OOI

OCEAN OBSERVATORIES INITIATIVE

SYSTEMS ENGINEERING MANAGEMENT PLAN FINAL

Version 1-00
Document Control Number 1100-00004
2015-01-26

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Document Control Sheet

Version	Date	Description	Originator
0-01	???	Initial draft	J.Pesaturo
???	???	Revision	J.Pesaturo
???	???	Revision	J.Pesaturo
???	???	Revision	J.Pesaturo
0-10	2014-06-17	Revised Draft	E Chapman
0-11	2014-06-20	Revised Draft	J.Pesaturo
0-12	2014-06-20	Revised Draft	E Chapman
0-13 through 0-17	2014-10-20 through 2014-11-06	Internal Drafts	K. Carr
0-18	2014-11-07	Revised Draft	K. Carr
0-19	2014-12-17	Format updates and Comments	S. White
0-20	2015-01-12	Revised to remove Liens after 2014-12-17 CCB	D. Penn
0-21	2015-01-26	Revised to remove Liens after NSF CCB 2015-01-26	D. Penn
1-00	2015-01-27	Initial Issue	M. Kelly

1   Introduction

This document describes the approach and process for accomplishing the work remaining in the Major Research Equipment and Facilities Construction (MREFC) phase of the Ocean Observatories Initiative (OOI) program.   This work includes: 1) finalizing the OOI Concept of Operations (CONOPS); 2) designing, developing, integrating, and testing the OOI Cyberinfrastructure; 3) conducting the remaining OOI Technical Reviews; 4) performing the remaining acquisition of equipment; 5) deploying and/or turning the remaining marine arrays and platforms; and 6) conducting Conditional Acceptance and Commissioning of the Marine Infrastructure and Cyberinfrastructure.

Details of the approach, process, and deliverables for these remaining work items are described in sections 2 through 7 of this document.

Unless specified otherwise, this document assumes the use of established OOI MREFC processes and procedures defined in the OOI Systems Engineering Management Plan (SEMP), the OOI Configuration Management Plan (CMP), and the OOI Test and Evaluation Strategy documents.   This document and an updated Integrated Master Schedule (IMS) together define the scope and schedule of the remaining OOI MREFC tasks through complete Commissioning of the OOI, and both this document and the IMS will be baselined through an Engineering Change Request (ECR).

This document supersedes the OOI Commissioning Plan (DCN 1004-00000), and any references to that Plan in other OOI documentation.

2   OOI Concept of Operations

The OOI CONOPS document outlines how the OOI operational team will fulfill the overarching objective of sustained data delivery to the user community within the annual budgetary targets, using the $55M ceiling for 2016 as the initial operational budget. This document is the guide for the Cyberinfrastructure Use Cases.

The CONOPS document describes operational concepts and assignment of responsibilities within the following categories:

- management and advisory structures;
- engineering management;
- cyberinfrastructure;
- network status;
- platform, glider and AUV operations;
- end-to-end data delivery, focus on data management/quality/evaluation;
- planning and procurement;

The CONOPS document also describes maintenance and refurbishment concepts and assignment of responsibilities, including:

- Recovery / redeployment of marine infrastructure;
- Refurbishment and servicing of recovered instruments, vehicles and supporting hardware;

Deliverable: The OOI CONOPS (DCN 1013-00000) is approved by System CCB and forwarded to NSF CCB for final approval.

3   Cyberinfrastructure

The OOI Cyberinfrastructure (CI) supports OOI data product generation, data search and download, command and control of instruments and platforms (for the cabled OOI deployments), system health and status monitoring, and asset management.

The OOI CI consists of a Service Oriented Architecture (SOA) framework called uFrame (Universal Framework; developed by Raytheon Omaha), a set of dataset/instrument/platform drivers and data product algorithms which plug in to the uFrame framework (developed by OOI Marine IO staff), and a user interface (developed by Applied Science Associates (ASA)).   The CI integration, and testing is managed by Rutgers University.

3.1   Cyberinfrastructure Concept of Operations, Use Cases and Requirements

The Concept of Operations (CONOPS) for the OOI Cyberinfrastructure is documented as part of the overall OOI Concept of Operations discussed in Section 2.   The CONOPS drives the development of a set of OOI Use Cases.   Additional input to the development of the CI Use Cases includes discussions with stakeholders, and existing knowledge and lessons learned from prior CI development. Stakeholders include both internal and external science users, marine operators, cyberinfrastructure operators, program management, and the program sponsor.

Both the OOI CONOPS and the OOI Use Cases are approved at the System Level CCB.

CI requirements were updated to reflect the capabilities provided by the core uFrame, and supplemented with any missing "must haves" based on a "must have list" derived from the approved CONOPS-driven Use Cases. The requirements take into consideration uFrame capabilities previously delivered on other uFrame systems (such as Tsunami and AWIPS II) including software design patterns as needed from those other systems. These uFrame-based and supplemented CI requirements after System Level CCB for approval, replace the Level 2, 3, and 4 requirements which are currently in the OOI DOORS CI requirements database. The prior CI requirements are still valid but the uFrame-based and supplemented CI requirements take precedence should a conflict exist.

The approved CI requirements derive tasking for the OOI CI uFrame development team and for the OOI CI Graphical User Interface (GUI) development team. The CI use cases and requirements will also provide the basis for the development of Requirements Verification Test Plans and Test Procedures, and System of Systems Validation Test Plans and Test Procedures.

At the time of the CI Final Review, which is scheduled in the IMS, the CI requirements must be in a verified state. The CI IO (Rutgers University) is responsible for writing Requirements Verification Test Plans and Test Procedures, conducting Requirements Verification testing, and recording Requirements Verification results in Test Reports.

Deliverable: The OOI CONOPS, DCN 1013-00000, is approved by System CCB and forwarded to NSF CCB for final approval.

Deliverable: The OOI Use Cases are approved by System CCB and forwarded to NSF CCB for final approval.

Deliverable: The CI requirements are approved by System CCB and forwarded to NSF CCB for final approval.

3.2   Cyberinfrastructure Development, Integration, and Test

This section outlines the process for development, integration, and testing of the OOI Cyberinfrastructure (CI).

Three parallel development and integration efforts will take place.   One effort is the development of all of the OOI dataset/instrument/platform drivers and data product algorithms, and their integration, in groups, into the uFrame framework. The second effort is the development and integration of OOINet User Interfaces.   The third effort is the development and integration of additional functionality into the uFrame itself, such as support for alerts and alarms and support for asset tracking. Sections 3.2.1 through 3.2.3 describe these three development and integration efforts.

At pre-determined uFrame integration points, Requirements Verification and CI Validation testing will be conducted on the integrated CI.   Requirements Verification and Validation testing will be conducted at the CI Implementing Organization (Rutgers University).

3.2.1   Development, Integration and Testing of Drivers and Algorithms

Creating scientifically useful data products from the raw data provided by the OOI instruments requires the integration of Drivers and Algorithms.

