NUCLEAR WASTE MANAGEMENT ORGANIZATION
SOCIÉTÉ DE GESTION DES DÉCHETS NUCLÉAIRES

August 2005

NWMO BACKGROUND PAPERS
6. TECHNICAL METHODS

6-16 ADAPTIVE PHASED MANAGEMENT: COST ESTIMATE SUMMARY REPORT

Golder Associates Ltd.,
Gartner Lee Limited

NWMO Background Papers

NWMO has commissioned a series of background papers which present concepts and contextual information about the state of our knowledge on important topics related to the management of radioactive waste. The intent of these background papers is to provide input to defining possible approaches for the long-term management of used nuclear fuel and to contribute to an informed dialogue with the public and other stakeholders. The papers currently available are posted on NWMO's web site. Additional papers may be commissioned.

The topics of the background papers can be classified under the following broad headings:

1. **Guiding Concepts** – describe key concepts which can help guide an informed dialogue with the public and other stakeholders on the topic of radioactive waste management. They include perspectives on risk, security, the precautionary approach, adaptive management, traditional knowledge and sustainable development.

2. **Social and Ethical Dimensions** - provide perspectives on the social and ethical dimensions of radioactive waste management. They include background papers prepared for roundtable discussions.

3. **Health and Safety** – provide information on the status of relevant research, technologies, standards and procedures to reduce radiation and security risk associated with radioactive waste management.

4. **Science and Environment** – provide information on the current status of relevant research on ecosystem processes and environmental management issues. They include descriptions of the current efforts, as well as the status of research into our understanding of the biosphere and geosphere.

5. **Economic Factors** - provide insight into the economic factors and financial requirements for the long-term management of used nuclear fuel.

6. **Technical Methods** - provide general descriptions of the three methods for the longterm management of used nuclear fuel as defined in the NFWA, as well as other possible methods and related system requirements.

7. **Institutions and Governance** - outline the current relevant legal, administrative and institutional requirements that may be applicable to the long-term management of spent nuclear fuel in Canada, including legislation, regulations, guidelines, protocols, directives, policies and procedures of various jurisdictions.

8. **Workshop Reports** - provide information on the outputs and outcomes of some NWMO engagement activities including discussions and expert workshops.

9. **Assessments** - provides perspectives on the advantages and limitations of the management approaches under study.

ADAPTIVE PHASED MANAGEMENT
COST ESTIMATE SUMMARY REPORT

Submitted to:

Nuclear Waste Management Organization

Prepared by:

Golder Associates Ltd. and Gartner Lee Limited

August 2005

05-1112-002

TABLE OF CONTENTS

TABLE OF CONTENTS (cont'd)

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES

ACRONYMS AND ABBREVIATIONS

APM	Adaptive Phased Management
CES-CRC	Centralized Extended Storage-Casks in Rock Caverns
DGR	Deep Geologic Repository
EA	Environmental Assessment
GAL	Golder Associates Limited
GLL	Gartner Lee Limited
JWO	Joint Waste Owners
m	Metre
NFWA	Nuclear Fuel Waste Act
NWMO	Nuclear Waste Management Organization
OPG	Ontario Power Generation
URL	Underground Research Laboratory

1.0 INTRODUCTION

Since the promulgation of the *Nuclear Fuel Waste Act* (NFWA) and the subsequent establishment of the Nuclear Waste Management Organization (NWMO), NWMO has undertaken a considerable amount of study and consultation. NWMO is now preparing to recommend to the Government of Canada a preferred approach for the long-term management of used nuclear fuel in Canada.

The NFWA requires that NWMO include, as a minimum, an analysis of three specific technical methods by Ontario Power Generation, New Brunswick Power, Hydro Quebec and Atomic Energy of Canada, herein identified as the Joint Waste Owners (JWO), in anticipation of the *Nuclear Fuel Waste Act* and this information was presented to NWMO in late 2003.

1. Deep Geologic Disposal in the Canadian Shield;
2. Storage at Nuclear Reactor Sites; and
3. Centralized Storage, either above or below ground.

Conceptual designs and cost estimates were developed for each of these methods by the Joint Waste Owners (JWO).

Based on the input it has received, the NWMO has concluded that none of the three management approaches specified in the NFWA perfectly addresses all of the objectives that Canadian citizens said were important for any management approach to address.

NWMO consequently developed an approach termed "Adaptive Phased Management". Preliminary details of the Adaptive Phased Management approach were developed by Golder Associates Ltd. (GAL) and Garner Lee Limited (GLL) through discussions and in conjunction with the NWMO prior to completion of an assessment of the benefits, risks and costs of implementing Adaptive Phased Management[1].

This report documents and summarizes cost estimation of the Adaptive Phased Management approach prepared by GAL-GLL in support of the above-noted assessment.

Adaptive Phased Management is briefly introduced in Section 2 and corresponds to the APM approach put forward in the NWMO Draft Study of May 2005, and which formed the basis for NWMO's draft recommendation. In order to permit an assessment similar to that conducted for the other three technical methods, NWMO commissioned two separate cost estimates for Adaptive Phase Management, which were developed by GAL-GLL in early 2005. These cost

[1] GAL- GLL 2005b. Refer to http://www.nwmo.ca/adx/asp/adxGetMedia.asp?DocID=1231,1090,199,20,1,Documents&MediaID=2350&Filename=92b_NWMO_Background_Paper.pdf

estimates were largely based on cost estimates prepared for the Joint Waste Owners for specific aspects of the other three technical methods. The background for the cost estimation is discussed in Section 3 of this document.

Subsequent sections of this report provide the details of the cost estimates for Adaptive Phased Management. This includes the derivation of Adaptive Phased Management facility costs (Section 4), the facility cost estimate (Section 5), an evaluation of the possible facility cost consequences of an alternate implementation scenario (Section 6), and consideration of allowances for interim storage, retrieval and transportation costs (Section 7).

2.0 THE ADAPTIVE PHASED MANAGEMENT CONCEPT

Adaptive Phased Management has three steps or phases of implementation:

- **Phase 1: Preparing for Central Used Fuel Management**
- **Phase 2: Central Storage and Technology Demonstration**
- **Phase 3: Long-term Containment, Isolation and Monitoring**

Adaptive Phased Management draws on the insights gained through the study of the three options mentioned in the NFWA, including the scope, schedule and required effort envisaged for relevant activities[2].

Implementation of Adaptive Phased Management starts with used fuel stored at reactor sites and allows decision makers the option of centralized storage while allowing continuing development of the deep geologic repository. This comprises interim storage at proven, existing reactor site storage facilities, followed by transport to a central storage facility utilizing dry storage containers in shallow rock caverns. Used nuclear fuel could subsequently be transferred for containment and isolation in a deep geologic repository and monitored *in-situ*, pending a decision to backfill, seal and close the repository.

The Adaptive Phased Management concept is therefore largely a compilation of desirable features from the previously developed Centralized Extended Storage-Casks in Rock Caverns (CES-CRC) concept (CTECH 2003a) and the previously developed Deep Geologic Repository (DGR) concept (CTECH 2002), but with schedules and decision points that are unique to Adaptive Phased Management. The total estimated cost, including interim storage, retrieval, transportation, and facility costs is $24.4 billion (2002 constant dollars), with an estimated Present Value of $6.1 billion (Jan. 2004 dollars). The alternate implementation scenario has a total estimated cost,

[2] For example, refer to http://www.nwmo.ca/adx/asp/adxGetMedia.asp?DocID=608,237,199,20,1,Documents&MediaID=1300&Filename=JWO_Overview.pdf

including interim storage, retrieval, transportation, and facility costs of $22.6 billion (constant 2002 dollars), and an estimated Present Value of $5.1 billion (Jan. 2004 dollars). These cost estimates are illustrative of a possible implementation of Adaptive Phased Management.

A specific conceptual design and optimized cost estimate will be developed for Adaptive Phased Management following a decision by the Government of Canada on the approach for long-term management of Canada's used nuclear fuel. Currently, the overall process for Adaptive Phased Management is envisaged as shown below in Figure 1.

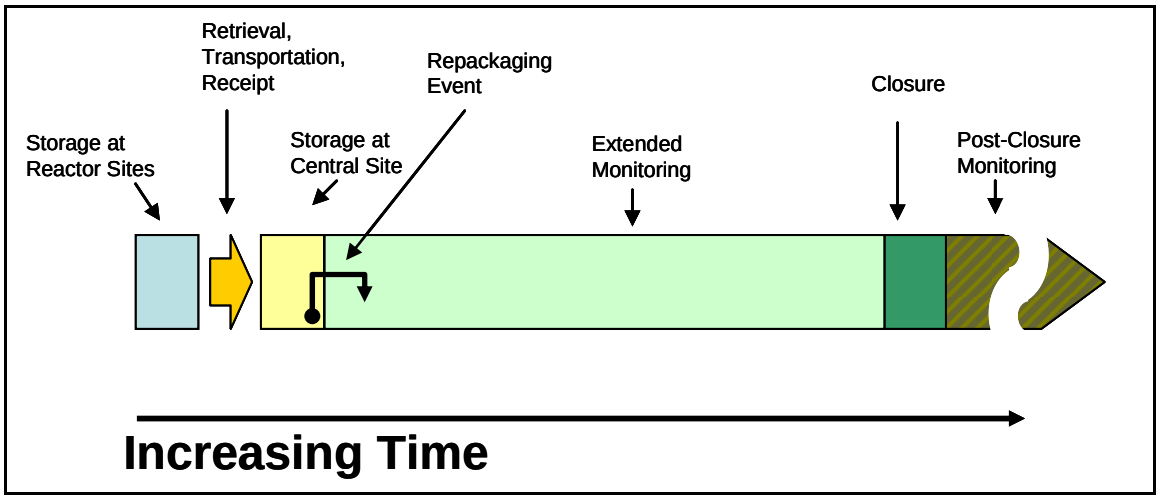

Figure 1: Schematic Process, Adaptive Phased Management

Based on the conceptual design for the other three technical methods, an illustrative schedule for Adaptive Phased Management is presented below in Figure 2.

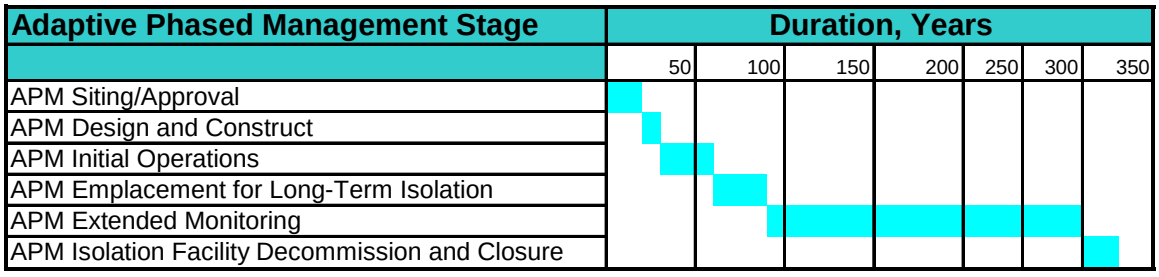

Figure 2: Conceptual Schedule, Adaptive Phased Management

The management of used nuclear fuel through the life of Adaptive Phased Management is illustrated schematically below in Figure 3.

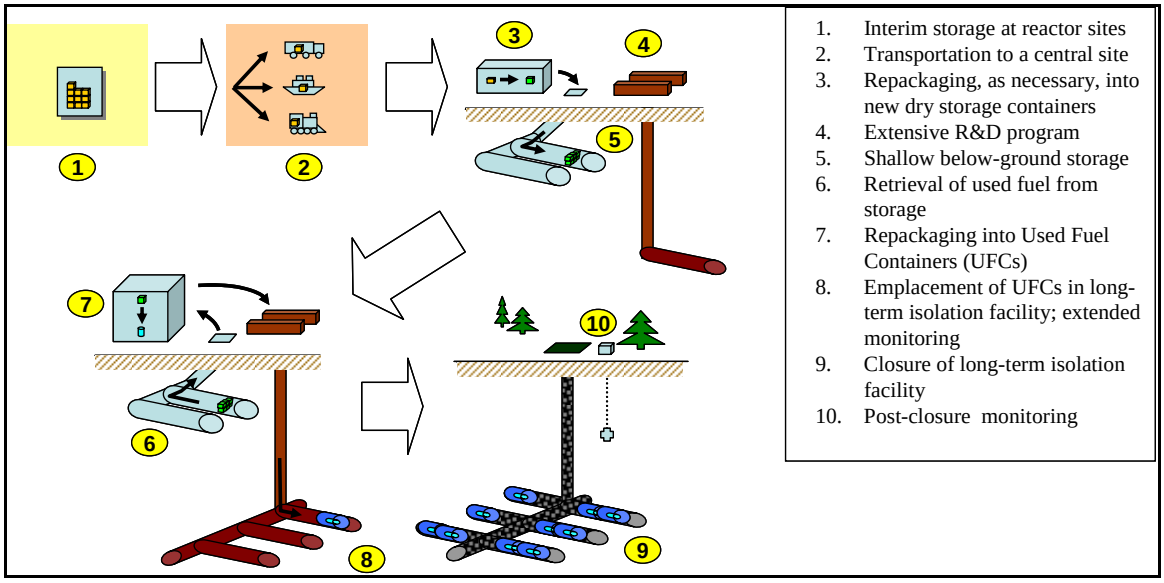

Figure 3: Schematic Movement of Used Nuclear Fuel, Adaptive Phased Management

3.0 BACKGROUND FOR COST ESTIMATES

GAL-GLL prepared two facility cost estimates in early 2005 for Adaptive Phased Management. The first derived costs for an Adaptive Phased Management facility[3] from existing Joint Waste Owners' studies of similar activities. At the request of NWMO, GAL-GLL evaluated an alternative implementation scenario for the facility[4].

Cost estimates developed for Adaptive Phased Management documented in the memoranda are for the facility only. Costs for interim storage and retrieval were taken as model assumptions from information provided by NWMO. Transportation costs were taken as an average of the cost estimates developed for 3 modes of transportation[5]. The facility costs, in addition to interim storage and retrieval, along with transportation costs, represent the estimated full cycle costs listed in the graph and tables of the Appendices and are illustrative of a possible implementation of Adaptive Phased Management.

These two memoranda and the supporting calculations were subject to third-party review, which concluded that the estimates were prepared with an appropriate methodology and should be considered adequate for the NWMO's current options assessment process (Hooker 2005).

[3] "Preliminary Cost Estimate for Fourth Management Approach", Golder Associates Ltd., March 7, 2005, Memorandum from John Davis (Golder) to Sean Russell (NWMO), File 05-1112-002.
[4] "Preliminary Cost Estimate for Fourth Management Approach, Omitting CRC-Related Costs", Golder Associates Ltd., March 10, 2005, Memorandum from John Davis and Pete Craig (Golder) to Sean Russell (NWMO), File 05-1112-002.
[5] Refer to COGEMA 2003

Discussions between GAL-GLL and NWMO also included evaluation of non-facility costs, such as interim storage, retrieval and transportation. These cost estimates are provided in Section 7. However, they are preliminary allowances and have not been subject to third party review, although the COGEMA estimates for specific transportation modes have been subject to such review and validation.

The description of Adaptive Phased Management was used as a basis for cost estimates in early 2005 and had been described in internal NWMO documents (e.g., working drafts of the study report "Choosing a Way Forward", specifically revision R1e, dated March 1, 2005). It considered components of both centralized rock caverns (i.e., CES-CRC)[6] and a deep geologic repository (i.e., DGR)[7]. As described in the CTECH documents, these concepts were originally envisioned for location in igneous rock (the Canadian Shield). However, Adaptive Phased Management allows siting in either the Canadian Shield or in suitable alternate geomedia, such as found in some sedimentary basins.

A supplementary study completed by RWE NUKEM in November 2004 (RWE NUKEM 2004) concluded that the CTECH DGR conceptual costs might be expected to decrease by on the order of 5% if the facility was constructed at a depth of approximately 500 metres (m), instead of 1000 m, in alternate geomedia and using components of the Nagra (Swiss national program) tunnel-based repository design. Given the uncertainty already inherent in cost estimates at the conceptual design stage, these relatively small cost adjustments imply that a single cost estimate may be representative of a facility which could be sited in either the Canadian Shield or in suitable alternate geomedia.

Additional evaluation was conducted for an alternative implementation scenario for Adaptive Phased Management involving a decision not to proceed with the development of a shallow storage facility development in year 20 and continue to manage used fuel at reactor sites until a deep isolation facility is operational at year 60. This special case served as a sensitivity analysis for the reference implementation of Adaptive Phased Management.

The majority (more than 94%) of estimated facility costs were based on existing cost estimates developed by CTECH and COGEMA at the conceptual design level for related activities. These existing cost estimates used acceptable cost estimating standards and represented a significant depth and breadth of work with significant supporting documentation. They have been validated by an independent third party and "considered suitable for their purpose in assessing the magnitude of the cost of the scenarios and their alternatives…" (ADH and River, 2004).

[6] As described in CTECH 2003a and CTECH 2003b.
[7] As described in CTECH 2003c and CTECH 2002.

By building on these existing cost estimates, a conceptual estimate for Adaptive Phased Management was developed on a reasonable basis, in the absence of a specific design and costing study for Adaptive Phased Management.

In the absence of cost estimates for items without similar existing estimates are solely allowances based on professional judgement and experience. However, these cost estimates for the decommissioning of shallow storage caverns, the construction and operation of an underground research laboratory and post closure monitoring of a sealed deep repository, constitute less than 4% of the total cost estimate.

The estimates documented in the Golder March 2005 memoranda did not include non-facility costs, such as the interim storage, retrieval and transportation of used nuclear fuel. Allowances for these non-facility costs for Adaptive Phased Management were developed in consultation with NWMO and are included in this report. Cost allowances presented for interim storage and retrieval were developed for discussion by annualizing lump sum estimates provided by Ontario Power Generation (OPG 2005); transportation allowances were developed for a generic transportation mode by averaging annual costs for all modes considered in previous estimates for used fuel waste transport to a central facility (COGEMA 2003).

4.0 DERIVATION OF ADAPTIVE PHASED MANAGEMENT FACILITY COSTS

A straight forward methodology was developed for determining the Adaptive Phased Management facility cost components from existing cost estimate studies (i.e., CTECH 2003b and CTECH 2003c). This methodology was applied to derive a composite cash flow for use in economic modelling. It is acknowledged that, in advance of a specific conceptual design, this costing exercise relied extensively on the judgement of the authors.

The facility cost structure presented below, though developed at a preliminary level, represents a reasonable synthesis of compatible features taken from the previously validated work. These features and costs were sequenced into a logical structure designed to allow time for extensive research and development, as well as opportunities to build community consensus and for broad public input into the decision-making process.

4.1 Major Assumptions

The resulting cash flow for the facility was based on the following major assumptions, which are illustrative of a possible implementation of Adaptive Phased Management:

- Interim Storage, Retrieval and Transportation Of Used Nuclear Fuel -
  - Used fuel continues to be managed at the reactor sites during siting and initial construction of the central facility, a period of 29 years. During this period, transportation plans/systems are developed.
  - During the next 30 years (i.e., year 30 to year 59) the used fuel is retrieved from storage at the reactor sites and transported to the central facility.

