture			
3	Wellhead Equipment Rupture			
4	Upward rapid leakage through installed well			
5	Upward slow leakage through installed well			
6	Upward rapid leakage through transecting wells			
7	Upward slow leakage through transecting wells			
8	Leaks due to undocumented deep wells, high rate			
9	Leaks due to undocumented deep wells, low rate			
10	Upward rapid leakage through caprock			
11	Upward slow leakage through caprock			
12	Release through existing faults			
13	Release through induced faults			

Using the defined probability and cost distributions, the Monte-Carlo simulation creates thousands of viable scenarios that project annual liability costs over a 25-year timeframe (15 years operational and 10 post-operational). Future payments are discounted at a rate of 2.0% and incorporate an annual inflation rate of 2.5%. Figure 5.5-1 illustrates the final distribution of total project liability based on the aggregate

results of 100,000 simulations. The Monte Carlo analysis was used to generate an expected value of \$5.34 million based on the results from all modeled outcomes. The input for the Monte-Carlo analysis is consistent with both risk events and costs used in the previously approved CC2 financial assurance documentation.

**Figure 5.5-1 Distribution of Emergency & Remedial Response Net-Present Value**



## 5.6 Cost Summary

Cost estimates detailed in Sections 5.1 through 5.5 were adjusted to net present values using the same method described in the emergency and remedial response section (future costs were inflated assuming an annual inflation rate of 2.5% and discounted at a rate of 2.0%). Table 5.6-1 summarizes the pre-adjusted and adjusted cost totals for the five cost categories.

**TABLE 5.6-1**  
**FINANCIAL ASSURANCE COST SUMMARY**

Category	Pre-adjusted	Adjusted NPV
<b>Sensitive, Confidential, or Privileged Information</b>		
<b>Total Financial Assurance Required:</b>		<b>\$14,344,000</b>