Four types of "plug-ins" will be developed and integrated into the uFrame architecture:
* Dataset agent drivers, which ingest engineering and science data from uncabled instruments and platforms
* Instrument agent drivers, which ingest data and provide command and control functionality for cabled instruments
* Platform agent drivers, which ingest data and provide command and control functionality for cabled platforms.
* Data Product Algorithms, which process a data stream from one of the three plug-ins described above and produces output data product(s)

Dataset agent drivers are developed according to Instrument Data Description (IDD) specifications, instrument drivers are developed according to Instrument Operational Specifications (IOSs), and Platform drivers are developed according to Node Operational Specifications (NOSs).

In addition to the drivers above, data product and QA/QC algorithms will be developed and integrated into the uFrame to support the creation of OOI Level 1 or Level 2 data products from dataset agent and instrument agent outputs. These algorithms are developed according to Data Product Specifications (DPSs).

Drivers and algorithms will be integrated into the uFrame in groups. Five integration (or build) groups have been defined in the CI portion of the IMS.   Placement of a driver or algorithm into an integration group is predominately based on the driver or algorithm's schedule priority in relationship to Conditional Acceptance and Commissioning events for OOI Marine IO platforms. For example, drivers and algorithms needed to support the earliest Conditional Acceptance event, the Conditional Acceptance of Pioneer II profiler moorings and gliders, are integrated into the uFrame first.

Once initial testing by the integration team is complete, each driver and algorithm in the group is then tested by subject matter experts.   For dataset agent drivers and data product algorithms, science subject matter experts (SMEs) will test the L0, L1, and L2 products produced and validate the correctness of output science data, checking for correct variable names and units, correct and complete metadata, and for reasonableness of the variable values.

For instrument and platform drivers, marine operations subject matter experts will test the command and control functionality of the driver.

If CI user interface functionality has been integrated into the uFrame at the time of the driver and algorithm testing, SME testers may use the user interface to access and visualize products produced by the drivers, and may use the user interface to execute command and control functionality.   If the user interface is not mature or integrated at the time of SME testing of drivers and algorithms, the SMEs will test using command line interfaces or rudimentary web interfaces to the uFrame and the data products.

Deliverable: Test Plans, Test Procedures, and Test Reports for Driver and Algorithm testing are created and posted to the OOI Document Management System, according to OOI policy described in the OOI Test and Evaluation Strategy document (1150-00000).

Deliverable: During driver and algorithm integration, the CI PM will provide weekly status to the OOI Sr. PM showing the Integration and test status of the drivers and algorithms into the uFrame.

3.2.2   Development, Integration, and Testing of the User Interface

An OOINet user interface is being developed to support data search and display, data download, and instrument and platform command and control functionality.

The user interface is being developed to meet requirements derived from the OOI CI CONOPS and the CI Use Cases. User Screen designs and associated wireframes will be developed in a collaborative environment with the Software Developer, System Engineer, uFrame Engineer, UI Developer, Operator and SME for the target screen.   An iterative design approach will be utilized, taking feedback from stakeholders to make changes to the screen design as needed and approved by OOI Leadership. Wireframes are stored in a public repository for review and feedback.

The UI design and wireframes will follow a simple design and development model, and adhere to common software engineering practices. Existing knowledge base from prior OOI development work is leveraged, and applied to design and wireframes. The design follows the Model View Controller(MVC) architecture for implementing graphical interfaces.

The wireframes will be utilized to create the framework for the UI front end and back end. The OOI UI front end design team will work in parallel with the back end (implementation) team to minimize turnaround time of a functional UI.

The marine infrastructure vocabulary used on the user interface screens will be determined based on the EPE ontology work and input from the Marine IO engineers and scientists.   This marine infrastructure vocabulary will be reviewed and approved at the System Level CCB.

As user interface functionality is developed, it will be unit tested by its developers, and integrated into the OOI CI uFrame product.

As each new user interface functionality is integrated into the OOI CI uFrame product, integration testing will be conducted jointly by the user interface developers (ASA) and the uFrame developers (Raytheon Omaha). In addition, regression testing of previously-integrated user interface functionality will be conducted as each new batch is integrated.

Deliverable: Test Plans, Test Procedures, and Test Reports for User Interface testing are created and posted to the OOI Document Management System, according to OOI policy described in the OOI Test and Evaluation Strategy document (1150-00000).

Deliverable: During user interface development and integration, the CI PM will provide weekly status to the OOI Sr PM showing the Integration and test status of the user interface functionality.

Deliverable: Marine Infrastructure Vocabulary (DCN 1100-00005)

Deliverable: The developed wireframes with updated screen vocabulary are reviewed and approved by the PMO and then released for design.

3.2.3   Development, Integration and Testing of Additional uFrame Functionality

Additional OOI-specific functionality is being developed and integrated into the OOI CI product according to requirements derived from the CI Use Cases.   Examples of this functionality include CI support for OOI asset management and CI support for marine operator alerts and alarms.

As this new CI functionality is developed, it will be unit tested by its developers, and integrated in functionality 'batches' with the uFrame and the CI User Interface.

As each new batch of functionality is integrated into the CI, integration testing will be conducted by the developers (Raytheon Omaha). In addition, regression testing of previously-integrated functionality will be conducted as each new batch is integrated.

Deliverable: Test Plans, Test Procedures, and Test Reports for testing of the additional uFrame functionality are created and posted to the OOI Document Management System, according to OOI policy described in the OOI Test and Evaluation Strategy document (1150-00000).

Deliverable: During functional development and integration, the CI PM will provide weekly status to the OOI Sr PM a report showing the Integration and test status of the additional uFrame functionality.

3.3   Cyberinfrastructure Data, Metadata, and Asset Management

OOINet includes an integrated data/metadata store and associated tools that support all data and asset management for the system.

To collect and maintain all types of data and metadata, a database, catalog, and associated tools derived from existing UFrame components are provided.

To support physical asset management, database records are maintained for each individual hardware component of the system, down to the lowest field replaceable unit, for all deployed, shore, and ship components owned by the program. Physical asset information maintained in the database includes:
- Asset identification: manufacturer make/model, serial number, institutional property tag number(s), and text description
- Asset configuration: hardware and software revision numbers
- Calibration history and parameters
- Current state: Deployed, test, refurbishment, storage, etc.
- Current location: Specific deployed location (host platform ID), storage location, etc.
- State history: Cradle to grave history of procurement, test, calibration, deployment, refurbishment, and retirement
- Procurement history: Identifiers for original purchase order and any subsequent change of hands (return for repair, refurbishment, calibration, transfer between organizations, retirement, etc.)
- Ancillary information links: links to supplier documentation, related assembly drawings, documents attached by users, etc.