- Receipt, Emplacement and Initial Storage at Central Facility -
  - The central storage facility is a centralized rock cavern system, essentially as described in CTECH 2003a. Dry storage containers are stored underground in caverns which are nominally 15 m wide by 16 m high by 452 m long. Each cavern has a capacity of approximately 948 storage containers, and includes an access isle and an overhead gantry crane. The caverns are constructed on a single level at a depth of nominally 50 m in either the Canadian Shield or other suitable geomedia and are accessed via ramps sized to allow two-way traffic. CTECH costs for an 11 cavern (includes one spare cavern) complex 50 m deep in rock are taken as representative.
  - As previously noted, siting and initial construction of the central facility occurs over a 29 year period (year 1 to year 29). As the intent is to allow the future construction of a long-term isolation facility (i.e., a deep geologic repository type facility) at the same location, it is assumed that the level of effort and hence costs for Siting, Public Affairs and Program Management are as previously developed for a deep geologic repository (CTECH 2003c).
  - The level of effort and costs for System Development, Safety Assessment, Licensing & Approvals, Facility Design & Construction and Environmental Assessment & Monitoring are as per CTECH's costs for a centralized rock cavern facility (CTECH 2003b), allowing for a much shorter facility duration. CTECH cost data for Safety Assessment, Licensing and Approvals and Facility Design & Construction were estimated for a centralized rock cavern project of approximately 350 years duration. For Adaptive Phased Management, these data series were truncated at year 109. This abrupt truncation of the cost data removes costs associated with repackaging used fuel when storage containers may reach the ends of their operational lives – repackaging costs formed a significant part of the CTECH cost estimate for a centralized rock cavern facility.
  - Used fuel is transported to the central facility and placed in the storage caverns between year 30 and year 59. Costs associated with receipt and emplacement of the used nuclear fuel are as previously developed for centralized rock cavern facility (CTECH 2003b).

- Following emplacement of the used fuel there is a 30 year storage period (year 60 to year 89) during which there is active management and maintenance of the storage facility and storage containers as the long-term isolation (deep geologic repository) aspect of the central facility is filled. From year 90 to year 109, centralized rock cavern capacity is maintained empty to provide operational flexibility.
- The level of effort and costs for facility operation are as per CTECH's costs for a centralized rock cavern facility (CTECH 2003b), allowing for a much shorter facility duration. For Adaptive Phased Management, the relevant data series is truncated at year 109. This decreases the duration of this activity and omits any costs associated with repackaging. However, it may overestimate the costs for years 90 through 109, when the centralized rock caverns are open, but presumed empty. No other estimates were available for operational costs during this period.
- In year 110, the centralized rock caverns are closed by plugging ramps and shafts and allowing the caverns to flood. Such closure costs were not anticipated by CTECH, and an allowance, based on professional judgement and believed to be conservative, has been assigned to years 106 to 114 (inclusive) to capture potential costs associated with the design, licensing, construction and monitoring of cavern closure. In all, $20 million (in 2002 Canadian dollars) has been allowed for all aspects of this activity pending a conceptual design and formal cost estimate.
- From early in the project through the commissioning of the long-term isolation component of the facility, a full-scale underground research laboratory (URL) is designed, constructed and operated. In year 60, it becomes part of the long-term isolation facility and it will be closed with them. An underground research laboratory cost estimate has been developed based on professional judgement and believed to be conservative, and has been assigned to years 15 to 59 (inclusive) to capture potential costs associated with the design, licensing, construction and operation of the underground research laboratory. In all, $1.38 billion (in 2002 Canadian dollars) has been allowed for all aspects of this activity pending a conceptual design and formal cost estimate. This allowance includes design and construction costs of approximately $300 million and operations costs of approximately $30 million/year.

- <u>Long-Term Isolation at Central Facility</u> -
  - It is assumed that the long-term isolation aspect of the facility is in-service in year 60 and will begin to accept fuel transferred from storage. In year 89, all used fuel is in place. From years 90 to year 300, shafts and perimeter tunnels remain open to allow extended monitoring of sealed emplacement rooms. Decommissioning and closure begins in year 301 and concludes in year 325. Monitoring of the closed facility continues from year 326 onwards in perpetuity.
  - For costing purposes, it is assumed that a separate, self-sufficient underground facility and new surface facilities for receiving, repackaging and re-emplacing the used fuel are constructed. These new facilities are as per CTECH 2002. A complex of 104 emplacement rooms, each with the capacity to contain 108 used fuel containers (copper-clad long-term isolation containers), will be constructed at a nominal depth of 500 to 1000 m. In all, the emplacement rooms together with access tunnels will take up an essentially square footprint of 2 km^2 in area (plan view). The complex will be served by four shafts and a variety of surface works.

  - It is assumed that the costs associated with fuel receipt in the CTECH estimate are sufficient to allow for the retrieval of used fuel from centralized rock caverns and repackaging as required.
  - To permit used fuel emplacement beginning in year 60, design and licensing of the long-term isolation facility should begin in year 30. Costs associated with System Development, Safety Assessment, Licensing & Approvals, Public Affairs, Facility Design & Construction, Environmental Assessment & Monitoring and Program Management are as per CTECH 2003c, with the following modifications: (1) Start dates have been shifted to reflect isolation in-service in year 60, as opposed to year 30; and (2) the isolation works will remain open for extended monitoring for a period of approximately 211 years, as opposed to 70 years. The former modification was merely the shift of the applicable series forward in time; the latter was accomplished by averaging annual costs from the original 70-year CTECH extended monitoring period and inserting 141 years of these average costs between CTECH data for years 129 and 130.
  - Decommissioning and closure of long-term isolation occurs between year 301 and year 325. Costs associated with decommissioning and closure are as per CTECH 2003c. These costs do not include an allowance for decommissioning and closure of the centralized rock caverns or the underground research laboratory.

- Post Closure Monitoring -
  - Post closure monitoring and institutional controls for the long-term isolation facility will commence in year 326 and will continue in perpetuity. An allowance on the order of $1 million per year is suggested for post closure monitoring. Accordingly, a lump sum payment of about $44.6 million in year 326 has been assumed, based on professional judgement, incorporating a discount rate of approximately 5.75% and inflation rates for labour, materials, other costs and contingency of approximately 4%, 2%, 2.6% and 2.6%, respectively.

4.2 Cost Derivation Process

Representative costs were derived for an Adaptive Phased Management facility as follows:

- Based on previous cost estimate studies for long-term used nuclear fuel management, major cost components were identified. Table 1 identifies the sources of cost values for the major components. Appendix A includes a tabular summary of actual original and adapted costs by element of the work breakdown structure.
- Corresponding cost components (at the second level of the respective work breakdown structures) were identified from applicable existing cost estimates (CTECH 2003c and CTECH 2003b).
- Applicable existing cost estimate cost components were summed to the second level of the work breakdown structure.
- Where no relevant CTECH data exists, annual allowances were developed based on professional judgement and summed to the second level of the work breakdown structure.

- All work breakdown structure element costs were compiled and start dates and duration for the various activities were adjusted.

Table 1: Adaptive Phased Management Facility Cost Components

Activity	Previous (CTECH) Concept Source	Adjustments to Cost Values for Use in Adaptive Phased Management
Siting	Deep Geologic Repository	No change required
Phase I System Development (Caverns)	Centralized Rock Caverns	No change required
Phase I Safety Assessment	Centralized Rock Caverns	Reduced to reflect reduced operational timeframe
Phase I Licensing and Approvals	Centralized Rock Caverns	Reduced to reflect reduced timeframe and no repackaging cycles
Phase I Public Affairs (note 1)	Deep Geologic Repository	No change required
Cavern Storage Design and Construct	Centralized Rock Caverns	Reduced to reflect operational timeframe
Cavern Storage Operations	Centralized Rock Caverns	Reduced to reflect reduced timeframe and no repackaging cycles
Cavern Storage EA and Monitoring	Centralized Rock Caverns	Reduced to reflect reduced timeframe and no repackaging cycles
Cavern Plug and Flood	n/a - new allowance	New - based on professional judgement
Cavern Program Management	Deep Geologic Repository	No change required
URL Construct and Operate	n/a - new allowance	New - based on professional judgement
Phase II System Development (Isolation)	Deep Geologic Repository	No change required
Phase II Safety Assessment	Deep Geologic Repository	Increased to account for longer timeframe (extended monitoring of an open repository)
Phase II Licensing and Approvals	Deep Geologic Repository	Increased to account for longer timeframe (extended monitoring of an open repository)
Phase II Public Affairs	Deep Geologic Repository	No change required
Isolation Design and Construct	Deep Geologic Repository	No change required
Isolation Operations	Deep Geologic Repository	Increased to account for longer timeframe (extended monitoring of an open repository)
Isolation EA and Monitoring	Deep Geologic Repository	Increased to account for longer timeframe (extended monitoring of an open repository)
Isolation Decommission and Closure	Deep Geologic Repository	No change required
Isolation Program Management	Deep Geologic Repository	No change required
Post-Closure Monitoring	n/a - new allowance	New - based on professional judgement

5.0 REPRESENTATIVE ADAPTIVE PHASED MANAGEMENT FACILITY COSTS

5.1 Annual and Total Cost

Representative costs for the Adaptive Phased Management facility are provided in Appendix A. The total cost is estimated, in undiscounted (constant) 2002 Canadian Dollars, as approximately $20.9 billion for the facility itself (i.e., not including interim storage, retrieval and transportation costs). These cost estimates are illustrative of a possible implementation of Adaptive Phased Management.

5.2 Present Value Estimation

Based on the annual costs presented in Appendix A, the present value (January 2004 Canadian Dollars) of the facility (i.e., excluding interim storage, retrieval and transportation) is approximately $4.2 billion. This value has been calculated by multiplying annual cost components (labour, materials, other, contingency) by applicable inflation indices and dividing by an applicable discount rate index, then summing across all years and components.

Escalation and discount rate indices for years 1 through 310 were provided by NWMO[8]. Escalation indices after year 310 were calculated by assuming annual inflation and discount rates assumed for year 310 continue unchanged. The escalation and discount rate indices differentiated between “Labour-Construction” and “Labour-Other”. Values for the former yield a lower present value. In the present value calculation conducted for NWMO, all labour was assumed to be "Labour-Other", and the corresponding inflation indices used, an assumption tending to increase estimated present value.

The present value calculations were verified by applying the same methodology to data for centralized rock caverns and a deep geologic repository as presented in a previous GAL-GLL assessment of the approaches referred to in the NFWA[9].

[8] Received electronically on February 11, 2005 in file "April 2002 EFS.xls" attached to the email "RE: cost escalators for re-run of pv" from P. Lovie (NWMO) to P. Craig (Golder Associates)
[9] GAL-GLL 2005a. Refer to http://www.nwmo.ca/adx/asp/adxGetMedia.asp?DocID=1231,1090,199,20,1,Documents&MediaID=2348&Filename=92a_NWMO_Background_Paper.pdf

Present value estimates for centralized rock caverns and a deep geologic repository determined in the verification tests were within 3% of the respective present values previously reported by the Joint Waste Owners (JWO, 2004a and 2004b). Assuming the annual costs are reasonable, the present value estimate reported for the facility is generally compatible with previous Joint Waste Owners' work. It is noted that GAL-GLL total cost and present value estimates – both for the test cases and for the facility - were conducted on the basis of the first thousand years of the project (as opposed to a single operational cycle in the case of Joint Waste Owners' estimates where a period of approximately 350 years was considered). GAL-GLL also assigned additional allowances for post-closure monitoring of sealed repositories.

5.3 Major Costing Limitations

The estimated costs for the Adaptive Phased Management facility are at a conceptual level because of a number of costing limitations. Accordingly, the cost estimate for the facility should be taken as a general indication of possible costs, suitable for comparing approaches and for preliminary assessment purposes only, and not as an accurate forecast. The principal limitations are as follows:

- Costs used are for explicitly different facility designs and are taken only as generally indicative of the costs for generally similar works and activities. Professional judgement was used based on experience with projects of similar nature and scale or international analogues.
- In the case of centralized rock cavern closure, underground research laboratory construction and operation and post closure repository monitoring, no specific individual costs analogues exist which can be included in the estimate; however, international analogues referenced within the JWO cost estimates provide an order of magnitude analogue for the underground research laboratory. For post closure monitoring cost estimates and centralized rock cavern closure cost estimates, professional judgement based on similar scaled projects was used to establish order of magnitude cost estimates. Allowances for these items are based on professional judgement and experience, without reference to specific conceptual design studies.
- Where the Adaptive Phased Management facility cost estimate used previously developed cost data for similar activities, but the duration of the activities differed, very simplistic methods were used to extend or shorten the span of annual cost data. This adjustment of time spans was designed to accommodate the projected implementation schedule. However, abruptly stopping expenditures in a given year or extending them by assuming continuation of average expenditures may lead to omission or distortion of back-end or cyclic costs.
- The cost estimate is preliminary and is subject to changes in the conceptual description of Adaptive Phased Management and the costing methodology, as well as to QA/QC review. The estimate was prepared to allow early assessment of Adaptive Phased Management and will be superseded by more accurate estimates as the concept evolves and conceptual and detailed design studies are completed.

6.0 POSSIBLE ALTERNATIVE IMPLEMENTATION SCENARIOS

6.1 Alternative Scenario Basis

At the request of NWMO, one possible alternative implementation scenario for Adaptive Phased Management was evaluated as a sensitivity analysis. As described in NWMO documents, Adaptive Phased Management allows for real choice by future generations during the management of used nuclear fuel. NWMO therefore explored the cost implications of early choices (i.e., those costs that can be predicted with greater certainty and that may have a significant impact on the present value estimates). Specifically, an alternative implementation scenario was developed in which future decision makers decide not to transport used nuclear fuel to a central rock cavern location, but instead opt to continue to store used fuel at reactor sites until a deep geologic repository is available.

The basis and methodology for the cost estimate for the facility of this alternative implementation remained as described previously for the base case for the Adaptive Phased Management, subject to the following:

- It was assumed that siting of a centralized facility, including construction and operation of an underground research laboratory and other research facilities, commences in year 1 and continues as previously discussed.
- Costs for siting, initial public affairs, and program management (years 1 to 29) remain unchanged.
- Centralized rock caverns related system development costs are omitted after year 20 (i.e., the decision not to proceed with centralized storage).
- Costs for design and construction related to the centralized rock cavern, operations and closure are completely omitted, as they were anticipated to occur after year 20.
- All costs for centralized rock cavern-related safety assessment, licensing and approvals, and environmental assessment and monitoring cease when the corresponding isolation (deep geologic repository) related activities begin (year 30). No allowance is made after year 29 for ramping down or closing off rock cavern activities.
- Underground research facility costs and schedule remain exactly as described in the base case, with design beginning in year 15, construction spanning years 19 through 23 (inclusive), and operations from year 23 to 59 (inclusive). These research facility costs and schedule have no underlying conceptual design and are solely allowances based on professional experience and judgment.
- Isolation (deep geologic repository) costs and schedule remain exactly as described in the base case.

The limitations of the alternative implementation scenario estimate are as described previously with additional caveats as follows:

- The feasibility from an engineering perspective of not including storage in centralized rock caverns while leaving other project components unchanged is not evaluated. No assurance is made regarding the workability of this alternative scenario.
- The nature of the source cost data series leaves a one-year (year 31) gap in public affairs and program management.

Table 2 shows the cost component structure underlying this estimate.

6.2 Representative Alternative Implementation Scenario - Facility Annual and Total Cost

The total cost estimate for the facility alone, without interim storage, retrieval and transportation is, in undiscounted (constant) 2002 Canadian Dollars, approximately $17.9 billion. This cost estimate is illustrative of a possible implementation of an alternative implementation scenario for Adaptive Phased Management.

6.3 Alternative Implementation Scenario - Facility Present Value Cost Estimation

The total cost estimate for the facility alone, without interim storage, retrieval and transportation is, in undiscounted (constant) 2002 Canadian Dollars, approximately $3.3 Billion. This cost estimate is illustrative of a possible implementation of an alternative implementation scenario for Adaptive Phased Management.

This value has been calculated by the same methodology as was used previously.

Table 2: Alternative Implementation Scenario - Facility Cost Components

Activity	Previous (CTECH) Concept Source	Adjustments to Cost Values for Use in Alternative Implementation Scenario
Siting	Deep Geologic Repository	No change required
Phase I System Development (Caverns)	Centralized Rock Caverns	Costs terminated after year 20
Phase I Safety Assessment	Centralized Rock Caverns	Costs terminated in year 29 (Phase II Safety Assessment picks up in year 30)
Phase I Licensing and Approvals	Centralized Rock Caverns	Costs terminated in year 29 (Phase II Licensing and Approvals picks up in year 30))
Phase I Public Affairs (note 1)	Deep Geologic Repository	No change required
Cavern Storage Design and Construct	Centralized Rock Caverns	Completely deleted (would have started in year 25)
Cavern Storage Operations	Centralized Rock Caverns	Completely deleted (would have started in year 30)
Cavern Storage EA and Monitoring	Centralized Rock Caverns	Costs terminated in year 29 (Phase II EA and Monitoring picks up in year 30)
Cavern Plug and Flood	n/a - new allowance	Completely deleted
Cavern Program Management	Deep Geologic Repository	No change required
URL Construct and Operate	n/a - new allowance	New - based on professional judgement
Phase II System Development (Isolation)	Deep Geologic Repository	No change required
Phase II Safety Assessment	Deep Geologic Repository	Increased to account for longer timeframe (extended monitoring of an open repository)
Phase II Licensing and Approvals	Deep Geologic Repository	Increased to account for longer timeframe (extended monitoring of an open repository)
Phase II Public Affairs	Deep Geologic Repository	No change required
Isolation Design and Construct	Deep Geologic Repository	No change required
Isolation Operations	Deep Geologic Repository	Increased to account for longer timeframe (extended monitoring of an open repository)
Isolation EA and Monitoring	Deep Geologic Repository	Increased to account for longer timeframe (extended monitoring of an open repository)
Isolation Decommission and Closure	Deep Geologic Repository	No change required
Isolation Program Management	Deep Geologic Repository	No change required
Post-Closure Monitoring	n/a - new allowance	New - based on professional judgement

7.0 ALLOWANCES FOR INTERIM STORAGE, RETRIEVAL AND TRANSPORTATION

The cost estimates provided above from the Golder March 2005 memoranda consider only facility costs. Assessment and decision-making require consideration of other, non-facility costs. Two such non-facility costs have been evaluated by NWMO and GAL-GLL, namely the costs for:

- Interim Storage and Retrieval; and
- Transportation.

Although beyond the scope of the facility cost estimates, these costs were in NWMO's consultation program and in GAL-GLL reports (GAL-GLL 2005a; GAL-GLL 2005 b). Allowances for these activities are discussed below and are included with facility cost estimates as shown in Appendix A and B. These allowances represent one possible set of costs for these activities. These allowances have not been subject to third-party review, although the COGEMA estimates for specific transportation modes have been subject to such review and validation. Further, alternative interpretations of appropriate allowances for these non-facility costs are possible given project uncertainties at this stage of project development.

The total estimated cost, including interim storage, retrieval, transportation, and facility costs is $24.4 billion (2002 constant dollars), with an estimated Present Value of $6.1 billion (Jan. 2004 dollars). The alternate implementation scenario has a total estimated cost, including interim storage, retrieval, transportation, and facility costs of $22.6 billion (constant 2002 dollars), and an estimated Present Value of $5.1 billion (Jan. 2004 dollars). These cost estimates are illustrative of a possible implementation of Adaptive Phased Management. Estimates by different parties of annual costs, total costs and present values for Adaptive Phased Management that include facility costs, interim storage costs, retrieval costs and transportation costs can be expected to vary according to the specific assumptions made, for instance, about the location of the central facility, the mode of transportation, the appropriate method of annualizing interim storage and retrieval costs, and the inflation and discount indices used. Accordingly, cash flow estimates shown in Appendix A and B may not equate to the exact present value estimates for Adaptive Phased Management and alternate implementation scenario shown in the GAL-GLL 2005b report. However, at this stage of the development of Adaptive Phased Management, cost estimates should be taken as a general indication of possible costs, suitable for comparing approaches and for preliminary assessment purposes only, and not as an accurate forecast.

