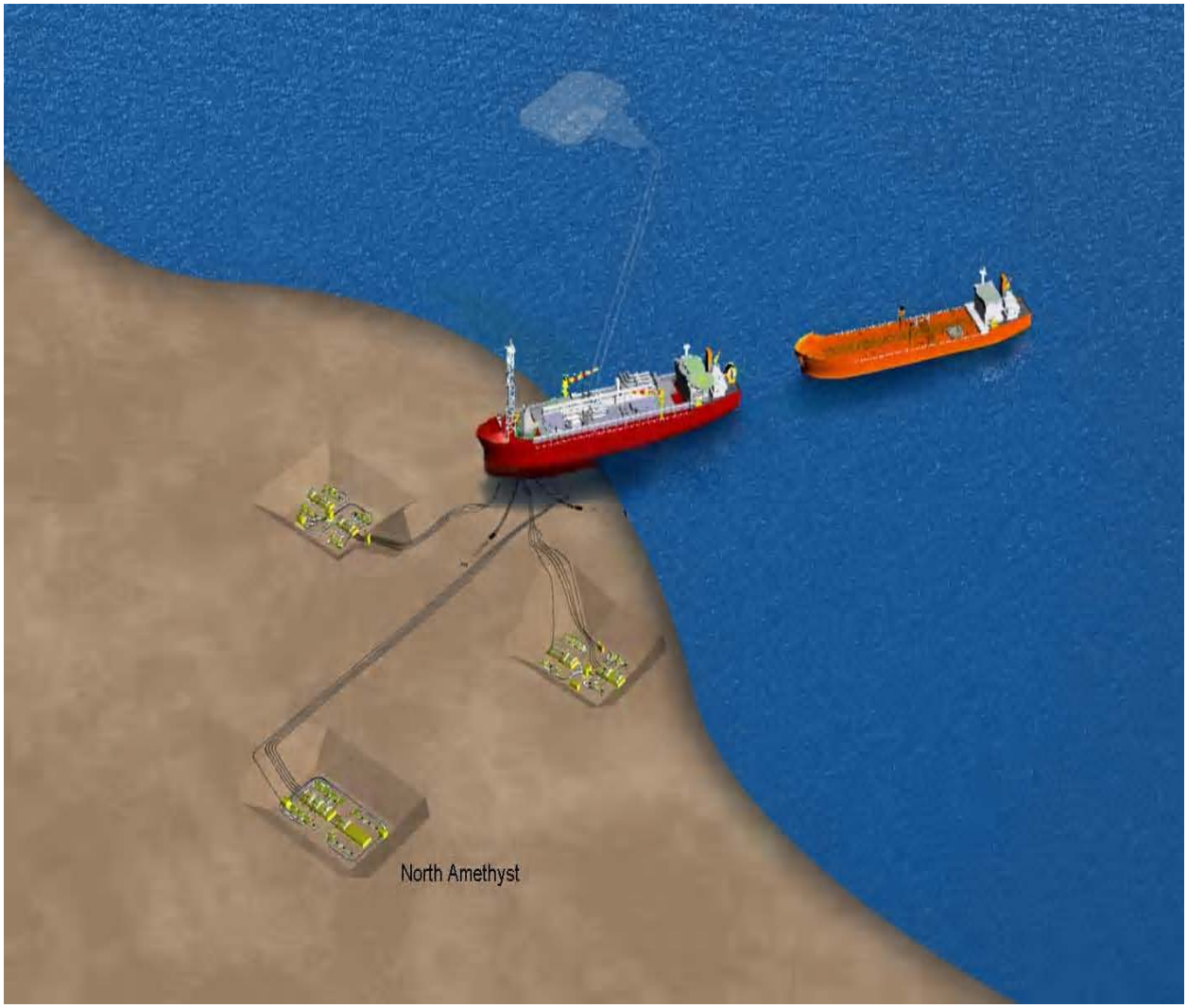
Husky Energy

White Rose Development Plan Amendment

SeaRose FPSO Modifications



Cover graphic: Tie-back Option A

August 2007

Husky Document No. SR-SRT-RP-0003

Table of Contents

List of Figures

List of Appendices

Executive Summary

Husky Oil Operations Limited (Husky) and its Joint-Venturer Petro-Canada propose to undertake development of the North Amethyst field. The field is located in the Jeanne d'Arc Basin on the Grand Banks and is encompassed by the Significant Discovery Licences (SDL) 1024 and 1044, Production Licence (PL) 1006 and Exploration Licence (EL) 1045.

The selected concept will be to tie back the field to the existing *SeaRose FPSO* (Floating Production, Storage, and Offloading) facility.

The Tie-back will consist of construction of a new glory hole with a capacity of up to sixteen wells. The North Amethyst Satellite Tie-back is expected to require from seven to ten wells consisting of four production and three to six water injection wells.

The flow line routing for the Tie-back is subject to FEED engineering, flow assurance studies and further economic evaluation. The results of these studies will determine the exact routing from the North Amethyst glory hole to the *SeaRose*. The field will, therefore, either be tied back from the glory hole directly via new flow lines and new dedicated riser systems (Option A) or via new flow lines to the existing subsea infrastructure (Option B).

If Option A, routing via new flowlines and new dedicated risers from the glory hole to the *SeaRose*, is selected, this will result in requirements for modifications to the *SeaRose* turret and topsides. These modifications would be to accommodate the new flow paths through the turret and from the turret to the topsides modules. If this option for routing is selected, the resulting modifications that would occur to the *SeaRose* turret, buoy and topsides are described in this Amendment to the White Rose Development Plan.

Alternatively, if it is determined that the flow line routing from the glory hole is to be via new flow lines to the existing subsea infrastructure (Option B) the modifications to the turret and topsides will not be required.

