SCHEDULE MANAGEMENT PLAN

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Document Control Sheet

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Table of Contents:

1 Introduction

1.1 Purpose

This document describes the plan and process for the maintenance of the Ocean Observatories Initiative (OOI) Integrated Master Schedule (IMS).

1.2 Scope

This document details the technical approach for the management of the Integrated Master Schedule by OOI and its Implementing Organizations (IO) outlined in the *OOI Systems Engineering Management Plan (SEMP),* the *OOI Earned Value Management (EVM) Plan,* and documented monthly by the *OOI – IMS Analysis* report. In addition to directions provided within this *OOI Schedule Management Plan*, step-by-step work instructions are referenced that help manage the specific processes and procedures required to properly maintain the IMS at a more detailed level. The OOI IMS is based on a prior initial OOI event identification and planning process. This initial planning consisted of constructing a hierarchy of project events and milestones which were then sequenced to produce the schedules.

The OOI IMS is a sequential network of tasks, organized by Work Breakdown Structure (WBS), used as a fundamental management tool that is critical in performing effective planning, scheduling, and execution of work efforts as well as support the Earned Value Management System (EVMS) and enables proactive management of project activities.

The initial development of the OOI IMS is documented in the OOI EVM Plan.

The OOI IMS is an integrated, networked schedule containing all the detailed discrete system and subsystems (or lower level Tasks) necessary to support the OOI and Ocean Leadership (OL). Detailed tasks are added to depict the steps required to meet the milestones. The IMS is directly traceable to the WBS and includes all the elements associated with development, production or modification, and delivery of the total product and project high level plan. Durations are entered for each discrete system and subsystems (or lower level task), along with predecessor and successor relationships, and any constraints that control the start or finish of each work package and planning package (or lower level task). The result is a fully networked schedule that supports critical path analysis. It should be noted that although durations are assigned at the work package and planning package (or lower level task) level, these durations also roll up to show the overall duration of any higher-level element.

The OOI PMO shall maintain the currency of the IMS throughout the project execution phase and maintain configuration control over the IMS. The IMS shall reflect progress with accurate start and finish dates for all tasks and milestones. Progress against the baseline plan shall be updated on a recurring and regular basis to provide management, team members, and the customer with an accurate measure of project status. Periodic risk assessments shall be performed to identify new potential risk areas based on current cost, schedule, and technical performance information. The IMS should also be utilized to allocate and realign staffing based on schedule status and forecasts.

The IMS or Project Schedule has two "versions":

Baseline Schedule:

A sequenced, resourced and budget-loaded network of project activities, reflecting firm deadlines, original estimated dates and budget criteria which have been formally agreed to by the OOI Senior Project Manager and Project Stakeholders (including contractually-binding targets and limits), and which requires formal approval prior to any changes being made. When resource

loaded, the baseline schedule forms the basis of the Performance Measurement Baseline (PMB), against which EV performance is measured.

The OOI Baseline schedule is controlled and maintained in the integrated Microsoft Project files. The schedule baseline data is maintained in the IMS fields:

1. Baseline Start Date
2. Baseline Finish Date
3. Baseline Duration
4. Baseline Work
5. Baseline Cost

Original task assignments by resources and task dependencies can be found in Alfresco, location: OOI/All Released, filename 1040-00000_IMS_OOI.mpp (Construction Baseline 2009-09-01, Versions OOI 1-00, PMO 2-00, CI 2-00, CG 4-00, RSN 5-00).

Working Schedule: (Active Schedule or Forecast Schedule):

Throughout the project's execution phase, the Working Schedule contains actual performance to date (actual start, actual finish and activity % complete) and the latest forecast of dates for future activities. This is the schedule used to further schedule planning packages, re-plan, manage resources and other day-to-day activities of managing the work of the project.

The Working Schedule is archived monthly in Alfresco, location: OOI → REFERENCE → SCHEDULE FILES AND COBRA COST FILES

1.3 Schedule Management Benefits

Generally, a properly maintained schedule provides the following information critical to effective project management:

- The tasks needed to deliver the project, their sequence, duration, and who is responsible for completion.
- Quantitative assessment of technical progress both against the baseline dates and previous status information.
- A reliable basis for forecasting future performance, refining the schedule, and successfully completing the project.
- Identification of schedule risks that may impact the baseline schedule, including resource availability.
- Credible basis for reporting technical progress to the customer and funding agency, focused on those areas of greatest impact, potential risk, key milestones and project completion.

During the actual project execution, the IMS will provide a framework for insight into the overall performance for both the OOI Project Management Office (PMO) and for the individual IO management teams. The IMS, when properly integrated with Work Breakdown Structure (WBS) and EVM through a sound technical management approach as documented in the OOI SEMP, enable the OOI project office to:

- Identify and assess actual progress versus the planned progress;
- Monitor the project critical path and help develop workarounds to problem areas;
- Assess project maturity;
- Assess the status of risk management activities based on the inclusion of the project risk mitigation tasks in the OOI IMS;

- Assess the progress on selected Key Performance Parameters (KPPs) and Technical Performance Measures (TPMs);
- Help develop and support “what-if” exercises, and to identify and assess candidate problem workarounds; and
- Provide better insight into potential follow-on efforts that were not part of the original scope.

1.4 General Monthly Maintenance Scope

The maintenance of the OOI schedules will be conducted on a monthly basis as specified by the OOI PMO. Individual Implementing Organizations (IOs) are encouraged to maintain their schedules on a more frequent basis (i.e., weekly or biweekly statusing).

The OOI IMS is defined to the level of detail necessary for day-to-day execution of the project and implementation of EVM in accordance with the OOI EVM policy. The OOI IMS contains the WBS elements that define and detail how the OOI requirements (Level 2), System Requirements (Level 3) and Subsystem Requirements (Level 4) will be implemented. The OOI IMS is a database file that is continuously updated to reflect the progress of the OOI. The OOI IMS is managed to:

- Maintain traceability to the preceding OOI and OL event identification and planning process
- Illustrate the interrelationships among events, milestones, and tasks
- Indicate the start and completion dates and duration for each event, milestone, and task
- Provide for critical path analysis
- Provide the ability to sort schedules multiple ways (e.g., by WBS, by EV metric, etc.)
- Provide schedule updates on a regular basis that indicate completed actions, schedule slips, and rescheduled actions
- Provide the capability for the OOI, IO, or support contractors to perform “what if” schedule exercises without inadvertently modifying the integrated master schedule
- Maintain consistency with the work package definitions and EVM
- Be traceable between the Work Breakdown Structure (WBS) items supported by each OOI IMS task
- Be vertically and horizontally traceable to the cost and schedule reporting instrument
- Provide the ability to track Milestones

1.5 Roles and Responsibilities

As part of the organization process for schedule maintenance and management, OOI uses the same roles as defined in Section 4 of the OOI EVM Plan.

1.6 IMS and Schedule Related Tools

The integration of MS Project 2007 Professional, MS Project Server 2007, and Cobra provide the fundamental tools for OOI planning, scheduling, and Basis of Estimate (BOE) development. The use of these and role of each tool is described in the OOI EVM Plan. Collectively, these applications and other available desktop tools provide the capability to conduct schedule analysis, update and control functions as described in remaining sections of this document.