7.1 Interim Storage and Retrieval

Interim storage of used nuclear fuel at existing facilities pending the commencement of a long-term management approach is the responsibility of the Joint Waste Owners, as is the staging of the material for transportation (i.e., retrieval). Ontario Power Generation, one of the Joint Waste Owners and the responsible party for the majority of Canada's used nuclear fuel, has estimated interim storage and retrieval costs for a deep geologic repository program (as described by CTECH 2002) as well as the costs for a deep geologic repository program with a facility in-service date 30 years later than the CTECH concept. These estimated costs, as lump sums in constant dollars and as present values, have been provided to the NWMO (OPG, 2005).

The storage and staging requirements considered by OPG in their estimates are relevant to Adaptive Phased Management and the alternative implementation scenario.

Annual and total cumulative costs presented in Appendix A and Appendix B include the relevant OPG estimates, annualized by dividing the provided constant dollar lump sums by the anticipated duration of the activities. As the source data did not differentiate the type of cost (e.g., "labour" or "materials and equipment"), these potential additional costs appear in the appendices as "unassigned".

7.2 Transportation

COGEMA has estimated costs for transportation of used nuclear fuel from reactor sites to a hypothetical centralized facility (COGEMA 2003). These costs depend on the location of the facility and the mode of transportation selected (road, rail or ship).

Adaptive Phased Management is potentially applicable to a wide range of sites; actual transportation costs are therefore impossible to reliably estimate at the present time. To provide a starting point for assessment and comparison, a representative transportation cost was developed by averaging the annual costs for all modes of transport considered by COGEMA.

Annual and total cumulative costs for this representative transportation cost are included in Appendix A and Appendix B. The start dates for initial transportation costs, including planning, have been chosen to synchronize the start of actual transportation with the anticipated in-service date of the centralized facility.

8.0 CONCLUSIONS

NWMO's mandate includes the selection and recommendation, to the Government of Canada, of an approach for the long-term management of Canada's used nuclear fuel. Based on detailed evaluation of options required by the *Nuclear Fuel Waste Act*, NWMO has arrived at a new approach, Adaptive Phased Management, that utilizes features of previously proposed approaches to best meet the objectives identified by Canadians as being important.

At NWMO's request, GAL-GLL developed facility cost estimates for Adaptive Phased Management. The cost estimates were reviewed by a third party and are considered adequate for the NWMO's current options assessment process. The cost estimates for a facility are summarized herein, with an additional discussion of non-facility costs. Supporting figures and tables of cost estimate data are attached in Appendices. These cost estimates are illustrative of a possible implementation of Adaptive Phased Management.

Adaptive Phased Management is currently described only at a conceptual level. The cost estimates documented herein are intended only as a basis for discussion and for comparative purposes. As such, the level of detail of the cost estimates and their accuracy is appropriate.

For these reasons, the cost estimates herein for Adaptive Phased Management should be taken as a general indication of possible costs suitable for comparing approaches and not as an accurate forecast.

Moreover, long-term management cost estimates (i.e., those for activities hundreds of years from now) are based on current technology costs and assumptions as to the timing and frequency of events. Such costs should be considered order-of-magnitude only, even assuming future generations choose to continue long-term storage using current technology. Further, cost estimates for items without similar existing estimates (i.e., the extensive early research laboratory component, the closure of rock caverns by plugging and flooding, and the monitoring of a decommissioned and closed deep repository in perpetuity) have no underlying conceptual design studies and, at this time, are solely allowances based on professional judgement and experience.

Based on the addition of costs without consideration for synergies in contemplated activities and on the conservatism used in setting allowances, current estimates of Adaptive Phased Management costs may be biased high. However, during final design, siting, and environmental assessment and licensing, modifications to the design or schedule could also result in greater-than-predicted costs. For example, delays, litigation, changes to regulatory policy, changes to the licensing and approval process, changes to applicable standards, changes to security requirements, changes to environmental assessment and effects mitigation requirements and many other possibilities unforeseeable by present-day designers can easily lead to costs in excess of original estimates, including contingency.

It is anticipated that a full risk analysis will be conducted on an optimized set of cost estimates when they are developed, after the Government of Canada have decided on the specific management approach to be implemented.

It is anticipated that NWMO will develop a more detailed, holistic cost estimate for Adaptive Phased Management once a specific design concept has been developed, following a decision by the Government of Canada to select a long-term management approach for used nuclear fuel in Canada.

9.0 REFERENCES

ADH Technologies Inc. and Charles River Associates (ADH and River). 2004. *Validation of Cost Estimating Process for Long-Term Management of Used Nuclear Fuel*. Prepared for the Nuclear Waste Management Organization.

A.W. Hooker Associates Ltd. (Hooker). 2005. *Validation of Cost Estimating Process for Adaptive Phased Management of the Long Term Management of Used Nuclear Fuel. Final Draft.* Prepared for the Nuclear Waste Management Organization.

COGEMA LOGISTICS (COGEMA). 2003. *Cost Estimate for Transportation of Used nuclear fuel to a Centralised Facility*. Report of a Study carried out for Ontario Power Generation, New Brunswick Power, Hydro Quebec and Atomic Energy of Canada Limited. Ref. 500276-B-010 Rev. 00

CTECH Radioactive Materials Management (CTECH). 2003a. *Conceptual Designs for a Four Centralized Extended Storage Facility Alternatives for Used Nuclear Fuel*. Report of a Study carried out for Ontario Power Generation, New Brunswick Power, Hydro Quebec and Atomic Energy of Canada Limited. 1105/MD18084/REP/08.

CTECH Radioactive Materials Management (CTECH). 2003b. *Cost Estimates for Four Centralized Extended Storage Facility Alternatives for Used Nuclear Fuel.* Report of a Study carried out for Ontario Power Generation, New Brunswick Power, Hydro Quebec and Atomic Energy of Canada Limited. 1105/MD18084/REP/11.

CTECH Radioactive Materials Management (CTECH). 2003c. *Cost Estimate for a Deep Geologic Repository for Used Nuclear Fuel.* Report of a Study carried out for Ontario Power Generation, New Brunswick Power, Hydro Quebec and Atomic Energy of Canada Limited. 1106/MD18085/REP/02.

CTECH Radioactive Materials Management (CTECH). 2002. *Conceptual Design for a Deep Geologic Repository for Used Nuclear Fuel*. Report of a Study carried out for Ontario Power Generation, New Brunswick Power, Hydro Quebec and Atomic Energy of Canada Limited. 1106/MD18085/REP/01.

Golder Associates Ltd. and Gartner Lee Limited (GAL-GLL). 2005a. February 2005. *Technical Report on Assessment of Benefits, Risks and Costs of Management Approaches by Illustrative Economic Region.* Prepared for the Nuclear Waste Management Organization. 05-1112-001.

Golder Associates Ltd. and Gartner Lee Limited (GAL-GLL). 2005b. April 2005. *Supplemental Report on Assessment of Benefits, Risks and Costs of a Proposed Adaptive Phased Management Approach by Illustrative Economic Region.* Prepared for the Nuclear Waste Management Organization. 05-1112-001.

Joint Waste Owners (JWO). 2004a. *Costs of Alternative Approaches for the Long-Term Management of Canada's Nuclear Fuel Waste, Deep Geologic Disposal Approach*. A Submission to the Nuclear Waste Management Office by Ontario Power Generation, Hydro-Quebec, New Brunswick Power and Atomic Energy of Canada Limited. Rev 01.

Joint Waste Owners (JWO). 2004b. *Costs of Alternative Approaches for the Long-Term Management of Canada's Nuclear Fuel Waste, Centralized Extended Storage Approach*. A Submission to the Nuclear Waste Management Office by Ontario Power Generation, Hydro-Quebec, New Brunswick Power and Atomic Energy of Canada Limited. Rev 02.

Ontario Power Generation (OPG). 2005. *Interim Storage and Retrieval Costs Estimate for DGR Option #4*. April 22, 2005 memorandum from John Kennard, Ontario Power Generation, to Paul Lovie, NWMO.

RWE Solutions (RWE NUKEM). 2004. Deep Geologic Repository in Sedimentary Rock: High-Level Review. 89148/REP/04, Issue 1.

APPENDIX A: ESTIMATED ADAPTIVE PHASED MANAGEMENT COSTS

Contents:

Figure A-1: Preliminary Annual Cash Flow, Adaptive Phased Management Facility

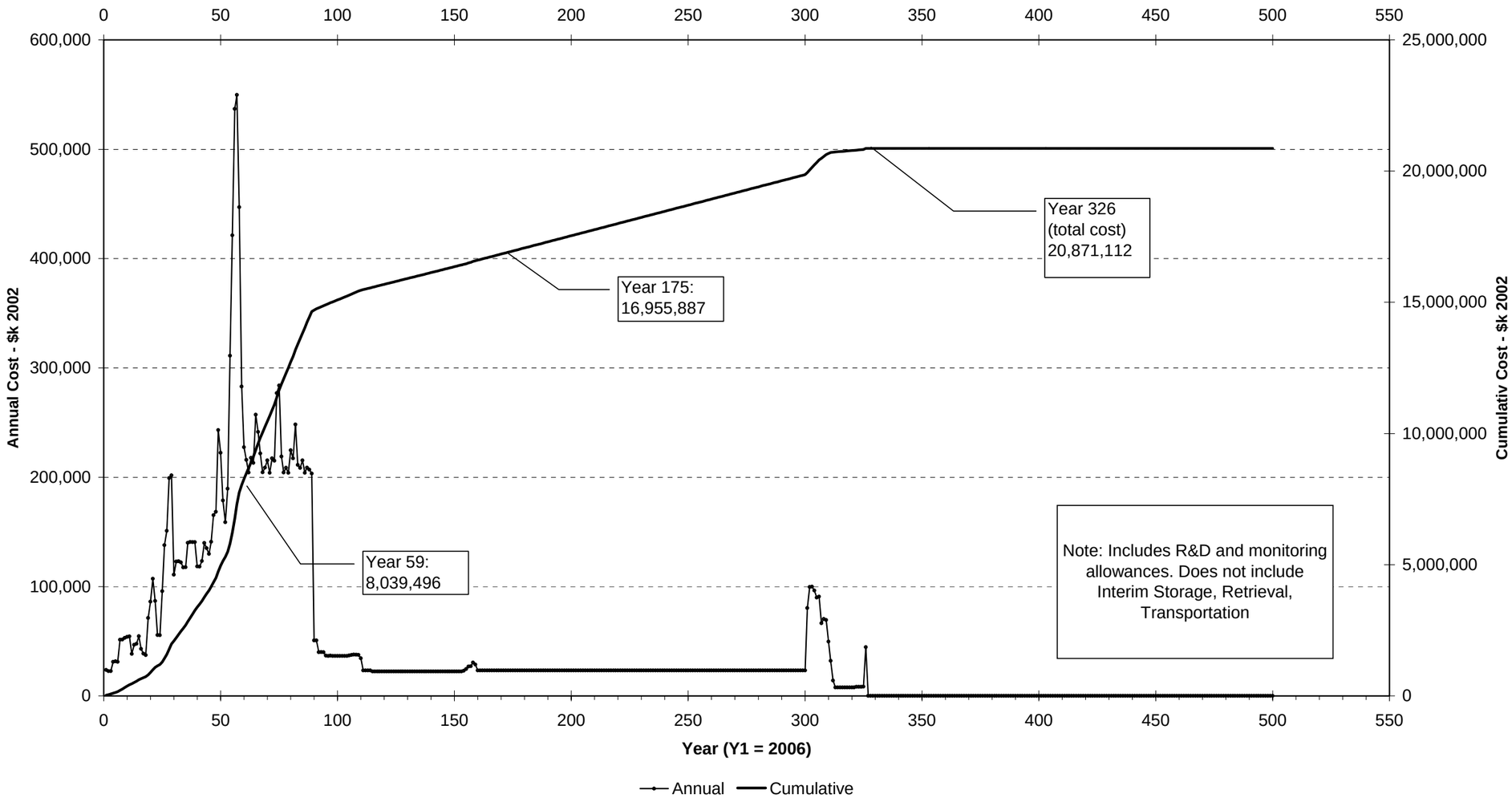

Figure A-2: Preliminary Annual Cash Flow, Adaptive Phased Management Facility Including Allowances for Interim Storage, Retrieval and Transportation

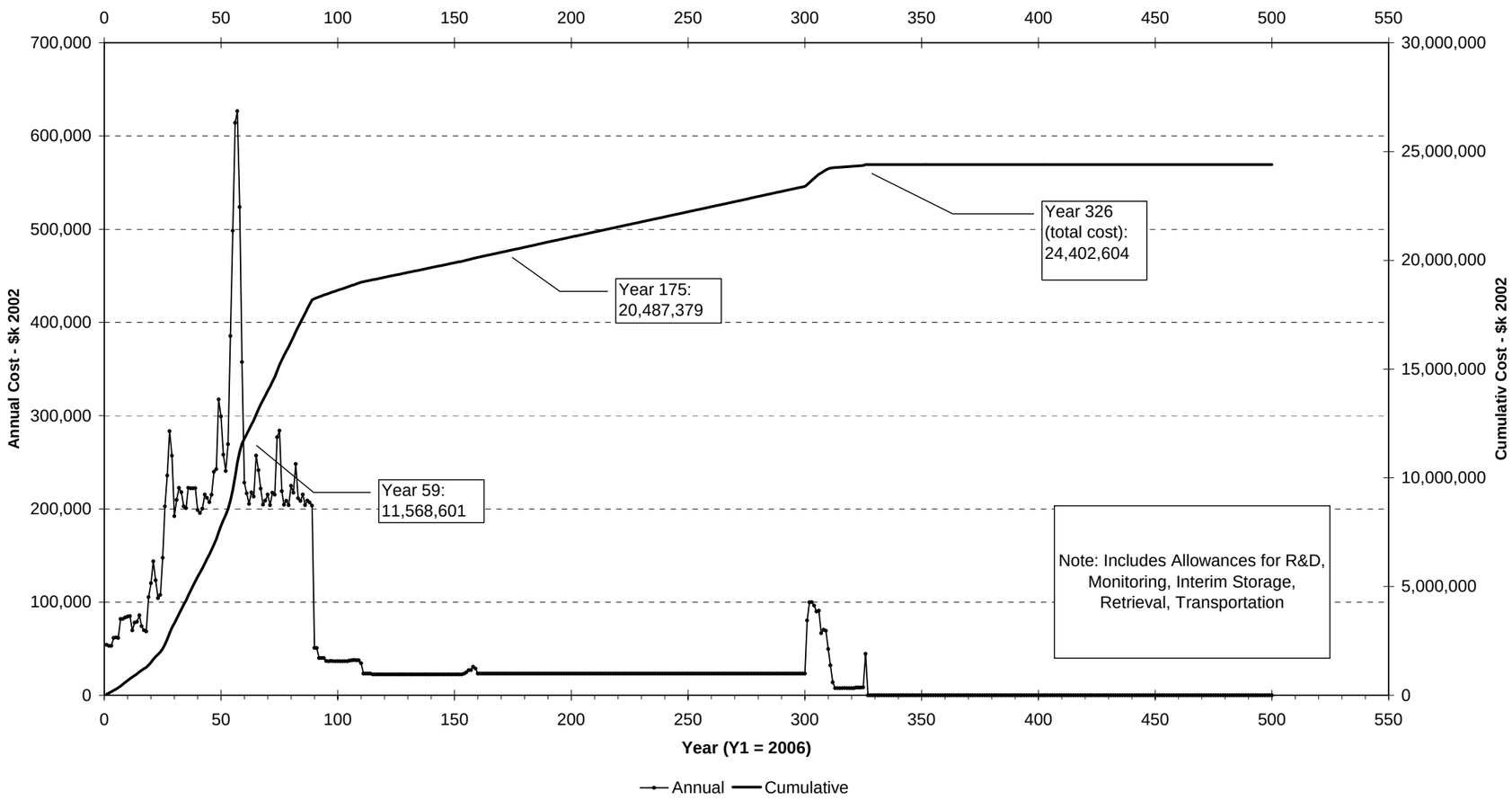

Table A-1: Adaptive Phased Management Cost Components by Work Breakdown Structure Number

WBS		Activity	Previous (CTECH) WBS		Original Total	New Total	Difference	Percent	Comments
610	115	Siting	550	15	396,844	396,844	0	0%	
610	120	Phase I System Development (Caverns)	564	20	89,338	89,338	0	0%	
610	125	Phase I Safety Assessment	564	25	37,271	23,311	-13,960	-37%	Large duration decrease
610	130	Phase I Licencing and Approvals	564	30	205,824	80,945	-124,879	-61%	Large duration decrease, no repackaging
610	135	Phase I Public Affairs (note 1)	550	35	106,945	106,945	0	0%	
610	140	Cavern Storage Design and Construct	564	40	536,468	530,544	-5,924	-1%	Year 131/132 costs deleted
610	145	Cavern Storage Operations	564	45	12,431,365	2,196,217	-10,235,148	-82%	Large duration decrease, no repackaging
610	155	Cavern Storage EA and Monitoring	564	55	530,341	152,496	-377,845	-71%	Large duration decrease, no repackaging
610	160	Cavern Plug and Flood	n/a - new allowance			20,000	20,000	na	Preliminary
610	190	Cavern Program Management (note 1)	550	90	285,044	285,044	0	0%	
610	195	URL Construct and Operate	n/a - new allowance			1,380,000	1,380,000	na	Preliminary
610	220	Phase II System Development (Isolation)	550	20	411,191	411,191	0	0%	
610	225	Phase II Safety Assessment	550	25	687,190	1,104,371	417,181	61%	Extended duration
610	230	Phase II Licencing and Approvals	550	30	120,421	182,660	62,239	52%	Extended duration
610	235	Phase II Public Affairs (note 2)	550	35	106,945	106,945	0	0%	
610	240	Isolation Design and Construct	550	40	2,381,931	2,381,931	0	0%	
610	245	Isolation Operations	550	45	7,208,354	9,793,927	2,585,573	36%	Extended duration
610	255	Isolation EA and Monitoring	550	55	236,142	457,904	221,762	94%	Extended duration
610	260	Isolation Decommission and Closure	550	60	840,825	840,825	0	0%	
610	290	Isolation Program Management (note 2)	550	90	285,044	285,044	0	0%	
610	310	Post-Closure Monitoring	n/a - new allowance			44,630	44,630		Preliminary
				sum	*26897483*	*20871111.58*			

Note 1: Included in 610 145 after Y29
Note 2: Included in 610 245 after Y60
General Note: All Costs in Constant 2002 kCAD

Table A-2: Preliminary Annual Cash Flow ($k 2002), Adaptive Phased Management Facility

