



Schedule Management Plan

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Document Information


Document Purpose	The Schedule Management Plan details the processes, tools and responsibilities for developing and managing the Implementation phase schedule for the Site C Clean Energy Project (the Project). This document is owned by the Scheduling Manager and will be progressively detailed throughout the Project, as necessary.
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Role	Name	Signature	Date
Prepared By:			
Reviewed By:			
Reviewed By:			
Accepted By:			

INTRODUCTION

The purpose of the Site C project schedule is to integrate and logically organize various project components, such as activities, milestones, and resources to enhance the likelihood of successful project completion within the approved project duration. The project schedule is a dynamic representation of the skills, techniques, experiences and acquired knowledge of the works to allow development of a schedule model approach to the project.

SCOPE OF PLAN

The scope of this Schedule Management Plan is to identify the processes for developing the YM-80004 Implementation phase schedule, describe the method for progressing the schedule, and detail the roles and responsibilities of project team members.

SCHEDULE DEVELOPMENT

Development of the Site C project schedule will be in accordance with BC Hydro's Project & Portfolio Management (PPM) practices, except where modified in this document. Building and maintaining project schedules will follow the below listed PPM guidelines.

- Create WBS
- Develop Resource Loaded Schedules
- Obtain Funding (Inc. Baselines and Work Package Agreement)
- Progress Project
- Mandatory Milestones (Level 1 to 5)

The Implementation phase WBS is created with the Project Manager and set up in SAP and transferred to Primavera P6 via use of the EPC transfer tool. Schedule activities, resources and expenses are populated in Primavera P6 and then transferred back to SAP to generate charge codes. Project budgeted costs in SAP and Primavera P6 should match the authorized Expenditure Authorization Request (EAR). Once the project schedule timescales and costs match the EAR requirements the schedule can be submitted to the project manager for agreement to form the Performance Management Baseline (PMB).

Schedule Content

The content of the Implementation Phase schedule is to include all Implementation phase activities including detailed design, procurement, construction, commissioning and completion of the Project. Schedule activities are decomposed from the work breakdown structure, and then scheduled in sequence through discussion with the project team members. BC Hydro resources, costs, and contractor direct costs are added to schedule activities.

The Site C Project Implementation phase schedule (the Schedule) will follow the PPM method for developing, building, maintaining and progressing project schedules.

The key objective of this project schedule is to provide a project management solution that improves the delivery and outcome of this project through integrated planning, execution, reporting and controls. Work packages are developed with the Work Package Manager (WPM) to determine schedule, resources, and costs which are integrated with other work packages in the project schedule. Development and integration of work packages are based on consistent PPM processes.

Three foundational concepts underpin the PPM approach to scheduling:

- i) Standard WBS and PPM Practices provide a framework for the project**
 - a. Provide consistency
 - b. Provide reliability
 - c. Establishes a foundation for project and portfolio management
- ii) Resource Loaded Schedules developed with Work Package Managers**
 - a. Supports resource management
 - b. Integrates scope, cost and schedule
 - c. Supports Earned Value management
- iii) Progressing and updating work packages**
 - a. Provides better visibility of project health
 - b. Enables timely change notices
 - c. Provides updated forecasts

This project schedule is dependent on a team approach and effective collaboration. Through integrated project schedules the project team can contribute to more effective and accurate schedule information.

Schedule Basis

The objective of the [Schedule Basis document](#) is to establish and maintain a disciplined approach in managing the schedule so that planned project outcomes are achieved. Effective schedule performance baselines are established early in the project life cycle. Measurements against the plan are made and evaluated (progress and forecasting), and corrective action is taken when measurements indicate a deviation from the plan is occurring or is likely to occur.

The Schedule Basis is a live document which will be updated throughout the lifecycle of the Project. Any changes to schedule baselines will be recorded in the Schedule Basis together with reasons for change. For further information on managing changes to the Performance Measurement Baseline please see the Project Change Control Procedure.