To support data management, records are maintained for all data collected and stored by the system. Data stored includes the following:

- All raw data received from the deployed systems, including science, engineering, and status data
- All L0/L1 data produced as raw data is ingested into the system by dataset agents, instrument agents, and platform agents
- All ancillary data submitted and linked to hardware and data assets by system users (logs, photos, QA/QC products, etc.)
- Provenance data associated with the above to define the source and processing history for stored data
- Time at which each sample was produced/collected

To associate the various data types to facilitate system operation and end user science activities, links between the various data types are maintained in the OOINet database. For example, each science/engineering data record is linked to the logical platform by which it was produced (an unambiguous identifier of which platform, node, and component). Based on this source identifier and the time at which the data were collected, they are linked to the specific component from which the data were collected and location at which the data were collected. Based on these links, specific hardware, software, calibration, and other associated information are available.

To facilitate user access to all forms of science and engineering data, the following capabilities are provided:

- General web-based database query tools to define and access any data type in the database
- Graphical user interfaces (GUIs) tailored to define, monitor, access, and edit asset management data; this includes management of logistics data and other component metadata (calibration parameters, state/location information, etc.)
- GUIs tailored to monitor, access, and annotate science/engineering data; this includes tabular and graphic display of data in a wide variety of formats

Deliverable:

To implement these data and asset management capabilities:

- Requirements will be developed based on review and update of system ConOps and Use Cases
- CI will develop and implement the required data model and database software, including web-based data query and access tools, based on existing uFrame components
- Rutgers/ASA will develop associated GUIs, in collaboration with representatives of the end user science and engineering communities
- The Marine Implementing Organizations will populate the asset metadata associated with each component at each deployment

3.4   Additional CI Testing

3.4.1   Testing for the CI Final Review

The CI functionality and user interface must be tested prior to CI Final Review, in the following areas: usability testing of the user interface, performance and load testing of the uFrame framework, and stability testing of the integrated CI.

3.4.2 Testing for Marine IO Commissioning milestones

At the time that a Marine Array is commissioned, the integrated CI, including the uFrame framework, driver and algorithm plug-ins, and the user interface, must be tested as part of System of Systems Validation Testing.   See Section 7.2.9.

The CI IO (Rutgers University) is responsible for conducting the testing against the CI Use Cases with the Marine Implementing Organizations (MIOs) and associated scientists.

Deliverable: Test Plans, Test Procedures, and Test Reports for testing described in this section are created and posted to the OOI Document Management System, according to OOI policy described in the OOI Test and Evaluation Strategy document (1150-00000).

4   Technical Reviews

4.1   Critical Design Review (CDR)

The condition for Commissioning requires that all CDRs have been conducted and all CDR Action Items are closed before the Commissioning Review.

Deliverable: The OOI SE will post the CDR Review Report to Alfresco within two weeks of the CDR.
Deliverable: Every month, the IO SE will review all open CDR Action Items and provide status updates to the OOI SE.
Deliverable: Every month, the OOI SE will provide to the OOI Sr PM a report showing all open CDR Action Items.

4.2   Production Readiness Review (PRR)

There are several Production Readiness Reviews still remaining in the MREFC Construction phase of the OOI Program.   They are listed in the IMS.   All PRR Action Items are to be closed before the Commissioning Review for the related component.

Deliverable: The OOI PMO will post a PRR Review Report to Alfresco within two weeks of each PRR.
Deliverable: Every month, the IO SE will review all open PRR Action Items and provide status updates to the OOI Sr PM.

The PRR details are defined in Attachment C.

4.3   EPE software reviews

At the end of the testing phase for each of the six Dot Releases, EPE will host a review of the current dot release for Review Panel approval. Immediately following that, there is a review of the plan for the next Dot Release Iteration.

Deliverable: The Review Panel Chair posts a Review Report to Alfresco within three weeks of each review.
Deliverable: Every month, the EPE PM provides to the OOI Sr. PM a report showing all open EPE review Action Items.

4.4 CI Final Review

The CI Final Review is a milestone at the end of the coding and testing of the final CI software release. The CI Final Review ensures that the CI system is ready for operations and release to the user community.   The date for the CI Final Review is found in the IMS.

The CI functionality and user interface must be tested prior to CI Final Review, in the following areas: usability testing of the user interface, performance and load testing of the uFrame framework, and stability testing of the integrated CI.

CI must also complete requirements verification testing for its requirements prior to the CI Final Review.

The CI Final Review artifacts and prerequisites are included in the "List of IRR, Conditional Acceptance, CI Final Review, and Commissioning Artifacts" in Attachment A.

Deliverable: The OOI SE will post a CI Final Review Report to Alfresco within two weeks of the CI Final Review.
Deliverable: Every week until all open actions are closed, the CI SE will provide to the OOI Sr PM a report showing all open CI Final Action Items.

5 Acquisition & Supply

Deliverable: Every month, the IO PM provides to the OOI Sr PM documentation of the remaining procurements, including their progress and status. This is used in the weekly Schedule Status call.   The IMS may be used instead of other supporting documentation if the IMS contains sufficient detail.

6 Remaining Deployments

The schedule for the remaining deployment cruises is found in the IMS. An Installation Readiness Review will be held for each remaining deployment cruise, and the Marine IO responsible for the deployment will provide status reports to the OL Sr PM both during and after the cruise.

6.1 Installation Readiness Review (IRR)

An Installation Readiness Review is conducted prior to each remaining cruise (i.e. Pioneer III, Endurance II, Irminger I, Southern Ocean I, Argentine Basin I). The IRR shall be conducted a minimum of 2 weeks prior to deployment of the assets, or later with permission from the OOI Sr. PM. The Marine IO shall determine the format of the review and conduct the review. The PMO will attend the IRR.

Deliverable: The required portion of the As-Built TDP is delivered by the IO SE to the PMO.
Deliverable: Installation Readiness Review Report (Attachment D) from the IO PM to the OOI Sr PM, including a reference to the location and document control number of all supporting artifacts. The IRR

Report is accepted by the OOI Sr PM and all IRR Critical Action Items are closed prior to the ship departing the pier.

6.2   Reporting during and after a Deployment Cruise

Deliverable: Daily reporting from the Marine IO PM to the OOI Sr. PM is required during a deployment cruise. The format for the reporting is determined at the IRR for the deployment.

Deliverable: The IO PM will provide to the OOI Sr. PM a quick-look cruise report within one week from the end of the cruise. The Quick-Look report will describe if everything was deployed (if not, what wasn't), was it working when the ship departed, and was data flowing (regardless of data quality).

Deliverable: The final cruise report is provided as part of the As-Built TDP at Conditional Acceptance (uncabled arrays) or Commissioning (cabled arrays).

7   Conditional Acceptance and Commissioning

The IMS will include Commissioning milestones for each of the Marine IO arrays (Pioneer, Endurance, Station Papa, Irminger Sea, Southern Ocean, Argentine Basin, and the Regional Cabled array).

Final Commissioning for each array will occur when all marine platforms in the array are deployed and operational, and when the full OOI Cyberinfrastructure (CI) and related User Interfaces (UI) are complete and verified. The full set of prerequisites for Final Commissioning is listed in Section 7.2.