Year	Labour	Equipment & Materials	Other	Contingency	Annual	Cumulative
1	14,220	0	4,331	5,147	23,698	23,698
2	13,644	0	4,006	4,945	22,596	46,293
3	13,644	0	4,006	4,945	22,596	68,889
4	19,561	0	4,469	7,103	31,133	100,022
5	19,881	0	4,519	7,251	31,651	131,673
6	19,561	0	4,469	7,103	31,133	162,807
7	22,760	0	14,325	14,307	51,393	214,199
8	22,865	0	14,231	14,353	51,449	265,648
9	23,158	0	15,206	14,750	53,114	318,763
10	23,722	0	15,206	14,981	53,909	372,672
11	23,872	0	15,489	15,090	54,451	427,123
12	18,652	0	9,933	9,805	38,390	465,513
13	24,118	344	10,163	12,132	46,757	512,271
14	24,679	344	10,139	12,519	47,681	559,952
15	28,606	344	11,698	13,991	54,639	614,591
16	25,205	344	7,781	9,704	43,034	657,625
17	22,558	344	7,310	8,471	38,683	696,308
18	22,591	427	6,243	8,077	37,338	733,647
19	30,612	16,427	9,467	14,732	71,238	804,885
20	33,612	24,427	10,467	17,732	86,238	891,124
21	40,335	32,427	12,497	21,949	107,208	998,332
22	34,112	24,384	10,480	17,810	86,786	1,085,118
23	25,263	10,384	8,457	11,523	55,627	1,140,746
24	27,175	6,384	10,446	11,506	55,511	1,196,257
25	50,207	11,094	14,957	19,576	95,834	1,292,091
26	62,025	26,725	15,995	33,050	137,795	1,429,887
27	68,699	31,099	15,968	35,147	150,912	1,580,799
28	77,729	57,927	18,061	45,520	199,236	1,780,035
29	78,676	58,195	18,635	46,209	201,714	1,981,749
30	38,665	37,242	17,950	17,065	110,922	2,092,671
31	47,070	36,755	19,456	19,626	122,907	2,215,577
32	47,312	36,755	19,460	19,727	123,254	2,338,831
33	46,162	36,755	19,475	19,677	122,069	2,460,900
34	45,570	32,337	19,797	19,777	117,481	2,578,381
35	45,630	32,337	19,902	19,832	117,701	2,696,082
36	64,413	22,947	25,951	26,750	140,062	2,836,144
37	65,038	22,947	25,871	26,901	140,758	2,976,901
38	64,942	22,947	25,878	26,846	140,614	3,117,515
39	65,141	22,950	25,751	26,810	140,652	3,258,167
40	50,192	25,711	20,979	21,523	118,405	3,376,572
41	50,009	25,712	21,066	21,491	118,278	3,494,850
42	53,417	25,712	21,692	22,497	123,317	3,618,167
43	61,520	29,312	21,914	27,043	139,789	3,757,956
44	60,381	24,894	22,723	27,094	135,092	3,893,048

Year	Labour	Equipment & Materials	Other	Contingency	Annual	Cumulative
45	57,419	24,326	22,550	25,532	129,827	4,022,875
46	64,052	24,326	24,814	27,708	140,899	4,163,774
47	81,563	21,522	28,951	33,297	165,333	4,329,107
48	83,794	22,169	28,303	34,116	168,382	4,497,489
49	102,894	34,674	55,458	50,209	243,234	4,740,723
50	80,774	35,360	60,254	45,993	222,381	4,963,104
51	63,174	34,978	42,908	37,713	178,773	5,141,877
52	61,310	23,502	40,721	33,325	158,858	5,300,735
53	67,147	33,105	49,955	39,347	189,553	5,490,288
54	110,864	82,712	53,294	64,363	311,234	5,801,522
55	153,384	128,197	50,558	89,158	421,297	6,222,819
56	188,429	192,200	42,469	113,886	536,984	6,759,803
57	179,683	210,203	46,531	113,249	549,666	7,309,469
58	143,999	162,946	46,896	93,182	447,023	7,756,492
59	108,979	73,441	38,782	61,802	283,003	8,039,496
60	74,037	87,982	25,191	40,175	227,385	8,266,881
61	72,289	80,154	25,179	38,260	215,881	8,482,762
62	65,598	80,154	23,016	35,604	204,371	8,687,133
63	68,302	83,854	27,486	38,129	217,771	8,904,905
64	68,191	80,154	27,435	37,356	213,136	9,118,041
65	78,943	100,233	33,137	44,925	257,239	9,375,280
66	76,262	94,559	28,708	42,019	241,547	9,616,827
67	73,242	85,589	24,221	38,680	221,733	9,838,560
68	65,686	80,154	23,027	35,621	204,487	10,043,047
69	65,598	83,854	23,016	36,344	208,812	10,251,859
70	65,635	89,315	23,026	37,450	215,426	10,467,285
71	65,546	79,940	23,015	35,557	204,059	10,671,344
72	68,139	83,641	27,434	38,050	217,264	10,888,608
73	68,227	79,940	29,284	37,695	215,146	11,103,753
74	94,308	97,787	35,548	49,253	276,896	11,380,649
75	93,463	110,946	29,302	50,114	283,825	11,664,474
76	71,318	85,293	24,216	38,198	219,024	11,883,498
77	65,759	79,940	23,019	35,644	204,363	12,087,861
78	65,634	83,641	23,026	36,314	208,615	12,296,476
79	65,546	79,940	23,015	35,557	204,059	12,500,534
80	68,423	89,444	27,473	39,318	224,658	12,725,192
81	68,139	83,641	27,434	38,050	217,264	12,942,456
82	80,710	90,818	33,245	43,443	248,216	13,190,672
83	68,362	82,639	23,506	36,826	211,333	13,402,004
84	65,546	83,641	23,015	36,297	208,499	13,610,504
85	65,635	89,315	23,026	37,450	215,426	13,825,930
86	65,546	79,940	23,015	35,557	204,059	14,029,988
87	65,759	83,641	23,019	36,384	208,803	14,238,792
88	67,453	79,940	23,399	36,091	206,883	14,445,675
89	65,995	79,730	22,524	35,138	203,386	14,649,061
90	27,304	3,834	9,316	10,341	50,794	14,699,855
91	27,215	3,834	9,305	10,323	50,676	14,750,532

Year	Labour	Equipment & Materials	Other	Contingency	Annual	Cumulative
92	20,108	3,834	7,706	8,329	39,976	14,790,508
93	20,196	3,834	7,717	8,346	40,092	14,830,600
94	20,108	3,834	7,706	8,329	39,976	14,870,576
95	18,016	3,834	7,226	7,735	36,811	14,907,388
96	17,790	3,834	7,184	7,678	36,486	14,943,873
97	18,003	3,834	7,188	7,765	36,790	14,980,663
98	17,878	3,834	7,195	7,695	36,602	15,017,265
99	17,790	3,834	7,184	7,678	36,486	15,053,751
100	17,878	3,834	7,195	7,696	36,604	15,090,355
101	17,790	3,834	7,184	7,678	36,486	15,126,841
102	17,790	3,834	7,184	7,678	36,486	15,163,327
103	17,878	3,834	7,195	7,695	36,602	15,199,929
104	17,790	3,834	7,184	7,678	36,486	15,236,415
105	18,073	3,963	7,223	7,811	37,071	15,273,485
106	18,390	3,834	7,384	7,878	37,486	15,310,971
107	18,603	3,834	7,388	7,965	37,790	15,348,761
108	18,478	3,834	7,395	7,895	37,602	15,386,363
109	18,390	3,834	7,384	7,878	37,486	15,423,849
110	15,822	7,145	4,338	7,125	34,431	15,458,280
111	12,134	3,145	3,127	4,907	23,313	15,481,593
112	12,134	3,145	3,127	4,907	23,313	15,504,906
113	12,134	3,145	3,127	4,907	23,313	15,528,219
114	12,134	3,145	3,127	4,907	23,313	15,551,532
115	11,822	2,945	2,938	4,725	22,431	15,573,962
116	11,734	2,945	2,927	4,707	22,313	15,596,275
117	11,734	2,945	2,927	4,707	22,313	15,618,588
118	11,734	2,945	2,927	4,707	22,313	15,640,901
119	11,734	2,945	2,927	4,707	22,313	15,663,214
120	11,822	2,945	2,938	4,725	22,431	15,685,645
121	11,734	2,945	2,927	4,707	22,313	15,707,958
122	11,734	2,945	2,927	4,707	22,313	15,730,271
123	11,734	2,945	2,927	4,707	22,313	15,752,584
124	11,734	2,945	2,927	4,707	22,313	15,774,897
125	11,822	2,945	2,938	4,725	22,431	15,797,327
126	11,734	2,945	2,927	4,707	22,313	15,819,640
127	11,734	2,945	2,927	4,707	22,313	15,841,953
128	11,734	2,945	2,927	4,707	22,313	15,864,266
129	11,734	2,945	2,927	4,707	22,313	15,886,579
130	11,822	2,945	2,938	4,725	22,431	15,909,010
131	11,734	2,945	2,927	4,707	22,313	15,931,323
132	11,734	2,945	2,927	4,707	22,313	15,953,636
133	11,734	2,945	2,927	4,707	22,313	15,975,949
134	11,734	2,945	2,927	4,707	22,313	15,998,262
135	11,822	2,945	2,938	4,725	22,431	16,020,692
136	11,734	2,945	2,927	4,707	22,313	16,043,005
137	11,734	2,945	2,927	4,707	22,313	16,065,318
138	11,734	2,945	2,927	4,707	22,313	16,087,631

Year	Labour	Equipment & Materials	Other	Contingency	Annual	Cumulative
139	11,734	2,945	2,927	4,707	22,313	16,109,944
140	11,822	2,945	2,938	4,725	22,431	16,132,375
141	11,734	2,945	2,927	4,707	22,313	16,154,688
142	11,734	2,945	2,927	4,707	22,313	16,177,001
143	11,734	2,945	2,927	4,707	22,313	16,199,314
144	11,734	2,945	2,927	4,707	22,313	16,221,627
145	11,822	2,945	2,938	4,725	22,431	16,244,057
146	11,734	2,945	2,927	4,707	22,313	16,266,370
147	11,734	2,945	2,927	4,707	22,313	16,288,683
148	11,734	2,945	2,927	4,707	22,313	16,310,996
149	11,734	2,945	2,927	4,707	22,313	16,333,309
150	11,822	2,945	2,938	4,725	22,431	16,355,740
151	11,734	2,945	2,927	4,707	22,313	16,378,053
152	11,734	2,945	2,927	4,707	22,313	16,400,366
153	11,734	2,945	2,927	4,707	22,313	16,422,679
154	12,087	2,945	3,088	4,919	23,039	16,445,717
155	12,942	2,945	3,354	5,264	24,505	16,470,222
156	13,809	2,945	4,409	5,685	26,848	16,497,070
157	13,958	2,945	4,442	5,727	27,072	16,524,141
158	16,567	2,945	4,830	6,242	30,583	16,554,724
159	15,975	2,945	3,924	5,914	28,758	16,583,482
160	12,333	2,945	3,104	4,893	23,275	16,606,757
161	12,333	2,945	3,104	4,893	23,275	16,630,033
162	12,333	2,945	3,104	4,893	23,275	16,653,308
163	12,333	2,945	3,104	4,893	23,275	16,676,583
164	12,333	2,945	3,104	4,893	23,275	16,699,858
165	12,333	2,945	3,104	4,893	23,275	16,723,134
166	12,333	2,945	3,104	4,893	23,275	16,746,409
167	12,333	2,945	3,104	4,893	23,275	16,769,684
168	12,333	2,945	3,104	4,893	23,275	16,792,960
169	12,333	2,945	3,104	4,893	23,275	16,816,235
170	12,333	2,945	3,104	4,893	23,275	16,839,510
171	12,333	2,945	3,104	4,893	23,275	16,862,786
172	12,333	2,945	3,104	4,893	23,275	16,886,061
173	12,333	2,945	3,104	4,893	23,275	16,909,336
174	12,333	2,945	3,104	4,893	23,275	16,932,611
175	12,333	2,945	3,104	4,893	23,275	16,955,887
176	12,333	2,945	3,104	4,893	23,275	16,979,162
177	12,333	2,945	3,104	4,893	23,275	17,002,437
178	12,333	2,945	3,104	4,893	23,275	17,025,713
179	12,333	2,945	3,104	4,893	23,275	17,048,988
180	12,333	2,945	3,104	4,893	23,275	17,072,263
181	12,333	2,945	3,104	4,893	23,275	17,095,539
182	12,333	2,945	3,104	4,893	23,275	17,118,814
183	12,333	2,945	3,104	4,893	23,275	17,142,089
184	12,333	2,945	3,104	4,893	23,275	17,165,364
185	12,333	2,945	3,104	4,893	23,275	17,188,640

Year	Labour	Equipment & Materials	Other	Contingency	Annual	Cumulative
186	12,333	2,945	3,104	4,893	23,275	17,211,915
187	12,333	2,945	3,104	4,893	23,275	17,235,190
188	12,333	2,945	3,104	4,893	23,275	17,258,466
189	12,333	2,945	3,104	4,893	23,275	17,281,741
190	12,333	2,945	3,104	4,893	23,275	17,305,016
191	12,333	2,945	3,104	4,893	23,275	17,328,292
192	12,333	2,945	3,104	4,893	23,275	17,351,567
193	12,333	2,945	3,104	4,893	23,275	17,374,842
194	12,333	2,945	3,104	4,893	23,275	17,398,117
195	12,333	2,945	3,104	4,893	23,275	17,421,393
196	12,333	2,945	3,104	4,893	23,275	17,444,668
197	12,333	2,945	3,104	4,893	23,275	17,467,943
198	12,333	2,945	3,104	4,893	23,275	17,491,219
199	12,333	2,945	3,104	4,893	23,275	17,514,494
200	12,333	2,945	3,104	4,893	23,275	17,537,769
201	12,333	2,945	3,104	4,893	23,275	17,561,045
202	12,333	2,945	3,104	4,893	23,275	17,584,320
203	12,333	2,945	3,104	4,893	23,275	17,607,595
204	12,333	2,945	3,104	4,893	23,275	17,630,870
205	12,333	2,945	3,104	4,893	23,275	17,654,146
206	12,333	2,945	3,104	4,893	23,275	17,677,421
207	12,333	2,945	3,104	4,893	23,275	17,700,696
208	12,333	2,945	3,104	4,893	23,275	17,723,972
209	12,333	2,945	3,104	4,893	23,275	17,747,247
210	12,333	2,945	3,104	4,893	23,275	17,770,522
211	12,333	2,945	3,104	4,893	23,275	17,793,798
212	12,333	2,945	3,104	4,893	23,275	17,817,073
213	12,333	2,945	3,104	4,893	23,275	17,840,348
214	12,333	2,945	3,104	4,893	23,275	17,863,623
215	12,333	2,945	3,104	4,893	23,275	17,886,899
216	12,333	2,945	3,104	4,893	23,275	17,910,174
217	12,333	2,945	3,104	4,893	23,275	17,933,449
218	12,333	2,945	3,104	4,893	23,275	17,956,725
219	12,333	2,945	3,104	4,893	23,275	17,980,000
220	12,333	2,945	3,104	4,893	23,275	18,003,275
221	12,333	2,945	3,104	4,893	23,275	18,026,551
222	12,333	2,945	3,104	4,893	23,275	18,049,826
223	12,333	2,945	3,104	4,893	23,275	18,073,101
224	12,333	2,945	3,104	4,893	23,275	18,096,376
225	12,333	2,945	3,104	4,893	23,275	18,119,652
226	12,333	2,945	3,104	4,893	23,275	18,142,927
227	12,333	2,945	3,104	4,893	23,275	18,166,202
228	12,333	2,945	3,104	4,893	23,275	18,189,478
229	12,333	2,945	3,104	4,893	23,275	18,212,753
230	12,333	2,945	3,104	4,893	23,275	18,236,028
231	12,333	2,945	3,104	4,893	23,275	18,259,304
232	12,333	2,945	3,104	4,893	23,275	18,282,579

Year	Labour	Equipment & Materials	Other	Contingency	Annual	Cumulative
233	12,333	2,945	3,104	4,893	23,275	18,305,854
234	12,333	2,945	3,104	4,893	23,275	18,329,129
235	12,333	2,945	3,104	4,893	23,275	18,352,405
236	12,333	2,945	3,104	4,893	23,275	18,375,680
237	12,333	2,945	3,104	4,893	23,275	18,398,955
238	12,333	2,945	3,104	4,893	23,275	18,422,231
239	12,333	2,945	3,104	4,893	23,275	18,445,506
240	12,333	2,945	3,104	4,893	23,275	18,468,781
241	12,333	2,945	3,104	4,893	23,275	18,492,057
242	12,333	2,945	3,104	4,893	23,275	18,515,332
243	12,333	2,945	3,104	4,893	23,275	18,538,607
244	12,333	2,945	3,104	4,893	23,275	18,561,882
245	12,333	2,945	3,104	4,893	23,275	18,585,158
246	12,333	2,945	3,104	4,893	23,275	18,608,433
247	12,333	2,945	3,104	4,893	23,275	18,631,708
248	12,333	2,945	3,104	4,893	23,275	18,654,984
249	12,333	2,945	3,104	4,893	23,275	18,678,259
250	12,333	2,945	3,104	4,893	23,275	18,701,534
251	12,333	2,945	3,104	4,893	23,275	18,724,810
252	12,333	2,945	3,104	4,893	23,275	18,748,085
253	12,333	2,945	3,104	4,893	23,275	18,771,360
254	12,333	2,945	3,104	4,893	23,275	18,794,635
255	12,333	2,945	3,104	4,893	23,275	18,817,911
256	12,333	2,945	3,104	4,893	23,275	18,841,186
257	12,333	2,945	3,104	4,893	23,275	18,864,461
258	12,333	2,945	3,104	4,893	23,275	18,887,737
259	12,333	2,945	3,104	4,893	23,275	18,911,012
260	12,333	2,945	3,104	4,893	23,275	18,934,287
261	12,333	2,945	3,104	4,893	23,275	18,957,563
262	12,333	2,945	3,104	4,893	23,275	18,980,838
263	12,333	2,945	3,104	4,893	23,275	19,004,113
264	12,333	2,945	3,104	4,893	23,275	19,027,388
265	12,333	2,945	3,104	4,893	23,275	19,050,664
266	12,333	2,945	3,104	4,893	23,275	19,073,939
267	12,333	2,945	3,104	4,893	23,275	19,097,214
268	12,333	2,945	3,104	4,893	23,275	19,120,490
269	12,333	2,945	3,104	4,893	23,275	19,143,765
270	12,333	2,945	3,104	4,893	23,275	19,167,040
271	12,333	2,945	3,104	4,893	23,275	19,190,316
272	12,333	2,945	3,104	4,893	23,275	19,213,591
273	12,333	2,945	3,104	4,893	23,275	19,236,866
274	12,333	2,945	3,104	4,893	23,275	19,260,141
275	12,333	2,945	3,104	4,893	23,275	19,283,417
276	12,333	2,945	3,104	4,893	23,275	19,306,692
277	12,333	2,945	3,104	4,893	23,275	19,329,967
278	12,333	2,945	3,104	4,893	23,275	19,353,243
279	12,333	2,945	3,104	4,893	23,275	19,376,518