Contractors' Schedules

Contractors' or third party schedule information shall be represented in the project schedule. These schedules will include any engineering, production, manufacturing, installation, testing and commissioning schedules, and other 3rd party schedules. The level of detail for integrating contractor schedule information should reflect the planned work in the context of enabling progress measurement. [Specific consideration is required for contracts that will be progressed in Unifier.](#)

Upon contract award vendors will submit to BC Hydro their P6 Base Work Program and Schedule, which upon BC Hydro's acceptance becomes the base schedule for the contract. The vendor will submit on a monthly basis, typically within three business days of the first day of each month, progressive amendments to the P6 Base Work Program and Schedule describing the actual progress of the work current to the last day of the previous calendar month and incorporating any time adjustments. Vendors will amend their scheduling using critical path methodology.

The vendor will also, on a weekly basis (or other frequency as described in the contract) submit a detailed three week look ahead schedule showing all aspects of work including critical path activities, equipment deliveries, estimated quantities, anticipated delays, etc. The three week look ahead also shows the vendors actual progress of work for the preceding week.

Schedule Integration

Once the contractor's schedule is accepted as a baseline, the contractor's schedule will be integrated into appropriate work packages. All contract milestones will be added to work packages using the PPM Code 4.95. On a monthly basis the Master Schedule will be updated with contractor schedule information. Should BC Hydro accept a new baseline from a contractor, the Performance Measurement Baseline may be updated to reflect that.

The assigned work package manager will ensure that any third party schedule follows the procedures for the development, control, and maintenance of schedules. The assigned Scheduler will be responsible for checking for conformance with the RFP and contract requirements as well as identifying emerging schedule risks.

Standard contract wording should also be included in any contractor agreement to reflect the requirements of this procedure.

Scheduling Method

The Site C Implementation phase schedule will be based on the Critical Path Method (CPM). The CPM determines the minimum total project duration and the earliest possible project finish date. Total float durations for activities are calculated using CPM. Early start date and finish dates are calculated for each activity by performing a forward pass from a specific project date. Late start and late finish dates are calculated by performing a backward pass on all activities starting from the earliest project finish date.

Activities with zero float will be identified as being Critical Path activities. Any activities with less than zero days float (negative float) will be reviewed and corrected as negative float contained within the project schedule suggests the project end date is not attainable.

Scheduling Tool

The Site C Implementation phase schedule will use Oracle Primavera P6 software, as implemented across BC Hydro.

Schedule Model ID's

The project structure in the integrated PPM system includes the following:

SAP – Source system for Work Breakdown Structure and Actuals
YM-80003 Pre Implementation Phase WBS & sunk costs
YM-80004 Early Works, Main Civil Works, Turbine & Generator and General Management WBS
New Project: Generating Station & Spillways
New Project: Reservoir Clearing & Highways
New Project: Mitigation & Compensation and Properties

P6 – Source system for resources & expenses, milestone dates, cost & schedule forecasts
YM-80004 All Implementation Phase work packages & activities.

Calendars and Work Periods

P6 allows project activities to be assigned to different work calendars. Calendars are assigned to activities to compute activity durations from dates and vice versa, Since PPM uses task dependant activities, the activity calendar is automatically assigned to the resource. It is the purpose of various calendars to limit or restrict activities to their specifically allocated work days.

The default calendar for YM-80004 schedule is the PPM Global Calendar “Z1-BC Hydro five day calendar with Canadian Holidays”. This calendar will be used for the majority of work packages under the General Management System as these activities will be expected to be completed on a typical 5 day business week with British Columbia statutory holidays. Schedule activities that contain resources or expenses must have a global calendar to allow transfer to SAP. A list of PPM compliant Global calendars are listed below;