However, the program recognizes that the full CI will not be available until later in the program and there may be need to conditionally accept an array prior to Final Commissioning. For this reason we have instituted the concept of Conditional Acceptance for designated deployments. Conditional Acceptance does not require a full CI implementation, but does require that all of the dataset or instrument agent drivers and data product algorithms needed to produce the L0 and L1 data products related to the instruments in the deployment are integrated into the CI and are operational.

Conditional Acceptance will occur by deployment.   A "deployment" can consist of a platform, a set of platforms, or the full array. There may be multiple 'turns', but Conditional Acceptance will be scheduled to correspond with the deployment closest in time to when the CI integration of the related drivers and algorithms is complete. The IMS lists the planned Conditional Acceptance deployments for each array. The full set of prerequisites for Conditional Acceptance of a deployment is listed in Section 7.1.

All requests for Conditional Acceptance and final Commissioning shall use the ECR process with approval at the NSF Board level. Prerequisite issues and punch-lists needed for Conditional Acceptance and Commissioning will be tracked using Redmine.   All Redmine data issues and punch-list items shall be completed before Final Commissioning.

7.1   Prerequisites for Conditional Acceptance

The prerequisites for Conditional Acceptance are:

7.1.1 A complete As-Built Technical Data Package (TDP) has been provided to the PMO

The As Built TDP is provided as part of the Commissioning Process as defined by section 1.10 of the CMP.

The contents of the As-Built TDP are listed for reference in Attachment B.   Note that for Marine IOs, the majority of the items in the As-Built TDP were previously due at the Installation Readiness Review (IRR) for the platform or group of platforms.

Deliverable: The complete As-Built TDP is delivered by the IO SE to the PMO SE.

7.1.2 The IO has verified all of its L3 and L4 requirements

All Marine IO Level 3 (Platform-Level) and Level 4 (Subassembly Level) requirements related to the deployment must be verified. Requirements verification is performed by testing on a requirement by requirement basis using one of the following methods: Inspection, Demonstration, Analysis or Test. Testing is performed according to pre-approved Verification Test Plans and Verification Test Procedures, and results are captured in a Requirements Verification Test Report. When a requirement is verified, its Verification Status is updated in DOORS.   Once the test results are confirmed as entered into DOORS, the Verification Procedure and Results Document is released, along with a Quick Look Report and a Formal Test Report. Requirements verification is executed by the IOs and reviewed by COL.

For the deployment or software being Conditionally Accepted, the responsible IO will provide a list of the applicable Level 3 and Level 4 requirements from DOORS, along with evidence that these requirements have been verified or waived.   This evidence includes the Verification Status attribute associated with each requirement (in a Compliance Matrix (RVCM) 'view' in DOORS, or in a spreadsheet exported from DOORS), Requirements Verification Test Plans, Requirements Verification Test Procedures, and Requirements Verification Test Reports.   Test Plans, Test Procedures, and Test Reports must be numbered and posted to the OOI Document Management System, according to OOI policy described in the OOI Test and Evaluation Strategy document (1150-00000).

Deliverable: Verification Status in DOORS set to Passed or Waived for all relevant L3 and L4 requirements.
Deliverable: Requirements Verification Test Plans, Test Procedures, and Test Reports are numbered and posted in Alfresco.

7.1.3 All action items from prior Technical Reviews have been closed

All required prior technical reviews must have been completed, and all related actions from these reviews must be closed. This includes action items from CDR, PRR, TRR, and IRR.

Deliverable: Technical Review Action Item status report is posted in the appropriate Commissioning Review folder in Alfresco for each prior review.

7.1.4 The Risk Register has been updated to show current status of risks related to the platforms or software undergoing Conditional Acceptance

Deliverable: Risk Register report is posted in the appropriate Commissioning Review folder in Alfresco.

7.1.5 Operational Status of the Deployment or Software has been provided to the PMO

Operational Status of all platforms or software undergoing Conditional Acceptance must be provided to the PMO. This status information may be presented in the form of Operational Metrics (once these have been defined), or in the form of a table or spreadsheet of operational status information.

Where operational issues have arisen, the responsible IO must present evidence to the PMO that Incident Reports and Failure Analysis Reports have been completed, if applicable, per the OOI Quality Plan (1003-00000) and OOI Safety Plan (1006-10002) and the OOI Environmental Health and Safety Plan (1006-10000) requirements. Proposed resolution of operational issues should be described, including any changes to design or operating procedures which are necessary to avoid the operational issue in the future.

Deliverable: An Operational Status report is delivered by the IO SE to the PMO SE for each platform and instrument in the deployment.

7.1.6 Validation Testing has been completed

Validation testing answers the question "Did we build the right system?", i.e., did we build a system that addresses and satisfies our user needs. Validation testing is conducted against user scenarios or use cases. Validation scenarios for Conditional Acceptance will include: 1) command and control of instruments and platforms; 2) monitoring of instruments and platforms; 3) telemetry of science and engineering data to shore; 4) extraction of complete datasets from recovered platforms and instruments; 5) management of data at the OMC or shore station; and 6) transmission of data from the OMC or shore station to CI.

For Conditional Acceptance, it is assumed that the final CI command, control and monitoring capabilities related to marine operations are not yet fully available, so Validation testing for Conditional Acceptance may use Marine IO or vendor software and user interfaces to test platform and instrument command, control and monitoring.

In the cases of multiple platforms of a single type that use the same data flow path, full validation is conducted on only one platform. For any additional platforms of similar type, validation is limited to a subset of the validation required for the first platform of a kind. The reduced approach is documented in the Validation Test Plan and applicable Procedures.

Deliverable: The Validation Test Plan is approved by System CCB and Validation Test Procedures are approved prior to the start of validation testing.
Deliverable: Validation Test Plans, Test Procedures, and Test Reports are posted to the OOI Document Management System, according to OOI policy described in the OOI Test and Evaluation Strategy document (1150-00000). Validation Test results are included or referenced in the Commissioning report.

7.1.7 The shore-side management component of the array (OMC or Shore Station) is operational and its design and operational procedures are documented

For the uncabled arrays, both telemetered and recovered data are stored and managed at a Marine IO shore-side Operations and Management Component (OMC) before being transferred to the CI. For the cabled arrays, data are received at the RSN Shore Station. For Conditional Acceptance, the OMC or Shore Station associated with the deployment must be operational, and the OMC or Shore Station design and operations must be documented.

Documents required for the OMC include OMC design documentation, documentation of the directory structure and file naming conventions at the OMC, data ingest instructions, and data backup, restore, and archiving procedures.

Documents required for the Shore Station include Shore Station and RSN Observatory Management System (OMS) design documentation, and user instructions for operation of the vendor (L3) management software and the OMS software.

7.1.8   All L0 and L1 Science and Engineering Data Products associated with the deployment are being produced by the OOI Cyberinfrastructure (uncabled array deployment)

All dataset agent drivers, instrument agent drivers, and data product algorithms required to produce L0 and L1 data products for the platforms and instruments in the deployment must be integrated into the CI and fully tested.   All L0 and L1 products for the deployment must be produced and stored (if applicable) by the CI for all telemetered and recovered data from the platforms and instruments involved. (Recovered data will come from platforms and instruments recovered in the previous deployment).