Year	Labour	Equipment & Materials	Other	Contingency	Annual	Cumulative
280	12,333	2,945	3,104	4,893	23,275	19,399,793
281	12,333	2,945	3,104	4,893	23,275	19,423,069
282	12,333	2,945	3,104	4,893	23,275	19,446,344
283	12,333	2,945	3,104	4,893	23,275	19,469,619
284	12,333	2,945	3,104	4,893	23,275	19,492,894
285	12,333	2,945	3,104	4,893	23,275	19,516,170
286	12,333	2,945	3,104	4,893	23,275	19,539,445
287	12,333	2,945	3,104	4,893	23,275	19,562,720
288	12,333	2,945	3,104	4,893	23,275	19,585,996
289	12,333	2,945	3,104	4,893	23,275	19,609,271
290	12,333	2,945	3,104	4,893	23,275	19,632,546
291	12,333	2,945	3,104	4,893	23,275	19,655,822
292	12,333	2,945	3,104	4,893	23,275	19,679,097
293	12,333	2,945	3,104	4,893	23,275	19,702,372
294	12,333	2,945	3,104	4,893	23,275	19,725,647
295	12,333	2,945	3,104	4,893	23,275	19,748,923
296	12,333	2,945	3,104	4,893	23,275	19,772,198
297	12,333	2,945	3,104	4,893	23,275	19,795,473
298	12,333	2,945	3,104	4,893	23,275	19,818,749
299	12,333	2,945	3,104	4,893	23,275	19,842,024
300	12,333	2,945	3,104	4,893	23,275	19,865,299
301	34,985	22,437	4,597	18,258	80,277	19,945,576
302	41,204	23,051	12,656	22,750	99,661	20,045,237
303	41,151	23,124	12,736	22,937	99,947	20,145,184
304	38,930	22,955	12,326	22,154	96,365	20,241,549
305	36,398	23,501	9,293	20,649	89,841	20,331,390
306	36,964	23,561	9,407	20,871	90,802	20,422,192
307	28,596	13,855	9,442	14,642	66,535	20,488,727
308	31,855	13,523	9,393	15,518	70,289	20,559,016
309	31,289	13,463	9,280	15,296	69,327	20,628,343
310	25,297	7,956	5,619	10,748	49,621	20,677,964
311	15,263	7,174	2,590	7,022	32,049	20,710,013
312	7,674	2,108	1,223	2,958	13,962	20,723,975
313	3,584	1,162	1,080	1,811	7,637	20,731,612
314	3,584	1,162	1,080	1,811	7,637	20,739,248
315	3,584	1,162	1,080	1,811	7,637	20,746,885
316	3,584	1,162	1,080	1,811	7,637	20,754,522
317	3,673	1,162	1,091	1,829	7,754	20,762,276
318	3,584	1,162	1,080	1,811	7,637	20,769,913
319	3,584	1,162	1,080	1,811	7,637	20,777,550
320	3,584	1,162	1,080	1,811	7,637	20,785,186
321	3,584	1,162	1,080	1,811	7,637	20,792,823
322	3,938	1,372	1,127	1,933	8,370	20,801,193
323	3,938	1,372	1,127	1,933	8,370	20,809,563
324	3,938	1,372	1,127	1,933	8,370	20,817,933
325	4,039	1,372	1,112	2,025	8,549	20,826,482
326	25,100	5,750	6,890	6,890	44,630	20,871,112

Table A-3: Preliminary Annual Cash Flow ($k 2002), Adaptive Phased Management Facility Including Allowances for Interim Storage, Retrieval and Transportation

Year	Unassigned	Labour	Materials and Equipment	Other	Contingency	Annual	Cumulative
1	30,424	14,220	0	4,331	5,147	54,121	54,121
2	30,424	13,644	0	4,006	4,945	53,020	107,141
3	30,424	13,644	0	4,006	4,945	53,020	160,160
4	30,424	19,561	0	4,469	7,103	61,557	221,717
5	30,424	19,881	0	4,519	7,251	62,075	283,792
6	30,424	19,561	0	4,469	7,103	61,557	345,349
7	30,424	22,760	0	14,325	14,307	81,817	427,166
8	30,424	22,865	0	14,231	14,353	81,873	509,038
9	30,424	23,158	0	15,206	14,750	83,538	592,576
10	30,424	23,722	0	15,206	14,981	84,333	676,909
11	30,424	23,872	0	15,489	15,090	84,875	761,784
12	30,424	19,081	0	10,023	10,016	69,545	831,329
13	30,424	24,547	344	10,253	12,343	77,912	909,241
14	30,424	25,108	344	10,229	12,730	78,836	988,076
15	30,424	29,035	344	11,788	14,202	85,794	1,073,870
16	30,424	25,634	344	7,861	9,913	74,176	1,148,046
17	30,424	22,987	344	7,390	8,680	69,825	1,217,871
18	30,424	23,020	427	6,323	8,286	68,480	1,286,351
19	30,424	32,484	17,159	9,719	15,612	105,398	1,391,749
20	30,424	35,481	25,157	10,719	18,611	120,391	1,512,139
21	30,424	43,803	33,742	12,759	23,089	143,816	1,655,956
22	30,424	37,580	25,699	10,742	18,950	123,394	1,779,350
23	30,424	34,412	15,976	8,786	14,580	104,178	1,883,528
24	30,424	38,839	12,506	10,807	15,100	107,676	1,991,204
25	30,424	60,433	18,239	15,318	23,189	147,603	2,138,807
26	30,424	73,552	44,382	16,356	37,900	202,614	2,341,422
27	30,424	82,894	64,107	16,329	42,068	235,822	2,577,244
28	30,424	91,726	90,515	18,422	52,349	283,436	2,860,679
29	30,424	91,220	66,229	18,946	50,139	256,956	3,117,636
30	49,924	53,023	40,252	27,883	21,017	192,099	3,309,735
31	49,924	63,732	41,924	29,787	24,213	209,578	3,519,314
32	49,924	65,675	51,741	29,762	25,556	222,657	3,741,971
33	49,924	62,738	50,495	29,761	24,985	217,902	3,959,873
34	49,924	59,602	38,669	30,059	24,493	202,748	4,162,621
35	49,924	59,425	34,334	32,031	24,950	200,664	4,363,285
36	49,924	78,380	24,299	38,154	31,753	222,509	4,585,794
37	49,924	78,531	23,894	37,931	31,789	222,068	4,807,862
38	49,924	78,566	24,136	38,017	31,419	222,061	5,029,923
39	49,924	78,720	24,212	37,923	31,382	222,160	5,252,083
40	49,924	63,000	26,271	33,726	25,931	198,852	5,450,935
41	49,924	60,527	25,712	33,913	25,486	195,562	5,646,498
42	49,924	64,674	25,712	33,362	26,450	200,122	5,846,620

Year	Unassigned	Labour	Materials and Equipment	Other	Contingency	Annual	Cumulative
43	49,924	72,071	29,312	33,757	30,297	215,361	6,061,981
44	49,924	71,472	24,894	35,132	30,339	211,761	6,273,742
45	49,924	68,590	24,326	35,358	28,777	206,975	6,480,718
46	49,924	73,821	24,326	36,397	30,652	215,120	6,695,838
47	49,924	91,358	21,522	40,566	36,250	239,620	6,935,457
48	49,924	93,563	22,169	39,886	37,060	242,602	7,178,059
49	49,924	112,662	34,674	67,041	53,153	317,454	7,495,514
50	49,924	91,593	36,559	71,838	49,274	299,187	7,794,701
51	49,924	74,983	37,275	54,523	41,311	258,017	8,052,718
52	49,924	73,987	27,206	52,305	37,237	240,659	8,293,377
53	49,924	78,909	35,929	61,538	43,003	269,304	8,562,680
54	49,924	120,633	82,712	64,877	67,307	385,454	8,948,134
55	49,924	165,980	128,205	62,096	92,224	498,430	9,446,564
56	49,924	200,995	192,227	53,976	116,948	614,069	10,060,633
57	49,924	192,247	210,228	58,038	116,310	626,747	10,687,380
58	49,924	156,311	162,946	58,367	96,239	523,786	11,211,166
59	49,924	119,463	73,441	49,734	64,875	357,435	11,568,601
60	0	74,700	87,982	25,191	40,308	228,181	11,796,782
61	0	72,952	80,154	25,179	38,392	216,677	12,013,459
62	0	66,261	80,154	23,016	35,736	205,167	12,218,626
63	0	68,302	83,854	27,486	38,129	217,771	12,436,397
64	0	68,191	80,154	27,435	37,356	213,136	12,649,533
65	0	78,943	100,233	33,137	44,925	257,239	12,906,772
66	0	76,262	94,559	28,708	42,019	241,547	13,148,320
67	0	73,242	85,589	24,221	38,680	221,733	13,370,052
68	0	65,686	80,154	23,027	35,621	204,487	13,574,540
69	0	65,598	83,854	23,016	36,344	208,812	13,783,352
70	0	65,635	89,315	23,026	37,450	215,426	13,998,778
71	0	65,546	79,940	23,015	35,557	204,059	14,202,836
72	0	68,139	83,641	27,434	38,050	217,264	14,420,100
73	0	68,227	79,940	29,284	37,695	215,146	14,635,246
74	0	94,308	97,787	35,548	49,253	276,896	14,912,142
75	0	93,463	110,946	29,302	50,114	283,825	15,195,966
76	0	71,318	85,293	24,216	38,198	219,024	15,414,991
77	0	65,759	79,940	23,019	35,644	204,363	15,619,353
78	0	65,634	83,641	23,026	36,314	208,615	15,827,968
79	0	65,546	79,940	23,015	35,557	204,059	16,032,027
80	0	68,423	89,444	27,473	39,318	224,658	16,256,685
81	0	68,139	83,641	27,434	38,050	217,264	16,473,948
82	0	80,710	90,818	33,245	43,443	248,216	16,722,164
83	0	68,362	82,639	23,506	36,826	211,333	16,933,497
84	0	65,546	83,641	23,015	36,297	208,499	17,141,996
85	0	65,635	89,315	23,026	37,450	215,426	17,357,422
86	0	65,546	79,940	23,015	35,557	204,059	17,561,481
87	0	65,759	83,641	23,019	36,384	208,803	17,770,284
88	0	67,453	79,940	23,399	36,091	206,883	17,977,167

Year	Unassigned	Labour	Materials and Equipment	Other	Contingency	Annual	Cumulative
89	0	65,995	79,730	22,524	35,138	203,386	18,180,554
90	0	27,304	3,834	9,316	10,341	50,794	18,231,348
91	0	27,215	3,834	9,305	10,323	50,676	18,282,024
92	0	20,108	3,834	7,706	8,329	39,976	18,322,000
93	0	20,196	3,834	7,717	8,346	40,092	18,362,093
94	0	20,108	3,834	7,706	8,329	39,976	18,402,069
95	0	18,016	3,834	7,226	7,735	36,811	18,438,880
96	0	17,790	3,834	7,184	7,678	36,486	18,475,366
97	0	18,003	3,834	7,188	7,765	36,790	18,512,156
98	0	17,878	3,834	7,195	7,695	36,602	18,548,758
99	0	17,790	3,834	7,184	7,678	36,486	18,585,244
100	0	17,878	3,834	7,195	7,696	36,604	18,621,848
101	0	17,790	3,834	7,184	7,678	36,486	18,658,333
102	0	17,790	3,834	7,184	7,678	36,486	18,694,819
103	0	17,878	3,834	7,195	7,695	36,602	18,731,421
104	0	17,790	3,834	7,184	7,678	36,486	18,767,907
105	0	18,073	3,963	7,223	7,811	37,071	18,804,978
106	0	18,390	3,834	7,384	7,878	37,486	18,842,464
107	0	18,603	3,834	7,388	7,965	37,790	18,880,254
108	0	18,478	3,834	7,395	7,895	37,602	18,917,856
109	0	18,390	3,834	7,384	7,878	37,486	18,955,342
110	0	15,822	7,145	4,338	7,125	34,431	18,989,772
111	0	12,134	3,145	3,127	4,907	23,313	19,013,085
112	0	12,134	3,145	3,127	4,907	23,313	19,036,398
113	0	12,134	3,145	3,127	4,907	23,313	19,059,711
114	0	12,134	3,145	3,127	4,907	23,313	19,083,024
115	0	11,822	2,945	2,938	4,725	22,431	19,105,455
116	0	11,734	2,945	2,927	4,707	22,313	19,127,768
117	0	11,734	2,945	2,927	4,707	22,313	19,150,081
118	0	11,734	2,945	2,927	4,707	22,313	19,172,394
119	0	11,734	2,945	2,927	4,707	22,313	19,194,707
120	0	11,822	2,945	2,938	4,725	22,431	19,217,137
121	0	11,734	2,945	2,927	4,707	22,313	19,239,450
122	0	11,734	2,945	2,927	4,707	22,313	19,261,763
123	0	11,734	2,945	2,927	4,707	22,313	19,284,076
124	0	11,734	2,945	2,927	4,707	22,313	19,306,389
125	0	11,822	2,945	2,938	4,725	22,431	19,328,820
126	0	11,734	2,945	2,927	4,707	22,313	19,351,133
127	0	11,734	2,945	2,927	4,707	22,313	19,373,446
128	0	11,734	2,945	2,927	4,707	22,313	19,395,759
129	0	11,734	2,945	2,927	4,707	22,313	19,418,072
130	0	11,822	2,945	2,938	4,725	22,431	19,440,502
131	0	11,734	2,945	2,927	4,707	22,313	19,462,815
132	0	11,734	2,945	2,927	4,707	22,313	19,485,128
133	0	11,734	2,945	2,927	4,707	22,313	19,507,441
134	0	11,734	2,945	2,927	4,707	22,313	19,529,754

Year	Unassigned	Labour	Materials and Equipment	Other	Contingency	Annual	Cumulative
135	0	11,822	2,945	2,938	4,725	22,431	19,552,185
136	0	11,734	2,945	2,927	4,707	22,313	19,574,498
137	0	11,734	2,945	2,927	4,707	22,313	19,596,811
138	0	11,734	2,945	2,927	4,707	22,313	19,619,124
139	0	11,734	2,945	2,927	4,707	22,313	19,641,437
140	0	11,822	2,945	2,938	4,725	22,431	19,663,867
141	0	11,734	2,945	2,927	4,707	22,313	19,686,180
142	0	11,734	2,945	2,927	4,707	22,313	19,708,493
143	0	11,734	2,945	2,927	4,707	22,313	19,730,806
144	0	11,734	2,945	2,927	4,707	22,313	19,753,119
145	0	11,822	2,945	2,938	4,725	22,431	19,775,550
146	0	11,734	2,945	2,927	4,707	22,313	19,797,863
147	0	11,734	2,945	2,927	4,707	22,313	19,820,176
148	0	11,734	2,945	2,927	4,707	22,313	19,842,489
149	0	11,734	2,945	2,927	4,707	22,313	19,864,802
150	0	11,822	2,945	2,938	4,725	22,431	19,887,232
151	0	11,734	2,945	2,927	4,707	22,313	19,909,545
152	0	11,734	2,945	2,927	4,707	22,313	19,931,858
153	0	11,734	2,945	2,927	4,707	22,313	19,954,171
154	0	12,087	2,945	3,088	4,919	23,039	19,977,210
155	0	12,942	2,945	3,354	5,264	24,505	20,001,714
156	0	13,809	2,945	4,409	5,685	26,848	20,028,562
157	0	13,958	2,945	4,442	5,727	27,072	20,055,634
158	0	16,567	2,945	4,830	6,242	30,583	20,086,217
159	0	15,975	2,945	3,924	5,914	28,758	20,114,974
160	0	12,333	2,945	3,104	4,893	23,275	20,138,250
161	0	12,333	2,945	3,104	4,893	23,275	20,161,525
162	0	12,333	2,945	3,104	4,893	23,275	20,184,800
163	0	12,333	2,945	3,104	4,893	23,275	20,208,076
164	0	12,333	2,945	3,104	4,893	23,275	20,231,351
165	0	12,333	2,945	3,104	4,893	23,275	20,254,626
166	0	12,333	2,945	3,104	4,893	23,275	20,277,902
167	0	12,333	2,945	3,104	4,893	23,275	20,301,177
168	0	12,333	2,945	3,104	4,893	23,275	20,324,452
169	0	12,333	2,945	3,104	4,893	23,275	20,347,727
170	0	12,333	2,945	3,104	4,893	23,275	20,371,003
171	0	12,333	2,945	3,104	4,893	23,275	20,394,278
172	0	12,333	2,945	3,104	4,893	23,275	20,417,553
173	0	12,333	2,945	3,104	4,893	23,275	20,440,829
174	0	12,333	2,945	3,104	4,893	23,275	20,464,104
175	0	12,333	2,945	3,104	4,893	23,275	20,487,379
176	0	12,333	2,945	3,104	4,893	23,275	20,510,655
177	0	12,333	2,945	3,104	4,893	23,275	20,533,930
178	0	12,333	2,945	3,104	4,893	23,275	20,557,205
179	0	12,333	2,945	3,104	4,893	23,275	20,580,480
180	0	12,333	2,945	3,104	4,893	23,275	20,603,756

Year	Unassigned	Labour	Materials and Equipment	Other	Contingency	Annual	Cumulative
181	0	12,333	2,945	3,104	4,893	23,275	20,627,031
182	0	12,333	2,945	3,104	4,893	23,275	20,650,306
183	0	12,333	2,945	3,104	4,893	23,275	20,673,582
184	0	12,333	2,945	3,104	4,893	23,275	20,696,857
185	0	12,333	2,945	3,104	4,893	23,275	20,720,132
186	0	12,333	2,945	3,104	4,893	23,275	20,743,408
187	0	12,333	2,945	3,104	4,893	23,275	20,766,683
188	0	12,333	2,945	3,104	4,893	23,275	20,789,958
189	0	12,333	2,945	3,104	4,893	23,275	20,813,233
190	0	12,333	2,945	3,104	4,893	23,275	20,836,509
191	0	12,333	2,945	3,104	4,893	23,275	20,859,784
192	0	12,333	2,945	3,104	4,893	23,275	20,883,059
193	0	12,333	2,945	3,104	4,893	23,275	20,906,335
194	0	12,333	2,945	3,104	4,893	23,275	20,929,610
195	0	12,333	2,945	3,104	4,893	23,275	20,952,885
196	0	12,333	2,945	3,104	4,893	23,275	20,976,161
197	0	12,333	2,945	3,104	4,893	23,275	20,999,436
198	0	12,333	2,945	3,104	4,893	23,275	21,022,711
199	0	12,333	2,945	3,104	4,893	23,275	21,045,986
200	0	12,333	2,945	3,104	4,893	23,275	21,069,262
201	0	12,333	2,945	3,104	4,893	23,275	21,092,537
202	0	12,333	2,945	3,104	4,893	23,275	21,115,812
203	0	12,333	2,945	3,104	4,893	23,275	21,139,088
204	0	12,333	2,945	3,104	4,893	23,275	21,162,363
205	0	12,333	2,945	3,104	4,893	23,275	21,185,638
206	0	12,333	2,945	3,104	4,893	23,275	21,208,914
207	0	12,333	2,945	3,104	4,893	23,275	21,232,189
208	0	12,333	2,945	3,104	4,893	23,275	21,255,464
209	0	12,333	2,945	3,104	4,893	23,275	21,278,739
210	0	12,333	2,945	3,104	4,893	23,275	21,302,015
211	0	12,333	2,945	3,104	4,893	23,275	21,325,290
212	0	12,333	2,945	3,104	4,893	23,275	21,348,565
213	0	12,333	2,945	3,104	4,893	23,275	21,371,841
214	0	12,333	2,945	3,104	4,893	23,275	21,395,116
215	0	12,333	2,945	3,104	4,893	23,275	21,418,391
216	0	12,333	2,945	3,104	4,893	23,275	21,441,667
217	0	12,333	2,945	3,104	4,893	23,275	21,464,942
218	0	12,333	2,945	3,104	4,893	23,275	21,488,217
219	0	12,333	2,945	3,104	4,893	23,275	21,511,492
220	0	12,333	2,945	3,104	4,893	23,275	21,534,768
221	0	12,333	2,945	3,104	4,893	23,275	21,558,043
222	0	12,333	2,945	3,104	4,893	23,275	21,581,318
223	0	12,333	2,945	3,104	4,893	23,275	21,604,594
224	0	12,333	2,945	3,104	4,893	23,275	21,627,869
225	0	12,333	2,945	3,104	4,893	23,275	21,651,144
226	0	12,333	2,945	3,104	4,893	23,275	21,674,420