1.7 IMS and Schedule Version Control

The OOI Project files are located on a dedicated server at the PMO. The files contain links between the different schedule files called “cross project dependencies” that depend on the name and location of the file to remain constant. This poses an issue with following the *OOI Configuration Management Plan* (CMP) versioning policy. The file name cannot change, as it will disturb the cross project dependencies within each of the files. Instead, the “File Properties” field

will be filled in with the version data of the file for each of the IO schedules, in accordance with the OOI CMP. When a copy of the file is needed or a complete set of files is exported from the server, the collection of files will be placed within its own folder and the naming convention of the folder will follow the OOI CMP.

1.8 IMS Back-up and Archive Strategy

The Microsoft Project Server configuration provides for file back-up and data recovery. In addition, a complete archive of all IO schedules will be created at the conclusion of the monthly status activity when the schedules are approved for publishing. The OOI Master Scheduler will create both a CD read only backup and move a complete set of files over to the Document Management System (see the IMS Archive Work Instruction for more details). In addition, local copies of files may be made by each IO for its use. See Section 3.1.4, C.

2 Pre-Baseline IMS Review

The OOI IMS documents a comprehensive understanding of the entire project, represents the complete scope of contracted work, and facilitates cross-functional and multi-organizational team participation from start to finish. The schedule baseline represents the finalized project plans and is under change control by the OOI PMO. Before the IMS baseline is established, the schedule will have undergone a thorough review to verify that the IMS:

- Represents the complete scope of contracted work
- Fully integrates with the contract budget
- Adequately addresses project risks associated with due dates and technical requirements
- Is supported by sufficient staffing levels at each IO to execute the work as planned
- Reflects how the work will be completed within the project's period of performance
- Identifies all IO cross project dependencies and "need by" dates
- Aligns to the requirements in the OOI EVM Plan to effectively monitor performance

Task /Responsibilities

The OOI Master Scheduler will perform a thorough review of the OOI IMS before the schedule baseline is established and prior to making any approved baseline changes thereafter. At a minimum the following checks will be made to ensure data quality and that the finalized IMS represents the intended plans of the OOI Senior Project Manager.

2.1 OOI IMS Pre-Baseline Review Steps:

Inputs: The OOI IMS has been reviewed and approved by all project stakeholders and is ready for final quantitative and qualitative assessments.

Step #	Task Description	Role(s) Responsible
1	Validate that the project start date is correct and that the project finish date is within the contractual period of performance.	IO Scheduler
2	Validate the WBS Structure for accuracy and consistency and verify that the numbering sequence is correct (vertical integration check).	IO Scheduler

Step #	Task Description	Role(s) Responsible
3	Check that the correct base calendar has been selected for use by both the project and the project resources.	IO Scheduler
4	Validate that the use of “hard” constraints has been minimized: i.e., Finish-No-Later-Than (FNLT), Start-No-Later-Than (SNLT), Must-Finish-On (MFO), and Must-Start-On (MSO). Document the reason why each “hard” constraint exists in the Notes field. See Table 1 below.	IO Scheduler/ IO PMs and CAMs
5	Verify that only “soft” constraints have been introduced such as Start-No-Earlier-Than (SNET) and Finish-No-Earlier-Than (FNET). See Table 2 below.	IO Scheduler
6	Check to ensure that deadlines have been minimized and document the reason why each deadline exists in the Notes field.	IO Scheduler/ IO PMs and CAMs
7	Investigate and document all instances of excessive lag times (i.e., where lag is greater than 60 working days). Lag should not be used to drive successor dates since it functions as *duration* and potentially impacts the critical path. Where needed, use a soft constraint (SNET or FNET) to hold the successor date and document its use in the Notes field so the purpose of the constraint is known when performing schedule analysis.	IO Scheduler/ IO PMs and CAMs
8	Check that all tasks have at least one predecessor and one successor.	IO Scheduler
9	Eliminate the use of negative lag or “lead time”. Lead distorts total slack and can adversely affect tracking tasks along the critical path.	IO Scheduler
10	Check that there are no predecessor or successor links on summary tasks.	IO Scheduler
11	Rework dependency logic for all instances of Start-to-Finish (SF) relationships in the schedule. This relationship type is counter-intuitive (“once the successor is finished, the predecessor can begin”) and should only very rarely (if ever) be used and with detailed justification.	IO Scheduler
12	Ensure all cross project dependency (CPD) links are established. Validate that “agreed to” or “need by” dates have been scheduled and reviewed by all IOs involved.	IO Scheduler/ IO PMs and CAMs
13	Ensure that all instances of negative total slack have been resolved prior to baselining the schedule using IO PM and CAM approved work around plans.	IO Scheduler/ IO PMs and CAMs
14	Investigate tasks and milestones that have total slack greater than 200 days. Long periods of inactivity suggest poor or missing task logic. Why does work for Task A have to be completed at this point in time if Task B is not scheduled to start until months later? Is there another activity that it should link to? Is there a step missing? Will resources be available when work on Task B resumes?	IO Scheduler/ IO PMs and CAMs

Step #	Task Description	Role(s) Responsible
15	Verify that resources in the schedule match exactly those in Cobra.	IO Scheduler/ IO PMs and CAMs
16	Validate the assignment of key resources loaded in the IMS are sufficiently supported by the IO staffing charts to ensure that personnel and labor requirements are available as planned. Identify peak resource loads and verify with the PMs that leveling delays have been considered.	IO Scheduler/ IO PMs and CAMs
17	Verify that all tasks have resources assigned.	IO Scheduler
18	Ensure that no resources are allocated on summary tasks.	IO Scheduler
19	Ensure schedule risk has been properly characterized and documented in the OOI Risk Register.	IO Scheduler/ IO PMs and CAMs
20	Check that a valid Performance Measurement Type (PMT) has been assigned to each Work Package and, if applicable, ensure each discrete task has been assigned an EV Milestone Weight.	IO Scheduler
21	Verify that the PMO has reviewed and given approval for all discrete WPs with durations greater than three months per the EVM Plan.	IO Scheduler/ IO PMs and CAMs
22	Verify that the PMO has reviewed and given approval for all discrete tasks that have durations greater than 40 days as prescribed by the OOI Schedule Management Plan.	IO Scheduler/ IO PMs and CAMs
23	Verify proper segregation of labor and non-labor resources at the work package level (i.e., Material, Travel, ODC, Equipment). Intermingling labor, material, equipment, ODC, etc. is discouraged (distorts EV performance measurements at the work package).	IO Scheduler/ IO PMs and CAMs

The pre-baseline review will include an investigation of constraints used in the schedule. The use of “hard” constraints, such as “Must Start On”, “Must Finish On”, “Finish No Later Than”, or “Start No Later Than” **will be minimized**. All instances where “hard” constraints or Deadlines are used **must be documented** to inform reviewers of their use and provide the rationale (saved in the Notes field). “Hard” constraints cause tasks to have zero days total slack and automatically make the task appear on the critical path. Table 1 (below) lists and describes the types of constraints and their prescribed uses.