Engineering data products must be produced for all engineering data streams.

7.1.9   All L0 and L1 Science and Engineering Data Products associated with the deployment are available through the CI.   (In early conditional acceptance events, this will be through a rudimentary web-based CI search and download capability)

All L0 and L1 and Engineering data products must be accessible through a CI interface. The complete CI User interface will allow users to search for, display, and download these OOI data products.   For early conditional acceptance milestones, the full CI User Interface will not yet be available, so a rudimentary web-based CI search and download capability will be used to satisfy this criterion.

7.1.10   Configuration Management Plan is approved and baselined

The Marine IO Configuration Management Plan has been approved and baselined.   This Plan must describe how the configuration of marine IO hardware and software will be managed.

7.1.11   Property Inventory Report is filed

A Marine IO property inventory report must be filed for all property involved in the deployment.

7.2   Prerequisites for Commissioning of a Marine Array

Commissioning of a Marine Array takes place after the marine array is deployed and operational, AND after the OOI Cyber infrastructure is fully operational.   A fully operational CI includes data product generation, data search and download, command and control of instruments and platforms (for the cabled OOI deployments), system health and status monitoring, and asset management.

Specific prerequisites for Commissioning of a Marine Array are listed in the following subsections.

7.2.1   Conditional Acceptance criteria 7.1.1, 7.1.2, 7.1.3, 7.1.4, 7.1.7, 7.1.10 and 7.1.11 have been satisfied for all platforms in the array

See Section 7.1 for details of these Conditional Acceptance prerequisites.

7.2.2   Final Review of the Cyberinfrastructure has been completed

See Section 4.4 for a description of the CI Final Review.

7.2.3   All L0, L1, and L2 Products associated with the array are being produced

At the time of Commissioning, all dataset agent drivers or instrument agent drivers associated with the array, as well as all data product algorithms associated with the array must be integrated into the CI uFrame architecture, must be tested, and must be producing correct and complete data products for the OOI.

These data products must contain both post deployment and post recovery calibrated data variables, and must be undergoing automated QC when they are created.

All metadata for each data product must be entered into the CI and must be available for display to a user.

All telemetered and recovered data from the array must be flowing through the CI and must be resulting in data product generation.

7.2.4 All L0, L1, and L2 Products associated with the array are available for search and download via the CI User Interface

The complete CI user interface functionality must be available to allow users to search for, visualize, and download all science and engineering data products associated with the instruments and platforms on the array.

7.2.5 All instruments and platforms associated with the array can be commanded and controlled via the CI User Interface (cabled arrays only)

For the cabled arrays, complete CI user interface functionality must be available to allow marine operators to command and control the instruments and platforms on the array.

7.2.6 All instruments and platforms associated with the array can be monitored via the CI User Interface

Alert and alarm thresholds for all instruments and platforms on the array have been defined by the Marine IO, and these values have been entered in the CI.

Alert and alarm functionality has been implemented in the CI. This includes user interface screens to display alerts and alarms, and also includes functionality to notify operators (e.g., by email or text) when an alert or alarm is raised.

Engineering data for the instruments and platforms on the array is accessible using the CI user interface.

7.2.7 Operational Metrics are being collected and reported

OOI Operational Metrics for the array are being collected and reported as required by the program.

7.2.8 All assets associated with the array are being tracked using the CI

- All assets associated with the array must be entered into the CI database.
- All metadata associated with those assets must be provided to CI by the Marine IO, and must be populated in the CI database.
- All User Interface functionality associated with asset tracking must be tested and operational.

7.2.9 System of systems Validation testing has been completed using the Marine IO array and the CI software release

At the time of Commissioning of an array, complete System of Systems Validation Testing is conducted. This testing is conducted according to the System of Systems Validation Test Plan for the array. This testing includes running operational scenarios against each of the relevant System level use cases. Validation testing is complete when all relevant released System use cases are run successfully. These use cases define end to end processes that affirm the system delivers to the L2 Science, Cyber-user, Operational and Common Requirements, and to the OOI Concept of Operations.

System of Systems Validation testing exercises all components of the OOI, including the marine infrastructure, telemetry, shore side systems at the OMC or RSN Shore Station, and the CI. End user activities in the Validation Testing scenarios are accomplished using the CI user interface whenever

relevant user interface functionality exists. Standard operating procedures for command, control and monitoring of the marine platforms and instruments will be exercised during Validation testing.

System of Systems Validation testing is defined and executed by the PMO with support from the Marine IOs and the Rutgers CI testing staff. The Marine IO scientists (and external scientists when available) will assist in Validation testing whenever science knowledge is required. Marine IO operators will assist in Validation testing whenever knowledge of instrument or platform operations is required.

In the cases of multiple platforms of a single type that use the same data flow path, full validation is conducted on only one platform. For any additional platforms of similar type, validation is limited to a subset of the validation required for the first platform of a kind. The reduced approach is documented in the Validation Test Plan and applicable Procedures.

Deliverable: The Validation Test Plan is approved by System CCB and Validation Test Procedures are approved prior to the start of validation testing.
Deliverable: Validation Test Plans, Test Procedures, and Test Reports are posted to the OOI Document Management System, according to OOI policy described in the OOI Test and Evaluation Strategy document (1150-00000). Validation Test results are included or referenced in the Commissioning report.

7.3   Conditional Acceptance and Commissioning Process

7.3.1   Reviews

For both Conditional Acceptance and Commissioning, a review event will be held. The PMO will lead the event, held at the respective Marine IO. Presentations will be made to NSF by the PMO, Marine IO, and CI. Prior to the review event, all prerequisites for Conditional Acceptance (section 7.1) or Commissioning (section 7.2), depending upon the review event, must be completed. The PMO will work with the applicable Marine IO and with CI to verify that all prerequisite documentation has been produced, that all prerequisite operational states have been achieved, and that all prerequisite validation testing has been completed.
The PMO will produce a Conditional Acceptance or Commissioning Report listing the status of all deliverables and listing any liens on the Conditional Acceptance or Commissioning, and will then schedule a Conditional Acceptance or Commissioning Review, where the PMO presents its recommendation to NSF.

If a platform, instrument, or software component is not operating as designed and/or the above deliverables cannot be satisfactorily completed, the IO will provide to the PMO a recommendation as to why there is reasonable justification to Conditionally Accept or Commission the proposed configuration and include appropriate supporting documentation.   This IO recommendation will be included in the PMO's Conditional Acceptance or Commissioning Report to NSF.

Deliverable: The artifacts listed in Attachment A for Conditional Acceptance or Commissioning will be delivered by the Marine IOs and the Cyberinfrastructure IO, acknowledging readiness to operate the platform or array.
Deliverable: The PMO will deliver to NSF a set of proposed Operational Metrics and Government Performance Metrics.   Once approved, these Operational Metrics will be gathered and reported as a prerequisite to the Commissioning Review.
Deliverable: The PMO will provide to the NSF a Conditional Acceptance or Commissioning Report, including a recommendation to Conditionally Accept or Commission.