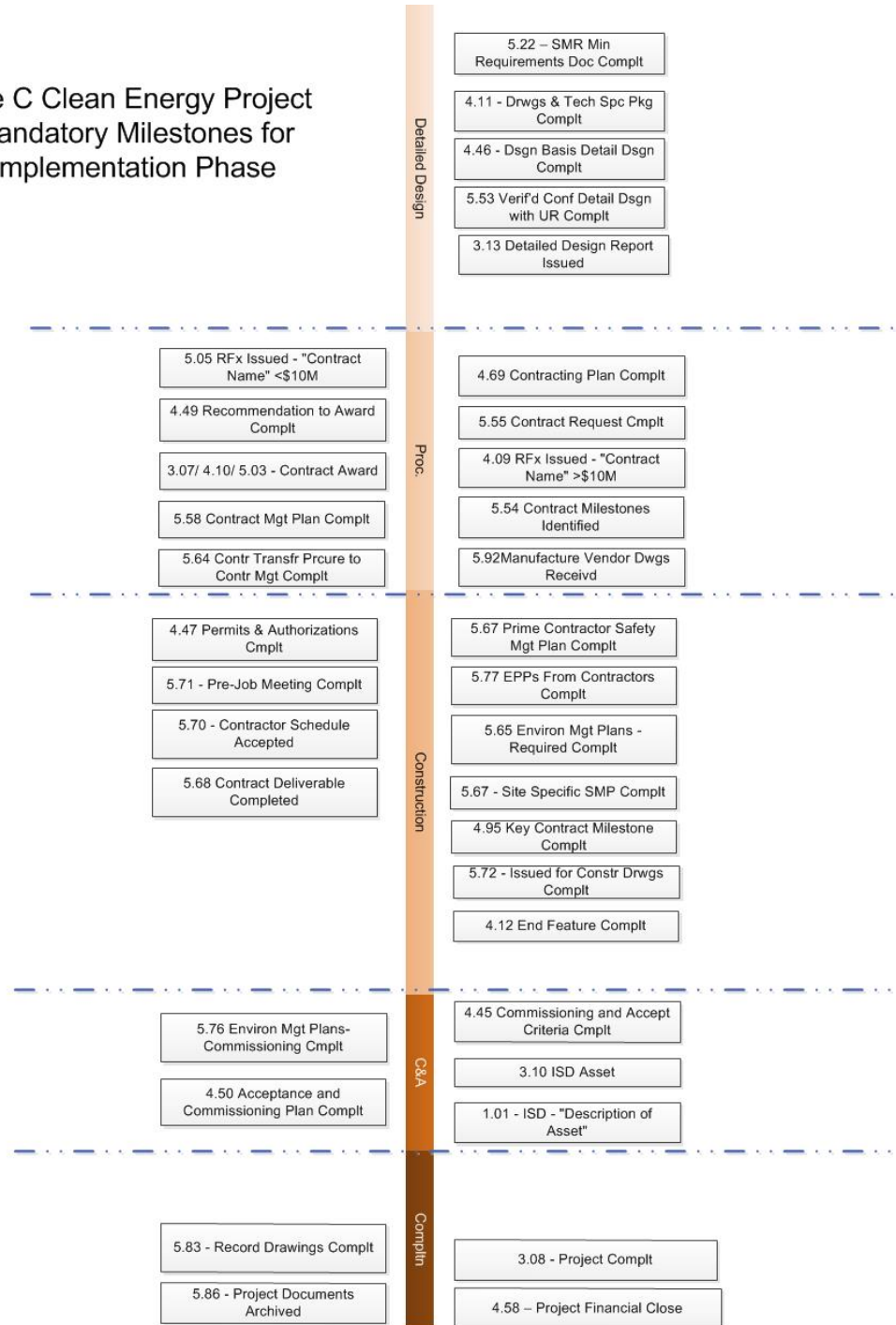
Project calendars have been developed for site activities that may require continuous working or be restricted by seasonal weather and environmental constraints. Project calendars should only be assigned to any activities then SAP transfer must be set to “false”. A list of project specific calendars is listed below. As an example, office-based activities such as design production will be based on a five day working week, whereas site-based activities will be scheduled on a six day week.

The default calendar for site based work will be based on a 6 day working week, although it is expected that the site will operate a seven day working week. This a minor contingency of 14% per working week for site based activities.

Mandatory Milestones

Site C will use the standard set of [PPM mandatory milestones](#), however they are inadequate for the Site C project to measure and manage interim deliverables through the lengthy work packages. Therefore, in addition the project identifies the following as mandatory:

**Site C Clean Energy Project
Mandatory Milestones for
Implementation Phase**



MAINTAINING BASELINES

The Site C Project maintains baselines for different purposes.

Baseline	Description
First Full Funding (FFF)	This baseline is established one time only, at the point of first full funding for the Implementation phase.
Performance Measurement Baseline (PMB)	This baseline is established at the beginning of a project phase or stage. The Site C PMB is updated annually to account for significant project changes to scope, schedule and cost, typically as a result of contract award or changes.
Prior Month Forecast Baseline (PMFB)	This baseline is established on a monthly basis. It contains the forecasted cost, milestones, resources at a point in time, and is used to compare against the PMB.