Table 1: Task Constraints

Task Constraint	Constraint Type	Description	Use
As Soon As Possible (ASAP)	Soft Constraint	Start task as soon as possible based on other constraints and relationships (e.g., predecessors)	Default for new tasks. Use this “soft” constraint for most tasks, because it allows the scheduling application to apply dates based on the activity network. This method may be called forward scheduling.
As Late As Possible (ALAP)	Soft Constraint	Start task as late as possible based on other constraints and relationships	Use this “soft” constraint when building a schedule from the project finish date (i.e., reverse scheduling). Minimize this type as it requires additional tracking considerations: (1) delays task start dates so task

			durations must finish on time to prevent future schedule impacts and (2) leaves gaps in time between tasks.
Finish No Earlier Than (FNET)	Soft Constraint	Finish task on or after the date entered	Use this "soft" constraint to specify that a task cannot **finish** before a specific date (a one-sided constraint on forward scheduling).
Start No Earlier Than (SNET)	Soft Constraint	Start task on or after the date entered	Use this "soft" constraint to specify that a task cannot **start** before a specific date (a one-sided constraint on forward scheduling).
Finish No Later Than (FNLT)	Hard Constraint	Finish task on or before the date entered	Use this "hard" constraint is used to specify that a task **must finish by** a specific date.
Start No Later Than (SNLT)	Hard Constraint	Start task on or before the date entered	Use this "hard" constraint to specify that a task **must start by** a specific date.
Must Finish On (MFO)	Hard Constraint	Finish the task on a specific date	Use this "hard" constraint to define a task that **must finish on** a specific date.
Must Start On (MSO)	Hard Constraint	Start the task on a specific date	Use this "hard" constraint to specify that a task **must start on** a specific date, which cannot be affected by schedule interdependencies.
Deadlines	Special*	Marks a task as having an important due date	The deadline functions as both a "soft" and "hard" constraint. It behaves as a "soft" constraint in that it does not constrain the task's finish date (allows predecessor tasks to push it forward). It is also functions as a "hard" constraint by changing the task's total slack to zero days, automatically making it appear on the critical path. The Deadline does not appear in the Constraint Type column. To find where Deadlines are used, open the Deadline column and filter on, "Yes".

Additional guidance for "soft" constraints: Recommend IMS developers use the types shown in Table 2 (below).

Table 2: Prescribed uses for Soft Constraints

Soft Constraint	Applicability
Start-No-Earlier-Than (SNET)	• Used when establishing cross project dependencies (CPDs) for which an IO has been given projected "Giver/Receiver" dates • With finish-to-start or start-to-start relationships, use SNET instead of adding long lag times between tasks to drive the start date of a successor task 30+ days into the future
Finish-No-Earlier-Than (FNET)	• "Just-in-time" tasks on separate contracts (for example, desire to hold delivery on two components until third component is available) • With finish-to-finish relationships, use FNET instead of adding long lag times between tasks to drive the start date of a successor task 30+ days into the future

Outputs:

The project critical path and schedule network logic (dates, durations, dependencies, build sequence, constraints, lag, total slack, and resource loads) have been validated. The IMS has passed all final quantitative and qualitative assessments and all findings and action items have been resolved. Work Packages have been verified for segregation of labor and non-labor, and totals costs for each Control Account and Work Package have been approved by the IO Project Managers, OOI Master Scheduler and OOI Senior Project Manager and is ready for the customer's final review.

2.2 Schedule Slack Analysis

"Slack" (also referred to as "float") is calculated by the amount of time a task can be delayed before successor tasks or the project finish date is affected. "Free slack" is the amount of time that a task can be delayed before its successor task is affected. "Total slack" is the number of days a task can be delayed before affecting OOI project finish date.

Quantification of schedule slack provides useful information for making decisions about time-sensitive issues and resource prioritization.

A. The PMO will analyze schedule slack to manage schedule risk and to accommodate or mitigate changes brought about by internal or external events.

B. IOs will use slack to optimize resource assignments to fulfill project requirements.

C. The OOI Master Scheduler will evaluate the IO's proposed use of schedule slack during critical path analysis and make recommendations as needed.

Analyzing Schedule Slack

When analyzing schedule slack, all instances where "hard" constraints and Deadlines are used must be validated or removed (see Table 1: Constraint Types, in Section 2.1 above). Total slack and free slack can then be analyzed.

The OOI Master Scheduler and the IO Schedulers evaluate "total slack" each time a series is analyzed, and also evaluate "free slack" periodically for noticeable shifts within each site. Significant findings are reported to the IO PM team.

2.3 Critical Path Analysis

The critical path is a networked series of tasks that collectively has the longest total duration and least amount of total slack leading up to the project finish date. This contiguous network of tasks dictates the calculated finish date of the project. Critical Path Analysis is a technique used to identify and monitor tasks that have the greatest potential to cause significant schedule delays, and in turn helps the OOI PMO take proper measures to avoid those situations.

The critical path is based on schedule network logic (dependencies), durations, lag, and constraints. By definition, any incomplete task having 0 days (or less) of Total Slack is "critical". Discrete tasks must be linked (have predecessors and successors) in order to properly calculate the Total Slack (also referred to as Total Float) in the project. If the logic is missing, the true critical path for the project will most likely be unknown.

Prior to generating the critical path report, the IO Scheduler will verify that the schedule logic has been validated to ensure that the critical path is calculated correctly. Refer to steps 4 through 14 of the "OOI IMS Pre-Baseline Review Steps" (in Section 2.1, above).

How the critical path is calculated: Along all task networks in the IMS and accounting for all scheduling factors (network logic, durations, lag, and constraints), the scheduling software determines the critical path by calculating total slack. Total slack is determined by the difference in time when comparing early start and early finish dates to the late start and late finish dates along a series of networked tasks. The early start and early finish dates are calculated by means of performing a forward pass through the schedule, using a specified start date. Late start and late finish dates are calculated by means of performing a backward pass through the schedule, starting from a specified completion date. After performing the forward and backward pass, the tasks and milestones along the critical path will have no difference in the early and late start dates and the early and late finish dates. The tasks and milestones that constitute the critical path will have zero days of total slack.

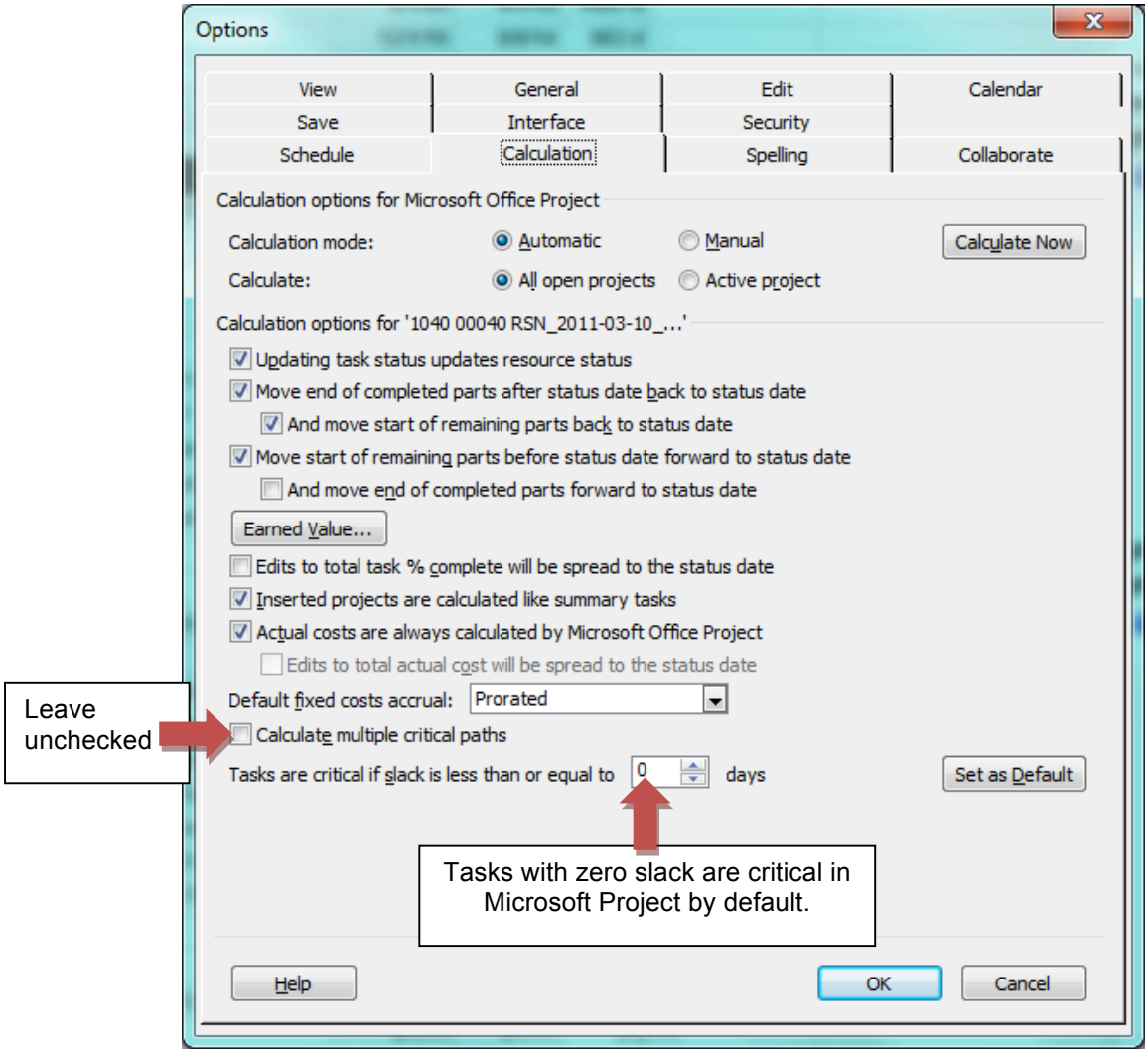
The critical path is dynamic and therefore it is essential to analyze the critical path report each month at a minimum after the status updates are incorporated.