Year	Unassigned	Labour	Materials and Equipment	Other	Contingency	Annual	Cumulative
227	0	12,333	2,945	3,104	4,893	23,275	21,697,695
228	0	12,333	2,945	3,104	4,893	23,275	21,720,970
229	0	12,333	2,945	3,104	4,893	23,275	21,744,245
230	0	12,333	2,945	3,104	4,893	23,275	21,767,521
231	0	12,333	2,945	3,104	4,893	23,275	21,790,796
232	0	12,333	2,945	3,104	4,893	23,275	21,814,071
233	0	12,333	2,945	3,104	4,893	23,275	21,837,347
234	0	12,333	2,945	3,104	4,893	23,275	21,860,622
235	0	12,333	2,945	3,104	4,893	23,275	21,883,897
236	0	12,333	2,945	3,104	4,893	23,275	21,907,173
237	0	12,333	2,945	3,104	4,893	23,275	21,930,448
238	0	12,333	2,945	3,104	4,893	23,275	21,953,723
239	0	12,333	2,945	3,104	4,893	23,275	21,976,998
240	0	12,333	2,945	3,104	4,893	23,275	22,000,274
241	0	12,333	2,945	3,104	4,893	23,275	22,023,549
242	0	12,333	2,945	3,104	4,893	23,275	22,046,824
243	0	12,333	2,945	3,104	4,893	23,275	22,070,100
244	0	12,333	2,945	3,104	4,893	23,275	22,093,375
245	0	12,333	2,945	3,104	4,893	23,275	22,116,650
246	0	12,333	2,945	3,104	4,893	23,275	22,139,926
247	0	12,333	2,945	3,104	4,893	23,275	22,163,201
248	0	12,333	2,945	3,104	4,893	23,275	22,186,476
249	0	12,333	2,945	3,104	4,893	23,275	22,209,751
250	0	12,333	2,945	3,104	4,893	23,275	22,233,027
251	0	12,333	2,945	3,104	4,893	23,275	22,256,302
252	0	12,333	2,945	3,104	4,893	23,275	22,279,577
253	0	12,333	2,945	3,104	4,893	23,275	22,302,853
254	0	12,333	2,945	3,104	4,893	23,275	22,326,128
255	0	12,333	2,945	3,104	4,893	23,275	22,349,403
256	0	12,333	2,945	3,104	4,893	23,275	22,372,679
257	0	12,333	2,945	3,104	4,893	23,275	22,395,954
258	0	12,333	2,945	3,104	4,893	23,275	22,419,229
259	0	12,333	2,945	3,104	4,893	23,275	22,442,504
260	0	12,333	2,945	3,104	4,893	23,275	22,465,780
261	0	12,333	2,945	3,104	4,893	23,275	22,489,055
262	0	12,333	2,945	3,104	4,893	23,275	22,512,330
263	0	12,333	2,945	3,104	4,893	23,275	22,535,606
264	0	12,333	2,945	3,104	4,893	23,275	22,558,881
265	0	12,333	2,945	3,104	4,893	23,275	22,582,156
266	0	12,333	2,945	3,104	4,893	23,275	22,605,432
267	0	12,333	2,945	3,104	4,893	23,275	22,628,707
268	0	12,333	2,945	3,104	4,893	23,275	22,651,982
269	0	12,333	2,945	3,104	4,893	23,275	22,675,257
270	0	12,333	2,945	3,104	4,893	23,275	22,698,533
271	0	12,333	2,945	3,104	4,893	23,275	22,721,808
272	0	12,333	2,945	3,104	4,893	23,275	22,745,083

Year	Unassigned	Labour	Materials and Equipment	Other	Contingency	Annual	Cumulative
273	0	12,333	2,945	3,104	4,893	23,275	22,768,359
274	0	12,333	2,945	3,104	4,893	23,275	22,791,634
275	0	12,333	2,945	3,104	4,893	23,275	22,814,909
276	0	12,333	2,945	3,104	4,893	23,275	22,838,185
277	0	12,333	2,945	3,104	4,893	23,275	22,861,460
278	0	12,333	2,945	3,104	4,893	23,275	22,884,735
279	0	12,333	2,945	3,104	4,893	23,275	22,908,010
280	0	12,333	2,945	3,104	4,893	23,275	22,931,286
281	0	12,333	2,945	3,104	4,893	23,275	22,954,561
282	0	12,333	2,945	3,104	4,893	23,275	22,977,836
283	0	12,333	2,945	3,104	4,893	23,275	23,001,112
284	0	12,333	2,945	3,104	4,893	23,275	23,024,387
285	0	12,333	2,945	3,104	4,893	23,275	23,047,662
286	0	12,333	2,945	3,104	4,893	23,275	23,070,938
287	0	12,333	2,945	3,104	4,893	23,275	23,094,213
288	0	12,333	2,945	3,104	4,893	23,275	23,117,488
289	0	12,333	2,945	3,104	4,893	23,275	23,140,763
290	0	12,333	2,945	3,104	4,893	23,275	23,164,039
291	0	12,333	2,945	3,104	4,893	23,275	23,187,314
292	0	12,333	2,945	3,104	4,893	23,275	23,210,589
293	0	12,333	2,945	3,104	4,893	23,275	23,233,865
294	0	12,333	2,945	3,104	4,893	23,275	23,257,140
295	0	12,333	2,945	3,104	4,893	23,275	23,280,415
296	0	12,333	2,945	3,104	4,893	23,275	23,303,691
297	0	12,333	2,945	3,104	4,893	23,275	23,326,966
298	0	12,333	2,945	3,104	4,893	23,275	23,350,241
299	0	12,333	2,945	3,104	4,893	23,275	23,373,516
300	0	12,333	2,945	3,104	4,893	23,275	23,396,792
301	0	34,985	22,437	4,597	18,258	80,277	23,477,069
302	0	41,204	23,051	12,656	22,750	99,661	23,576,729
303	0	41,151	23,124	12,736	22,937	99,947	23,676,677
304	0	38,930	22,955	12,326	22,154	96,365	23,773,041
305	0	36,398	23,501	9,293	20,649	89,841	23,862,882
306	0	36,964	23,561	9,407	20,871	90,802	23,953,685
307	0	28,596	13,855	9,442	14,642	66,535	24,020,219
308	0	31,855	13,523	9,393	15,518	70,289	24,090,508
309	0	31,289	13,463	9,280	15,296	69,327	24,159,836
310	0	25,297	7,956	5,619	10,748	49,621	24,209,456
311	0	15,263	7,174	2,590	7,022	32,049	24,241,505
312	0	7,674	2,108	1,223	2,958	13,962	24,255,467
313	0	3,584	1,162	1,080	1,811	7,637	24,263,104
314	0	3,584	1,162	1,080	1,811	7,637	24,270,741
315	0	3,584	1,162	1,080	1,811	7,637	24,278,378
316	0	3,584	1,162	1,080	1,811	7,637	24,286,014
317	0	3,673	1,162	1,091	1,829	7,754	24,293,769
318	0	3,584	1,162	1,080	1,811	7,637	24,301,405

Year	Unassigned	Labour	Materials and Equipment	Other	Contingency	Annual	Cumulative
319	0	3,584	1,162	1,080	1,811	7,637	24,309,042
320	0	3,584	1,162	1,080	1,811	7,637	24,316,679
321	0	3,584	1,162	1,080	1,811	7,637	24,324,315
322	0	3,938	1,372	1,127	1,933	8,370	24,332,685
323	0	3,938	1,372	1,127	1,933	8,370	24,341,055
324	0	3,938	1,372	1,127	1,933	8,370	24,349,425
325	0	4,039	1,372	1,112	2,025	8,549	24,357,974
326	0	25,100	5,750	6,890	6,890	44,630	24,402,604

APPENDIX B: ESTIMATED ALTERNATIVE IMPLEMENTATION SCENARIO COSTS

Contents:

Figure B-1: Preliminary Annual Cash Flow, Alternative Implementation Scenario Facility

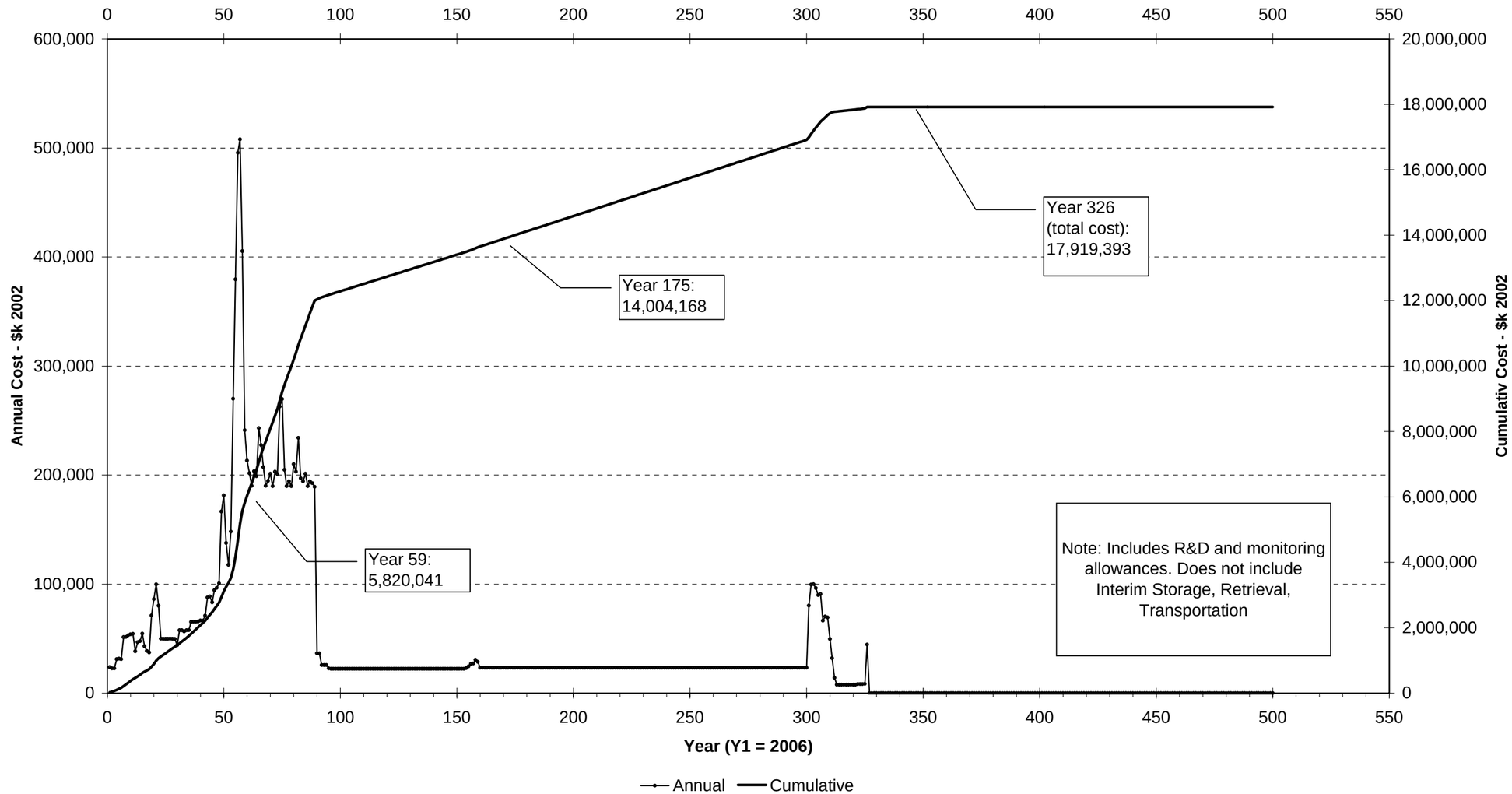

Figure B-2: Preliminary Annual Cash Flow, Alternative Implementation Scenario Facility Including Allowances for Interim Storage, Retrieval and Transportation

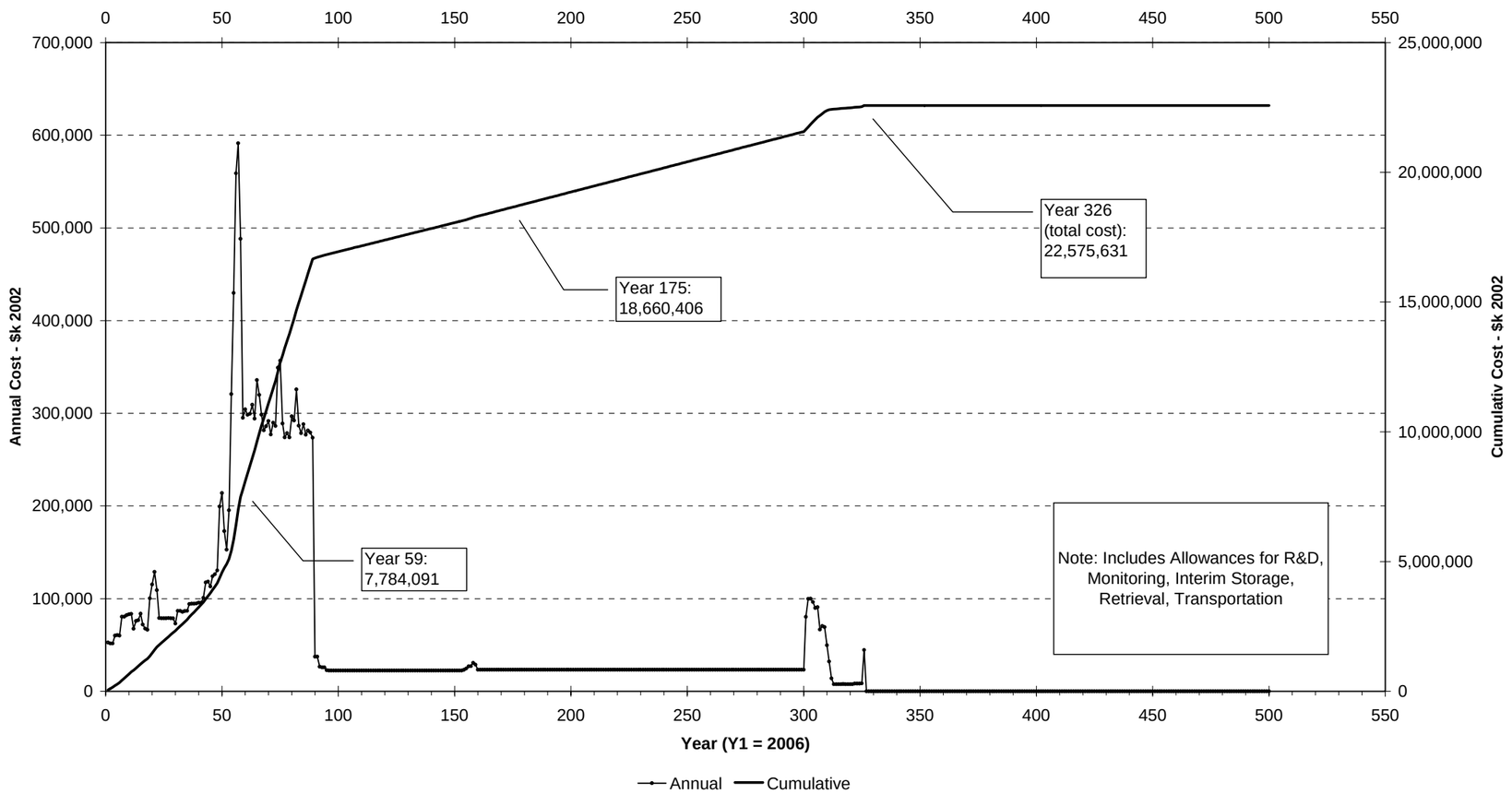

Table B-1: Alternative Implementation Scenario Cost Components by Work Breakdown Structure Number

WBS		Activity	Previous (CTECH) WBS		Original Total	New Total	Difference	Percent	Comments
610	115	Siting	550	15	396,844	396,844	0	0%	
610	120	Phase I System Development (Caverns)	564	20	89,338	58,098	-31,240	-35%	Abort after year 20 (no-go decision)
610	125	Phase I Safety Assessment	564	25	37,271	20,271	-17,000	-46%	Aborted after year 29 (610 225 starts in year 30)
610	130	Phase I Licencing and Approvals	564	30	205,824	32,085	-173,739	-84%	Aborted after year 29 (610 230 starts in year 30)
610	135	Phase I Public Affairs (note 1)	550	35	106,945	106,945	0	0%	
610	140	Cavern Storage Design and Construct	564	40	536,468	0	-536,468	-100%	Starts year 25 - completely aborted
610	145	Cavern Storage Operations	564	45	12,431,365	0	-12,431,365	-100%	Starts year 30 - completely aborted
610	155	Cavern Storage EA and Monitoring	564	55	530,341	30,678	-499,663	-94%	Aborted after year 29 (610 255 starts in year 30)
610	160	Cavern Plug and Flood	n/a - new allowance			0	0	na	Completely aborted
610	190	Cavern Program Management (note 1)	550	90	285,044	285,044	0	0%	
610	195	URL Construct and Operate	n/a - new allowance			1,380,000	1,380,000	na	Preliminary
610	220	Phase II System Development (Isolation)	550	20	411,191	411,191	0	0%	
610	225	Phase II Safety Assessment	550	25	687,190	1,104,371	417,181	61%	Extended duration
610	230	Phase II Licencing and Approvals	550	30	120,421	182,660	62,239	52%	Extended duration
610	235	Phase II Public Affairs (note 2)	550	35	106,945	106,945	0	0%	
610	240	Isolation Design and Construct	550	40	2,381,931	2,381,931	0	0%	
610	245	Isolation Operations	550	45	7,208,354	9,793,927	2,585,573	36%	Extended duration
610	255	Isolation EA and Monitoring	550	55	236,142	457,904	221,762	94%	Extended duration
610	260	Isolation Decommission and Closure	550	60	840,825	840,825	0	0%	
610	290	Isolation Program Management (note 2)	550	90	285,044	285,044	0	0%	
610	310	Post-Closure Monitoring	n/a - new allowance			44,630	44,630		Preliminary
			sum ($k 2002)		*26,897,483*	*17,919,393*			

Note 1: Previously included in 610 145 after Y29; now one-year gap in public affairs and program management coverage (year 30) before 610 235 and 610 290 begin (year 31)
Note 2: Included in 610 245 after Y60
General Note: All Costs in Constant $k 2002 (Canadian)

Table B-2: Preliminary Annual Cash Flow ($k 2002), Alternative Implementation Scenario Facility