7.3.2 Approval

The decision to Conditionally Accept or Commission each element of the OOI is the responsibility of the NSF Program Manager.

Deliverable: After Conditional Acceptance or Commissioning Approval, the OOI Program Director will notify the IOs via email that Conditional Acceptance or Commissioning has taken place. The OOI Program Director may delegate the responsibility for notification to the COTR level.

Deliverable: The public is informed via the OOI website when each new platform is commissioned.

8   Safety and Quality Roles

8.1   Safety

All activities conducted throughout the remainder of MREFC and all activities conducted during the O&M phase of OOI will be conducted in accordance with the OOI Safety Plan (DCN 1006-10002).

The OL Safety Manager will review all safety-related artifacts at all technical reviews, IRRs, Conditional Acceptance Reviews and Commissioning Reviews.

A baseline Hazard Assessment provided at TRR for each platform addressed and documented the safety and environmental hazards identified during the assembly, disassembly, operations and maintenance of the related equipment. This Assessment documented the review, and mitigation if applicable, of potential hazards. The Safety Manager will inspect each As-Built platform and will assess any deviation of the delivered platform from its Baseline Hazard Assessment. The Safety Manager will determine if the As-Built platform fully complies with the Baseline requirements for safety with respect to buildability and deployability.

Deliverable: At IRR, Conditional Acceptance, and Commissioning Reviews, the OOI Safety Manager shall provide certification to the OOI Project Manager that the As-Built platform fully complies with the Hazard Assessments delivered at TRR for the original platform design. If the As-Built platform differs from the original design, the IO Project Manager shall provide certification that it has been re-examined and assessed for safety with respect to the differences in buildability and deployability, in accordance with the requirements of the Hazard Assessment Procedure.

8.2   Quality

All activities conducted throughout the remainder of MREFC and all activities conducted during the O&M phase of OOI will be conducted in accordance with the OOI Quality Plan (DCN 1003-00000).

The OL Quality Manager will review both component and process quality at all technical reviews, IRRs, Conditional Acceptance Reviews and Commissioning Reviews. The Quality Manager will assess the IO deliverables regarding the as-produced platforms and software, and will note any deviation from the original CDR TDP.

Deliverable: At IRR Conditional Acceptance, and Commissioning Reviews, the OOI Quality Manager will provide certification to the OOI Project Manager that the as-produced platforms fully conform to the original CDR (or PRR) TDP, as modified by any approved ECRs. If the As-Built TDP differs from the original TDP, the IO Project Manager shall document the differences and provide them for approval by ECR.

Attachment A – List of IRR, Conditional Acceptance, CI Final Review, and Commissioning Artifacts

Checklist Item	Note/Artifacts	Artifact Repository	IRR	Conditional Acceptance	CI Final Review	Commissioning
As-Built baseline of the Technical Data Package						
As-Built baseline of the Technical Data Package	Artifacts: TDP Index file All As-Built TDP Artifacts, including: Top Level Platform Drawing Bill of materials / Parts List - Drawing Tree(s) List of Applicable DOORS Requirements Modules Use cases Specifications for all drivers and algorithms including both scientific and engineering data streams. QCT Reports Functional checklists	Alfresco ARCHIVE / Technical Data Package (TDP) Repository - TDP Index File, Top Level Platform Drawing, Bill of Materials / Parts list, Drawing Tree, List of Applicable DOORS Modules Alfresco CONTROLLED - All TDP documents which are baselined; Test Procedures Alfresco ARCHIVE / Test Documents - All TDP documents which are Test Reports Alfresco REFERENCE / Instrument and Vehicle Documents - All TDP documents which come from instrument or vehicle vendor Source code repositories (e.g., github) DOORS	partial	yes	yes	yes
Requirements Verification						
Verification Test Plan(s)	Requirements Verification Test Plan(s)	Alfresco CONTROLLED		yes	yes	yes
Verification Test Procedures	Requirements Verification Test Procedures	Alfresco CONTROLLED		yes	yes	yes
Verification Test Reports	Requirements Verification Test Reports	Alfresco ARCHIVE / Test Documents		yes	yes	yes
DOORS Requirements Verification Matrix	DOORS Requirements Verification view, and/or exported spreadsheet	DOORS Alfresco ARCHIVE/Commissioning Reviews/ <MIO Commissioning Review>		yes	yes	yes
Closure of Prior Reviews						
CDR review (including closure of all action items.) PRR review, if applicable (including closure of all action items)	Tech Review Report from Alfresco and export of applicable Action Items from JIRA (all of which should be closed).	Tech Review Report in Alfresco CONTROLLED Action items in JIRA JIRA reports generated and posted in Alfresco ARCHIVE/Commissioning Reviews/ <MIO Commissioning Review>		yes	yes	yes
Risk Register						
Risk Register	Risk report exported from SAF for the Commissioning Review. Risks should be reviewed in advance of the Review and appropriate risks should be retired.	SAF Risk Register Status Report posted in Alfresco ARCHIVE/Commissioning Reviews/ <MIO Commissioning Review> OR ARCHIVE/CI Final Review		yes	yes	yes
Operational Status						
	For each platform, spreadsheet showing platform operational status and operational status of each instrument on the platform; for cyberinfrastructure, spreadsheet showing operational status Operational Metrics (Marine IOs, CI) Defect List (Jira)	Alfresco ARCHIVE/Commissioning Reviews/ <MIO Commissioning Review> OR for CI, Alfresco ARCHIVE/CI Final Review Operational Metrics reports Jira		yes	yes	yes
Validation Testing						
Platform Validation Test Plan	Test Plan(s)	Alfresco CONTROLLED		yes		
Platform Validation Test Procedures	Test Procedures, including demonstration of the MIO or Vendor UI	Alfresco CONTROLLED		yes		
Platform Validation Test Reports	Test Reports	Alfresco ARCHIVE / Test Documents		yes		
System-of-systems Validation Test Plan (including all CI Use Cases)	Test Plan(s)	Alfresco CONTROLLED				yes
System-of-systems Validation Test Procedures	Test Procedures, including demonstration of the CI UI	Alfresco CONTROLLED				yes
System-of-systems Validation Test Reports	Test Reports	Alfresco ARCHIVE / Test Documents				yes
Defect List	Report from JIRA	Alfresco ARCHIVE/Commissioning Reviews/ <Commissioning Review> JIRA		yes		yes
Documents that will be used to enter instrument and platform metadata in OOINet				n/a		
	Mission Plans for Mobile Assets	Vault or OMC folders	yes			
	As-Deployed Sampling Plan	ARCHIVE/Commissioning Reviews/ <MIO Commissioning Review>	yes			
	As Deployed Configuration Spreadsheets	Alfresco ARCHIVE / Technical Data Package (TDP) Repository	yes			
	Quality Conformance Test Results for Vendor Supplied Instruments and Platforms	Alfresco ARCHIVE / Test Documents	yes			
CM Plans						
Marine IO CM Plan describing how the configuration of marine IO hardware and software will be managed	Marine IO CM Plan	Alfresco CONTROLLED		yes		yes
CM Plan describing how the configuration of cyberinfrastructure hardware and software will be managed (Rutgers)	Cyberinfrastructure IO CM Plan	Alfresco CONTROLLED			yes	
OOI method to control the configuration of data and metadata	Cyberinfrastructure IO CM Plan /OOI Data Management Plan	Alfresco CONTROLLED			yes	
Property Inventory Report						
Property Inventory Report	IO Property Inventory Report	Alfresco ARCHIVE/Commissioning Reviews/ <MIO Commissioning Review>		yes	yes	yes
OOINet Testing						
Load Testing	Test Reports	Alfresco ARCHIVE / Test Documents			yes	
User Screen integration testing	Test Reports	Alfresco ARCHIVE / Test Documents			yes	
Usability testing	Test Reports	Alfresco ARCHIVE / Test Documents			yes	
Driver and Algorithm testing - This would include (MIP-like) testing of all data products for correctness, as well as testing of platform and instrument command and control for cabled instruments and platforms.	Test Reports	Alfresco ARCHIVE / Test Documents		yes		yes