The IO Scheduler will review the IO critical path each month with the IO PMs and CAMs so the teams can be aware of any changes and can analyze the effects if date changes occur to critical tasks or milestones. It is ***important*** that the IO PMs, CAMs, and technical leads evaluate the tasks that comprise the critical path and validate that the critical path seems logical. The critical path generally is composed of tasks that are the most technically challenging, have higher degrees of associated risk, and precede major milestones. Level of effort tasks should never appear at any point along the critical path. The IO PMs, CAMs, and technical leads will work with the IO Scheduler to make adjustments to the network logic as needed to ensure that the critical path is accurately represented.

The OOI Master Scheduler will perform an integrated critical path assessment that traces the critical path through all the IO schedules and distribute the report for the PMO and all IO stakeholders to review. The OOI Master Scheduler will analyze the critical and near-critical paths of the OOI schedule each month and prepare and document the findings as part of the OOI IMS analysis report for submission to the PMO. The "near-critical path" is defined by a series of networked tasks having less than 20 working days total slack. Analysis will concentrate on tasks and milestones having the least amount of total slack and greatest technical significance to the completion of the project.

The tasks and milestones that make up the critical path and near-critical path will be provided in a Project file report as well as Analysis of the critical path that will be written and delivered as part of the monthly IMS submittal.

Project Settings for calculating the critical path are found by selecting Tools on the menu bar >> Options >> Calculation tab.



The specific steps and procedures for validating and maintaining the critical path is detailed in the OOI Critical Path Analysis Work Instruction and is located in Alfresco (OOI > REFERENCE > SCHEDULE FILES AND COBRA COST FILES.

2.4 Schedule Risk, Risk Mitigation and Scheduling Contingency

The overall construction of the OOI IMS is comprised of tasks and scope that are fixed and certain. However, there are items within the OOI IMS where the durations may change and are carefully managed as Schedule Risk. Two examples of Schedule Risk are regulatory processes for permitting and weather delays during deployment.

Two methodologies are used to address schedule risk in the implementation of the OOI IMS. The first is the creation of schedule contingency (see Section 2.6, below), and the other is a monthly analysis of the schedule critical path.

Duration analysis as a function of schedule risk analysis is performed using the Risk+ tool and calculated using a modified PERT methodology. The task durations in the IMS are taken as the

"most likely" (50% probability of being longer or shorter). "Best case" (33% probability of being shorter) and "worst case" (33% probability of being longer) task durations are calculated as a given percentage difference from "most likely". For some tasks a default -25% "optimistic" and +25% "pessimistic" duration was used, but each task was evaluated separately.

The pessimistic (worst case) durations for each task are used to recalculate the completion dates for all duration reporting points. As long as the total slack for site completion under the pessimistic analysis is not less than zero, the difference between the most likely finish date and the pessimistic finish date represents schedule contingency. The weather window of each site is reviewed to verify that under the pessimistic analysis installations can still proceed within the weather window.

For OOI, the pessimistic completion date for the last installation site as originally planned was August 2014 within a one-sigma confidence level (69%). The end date of the construction project is 01 March 2015. The difference between these two dates represents an additional 10% of project schedule contingency.

For each site where a Marine installation takes place, duration analysis reporting points are selected. IO Project Managers and the OOI Senior Project Manager may require that a Monte Carlo simulation be performed to provide a statistical range of completion dates for tasks leading up to key project milestones. If the simulation indicates there is a low confidence in achieving any of the desired reporting point completion dates, possible mitigating actions and their impact on the simulation will also be provided.

In regular practice, the OL OOI Scheduling Team conducts updated schedule critical path and risk analyses at a minimum monthly and the OL OOI Senior Project Manager and the IO Project Managers review the results in weekly conference call meetings. During these weekly meetings, the OL OOI Senior Project Manager asks each IO PM if there are any issues preventing progress within their scope of deliverables and requires them to identify mitigation activities to address schedule risks and records them in the notes from the meeting on Confluence to status each week. If any milestone or critical path date slips further than allowed by the OOI CMP and per Sections 4.2 and 4.3 of this document then an ECR is required to change the date and put in place actions to prevent further delays.

In addition to the weekly schedule critical path and risk reviews between the PMO and IOs, the IO PMs employ additional schedule management techniques including: holding weekly internal progress review meetings internal, creating integrated product teams and assigning sub-leads to manage tasks to a more detailed level, holding weekly procurement specific status meetings, generating and reviewing sub-milestone spreadsheets, utilizing Jira to manage inchstones, holding monthly risk and opportunity management board meetings, providing work completion data and schedule variance reports for the monthly earned value management report to the NSF, and preparing for and holding quarterly progress review meetings with the NSF.

2.5 Cross Project Dependencies (CPDs)

A cross project dependency is a deliverable or milestone that must be completed by an IO before another IO can perform subsequent work. CPDs are grouped at the top of each IO schedule for increased visibility. CPDs identify delivery points for integration (also known as "giver" and "receiver" milestones).

The "agreed to" or "need by" date is represented in the baseline finish field. The CPD dates are reviewed each month during the IMS status process. Significant changes are reported to the appropriate IOs. If the "giver" date is earlier than the "receiver" date, no action is likely required. If the "giver" date is later than the "receiver" date, further analysis and discussion is required to identify corrective action. CPDs are proactively managed. Careful analysis is conducted for tasks preceding these key integration activities to detect/avoid potential schedule impacts.

2.6 Schedule Contingency

Schedule Contingency was calculated at the outset of the project using the same modified PERT methodology discussed in Section 2.4.