Year	Labour	Equipment & Materials	Other	Contingency
1	14,220	0	4,331	5,147
2	13,644	0	4,006	4,945
3	13,644	0	4,006	4,945
4	19,561	0	4,469	7,103
5	19,881	0	4,519	7,251
6	19,561	0	4,469	7,103
7	22,760	0	14,325	14,307
8	22,865	0	14,231	14,353
9	23,158	0	15,206	14,750
10	23,722	0	15,206	14,981
11	23,872	0	15,489	15,090
12	18,652	0	9,933	9,805
13	24,118	344	10,163	12,132
14	24,679	344	10,139	12,519
15	28,606	344	11,698	13,991
16	25,205	344	7,781	9,704
17	22,558	344	7,310	8,471
18	22,591	427	6,243	8,077
19	30,612	16,427	9,467	14,732
20	33,612	24,427	10,467	17,732
21	35,601	32,083	12,277	19,844
22	29,814	24,083	10,281	15,931
23	21,689	10,083	8,288	9,861
24	23,601	6,083	10,277	9,844
25	23,601	6,083	10,277	9,844
26	23,601	6,083	10,277	9,844
27	23,777	6,083	10,250	9,918
28	23,652	6,083	10,257	9,848
29	23,564	6,083	10,246	9,831
30	19,206	7,884	7,499	9,394
31	28,320	7,884	9,111	12,377
32	28,320	7,884	9,111	12,377
33	27,267	7,884	9,119	12,383
34	27,601	7,884	9,452	12,717
35	27,632	7,884	9,557	12,758
36	32,060	7,884	10,786	14,502
37	32,444	7,884	10,702	14,552
38	32,444	7,884	10,702	14,552
39	32,700	7,884	10,586	14,518
40	33,351	7,884	10,634	14,727
41	33,139	7,884	10,721	14,681
42	36,306	7,884	11,343	15,586
43	44,506	11,484	11,558	20,187

Year	Labour	Equipment & Materials	Other	Contingency
44	44,291	11,484	12,378	20,473
45	41,301	10,916	12,205	18,897
46	47,905	10,916	14,469	21,059
47	49,949	11,170	14,182	21,300
48	52,612	11,817	13,843	22,370
49	66,472	23,869	39,539	36,659
50	65,158	26,364	50,215	39,542
51	47,530	25,982	32,869	31,248
52	45,637	14,505	30,682	26,845
53	51,358	24,108	39,905	32,836
54	95,135	73,715	43,255	57,855
55	137,431	119,071	40,491	82,521
56	172,643	183,203	32,430	107,349
57	163,656	201,206	36,488	106,611
58	128,068	153,949	36,846	86,600
59	93,004	64,375	28,718	55,134
60	67,981	87,093	20,934	37,204
61	66,233	79,265	20,922	35,289
62	59,542	79,265	18,759	32,633
63	62,158	82,965	23,218	35,141
64	62,135	79,265	23,178	34,385
65	72,887	99,344	28,880	41,954
66	70,206	93,670	24,451	39,048
67	66,973	84,700	19,960	35,622
68	59,542	79,265	18,759	32,633
69	59,542	82,965	18,759	33,373
70	59,579	88,426	18,769	34,479
71	59,490	79,051	18,758	32,586
72	62,083	82,752	23,177	35,079
73	62,083	79,051	25,016	34,707
74	88,252	96,898	31,291	46,282
75	87,407	110,057	25,045	47,143
76	65,262	84,404	19,959	35,227
77	59,490	79,051	18,758	32,586
78	59,490	82,752	18,758	33,326
79	59,490	79,051	18,758	32,586
80	62,172	88,426	23,188	36,232
81	62,083	82,752	23,177	35,079
82	74,654	89,929	28,988	40,472
83	62,218	81,750	19,238	33,838
84	59,490	82,752	18,758	33,326
85	59,579	88,426	18,769	34,479
86	59,490	79,051	18,758	32,586
87	59,490	82,752	18,758	33,326
88	61,309	79,051	19,131	33,103
89	59,939	78,841	18,267	32,167

Year	Labour	Equipment & Materials	Other	Contingency
90	21,248	2,945	5,059	7,370
91	21,159	2,945	5,048	7,352
92	14,052	2,945	3,449	5,358
93	14,052	2,945	3,449	5,358
94	14,052	2,945	3,449	5,358
95	11,960	2,945	2,969	4,764
96	11,734	2,945	2,927	4,707
97	11,734	2,945	2,927	4,707
98	11,734	2,945	2,927	4,707
99	11,734	2,945	2,927	4,707
100	11,822	2,945	2,938	4,725
101	11,734	2,945	2,927	4,707
102	11,734	2,945	2,927	4,707
103	11,734	2,945	2,927	4,707
104	11,734	2,945	2,927	4,707
105	11,822	2,945	2,938	4,725
106	11,734	2,945	2,927	4,707
107	11,734	2,945	2,927	4,707
108	11,734	2,945	2,927	4,707
109	11,734	2,945	2,927	4,707
110	11,822	2,945	2,938	4,725
111	11,734	2,945	2,927	4,707
112	11,734	2,945	2,927	4,707
113	11,734	2,945	2,927	4,707
114	11,734	2,945	2,927	4,707
115	11,822	2,945	2,938	4,725
116	11,734	2,945	2,927	4,707
117	11,734	2,945	2,927	4,707
118	11,734	2,945	2,927	4,707
119	11,734	2,945	2,927	4,707
120	11,822	2,945	2,938	4,725
121	11,734	2,945	2,927	4,707
122	11,734	2,945	2,927	4,707
123	11,734	2,945	2,927	4,707
124	11,734	2,945	2,927	4,707
125	11,822	2,945	2,938	4,725
126	11,734	2,945	2,927	4,707
127	11,734	2,945	2,927	4,707
128	11,734	2,945	2,927	4,707
129	11,734	2,945	2,927	4,707
130	11,822	2,945	2,938	4,725
131	11,734	2,945	2,927	4,707
132	11,734	2,945	2,927	4,707
133	11,734	2,945	2,927	4,707
134	11,734	2,945	2,927	4,707
135	11,822	2,945	2,938	4,725

Year	Labour	Equipment & Materials	Other	Contingency
136	11,734	2,945	2,927	4,707
137	11,734	2,945	2,927	4,707
138	11,734	2,945	2,927	4,707
139	11,734	2,945	2,927	4,707
140	11,822	2,945	2,938	4,725
141	11,734	2,945	2,927	4,707
142	11,734	2,945	2,927	4,707
143	11,734	2,945	2,927	4,707
144	11,734	2,945	2,927	4,707
145	11,822	2,945	2,938	4,725
146	11,734	2,945	2,927	4,707
147	11,734	2,945	2,927	4,707
148	11,734	2,945	2,927	4,707
149	11,734	2,945	2,927	4,707
150	11,822	2,945	2,938	4,725
151	11,734	2,945	2,927	4,707
152	11,734	2,945	2,927	4,707
153	11,734	2,945	2,927	4,707
154	12,087	2,945	3,088	4,919
155	12,942	2,945	3,354	5,264
156	13,809	2,945	4,409	5,685
157	13,958	2,945	4,442	5,727
158	16,567	2,945	4,830	6,242
159	15,975	2,945	3,924	5,914
160	12,333	2,945	3,104	4,893
161	12,333	2,945	3,104	4,893
162	12,333	2,945	3,104	4,893
163	12,333	2,945	3,104	4,893
164	12,333	2,945	3,104	4,893
165	12,333	2,945	3,104	4,893
166	12,333	2,945	3,104	4,893
167	12,333	2,945	3,104	4,893
168	12,333	2,945	3,104	4,893
169	12,333	2,945	3,104	4,893
170	12,333	2,945	3,104	4,893
171	12,333	2,945	3,104	4,893
172	12,333	2,945	3,104	4,893
173	12,333	2,945	3,104	4,893
174	12,333	2,945	3,104	4,893
175	12,333	2,945	3,104	4,893
176	12,333	2,945	3,104	4,893
177	12,333	2,945	3,104	4,893
178	12,333	2,945	3,104	4,893
179	12,333	2,945	3,104	4,893
180	12,333	2,945	3,104	4,893
181	12,333	2,945	3,104	4,893

Year	Labour	Equipment & Materials	Other	Contingency
182	12,333	2,945	3,104	4,893
183	12,333	2,945	3,104	4,893
184	12,333	2,945	3,104	4,893
185	12,333	2,945	3,104	4,893
186	12,333	2,945	3,104	4,893
187	12,333	2,945	3,104	4,893
188	12,333	2,945	3,104	4,893
189	12,333	2,945	3,104	4,893
190	12,333	2,945	3,104	4,893
191	12,333	2,945	3,104	4,893
192	12,333	2,945	3,104	4,893
193	12,333	2,945	3,104	4,893
194	12,333	2,945	3,104	4,893
195	12,333	2,945	3,104	4,893
196	12,333	2,945	3,104	4,893
197	12,333	2,945	3,104	4,893
198	12,333	2,945	3,104	4,893
199	12,333	2,945	3,104	4,893
200	12,333	2,945	3,104	4,893
201	12,333	2,945	3,104	4,893
202	12,333	2,945	3,104	4,893
203	12,333	2,945	3,104	4,893
204	12,333	2,945	3,104	4,893
205	12,333	2,945	3,104	4,893
206	12,333	2,945	3,104	4,893
207	12,333	2,945	3,104	4,893
208	12,333	2,945	3,104	4,893
209	12,333	2,945	3,104	4,893
210	12,333	2,945	3,104	4,893
211	12,333	2,945	3,104	4,893
212	12,333	2,945	3,104	4,893
213	12,333	2,945	3,104	4,893
214	12,333	2,945	3,104	4,893
215	12,333	2,945	3,104	4,893
216	12,333	2,945	3,104	4,893
217	12,333	2,945	3,104	4,893
218	12,333	2,945	3,104	4,893
219	12,333	2,945	3,104	4,893
220	12,333	2,945	3,104	4,893
221	12,333	2,945	3,104	4,893
222	12,333	2,945	3,104	4,893
223	12,333	2,945	3,104	4,893
224	12,333	2,945	3,104	4,893
225	12,333	2,945	3,104	4,893
226	12,333	2,945	3,104	4,893
227	12,333	2,945	3,104	4,893

Year	Labour	Equipment & Materials	Other	Contingency
228	12,333	2,945	3,104	4,893
229	12,333	2,945	3,104	4,893
230	12,333	2,945	3,104	4,893
231	12,333	2,945	3,104	4,893
232	12,333	2,945	3,104	4,893
233	12,333	2,945	3,104	4,893
234	12,333	2,945	3,104	4,893
235	12,333	2,945	3,104	4,893
236	12,333	2,945	3,104	4,893
237	12,333	2,945	3,104	4,893
238	12,333	2,945	3,104	4,893
239	12,333	2,945	3,104	4,893
240	12,333	2,945	3,104	4,893
241	12,333	2,945	3,104	4,893
242	12,333	2,945	3,104	4,893
243	12,333	2,945	3,104	4,893
244	12,333	2,945	3,104	4,893
245	12,333	2,945	3,104	4,893
246	12,333	2,945	3,104	4,893
247	12,333	2,945	3,104	4,893
248	12,333	2,945	3,104	4,893
249	12,333	2,945	3,104	4,893
250	12,333	2,945	3,104	4,893
251	12,333	2,945	3,104	4,893
252	12,333	2,945	3,104	4,893
253	12,333	2,945	3,104	4,893
254	12,333	2,945	3,104	4,893
255	12,333	2,945	3,104	4,893
256	12,333	2,945	3,104	4,893
257	12,333	2,945	3,104	4,893
258	12,333	2,945	3,104	4,893
259	12,333	2,945	3,104	4,893
260	12,333	2,945	3,104	4,893
261	12,333	2,945	3,104	4,893
262	12,333	2,945	3,104	4,893
263	12,333	2,945	3,104	4,893
264	12,333	2,945	3,104	4,893
265	12,333	2,945	3,104	4,893
266	12,333	2,945	3,104	4,893
267	12,333	2,945	3,104	4,893
268	12,333	2,945	3,104	4,893
269	12,333	2,945	3,104	4,893
270	12,333	2,945	3,104	4,893
271	12,333	2,945	3,104	4,893
272	12,333	2,945	3,104	4,893
273	12,333	2,945	3,104	4,893

Year	Labour	Equipment & Materials	Other	Contingency
274	12,333	2,945	3,104	4,893
275	12,333	2,945	3,104	4,893
276	12,333	2,945	3,104	4,893
277	12,333	2,945	3,104	4,893
278	12,333	2,945	3,104	4,893
279	12,333	2,945	3,104	4,893
280	12,333	2,945	3,104	4,893
281	12,333	2,945	3,104	4,893
282	12,333	2,945	3,104	4,893
283	12,333	2,945	3,104	4,893
284	12,333	2,945	3,104	4,893
285	12,333	2,945	3,104	4,893
286	12,333	2,945	3,104	4,893
287	12,333	2,945	3,104	4,893
288	12,333	2,945	3,104	4,893
289	12,333	2,945	3,104	4,893
290	12,333	2,945	3,104	4,893
291	12,333	2,945	3,104	4,893
292	12,333	2,945	3,104	4,893
293	12,333	2,945	3,104	4,893
294	12,333	2,945	3,104	4,893
295	12,333	2,945	3,104	4,893
296	12,333	2,945	3,104	4,893
297	12,333	2,945	3,104	4,893
298	12,333	2,945	3,104	4,893
299	12,333	2,945	3,104	4,893
300	12,333	2,945	3,104	4,893
301	34,985	22,437	4,597	18,258
302	41,204	23,051	12,656	22,750
303	41,151	23,124	12,736	22,937
304	38,930	22,955	12,326	22,154
305	36,398	23,501	9,293	20,649
306	36,964	23,561	9,407	20,871
307	28,596	13,855	9,442	14,642
308	31,855	13,523	9,393	15,518
309	31,289	13,463	9,280	15,296
310	25,297	7,956	5,619	10,748
311	15,263	7,174	2,590	7,022
312	7,674	2,108	1,223	2,958
313	3,584	1,162	1,080	1,811
314	3,584	1,162	1,080	1,811
315	3,584	1,162	1,080	1,811
316	3,584	1,162	1,080	1,811
317	3,673	1,162	1,091	1,829
318	3,584	1,162	1,080	1,811
319	3,584	1,162	1,080	1,811

Year	Labour	Equipment & Materials	Other	Contingency
320	3,584	1,162	1,080	1,811
321	3,584	1,162	1,080	1,811
322	3,938	1,372	1,127	1,933
323	3,938	1,372	1,127	1,933
324	3,938	1,372	1,127	1,933
325	4,039	1,372	1,112	2,025
326	25,100	5,750	6,890	6,890

Table B-3: Preliminary Annual Cash Flow ($k 2002), Alternative Implementation Scenario Including Interim Storage, Retrieval and Transportation

Year	Unassigned	Labour	Equipment & Materials	Other	Contingency	Annual	Cumulative
1	28,991	14,220	0	4,331	5,147	52,688	52,688
2	28,991	13,644	0	4,006	4,945	51,587	104,275
3	28,991	13,644	0	4,006	4,945	51,587	155,861
4	28,991	19,561	0	4,469	7,103	60,124	215,985
5	28,991	19,881	0	4,519	7,251	60,642	276,627
6	28,991	19,561	0	4,469	7,103	60,124	336,751
7	28,991	22,760	0	14,325	14,307	80,384	417,134
8	28,991	22,865	0	14,231	14,353	80,439	497,574
9	28,991	23,158	0	15,206	14,750	82,105	579,679
10	28,991	23,722	0	15,206	14,981	82,900	662,579
11	28,991	23,872	0	15,489	15,090	83,442	746,021
12	28,991	18,652	0	9,933	9,805	67,381	813,402
13	28,991	24,118	344	10,163	12,132	75,748	889,150
14	28,991	24,679	344	10,139	12,519	76,672	965,821
15	28,991	28,606	344	11,698	13,991	83,630	1,049,451
16	28,991	25,205	344	7,781	9,704	72,025	1,121,476
17	28,991	22,558	344	7,310	8,471	67,674	1,189,150
18	28,991	22,591	427	6,243	8,077	66,329	1,255,479
19	28,991	30,612	16,427	9,467	14,732	100,229	1,355,708
20	28,991	33,612	24,427	10,467	17,732	115,229	1,470,937
21	28,991	35,601	32,083	12,277	19,844	128,796	1,599,734
22	28,991	29,814	24,083	10,281	15,931	109,100	1,708,834
23	28,991	21,689	10,083	8,288	9,861	78,912	1,787,746
24	28,991	23,601	6,083	10,277	9,844	78,796	1,866,542
25	28,991	23,601	6,083	10,277	9,844	78,796	1,945,338
26	28,991	23,601	6,083	10,277	9,844	78,796	2,024,134
27	28,991	23,777	6,083	10,250	9,918	79,018	2,103,152
28	28,991	23,652	6,083	10,257	9,848	78,830	2,181,981
29	28,991	23,564	6,083	10,246	9,831	78,714	2,260,695
30	28,991	19,206	7,884	7,499	9,394	72,973	2,333,668
31	28,991	28,320	7,884	9,111	12,377	86,682	2,420,351
32	28,991	28,320	7,884	9,111	12,377	86,682	2,507,033
33	28,991	27,267	7,884	9,119	12,383	85,644	2,592,677
34	28,991	27,601	7,884	9,452	12,717	86,645	2,679,322
35	28,991	27,632	7,884	9,557	12,758	86,822	2,766,144
36	28,991	32,060	7,884	10,786	14,502	94,223	2,860,367
37	28,991	32,444	7,884	10,702	14,552	94,573	2,954,940
38	28,991	32,444	7,884	10,702	14,552	94,573	3,049,513
39	28,991	32,700	7,884	10,586	14,518	94,679	3,144,192
40	28,991	33,351	7,884	10,634	14,727	95,587	3,239,779

Year	Unassigned	Labour	Equipment & Materials	Other	Contingency	Annual	Cumulative
41	28,991	33,139	7,884	10,721	14,681	95,416	3,335,195
42	28,991	36,735	7,884	11,433	15,797	100,840	3,436,034
43	28,991	44,935	11,484	11,648	20,399	117,456	3,553,491
44	28,991	44,720	11,484	12,468	20,685	118,348	3,671,838
45	28,991	41,731	10,916	12,295	19,108	113,040	3,784,879
46	28,991	48,335	10,916	14,549	21,267	124,057	3,908,936
47	28,991	50,378	11,170	14,262	21,509	126,309	4,035,245
48	28,991	53,041	11,817	13,923	22,578	130,351	4,165,596
49	28,991	68,344	24,601	39,791	37,538	199,264	4,364,860
50	28,991	67,027	27,094	50,467	40,420	213,998	4,578,858
51	28,991	50,999	27,297	33,131	32,387	172,804	4,751,662
52	28,991	49,105	15,820	30,944	27,984	152,844	4,904,506
53	28,991	60,507	29,700	40,233	35,892	195,324	5,099,830
54	28,991	106,800	79,837	43,616	61,448	320,692	5,420,522
55	28,991	147,657	126,217	40,853	86,133	429,850	5,850,372
56	28,991	184,170	200,860	32,791	112,199	559,011	6,409,383
57	28,991	177,851	234,214	36,850	113,533	591,438	7,000,821
58	28,991	142,065	186,537	37,207	93,430	488,230	7,489,051
59	28,991	105,548	72,408	29,030	59,064	295,040	7,784,091
60	59,810	82,339	90,104	30,867	41,156	304,276	8,088,367
61	59,810	82,894	84,433	31,253	39,876	298,266	8,386,633
62	59,810	77,904	94,250	29,062	38,462	299,488	8,686,121
63	59,810	78,734	96,705	33,504	40,449	309,202	8,995,322
64	59,810	76,167	85,597	33,440	39,101	294,115	9,289,438
65	59,810	86,682	101,342	41,010	47,072	335,915	9,625,353
66	59,810	84,173	95,022	36,653	44,051	319,708	9,945,061
67	59,810	80,466	85,647	32,021	40,509	298,452	10,243,513
68	59,810	73,166	80,453	30,898	37,205	281,532	10,525,045
69	59,810	73,121	84,227	30,931	37,945	286,034	10,811,079
70	59,810	72,388	88,986	31,516	38,886	291,586	11,102,665
71	59,810	70,009	79,051	31,605	36,581	277,056	11,379,721
72	59,810	73,341	82,752	34,847	39,032	289,782	11,669,502
73	59,810	72,635	79,051	36,859	37,961	286,315	11,955,818
74	59,810	99,343	96,898	43,700	49,527	349,278	12,305,096
75	59,810	98,578	110,057	37,853	50,388	356,686	12,661,782
76	59,810	75,031	84,404	31,543	38,171	288,958	12,950,740
77	59,810	69,286	79,051	30,373	35,538	274,058	13,224,798
78	59,810	69,259	82,752	30,342	36,270	278,433	13,503,231
79	59,810	69,259	79,051	30,342	35,530	273,992	13,777,223
80	59,810	72,991	89,625	34,772	39,513	296,710	14,073,933
81	59,810	73,892	85,049	34,792	38,678	292,220	14,366,154
82	59,810	87,331	93,633	40,572	44,384	325,730	14,691,883
83	59,810	73,980	84,574	30,822	37,494	286,681	14,978,564