Performance Measurement Baseline Updates

Annually the project team will undertake a forecast review process that will identify significant potential changes to cost, schedule and scope for the project. Potential changes may arise due to contract awards, contract changes, unforeseen conditions, external stakeholders, etc. The project team will also process work package level change notices throughout the year using the control budget and control date functionality. Based on these two conditions, the performance measurement baseline may be updated on an annual basis, subject to the approval of the Site C Leadership team.

Control Date

The Control Date is the latest date that the project manager and the work package manager have agreed upon to complete Level 3–5 milestones that fall within the Work Package. At the start of the project, the Planned Date (PMB), Control Date and Forecast Date are the same. If at some point in the project the work package manager identifies that the Forecast Date is at risk, the work package manager will request the Forecast Date be updated to the new date. A Change Log entry will be created following the Project Change Control Procedure. The Control Date will be updated after the project manager approves the change in the Change Log. The work package manager is accountable to complete the milestones in their Work Packages by the Control Date.

PROGRESSION CYCLE

Each month the project will conduct the Progression Cycle. The cycle begins with the actual costs collected in SAP transferred to Primavera P6, via the EPC transfer. Activity progress is collected from the accountable Work Package Manager and includes estimated cost, duration and resources to complete, percentage complete as per rules of

credit, as well as forecasted milestone dates. Any activities completed during the reporting cycle will have their actual start or actual finish dates recorded. Progress is updated in the P6 schedule by schedulers assigned to sub-projects. Once the schedule has been updated and the progression cycle is complete the remaining cost values are transferred back to SAP via the EPC transfer tool.

Progression Meetings

Following the collection of progress and updates to the schedule, each Sub-Project Manager conducts a progression meeting with their respective Work Package Managers, project controls, finance and other stakeholders as required. Progression meetings provide a venue for cost, schedule, scope and resource forecasts, as well as risks, to be tested, questioned and validated. The culmination of these progression meetings and associated updates feed into the Leads Progression Meeting. The Leads Progression Meeting is the final step in the progression cycle, and is the basis for capturing the Prior Month Forecast Baseline. See Appendix A for a sample agenda of the Leads Progression Meeting. See Appendix B for the Progression Meeting Framework.

QA/QC FOR PMB/ PMFB

Prior to taking a baseline, the project schedule should conform with QA/QC checks of the scheduling department.

For new PMBs the Scheduler should complete QC on their respective work packages within the project schedule. The Scheduling Team Lead will then perform QA checks of the full project schedule to verify all QC items have been addressed, and document the review in the [QA/QC Form](#). New PMBs may be taken prior to the start of a phase change or through the change control procedure.

Prior to completing the monthly schedule progressions QA/ QC checks will also be performed prior to taking a PMFB (Prior Month Forecast Baseline). Monthly QC shall be carried out by the Scheduler and QA will be verified by the Scheduling Team Lead. Additional checks will be carried out against the previous PMFB to ensure any large variances are identified from month to month. Extract below is a sample spreadsheet for monthly QA/QC feedback.

An independent QA/QC check is also performed monthly by the Project Delivery Project Controls department and a Schedule Quality Report is issued to the scheduling team.

The schedule quality report highlights issues that cause anomalies in the forecast (cost & schedule) and Earned Value in the published PMFBs every month. These issues are reviewed with the Site C Scheduler(s) and resolved in the next Progression cycle.