As a routine part of monthly schedule and EV reporting, the IO PMs and CAMs will provide input to the IO Schedulers to create a narrative report using the CPR Format 5 as a guide for describing the cause and expected mitigation efforts of delays in Control Accounts that are greater than the allowable limits stated in the EVM Plan. If needed, additional tasks will be added to detail the delay and/or mitigation activities. This narrative will be part of the report that accompanies the monthly submission.

2.7 Graphical Display and Reporting

For reporting purposes, it is convenient to show progress graphically in the IMS. To do so, the following conventions will be used:

Summary tasks contain the earliest start and the latest finish of the group of tasks which are assigned to it. Summary data will be shown as a black Gantt bar with a triangle milestone at the start and finish.

Tasks will be represented as individual Gantt bars, with the baseline shown below the current data. The Current Gantt bar will extend from the start of the task to the finish and be shown as an empty bar, and as work progresses the Gantt bar will fill in solid. Blue will be used for items that are not on the critical path and red will be used for items that are directly on the critical path.

Milestones have no duration, and there are no resources assigned to them. Milestones will be represented as individual diamond shapes, Empty for incomplete and solid for completed milestones.

2.8 Level of Effort (LOE) Tasks and Reporting

A Level of Effort (LOE) task is one without a deliverable product, such as most tasks commonly found in Project Management or System Engineering. Level of Effort (LOE) work packages or tasks are included in the IMS and are clearly identified as such, and separated from other discrete tasks in the schedule files. These tasks are included into the IMS for planning and budgeting with their own WBS element number. Level of Effort should not be linked to discrete work and shall never drive tasks on the critical path.

2.9 Deprecated Tasks and Reporting

A “Deprecated” marker is used to retain the structural integrity of the WBS when scope from a Control Account (CA) or Work Package (WP) has been deleted or moved. Task and milestones below the Work Package level do not require deprecation. A deprecated CA or WP will be represented in the schedule as having:

- a “D” as the Element Type
- “DEPRECATED” in the name field that precedes the original CA or WP name
- a duration of zero days
- maintained its original start date (using a SNET constraint)
- no resources assigned or cost associated

Because a deprecated CA or WP is recognized only as a placeholder, it will be marked complete at the point in time when the start date appears in the current statusing period. Statusing a

deprecated task early or late may disrupt the higher summary level elements by finishing outside of the original date range of its “parent” summary.

3 Monthly Statusing Process

Status information will be collected monthly at a minimum from the IO PMs and CAMs at the detail task level and entered into the Working Schedule by the IO Scheduler:

- Actual start and actual finish dates for tasks that started or finished in the period of performance
- Updates to forecast start and finish dates
- Updates to performance metrics for tasks currently in progress

Each IO Scheduler collects and enters status from the IO PMs and CAMs following the detailed procedure described in Section 3.1 of this document. After IO Status is complete, the IO Schedulers analyze schedule changes, identify schedule conflicts, and investigate delays to major milestones. Each IO Scheduler will generate exception reports and review the schedule changes with the IO PMs and CAMs to resolve post-status issues. The OOI Master Scheduler will collect and incorporate the approved IO schedule updates in the OOI IMS.

The updated schedule is used to generate EV reporting and analysis. *Figure 1 - OOI IMS Status Update Workflow Summary* depicts a general process flow for completion of the monthly IMS schedule update and subsequent Earned Value Analysis. Detailed steps for updating the IMS, refer to the process flow diagram contained in Section 3.1 of this document.