Attachment B – Technical Data Package

OOI > REFERENCE > Process Library > Systems Engineering, Integration, and Test> AS_BUILT_BASELINE_TECHNICAL_DATA_PACKAGE.DOC

Data that comprises the As-Built Baseline of the Technical Data Package (TDP)
(Associated with each deployment of a platform)

Note: Text in blue indicates items *in addition* to the Production Baseline TDP.
Note: These items are due as part of the Installation Readiness Review for the platform deployment, except those items in ***Italic bold text***, which are due later, at either Conditional Acceptance (uncabled) or Commissioning (cabled) of the platform. For the Cyberinfrastructure (CI), these items are due at the CI review that signifies operational readiness.

(A) Product Definition Data
- Drawing Tree(s) – breakdown of top level assemblies to sub-assemblies (includes array-level drawing tree and platform-level drawing tree(s))
- Bill of materials / Parts List - includes all make and buy items to fabricate the entire design
- Appropriate white papers (ex. trade studies, site characterization papers, analyses.)
- Use Cases (software)
- Test Plans
- Test Procedures
- ***Test Reports***

(B) Engineering Drawings
- Commercial Off-the-Shelf (COTS) Source Control Drawings (SCDs)
- ***Assembly drawings (includes array-level drawing and platform-level drawing(s))***
- ***Detail part drawings for make items***
- ***Printed Circuit Board (PCB) layouts***
- ***Electronics Gerber files***
- Interface Control Documents (ICDs)
- N2 Diagrams
- Software architecture drawings

(C) Associated Lists
- Material Safety Data Sheets (MSDS) for hazardous materials
- Final Hazard Assessment(s)
- Final Safety/Environmental Checklist
- Final Software Safety Assessment(s)

(D) Specifications
- Approved specifications for any components, equipment, and/or materials that require a specification to procure
- Approved Instrument Data Descriptions (IDDs) for all Dataset Agent Drivers related to the instruments on this platform
- Approved Data Product Specifications (DPSs) for all Data Product Algorithms related to the instruments on this platform
- Approved Node Operational Specifications (NOSs) for all Platform Agent Drivers related to this platform
- Approved Instrument Operational Specifications (IOSs) for all Instrument Agent Drivers related to this platform

(E) Requirements
- ***DOORS requirements (L3, L4, Interface) (Verified or Waived)***
- ***Approved Waivers***

(F) Quality Assurance Records
- Test instrument calibration data
- Quality Control (QC) test/demo/inspection sign-off documentation
- Vendor Certificates of Conformance

(G) Reliability Data
- Description of preventative maintenance needed during operations and the expected periodicity
- Changes to the design since the last baseline that may affect the Availability

(H) Packing Details
- Type of protective measures used in packing such as crates, foam, protective wraps (mechanical, ESD, etc.)
- Special shipping equipment or packaging as applicable

(I) Modeling data
- Model analysis results/reports (Ex. Finite Element Method (FEM) buckling models for structure and pressure vessels. Ex. arrangement and envelope models to show equipment can fit, be assembled, and maintained over the operational lifetime.)

(J) Software
- Software design documents
- Data Flow diagrams
- All of the source packages (may be source code, but could include proprietary executables)

- The build instructions
- User documentation

(K) Operations Documentation

- Standard Operating Procedures (or Work Instructions) (hardware, software)
    - Deployment / Installation Procedures (hardware, software)
    - Recovery Procedures (marine hardware)
    - Command and Control Procedures (marine hardware)
    - System Health Monitoring Procedures (hardware, software)
    - Emergency Procedures (hardware, software)
    - Data Recovery / Download Procedures (marine hardware)
    - Data Transmission Procedures (marine hardware)
    - Troubleshooting Procedures (hardware, software)
    - Safety Procedures (hardware)
    - Software / Firmware Release Upgrade Procedures (hardware, software)
    - Mission Planning Procedures (mobile assets)
    - Procedures for collecting Performance Metrics
- Training materials (hardware, software)
- Cruise Plan
- *Cruise Report*
- Disposal Plans for Hazardous Materials

(L) Maintenance Documentation

- Refurbishment and Preventative Maintenance Procedures (marine hardware)
- Repair Procedures (marine hardware)
- Sparing Strategy (hardware)
- Software Maintenance Procedures (software)

Attachment C – Production Readiness Review Technical Review Procedure

OOI > REFERENCE > Process Library > Systems Engineering, Integration, and Test> PRR_Technical_Review_Procedure.docx

1 Purpose

1.1 The purpose of this procedure is to establish a standard process for the internal OOI Production Readiness Reviews (PRR).

1.2 Technical reviews are an essential part of the Systems Engineering process. The different technical reviews are described in the OOI Systems Engineering Management Plan (DCN 1100-00000). This document provides additional information about applicability of the reviews and how they shall be prepared for and conducted.

1.3 As readiness reviews, the purpose of PRRs is to evaluate the readiness of the item to enter production. They are reviews of status rather than reviews of design content.

2 Applicability

2.2 This Procedure applies to all PRRs identified by the Tracked Design Item (TDI) Table (DCN 1100-00003). Lower-level configuration items are subject to Implementing Organization (IO) specific technical review procedures for PRRs. The content of this procedure should be considered for technical reviews of lower level elements but this procedure is not authoritative for those reviews.

3 Definitions

3.1 For definitions of terms used in this Procedure, see the OOI L2 Reference Module in DOORS. An export of the controlled version is contained in the document management system (Alfresco).

3.2 *Entry Criteria*: The conditions that must exist before a technical review can commence.

3.3 *Exit Criteria*: The conditions that must exist before a technical review can be deemed complete.