Schedule Quality Issue	Impact on Schedule
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Schedule Quality Issue	Impact on Schedule
Completed Activities with Remaining Cost (CARC)	This amount may inflate the total ETC of the project. BW will not show this amount in the ETC field.
100% Phy. Complete In-Progress Activities	These activities have been marked 100% physically complete however the Finish Date has not been actualized. Such activities may affect both, Cost and Schedule of the Project.
Missing Logic	Activities with missing predecessors or successors may affect both the forecast and Total Float calculations.
Activities Riding the Data Date	These activities have been forecasting to either Start or Finish at the Data Date for two consecutive progression cycles. They affect the forecast creating a 'bow' in the immediate ETC.
Key milestones at DD	These 'Key' [All Level 1, 2, 3 plus 4.10, 4.12, 5.28, 5.30 and 5.72] milestones appear to be riding the Data Date. Milestones are logic-hotspots, they may be pushing other activities to the right. Also if these milestones are constrained they may be affecting the float calculation.
Percent Complete Type Correction	The Earned Value will be reported incorrectly for cost activities where the Physical Percent Complete type is set other than 'Physical'.
Activities with Actuals not Started	These activities have accumulated at least 15% of Actuals of their 'At Completion Cost' (EAC) and have not started yet. These future actuals could have an effect on the schedule and EV (since the Phys. % complete is 0).
Activities with Actuals but no Physical % Complete	These In-Progress activities have accumulated at least 15% of Actuals of their 'At Completion Cost' (EAC) but no Physical % complete recorded
Activities with Actual Date > DD	The start-date may be inaccurate/accidentally actualized.
Activities with Negative Float	Negative float implies being behind schedule on a deliverable or In-Service Date of the project.

MONITORING & REPORTING

All schedule milestones are monitored by the accountable Work Package Manager and Project Manager. Changes in Plan Date for Level 1, 2 and 3 milestones are subject to the Project Level Change Notice procedure and will trigger an out of cycle Performance Measurement Baseline update. Level 4 & 5 milestones where the forecast date is 3

months later than the plan date are subject to the Work Package Change Notice procedure. The plan date for these milestones must be updated in the Control Date field in P6.

Schedule performance index is monitored by the accountable Work Package Manager and Project Manager. Where work package and/or sub-project SPI values are lower than .09 or higher than 1.10 must be escalated to the Site C Leadership team.

Schedule monitoring and reporting is a direct output of the progression cycle. It enables Work Package Managers, Project Managers, sponsor, initiator and other stakeholders to monitor and understand schedule performance, milestone forecasts, and work efficiency. On a monthly basis the Site C Project produce the following schedule reports:

Report	Description
12 Month Look Ahead	12 month rolling forecast and status of key milestones ¹ by Work Package Manager or Sub-project
6 Month Look Ahead	6 month look ahead of all schedule activities, summarized by sub-project
Critical Path	List and Gantt chart of critical path activities including planned start and finish dates and days of float.
Near Critical Path	List and Gantt chart of near critical path ² activities including planned start and finish dates and days of float.
Schedule Performance Index ³	Schedule Performance Index (SPI) at the Sub-project and work package level for construction and engineering work packages only.

Roles & Responsibilities

Role	Responsibilities
Sponsor	Review and approve the final baseline schedule and only significant changes through the schedule change control process.
Project Director & Vice President	Approve the project's Schedule Management Plan, baseline schedule, and any significant changes through the schedule change control process. The Project Director is ultimately responsible for the schedule and to complete the project according to the schedule.
Project Managers	Oversee, provide input to the schedule (via the change control process)

¹ Key Milestones are defined as all Level 1, 2, and 3 milestones, as well as 4.12 End Feature Complete and 5.68 Contract Deliverable Complete.