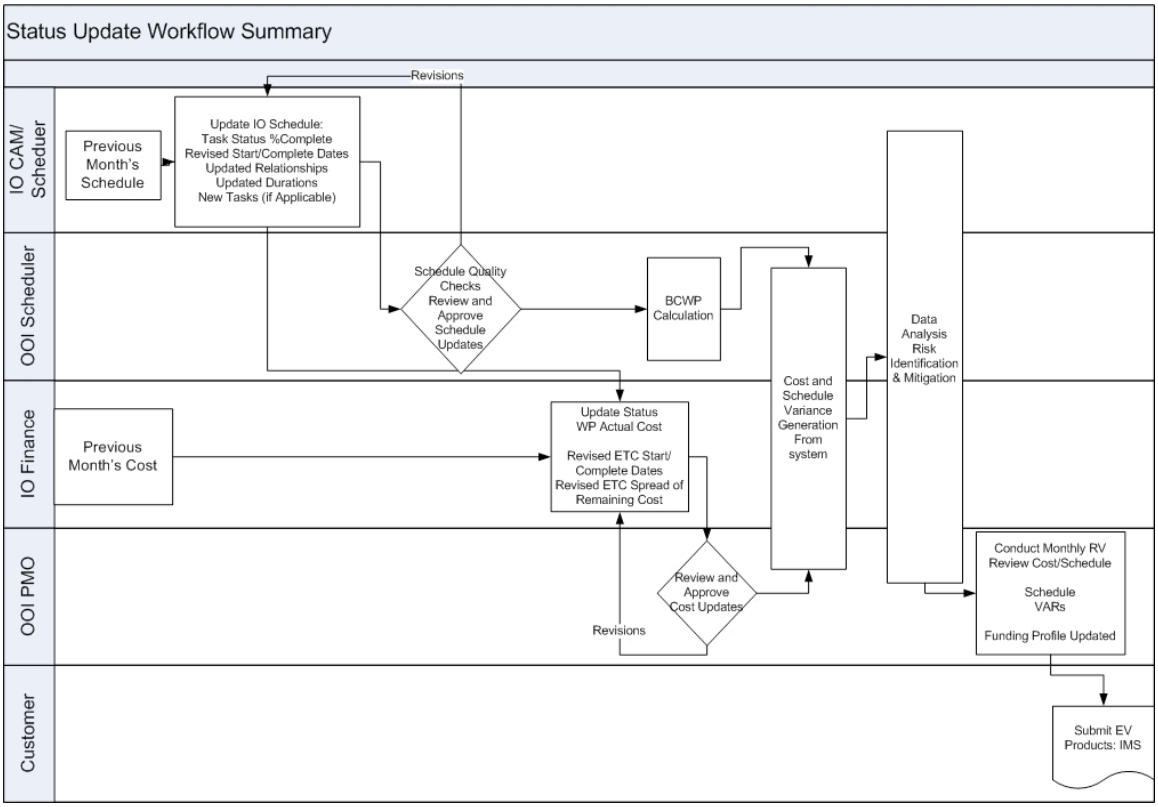


Figure 1 - OOI IMS Status Update Workflow Summary

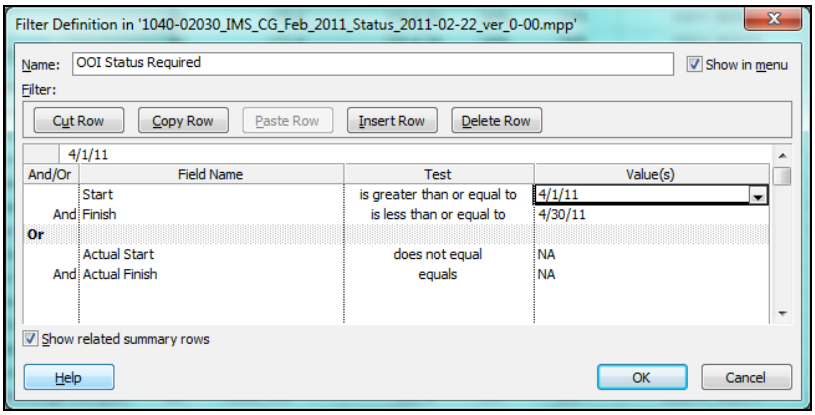
3.1 Statusing the IMS

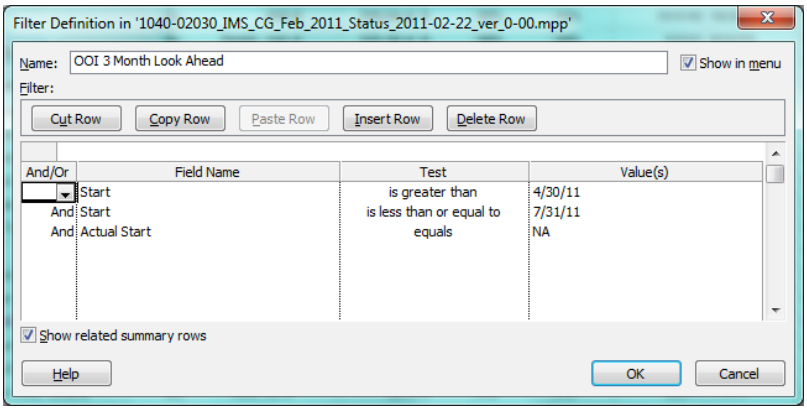
By the first day of the new reporting period, the OOI Master Scheduler initiates the start of the new monthly status cycle by informing the IO Schedulers to begin statusing the IO schedules. The following paragraphs reference the process diagram and workflow from Figure 2. A general timeline is included within the figure.

3.1.1 Preparing the Schedule for Monthly Statusing

Inputs: The OOI IMS from the previous reporting period has been reviewed and approved by all project stakeholders.

Step #	Task Description	Role(s) Responsible
1	Notify the IO Schedulers to begin collecting the current reporting period's status updates. Email each IO Scheduler and copy each IO COTR. The message should: a) Indicate the start of the current reporting period b) Communicate the status due date per the Status Cycle Calendar c) Remind the IO Schedulers to perform the month-end schedule review prior to submitting the status updates (see checklist below (Section 3.1.3, Step 2) d) Prompt the IO Schedulers to ***immediately*** communicate issues that have potential to delay status submission by the Status Cycle due date to the OOI Master Scheduler and respective IO COTR.	OOI Master Scheduler
2	Access the current version of the IO schedule.	IO Scheduler
3	Input the current Status Date in MS Project: From the menu bar, click Project → Project Information → Status Date Change the Project Status Date to reflect the last day in the calendar month in which performance is being reported. Ex: If the EV reporting period is measuring progress for the month of April, the Status Date would be 04-30-20xx.	IO Scheduler
4	Verify that the correct base calendar has been selected for use by both the project and the project resources.	IO Scheduler

Step #	Task Description	Role(s) Responsible
5	Generate reports for each IO PM and CAM that include a complete list of tasks that require status updates for the current reporting period. Update the filter, “OOI Status Required”. Enter the first day of the reporting period in the first row [Start date] and the last day of the reporting period in the second row [Finish date]. Click OK. Project will return the list of tasks that have scheduled Start/Finish dates in the reporting period and all tasks that are currently in progress. Example: if the reporting period covers status through April 30, then the report will return all tasks that require status through April 30 (see below).  IO PMs and CAMs will provide Actual Start/Finish dates for tasks that did actually start/finish in the current period and provide updated EV % Complete values. For tasks that did not actually start or finish, the IO PMs and CAMs will provide a new Forecast Start/Finish date. See Step 7 for IO PM and CAM directions.	IO Scheduler

Step #	Task Description	Role(s) Responsible
6	Generate a three month look-ahead report for each IO PM and CAM that lists all tasks scheduled to start in the next three months. This report is used as a planning resource for the IO PMs and CAMs and does not necessarily require any updates from the IO PMs and CAMs. Update the filter, “OOI 3 Month Look Ahead”. In the first row [Start date], enter the last day in the current reporting period. In the second row [Start date], enter the last day in the reporting period three months into the future. Click OK. Example: if the reporting period covers status through April 30, then the three-month look-ahead will include all tasks scheduled to start through July 31. 	IO Scheduler

Outputs: The IO PMs and CAMs are provided with the reports and can begin entering their updates.

3.1.2 Collect IO Status Updates from IO PMs and CAMs

Each IO PM and CAM will provide updates to the status report distributed by the IO Scheduler. When finished, the IO PMs and CAMs will submit the status updates to the IO Schedulers.

Inputs: The IO Schedulers have distributed the schedule statusing reports and have notified the responsible IO PMs and CAMs to proceed with entering task progress updates for the current reporting period.

Step #	Task Description	Role(s) Responsible
1	IO PM and CAM directions for statusing their assigned tasks in the current status period: a. Enter an Actual Start date for tasks that have started. If a task has an actual start, it must have an EV% Complete value greater than zero. b. If a task was scheduled to start within the current status period and yet did not start, provide a new Forecast Start date. If a task does not have an actual start, it must have an EV% Complete value of zero. c. Enter the Actual Finish date for all tasks that have finished. If a task has an actual finish, it must have an EV% Complete value of 100. d. If a task was scheduled to finish during the current status period but has not finished, enter a new Forecast Finish date. If a task does not have an actual finish, it must have an EV% Complete value less than 100.	IO PM and CAM

Outputs: Each IO PM and CAM has provided updates to the status report and submitted the status updates to the IO Scheduler.

3.1.3 The IO Scheduler begins incorporating status updates into the IO schedule.

Inputs: All status updates have been received from the IO PMs and CAMs for the current reporting period.

Step #	Task Description	Role(s) Responsible
1	Enter the IO PM's and CAMs' status updates into the IO schedules.	IO Scheduler
2	Verify that all tasks that require status for the current reporting period have been updated. Save and publish updates back to the PM and CAMs for review. Run reviews using analysis software (i.e., Steelray Project Analyzer) or employ a similar systematic process. a) Ensure all tasks at the lowest level of the WBS have proper predecessors and successors. b) Verify that summary tasks do not have predecessors or successors. c) Ensure all resources are assigned at the lowest level of the WBS (not on summary tasks except for approved Summary Level Planning Packages). d) Investigate and resolve all negative total slack issues. e) Investigate and understand dependencies that have total slack greater than 200 days. Long periods of inactivity suggest: i. Improper links/dependencies – If the next activity in sequence is not scheduled to start until months later, why does the predecessor have to be completed so early? Is there another activity that the predecessor should link to? Is there a step missing, or is it truly a legitimate gap in between? ii. Lack of task detail (are long duration tasks preventing the use of proper Finish-to-Start (FS) dependencies? e.g., parallel tasking with SS or FF dependencies can create large amounts of total slack and prevent management from monitoring changes to slipped tasks) iii. Potential staffing issues – will resources be available when work resumes after a long reprieve? f) Investigate and understand the use of lag > 30 days. As a rule, the use of lag to drive successor dates should be minimized since lag functions as *duration* in the schedule, manipulates start or finish dates date of successor tasks, and has the potential to falsely impact the Critical Path. Lag is not easily identified and over time the purpose of its intended use can be forgotten when trying to validate the critical or near-critical path. Lag must be documented in the Task Notes column and monitored closely EVERY time	IO Scheduler

	the schedule is statused to prevent false impacts to the critical path. In cases where a successor task is needed to start more than 30 days after a predecessor, consider using a soft constraint such as "Start No Earlier Than" to hold the start of the successor task in place (see Table 2, Sect. 2.1). g) Ensure negative lag ("lead" time) between dependencies is not used. Replace negative lag with improved dependency logic and task relationships. h) Out of Sequence tasks – user PERT Chart Expert to analyze the network logic and validate the steps and sequence of the actual development process with the CAM. Make appropriate changes to dependencies as necessary to ensure the IMS reflects the most current plans. i) Evaluate CPDs and check for changes to agreed dates. Work with IO PMs and CAMs to resolve conflicts or escalate risks.	
3	Incorporate the updates from each of the IO schedules into the master schedule and validate Step 2 above at the IMS level with emphasis given to analyzing CPDs. Communicate findings and work with the IO Schedulers to resolve issues.	OOI Master Scheduler / IO Schedulers

Outputs: The IO schedules have been statused and reviewed by the IO PMs and CAMs and incorporated into the IMS. Any changes to major milestones have been documented and communicated and all schedule conflicts have been resolved. The IMS is ready for the OOI Senior Project Manger's review and monthly reporting can begin.