4 Procedure/Responsibilities

The technical reviews identified on the TDI Table are conducted between an IO and the Program Management Office (PMO). The OOI Chief Systems Engineer (or his/her delegate) shall Chair the review. The Chair makes a readiness assessment to the applicable IO Contracting Officer Technical Representative (COTR). The COTR is the final approval authority for cost, schedule, and technical issues and shall determine if the TDI has passed the PRR review.

Grouping of multiple TDI review sessions into a larger meeting event is permissible, and strongly encouraged from a resource and travel efficiency standpoint; however, for traceability, each review shall be conducted and documented individually.

An IO, with approval of the OOI Chief Systems Engineer, may elect to designate a PRR between the IO and a subcontractor as also being the PRR between the IO and the PMO. This is acceptable and encouraged for efficiency. In that case, the IO remains accountable for following this procedure and for all artifacts required for the PRR.

4.1 Entry Criteria:

When a TDI is sufficiently mature, a technical review may be scheduled. The applicable entry criteria shall be completed prior to the review. If the entry criteria are not met one week prior to the review, then the review shall be rescheduled. Appendix A lists the Entry Criteria.

4.2 Inputs:

Review Preparation: At least two weeks prior to the review, the IO Chief Systems Engineer shall discuss review preparation with the OOI Chief Systems Engineer. This discussion should include intended participants, location, duration, format, and any artifacts to be reviewed. This discussion also provides a suitable venue to authorize any variations or modifications from this procedure.

Review Participation: In order to provide sufficient time for planning, members of the PMO are identified and individually contacted to solicit their participation no later than two weeks prior to the review. The other IOs should be notified but attendance is not required. The following functional areas should be represented in the review:

- Project Management (including the applicable COTR or representative)
- Systems Engineering (including the OOI Chief Systems Engineer or representative, and the IO Chief Systems Engineer or representative)
- Operations and Maintenance
- Safety
- Quality
- Other groups as needed for technical and/or programmatic expertise

Review Invitation: No later than 1 week prior to the review, all attendees should be provided with a formal invitation that includes details about the meeting.

Review Package: No later than 1 week prior to the review, the review package, including items required as Entry Criteria, is assembled and loaded/linked to a common work area for review (generally the Technical Review Repository page in Confluence). Additional lead time and technical content is encouraged whenever circumstances permit.

4.3 Conduct of the Review

Readiness reviews are intended to be expeditious events of approximately one hour. Generally conference call capabilities should be used to reduce travel burdens on participants. Different formats are permissible as long as the format is agreed to in advance by the OOI Chief Systems Engineer and the applicable COTR.   If substantial issues are discovered, the review may be rescheduled. Appendix B includes the PRR Checklist that shall be used during the review.

4.4 Outputs:

Action Items: Action items are recorded at each review. Any action items that is completed before formal closure of the review are entered into the OOI Action Item Tracking System ("JIRA") and monitored through closure.

Authorization to proceed: A successful PRR results in authorization for the IO to enter Production for the TDI.

4.5 Exit Criteria:

The technical review is not completed until the applicable exit criteria are completed and the OOI Chief Systems Engineer and the applicable COTR agree to the closure of the review. The OOI Sr. Project Manager is the final arbiter of unresolved issues. Appendix C lists the Exit Criteria.

5 Relevant Documents

5.1   Governing Documents: (Upward Traceability)

- OOI Systems Engineering Management Plan (DCN 1100-00000)

5.2   Other Relevant Documents:

- Tracked Design Item Table (DCN 1100-00003)

Appendix A: PRR Entry Criteria Checklist

Entry Criteria	PRR
Action Items from all previous reviews and technical interchange meetings are closed out.	
The applicable requirements are successfully verified or waivers are approved with no pending ECRs.	
The interface control documents (ICDs), drawings, and/or schematics for all interfaces have been updated from CDR as required.	
The design of the TDI as documented via models, block diagrams and drawings has been updated from CDR as required.	
The Executed IO Requirements Verification Test Procedures with test results are posted to Alfresco. (Test Procedures shall follow the format identified in the Test Procedures Template DCN#1160-00001 or an IO-format that has been reviewed and approved by the PMO.)	

Appendix B: PRR Checklist and Meeting Contents

PRR Checklist	Complete ?
The applicable requirements are successfully verified or waivers are approved.	[ ]
The details of all interfaces (mechanical, electrical, optical and data) internal and external to the tracked design item of the review are resolved and documented. The interface control documents (ICDs), drawings, and/or schematics for all interfaces have been updated from CDR as required.	[ ]
The design of the TDI as documented via models, block diagrams and drawings has been updated from CDR as required.	[ ]
The Production Baseline of the TDP is documented and ready for release.	[ ]
The estimate of the item's operational availability during deployment has been updated from CDR as required.	[ ]
The Executed IO Requirements Verification Test Procedures with test results are posted to Alfresco. (Test Procedures shall follow the format identified in the Test Procedures Template DCN#1160-00001 or an IO-format that has been reviewed and approved by the PMO.)	[ ]
Production risks (such long lead items, material availability, diminishing resources) have been sufficiently mitigated.	[ ]
Any special provisions for the manufacture of the design are understood by the manufacturer and are within their capabilities.	[ ]
The findings of any Quality Assurance Audits have been addressed.	[ ]

Appendix C: PRR Exit Criteria Checklist

Exit Criteria	PRR
Meeting minutes edited, reviewed, finalized, and distributed	
Action Items closed in the JIRA database	
Presentation slides updated for errors and/or action items	
Production Baseline of the TDP is posted in Alfresco	

Attachment D – Installation Readiness Review Report Template

FOR REFERENCE ONLY:
OOI > REFERENCE > Process Library > Systems Engineering, Integration, and Test> Installation_Readiness_Review_Report_Template.docx

Date:

From: [IO Project Manager]
To: [OOI Sr Project Manager]

Subject: Installation readiness of [name of array or cruise]

This letter documents the readiness of all activities required for deployment of the subject system, including:

	Item	Ready
1	All instruments planned for the deployment are integrated onto the platforms or are ready to be integrated at sea	
2	All instruments have been tested successfully	
3	All platforms have been tested successfully	
4	Emergency process, procedures, and contacts are ready	
5	Safety training is complete	
6	Operations training is complete	
7	Cruise staffing is in place and a draft cruise plan is in place	
8	The associated shore facilities (OMCs and/or shore station) are ready	
9	System for sea-to-shore data communication is ready	
10	All platforms can be commanded and controlled	
11	Initial mission plans are developed and documented for mobile assets	
12	All deviations from the OOI baselined sampling strategy are documented for all instruments to be deployed	
13	All permits, clearances, and authorizations are in place if needed	
14	All PATONs are in place if needed	
15	The property management system has been updated for those items that are covered by the Property Management Plan	
16	As-Built TDP is posted (except for post-IRR items as indicated in As-Built TDP template)	
17	As-Built configuration is documented	

[Signature]
[Typed Name]
[IO] Project Manager