Year	Unassigned	Labour	Equipment & Materials	Other	Contingency	Annual	Cumulative
84	59,810	69,259	82,752	30,342	36,270	278,433	15,256,997
85	59,810	72,175	88,434	30,307	37,545	288,272	15,545,268
86	59,810	72,056	79,079	30,265	35,647	276,856	15,822,125
87	59,810	72,055	82,777	30,265	36,387	281,293	16,103,418
88	59,810	73,621	79,051	30,601	36,160	279,244	16,382,661
89	59,810	70,423	78,841	29,218	35,240	273,531	16,656,193
90	0	21,911	2,945	5,059	7,502	37,417	16,693,609
91	0	21,822	2,945	5,048	7,484	37,299	16,730,908
92	0	14,715	2,945	3,449	5,490	26,599	16,757,507
93	0	14,052	2,945	3,449	5,358	25,803	16,783,311
94	0	14,052	2,945	3,449	5,358	25,803	16,809,114
95	0	11,960	2,945	2,969	4,764	22,638	16,831,752
96	0	11,734	2,945	2,927	4,707	22,313	16,854,065
97	0	11,734	2,945	2,927	4,707	22,313	16,876,378
98	0	11,734	2,945	2,927	4,707	22,313	16,898,691
99	0	11,734	2,945	2,927	4,707	22,313	16,921,004
100	0	11,822	2,945	2,938	4,725	22,431	16,943,435
101	0	11,734	2,945	2,927	4,707	22,313	16,965,747
102	0	11,734	2,945	2,927	4,707	22,313	16,988,060
103	0	11,734	2,945	2,927	4,707	22,313	17,010,373
104	0	11,734	2,945	2,927	4,707	22,313	17,032,686
105	0	11,822	2,945	2,938	4,725	22,431	17,055,117
106	0	11,734	2,945	2,927	4,707	22,313	17,077,430
107	0	11,734	2,945	2,927	4,707	22,313	17,099,743
108	0	11,734	2,945	2,927	4,707	22,313	17,122,056
109	0	11,734	2,945	2,927	4,707	22,313	17,144,369
110	0	11,822	2,945	2,938	4,725	22,431	17,166,799
111	0	11,734	2,945	2,927	4,707	22,313	17,189,112
112	0	11,734	2,945	2,927	4,707	22,313	17,211,425
113	0	11,734	2,945	2,927	4,707	22,313	17,233,738
114	0	11,734	2,945	2,927	4,707	22,313	17,256,051
115	0	11,822	2,945	2,938	4,725	22,431	17,278,482
116	0	11,734	2,945	2,927	4,707	22,313	17,300,795
117	0	11,734	2,945	2,927	4,707	22,313	17,323,108
118	0	11,734	2,945	2,927	4,707	22,313	17,345,421
119	0	11,734	2,945	2,927	4,707	22,313	17,367,734
120	0	11,822	2,945	2,938	4,725	22,431	17,390,164
121	0	11,734	2,945	2,927	4,707	22,313	17,412,477
122	0	11,734	2,945	2,927	4,707	22,313	17,434,790
123	0	11,734	2,945	2,927	4,707	22,313	17,457,103
124	0	11,734	2,945	2,927	4,707	22,313	17,479,416
125	0	11,822	2,945	2,938	4,725	22,431	17,501,847
126	0	11,734	2,945	2,927	4,707	22,313	17,524,160

Year	Unassigned	Labour	Equipment & Materials	Other	Contingency	Annual	Cumulative
127	0	11,734	2,945	2,927	4,707	22,313	17,546,473
128	0	11,734	2,945	2,927	4,707	22,313	17,568,786
129	0	11,734	2,945	2,927	4,707	22,313	17,591,099
130	0	11,822	2,945	2,938	4,725	22,431	17,613,529
131	0	11,734	2,945	2,927	4,707	22,313	17,635,842
132	0	11,734	2,945	2,927	4,707	22,313	17,658,155
133	0	11,734	2,945	2,927	4,707	22,313	17,680,468
134	0	11,734	2,945	2,927	4,707	22,313	17,702,781
135	0	11,822	2,945	2,938	4,725	22,431	17,725,212
136	0	11,734	2,945	2,927	4,707	22,313	17,747,525
137	0	11,734	2,945	2,927	4,707	22,313	17,769,838
138	0	11,734	2,945	2,927	4,707	22,313	17,792,151
139	0	11,734	2,945	2,927	4,707	22,313	17,814,464
140	0	11,822	2,945	2,938	4,725	22,431	17,836,894
141	0	11,734	2,945	2,927	4,707	22,313	17,859,207
142	0	11,734	2,945	2,927	4,707	22,313	17,881,520
143	0	11,734	2,945	2,927	4,707	22,313	17,903,833
144	0	11,734	2,945	2,927	4,707	22,313	17,926,146
145	0	11,822	2,945	2,938	4,725	22,431	17,948,577
146	0	11,734	2,945	2,927	4,707	22,313	17,970,890
147	0	11,734	2,945	2,927	4,707	22,313	17,993,203
148	0	11,734	2,945	2,927	4,707	22,313	18,015,516
149	0	11,734	2,945	2,927	4,707	22,313	18,037,829
150	0	11,822	2,945	2,938	4,725	22,431	18,060,259
151	0	11,734	2,945	2,927	4,707	22,313	18,082,572
152	0	11,734	2,945	2,927	4,707	22,313	18,104,885
153	0	11,734	2,945	2,927	4,707	22,313	18,127,198
154	0	12,087	2,945	3,088	4,919	23,039	18,150,237
155	0	12,942	2,945	3,354	5,264	24,505	18,174,741
156	0	13,809	2,945	4,409	5,685	26,848	18,201,589
157	0	13,958	2,945	4,442	5,727	27,072	18,228,661
158	0	16,567	2,945	4,830	6,242	30,583	18,259,244
159	0	15,975	2,945	3,924	5,914	28,758	18,288,001
160	0	12,333	2,945	3,104	4,893	23,275	18,311,277
161	0	12,333	2,945	3,104	4,893	23,275	18,334,552
162	0	12,333	2,945	3,104	4,893	23,275	18,357,827
163	0	12,333	2,945	3,104	4,893	23,275	18,381,103
164	0	12,333	2,945	3,104	4,893	23,275	18,404,378
165	0	12,333	2,945	3,104	4,893	23,275	18,427,653
166	0	12,333	2,945	3,104	4,893	23,275	18,450,929
167	0	12,333	2,945	3,104	4,893	23,275	18,474,204
168	0	12,333	2,945	3,104	4,893	23,275	18,497,479
169	0	12,333	2,945	3,104	4,893	23,275	18,520,754

Year	Unassigned	Labour	Equipment & Materials	Other	Contingency	Annual	Cumulative
170	0	12,333	2,945	3,104	4,893	23,275	18,544,030
171	0	12,333	2,945	3,104	4,893	23,275	18,567,305
172	0	12,333	2,945	3,104	4,893	23,275	18,590,580
173	0	12,333	2,945	3,104	4,893	23,275	18,613,856
174	0	12,333	2,945	3,104	4,893	23,275	18,637,131
175	0	12,333	2,945	3,104	4,893	23,275	18,660,406
176	0	12,333	2,945	3,104	4,893	23,275	18,683,682
177	0	12,333	2,945	3,104	4,893	23,275	18,706,957
178	0	12,333	2,945	3,104	4,893	23,275	18,730,232
179	0	12,333	2,945	3,104	4,893	23,275	18,753,507
180	0	12,333	2,945	3,104	4,893	23,275	18,776,783
181	0	12,333	2,945	3,104	4,893	23,275	18,800,058
182	0	12,333	2,945	3,104	4,893	23,275	18,823,333
183	0	12,333	2,945	3,104	4,893	23,275	18,846,609
184	0	12,333	2,945	3,104	4,893	23,275	18,869,884
185	0	12,333	2,945	3,104	4,893	23,275	18,893,159
186	0	12,333	2,945	3,104	4,893	23,275	18,916,435
187	0	12,333	2,945	3,104	4,893	23,275	18,939,710
188	0	12,333	2,945	3,104	4,893	23,275	18,962,985
189	0	12,333	2,945	3,104	4,893	23,275	18,986,260
190	0	12,333	2,945	3,104	4,893	23,275	19,009,536
191	0	12,333	2,945	3,104	4,893	23,275	19,032,811
192	0	12,333	2,945	3,104	4,893	23,275	19,056,086
193	0	12,333	2,945	3,104	4,893	23,275	19,079,362
194	0	12,333	2,945	3,104	4,893	23,275	19,102,637
195	0	12,333	2,945	3,104	4,893	23,275	19,125,912
196	0	12,333	2,945	3,104	4,893	23,275	19,149,188
197	0	12,333	2,945	3,104	4,893	23,275	19,172,463
198	0	12,333	2,945	3,104	4,893	23,275	19,195,738
199	0	12,333	2,945	3,104	4,893	23,275	19,219,013
200	0	12,333	2,945	3,104	4,893	23,275	19,242,289
201	0	12,333	2,945	3,104	4,893	23,275	19,265,564
202	0	12,333	2,945	3,104	4,893	23,275	19,288,839
203	0	12,333	2,945	3,104	4,893	23,275	19,312,115
204	0	12,333	2,945	3,104	4,893	23,275	19,335,390
205	0	12,333	2,945	3,104	4,893	23,275	19,358,665
206	0	12,333	2,945	3,104	4,893	23,275	19,381,941
207	0	12,333	2,945	3,104	4,893	23,275	19,405,216
208	0	12,333	2,945	3,104	4,893	23,275	19,428,491
209	0	12,333	2,945	3,104	4,893	23,275	19,451,766
210	0	12,333	2,945	3,104	4,893	23,275	19,475,042
211	0	12,333	2,945	3,104	4,893	23,275	19,498,317
212	0	12,333	2,945	3,104	4,893	23,275	19,521,592

Year	Unassigned	Labour	Equipment & Materials	Other	Contingency	Annual	Cumulative
213	0	12,333	2,945	3,104	4,893	23,275	19,544,868
214	0	12,333	2,945	3,104	4,893	23,275	19,568,143
215	0	12,333	2,945	3,104	4,893	23,275	19,591,418
216	0	12,333	2,945	3,104	4,893	23,275	19,614,694
217	0	12,333	2,945	3,104	4,893	23,275	19,637,969
218	0	12,333	2,945	3,104	4,893	23,275	19,661,244
219	0	12,333	2,945	3,104	4,893	23,275	19,684,519
220	0	12,333	2,945	3,104	4,893	23,275	19,707,795
221	0	12,333	2,945	3,104	4,893	23,275	19,731,070
222	0	12,333	2,945	3,104	4,893	23,275	19,754,345
223	0	12,333	2,945	3,104	4,893	23,275	19,777,621
224	0	12,333	2,945	3,104	4,893	23,275	19,800,896
225	0	12,333	2,945	3,104	4,893	23,275	19,824,171
226	0	12,333	2,945	3,104	4,893	23,275	19,847,447
227	0	12,333	2,945	3,104	4,893	23,275	19,870,722
228	0	12,333	2,945	3,104	4,893	23,275	19,893,997
229	0	12,333	2,945	3,104	4,893	23,275	19,917,272
230	0	12,333	2,945	3,104	4,893	23,275	19,940,548
231	0	12,333	2,945	3,104	4,893	23,275	19,963,823
232	0	12,333	2,945	3,104	4,893	23,275	19,987,098
233	0	12,333	2,945	3,104	4,893	23,275	20,010,374
234	0	12,333	2,945	3,104	4,893	23,275	20,033,649
235	0	12,333	2,945	3,104	4,893	23,275	20,056,924
236	0	12,333	2,945	3,104	4,893	23,275	20,080,200
237	0	12,333	2,945	3,104	4,893	23,275	20,103,475
238	0	12,333	2,945	3,104	4,893	23,275	20,126,750
239	0	12,333	2,945	3,104	4,893	23,275	20,150,025
240	0	12,333	2,945	3,104	4,893	23,275	20,173,301
241	0	12,333	2,945	3,104	4,893	23,275	20,196,576
242	0	12,333	2,945	3,104	4,893	23,275	20,219,851
243	0	12,333	2,945	3,104	4,893	23,275	20,243,127
244	0	12,333	2,945	3,104	4,893	23,275	20,266,402
245	0	12,333	2,945	3,104	4,893	23,275	20,289,677
246	0	12,333	2,945	3,104	4,893	23,275	20,312,953
247	0	12,333	2,945	3,104	4,893	23,275	20,336,228
248	0	12,333	2,945	3,104	4,893	23,275	20,359,503
249	0	12,333	2,945	3,104	4,893	23,275	20,382,778
250	0	12,333	2,945	3,104	4,893	23,275	20,406,054
251	0	12,333	2,945	3,104	4,893	23,275	20,429,329
252	0	12,333	2,945	3,104	4,893	23,275	20,452,604
253	0	12,333	2,945	3,104	4,893	23,275	20,475,880
254	0	12,333	2,945	3,104	4,893	23,275	20,499,155
255	0	12,333	2,945	3,104	4,893	23,275	20,522,430

Year	Unassigned	Labour	Equipment & Materials	Other	Contingency	Annual	Cumulative
256	0	12,333	2,945	3,104	4,893	23,275	20,545,706
257	0	12,333	2,945	3,104	4,893	23,275	20,568,981
258	0	12,333	2,945	3,104	4,893	23,275	20,592,256
259	0	12,333	2,945	3,104	4,893	23,275	20,615,531
260	0	12,333	2,945	3,104	4,893	23,275	20,638,807
261	0	12,333	2,945	3,104	4,893	23,275	20,662,082
262	0	12,333	2,945	3,104	4,893	23,275	20,685,357
263	0	12,333	2,945	3,104	4,893	23,275	20,708,633
264	0	12,333	2,945	3,104	4,893	23,275	20,731,908
265	0	12,333	2,945	3,104	4,893	23,275	20,755,183
266	0	12,333	2,945	3,104	4,893	23,275	20,778,459
267	0	12,333	2,945	3,104	4,893	23,275	20,801,734
268	0	12,333	2,945	3,104	4,893	23,275	20,825,009
269	0	12,333	2,945	3,104	4,893	23,275	20,848,284
270	0	12,333	2,945	3,104	4,893	23,275	20,871,560
271	0	12,333	2,945	3,104	4,893	23,275	20,894,835
272	0	12,333	2,945	3,104	4,893	23,275	20,918,110
273	0	12,333	2,945	3,104	4,893	23,275	20,941,386
274	0	12,333	2,945	3,104	4,893	23,275	20,964,661
275	0	12,333	2,945	3,104	4,893	23,275	20,987,936
276	0	12,333	2,945	3,104	4,893	23,275	21,011,212
277	0	12,333	2,945	3,104	4,893	23,275	21,034,487
278	0	12,333	2,945	3,104	4,893	23,275	21,057,762
279	0	12,333	2,945	3,104	4,893	23,275	21,081,037
280	0	12,333	2,945	3,104	4,893	23,275	21,104,313
281	0	12,333	2,945	3,104	4,893	23,275	21,127,588
282	0	12,333	2,945	3,104	4,893	23,275	21,150,863
283	0	12,333	2,945	3,104	4,893	23,275	21,174,139
284	0	12,333	2,945	3,104	4,893	23,275	21,197,414
285	0	12,333	2,945	3,104	4,893	23,275	21,220,689
286	0	12,333	2,945	3,104	4,893	23,275	21,243,965
287	0	12,333	2,945	3,104	4,893	23,275	21,267,240
288	0	12,333	2,945	3,104	4,893	23,275	21,290,515
289	0	12,333	2,945	3,104	4,893	23,275	21,313,790
290	0	12,333	2,945	3,104	4,893	23,275	21,337,066
291	0	12,333	2,945	3,104	4,893	23,275	21,360,341
292	0	12,333	2,945	3,104	4,893	23,275	21,383,616
293	0	12,333	2,945	3,104	4,893	23,275	21,406,892
294	0	12,333	2,945	3,104	4,893	23,275	21,430,167
295	0	12,333	2,945	3,104	4,893	23,275	21,453,442
296	0	12,333	2,945	3,104	4,893	23,275	21,476,718
297	0	12,333	2,945	3,104	4,893	23,275	21,499,993
298	0	12,333	2,945	3,104	4,893	23,275	21,523,268

Year	Unassigned	Labour	Equipment & Materials	Other	Contingency	Annual	Cumulative
299	0	12,333	2,945	3,104	4,893	23,275	21,546,543
300	0	12,333	2,945	3,104	4,893	23,275	21,569,819
301	0	34,985	22,437	4,597	18,258	80,277	21,650,096
302	0	41,204	23,051	12,656	22,750	99,661	21,749,756
303	0	41,151	23,124	12,736	22,937	99,947	21,849,704
304	0	38,930	22,955	12,326	22,154	96,365	21,946,068
305	0	36,398	23,501	9,293	20,649	89,841	22,035,909
306	0	36,964	23,561	9,407	20,871	90,802	22,126,712
307	0	28,596	13,855	9,442	14,642	66,535	22,193,246
308	0	31,855	13,523	9,393	15,518	70,289	22,263,535
309	0	31,289	13,463	9,280	15,296	69,327	22,332,863
310	0	25,297	7,956	5,619	10,748	49,621	22,382,483
311	0	15,263	7,174	2,590	7,022	32,049	22,414,532
312	0	7,674	2,108	1,223	2,958	13,962	22,428,494
313	0	3,584	1,162	1,080	1,811	7,637	22,436,131
314	0	3,584	1,162	1,080	1,811	7,637	22,443,768
315	0	3,584	1,162	1,080	1,811	7,637	22,451,405
316	0	3,584	1,162	1,080	1,811	7,637	22,459,041
317	0	3,673	1,162	1,091	1,829	7,754	22,466,796
318	0	3,584	1,162	1,080	1,811	7,637	22,474,432
319	0	3,584	1,162	1,080	1,811	7,637	22,482,069
320	0	3,584	1,162	1,080	1,811	7,637	22,489,706
321	0	3,584	1,162	1,080	1,811	7,637	22,497,342
322	0	3,938	1,372	1,127	1,933	8,370	22,505,712
323	0	3,938	1,372	1,127	1,933	8,370	22,514,082
324	0	3,938	1,372	1,127	1,933	8,370	22,522,452
325	0	4,039	1,372	1,112	2,025	8,549	22,531,001
326	0	25,100	5,750	6,890	6,890	44,630	22,575,631