3.1.4 Finalizing, Publishing, and Archiving the IMS

A. The approved IMS is updated with correct version data in accordance with the CMP.

B. The IMS is published in various reporting and viewing formats for OOI PMs, CAMs, team members, and stakeholders to view and analyze.

C. A complete Read Only copy of the published IMS is archived onto Alfresco, location: OOI → REFERENCE → SCHEDULE FILES AND COBRA COST FILES and on Compact Disk maintained in the B.O.B.

D. The monthly IMS Analysis Report is submitted for review and approval with the EV reports.

The monthly status cycle is provided on the following page (Figure 2) illustrating the workflow and approval process. The corresponding Section Number of the SMP is indicated with the activities in the diagram.

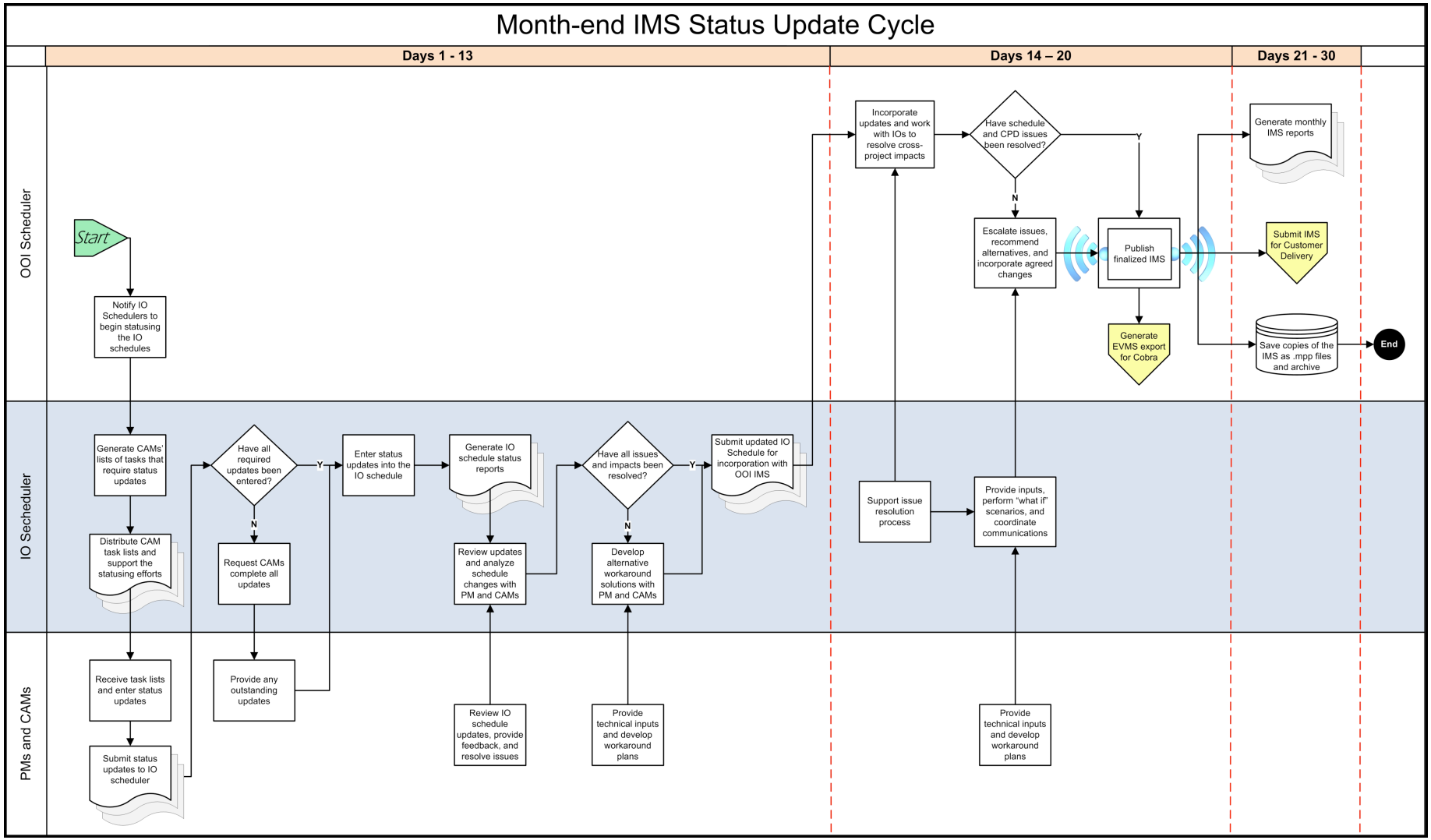

Month-end IMS Status Update Cycle
Days 1 - 13
Days 14 – 20
Days 21 - 30
OOI Scheduler
IO Secheduler
PMs and CAMs
Start
Notify IO Schedulers to begin statusing the IO schedules
Generate CAMs' lists of tasks that require status updates
Distribute CAM task lists and support the statusing efforts
Receive task lists and enter status updates
Submit status updates to IO scheduler
Have all required updates been entered?
Y
N
Request CAMs complete all updates
Provide any outstanding updates
Enter status updates into the IO schedule
Generate IO schedule status reports
Review updates and analyze schedule changes with PM and CAMs
Review IO schedule updates, provide feedback, and resolve issues
Have all issues and impacts been resolved?
Y
N
Develop alternative workaround solutions with PM and CAMs
Provide technical inputs and develop workaround plans
Submit updated IO Schedule for incorporation with OOI IMS
Incorporate updates and work with IOs to resolve cross-project impacts
Support issue resolution process
Have schedule and CPD issues been resolved?
Y
N
Escalate issues, recommend alternatives, and incorporate agreed changes
Provide inputs, perform "what if" scenarios, and coordinate communications
Provide technical inputs and develop workaround plans
Publish finalized IMS
Generate EVMS export for Cobra
Generate monthly IMS reports
Submit IMS for Customer Delivery
Save copies of the IMS as .mpp files and archive
End

Figure 2

3.2 Integration with Cost Data

Integration with Cost Data for use in EV calculations is specified in detail and outlined in the *OOI Earned Value Management Plan.* The OOI Master Scheduler will export the schedule status (performance) data after the month-end IMS has been finalized and published. The status data is calculated as Budgeted Cost of Work Performed (BCWP) in the EV tool and used for EV analysis.