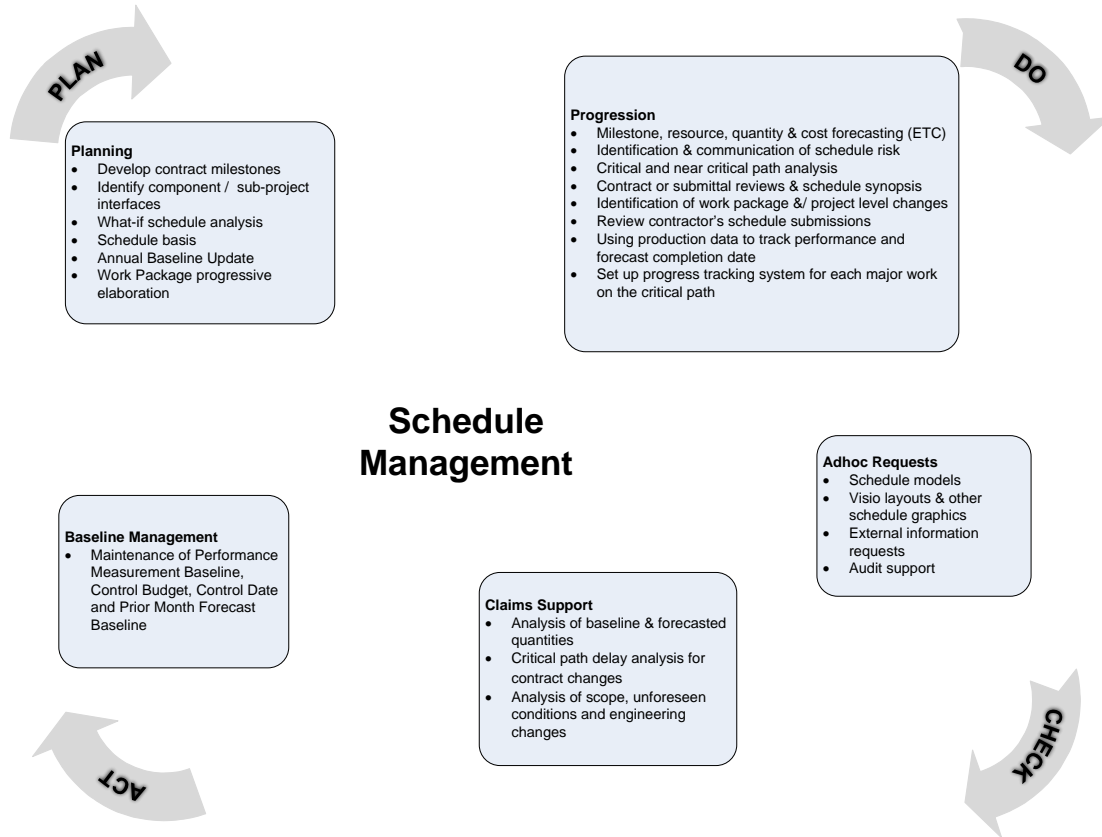
² Near critical path activities are those that have less than three months float.

³ The Schedule Performance Index (SPI) is a measure of schedule efficiency, expressed as the ratio of earned value to planned value

Role	Responsibilities
	and review schedule status reports provided by the Project Scheduler. The Project Manager will also evaluate time-risk recommendations from the Project Scheduler to avoid schedule issues.
Functional Managers	Notify the Project Manager and Project Scheduler of workload changes that may affect the schedule. The Functional Manager will also review and approve time estimates provided by staff for the schedule.
Schedulers	Lead the schedule management effort, sponsor task-tracking activities, facilitate schedule status communication, and maintain the projects' scheduling tool and supporting documentation. The Project Scheduler will make recommendations to the Project Manager to avert schedule variances that may adversely affect the project budget, expenditures, or critical path.
Project Controls	Periodically audit scheduling practices to validate compliance with this Schedule Management Plan
Project Team Members	Provide accurate time estimates for the beginning and completion of work as well as status reports on the achievement of those times.

Scheduler Role

The Scheduling role and function exists in both the Finance and Project Management teams. The Finance Schedulers have overall accountability for the progression cycle and baseline management while the Project Management Schedulers have overall accountability for contract planning, contractor & site schedule support and claims support. Please see Appendix XX for a RACI matrix for schedulers.



SCHEDULE RISK ANALYSIS

Schedule risk analysis is performed on a regular basis using the Primavera Risk tool. Schedulers perform a variety of what-if scenario analysis to determine schedule impact should key procurements be delayed, should unfound conditions occur, or as other risks arise that warrant assessment.

Going forward, it is recommended that Site C conduct an annual [constructability review](#) to ensure planning, design, scheduling, cost estimating and contracting principles are optimized. This review shall precede the annual baseline update.

SCHEDULE CONTINGENCY AND FLOAT

Schedule contingency is a duration added to the schedule to account for schedule risk. Float is the duration between the earliest & latest dates that an activity can be done to meet the project deadline. Float is linked to critical path. The Critical path is the sequence of logically linked activities such that, if one of the critical path activities were to be delayed, then the completion date of the entire project would be delayed. The schedule contingency and float for the Site C project is documented in the [Schedule Basis](#).

APPROVALS:

Manager, Business Planning, Scheduling & Reporting		Date
Director, Finance		Date
Project Manager & Director Operations		Date
Vice President & Project Director		Date

Appendix A

Scheduler RACI