4 Schedule Baseline Change Control

Schedule baseline change control authority is governed by the OOI CMP and the thresholds defined in the OOI EVM Plan.

Schedule baseline change requests are initiated by PMO or IO PMs and CAMs. The IO Scheduler will create a "what if" Project file that represents the proposed changes. A current state and future state comparison is conducted ("before and after" assessment), the results are quantified and documented, and the findings are submitted along with the "what if" Project file as supporting documentation to accompany the ECR.

The OOI Master Scheduler will analyze the change request, "what if" file, and supporting documentation, performing all checks listed in the OOI IMS Pre-Baseline Review Steps. Refer to Section 2.1. Any issues or schedule risks will be quantified, documented, and reported in the SAF Change Control system prior to the CCB review.

ALL ECRs having schedule impact ***MUST*** be accompanied by a "what if" .mpp file

Schedule exports or spreadsheets are ***not*** sufficient substitutes.

Microsoft Project 2007
"what if" .mpp file

4.1 Schedule Baseline Governance per the CMP and EVM Plan

Throughout the lifecycle of the OOI Project, maintenance is performed on the baseline schedule data contained within the IMS and is permitted within the conditions identified within Paragraph 7.1 of the OOI CMP and Section 6 of the OOI EVM Plan. All types of baseline maintenance require ECR submission and must be approved by the appropriate CCB level. ECRs will be tracked and documented in the ECR log to ensure traceability to the original project baseline.

4.2 Types of Baseline Maintenance

Baseline maintenance falls into three main categories:

A. **Clerical Corrections:** A clerical correction can be performed at any time and falls under the CMP paragraph 6.2.2 Class II change definition. These minor changes are specifically used to correct:

- Textual or typographical errors
- Improperly set baseline field(s)
- Normal accounting adjustments (rate changes, cost corrections, reburdens, etc.)

In many cases, only the IO PM, CAM and SE will need to review and validate that the clerical correction is implemented. The ECR record of change and a copy of the before/after portion where the changes occurred are necessary for traceability. Depending on the change, the data may or may not need to be re-submitted to correct EV reporting.

B. **Engineering Change Requests (ECRs)**: Performing routine baseline maintenance is a normal and expected process to ensure that the IMS contains the most current and accurate reflection of the project's execution plan. ECRs are analyzed are required for IO PM and CAM Adjustments with schedule impacts, Progressive Elaboration, and project Re-planning.

1) **IO PM and CAM Adjustments** are individual changes initiated by an IO PM and CAM to request a baseline change to a future work package outside of the Annual Work Plan progressive elaboration. If a proposed baseline change is identified as having schedule impact, the IO Scheduler will create a "what if" Project file that represents the proposed changes. A current state and future state comparison is conducted ("before and after" assessment), the results are quantified and documented, and the findings are submitted along with the "what if" Project file as supporting documentation to accompany the ECR. The ECR is analyzed to determine the class rating per Section 7.4 of the CMP.

a. **Class II** baseline changes *below* the Work Package level are reviewed at the IO CCB. The IO Scheduler will analyze the change request, "what if" file, and supporting documentation, performing all checks listed in the OOI IMS Pre-Baseline Review Steps (Section 2.1). Any issues or schedule risks will be quantified and documented and reported in the SAF Change Control system prior to the CCB review. If approved, the IO scheduler will notify the OOI Master Scheduler to incorporate the ECR and make the approved baseline changes.

b. **Class I** baseline changes (or changes *at or above* the Work Package level) are reviewed at the System Level CCB. The IO Scheduler will create and submit the "what if" file and supporting analysis for documentation. The OOI Master Scheduler will analyze the "what if" file and supporting schedule impact documentation and perform all checks listed in the OOI IMS Pre-Baseline Review Steps (Section 2.1). Any issues or schedule risks will be quantified and documented and reported in the SAF Change Control system prior to the CCB review. If approved, the OOI master scheduler will incorporate the ECR and make the approved baseline changes. The responsible IO PM and CAM will update the WBS Dictionary.

2) **Progressive Elaboration** planning is conducted as an OOI exercise of adding detail to future planning packages as per the development of the Annual Work Plans (AWP). Planning packages are converted into work packages with detail tasks leading up to major events or project milestones. All changes must occur before the baseline start date of the planning package. The planning package must not be opened (e.g., has no "actual start date") or have any actual costs incurred (no "actual costs" reported). The responsible IO PM and CAM will update the WBS Dictionary to document the changes from planning package to detailed work package.

In the event that a planning package is identified to start in the current status period, an in-month ECR should be conducted to convert the planning package and allow Earned Value to be assessed. This rule should be used on an exception basis only as proper scheduling practices dictate monthly/quarterly look-ahead analysis to adequately detail plan work in advance.

3) **Re-planning** (or retime-phasing) is initiated by the IO PM and CAM and consists of adjusting the schedule baseline for future work packages. Typically, this category of change results from corrective action plans to delay non-critical work and has little or no scope/budget impact.

   The IO Scheduler will create and submit the "what if" file and supporting analysis for documentation. The OOI Master Scheduler will analyze the "what if" file and supporting schedule impact documentation and perform all checks listed in the OOI IMS Pre-Baseline Review Steps (Section 2.1). Careful attention is given to detecting changes in the critical path and cross-project dependencies caused by the retime-phasing of work. Any issues or schedule risks will be documented and reported in the SAF Change Control system prior to the CCB review. If approved, the OOI master scheduler will incorporate the ECR and make the approved baseline changes.

C. **Reprogramming:** This type of maintenance only occurs when the Customer or OOI PMO declares that a severe technical or programmatic issue has rendered the IMS baseline unachievable and no longer provides a realistic baseline to measure project performance. An Over Target Baseline (OTB) or Over Target Schedule (OTS) should be declared only after all other recovery options have been exhausted. Before reprogramming can begin, complete customer disclosure is required as well as their approval to proceed.

   The OOI PMO may decide to reset schedule and/or cost variance (BCWS = BCWP = ACWP) as a separate action resulting from an OTB decision (refer to the OOI EVM Plan section 2.19). If variances are adjusted, their historical cumulative values are retained to ensure traceability.

   Formal reprogramming should only be considered if the overall remaining work is between 15 and 85 percent. The baseline from current time forward is rebuilt and a new Estimate to Complete (ETC) is calculated for the remaining work.

4.3 Baseline Maintenance Process

Changes to the schedule baseline are governed by the CMP as an Engineering Change Request (ECR). ECRs are typically initiated by the IO PM and CAM and schedule analysis support is provided by the IO Scheduler. Section 7.1 of the CMP requires that ECRs be accompanied by documentation that:

1. Identifies the WBS element in question.
2. Describes the aspect of the WBS element to be changed as part of the request.
3. Includes a description of the cost, schedule and scope impacts, from the requestor's point of view, of leaving the control account as-is compared to incorporating the suggested change. (This provides the Change Control Board a better understanding of why the change is being submitted and what importance it has from the perspective of the submitting party.)
4. The assessment steps in CMP section 7.1.1 call for the following analysis documentation:
   i. Additional management effort to revise the schedule and notify affected parties.
   ii. Impact on control account attributes.
   iii. Impact on control account design documents.
   iv. Impact on quality of the system.

v. The risk increased cost of changes at later stages of the project (exponential factor).

Furthermore, all ECRs determined as having schedule impact will be accompanied by a by a "what if" .mpp file. Schedule exports or spreadsheets are not sufficient substitutes.

Figure 3: Schedule Baseline Change Process