If the North Amethyst Drill Centre (NADC) is tied back to the *SeaRose* using option A, there would be requirements for the installation of control valves, pipe work, instruments and controls in the buoy and turret. Two production risers, one water injection flow line and one gas lift flow line would also need to be installed from the buoy through the turret to module MO1. Additionally, chemical injection and subsea controls equipment would also need to be installed and two pig launchers to enable pigging.

The glory hole construction and subsea installation activities associated with developing the Tie-back will be similar to those employed for the existing White Rose Development.

A description of the North Amethyst subsurface and subsea installation portions of the Tie-back Project is presented in *North Amethyst Satellite Tie-back Development Plan* (Husky Document No. SR-SRT-RP-0002), submitted concurrently with this document.

The total predicted recoverable oil from North Amethyst is 70 mm bbls on a P50 basis (estimated as of August 2007). The estimated cost of the *SeaRose* modifications for the North Amethyst Satellite Tie-back is estimated to be approximately $75 million (CDN).

If Option A is selected, the *SeaRose* will be removed from station and taken to a port to execute the work required in the turret and on the topsides.

The FEED engineering, flow assurance studies, and further economic evaluation will also determine if enhancement to the *SeaRose* topsides processing plant is required. In determining whether enhancement is required, the studies will address the requirements to tie in oil from adjacent pools. If in fact, it is determined that topsides enhancement is required as a result of tie-back of North Amethyst and adjacent pools, the work required may be executed during the period the *SeaRose* is in port for Option A turret and topsides modifications.

Preliminary studies have indicated the maximum enhancements that can be reasonably made to the *SeaRose* topsides processing plant to maintain oil production capacity when water cut increases and to enable more gas handling. The preliminary studies have indicated that the potential enhancements may result in an increase in gas handling capacity from 4.2E+6 Sm^3/day (150 mmscfd) to 6.14E+6 Sm^3/day (217 mmscfd). Water injection capacity may be increased from 44,000 m^3/day (277,000 bpd) to 57,000 m^3/day (359,000 bpd), and produced water handling capacity may increase from 28,000 m^3/day (176,400 bpd) to 31,000 m^3/day (195,300 bpd). The total liquids handling capacity will increase from 33,000 m^3/day to 39,000 m^3/day. There may also be a power generation enhancement.

The cost of the potential modifications to the topsides processing plant is estimated to be approximately $260 million (CDN).

A Benefits Plan (Husky Document No. SR-SRT-RP-0006) and a Concept Safety Analysis (Husky Document No. SR-HSE-RP-0003) have been submitted to the C-NLOPB as separate reports. The Benefits Plan and the Concept Safety Analysis consider both the White Rose Development Plan Amendment for *SeaRose FPSO* modifications and the North Amethyst Development Plan.

As further information becomes available, plans will be modified and refined. Submission of this document does not commit Husky to proceed with the tie-back or facilities expansion. It should also be noted that this potential tie-back and facilities expansion work is currently in the preliminary front end engineering (FEED) phase and has not yet been sanctioned by the White Rose partners.

1.0 Introduction

Husky Oil Operations Limited (Husky), as the Operator and in joint-venture with Petro-Canada (PetroCan), submitted a Development Application (DA) for the White Rose Development to the Canada-Newfoundland and Labrador Offshore Petroleum Board (C-NLOPB) in January 2001. This DA was prepared pursuant to the Canada-Newfoundland Atlantic Accord Implementation Act and the Canada-Newfoundland and Labrador Atlantic Accord Implementation Newfoundland and Labrador Act. The C-NLOPB approved the White Rose DA in December 2001. The Production License PL 1006 applies to the existing White Rose Development.

This document is being submitted to outline the potential modifications to the *SeaRose FPSO* (Floating, Production, Storage, Offloading) facility that may be required to tie-back the North Amethyst satellite field to the facility, specifically modifications to the buoy, turret, and topsides. Husky and its joint-venturer Petro-Canada propose to undertake development of the North Amethyst field in the Jeanne d'Arc Basin on the Grand Banks within the Significant Discovery Licences (SDL) 1024 and 1044, Production Licence (PL) 1006 and Exploration Licence (EL) 1045. The tie-back will consist of construction of a new glory hole with a capacity of up to sixteen wells. The North Amethyst Satellite Tie-back is expected to require from seven to ten wells consisting of four production and three to six water injection wells. Further field optimization and planning will determine the final well count.

As well, this document outlines potential enhancements to the *SeaRose* that will allow for increased handling capacity of produced water and gas.

A description of the subsurface and subsea installation portions of the North Amethyst Satellite Tie-back Project is presented in *North Amethyst Satellite Tie-back Development Plan* (Husky Document No. SR-SRT-RP-0002), submitted concurrently with this document.

2.0 Development Overview

The White Rose oil field is located on the Grand Banks, approximately 350 km east of the Island of Newfoundland on the eastern edge of the Jeanne d'Arc Basin (Figure 2-1 White Rose Oil Field)

Figure 2-1 White Rose Oil Field

The White Rose SDL consists of both oil and gas fields or pools, including the South Avalon Pool, the North Avalon Pool, and the West Avalon Pool. The main oil reservoir at White Rose is the Ben Nevis - Avalon Formation sandstone.

The White Rose Development utilizes the *SeaRose*, an FPSO facility with ice avoidance capacity (disconnectable turret) and subsea wells. Crude oil is transported direct to market by shuttle tankers. Oil production from the White Rose field commenced in November 2005.

Subsea installations for the initial development scope (South Avalon) consisted of a potential of 21 subsea wells. As of July 2007, 17 wells have been drilled and completed (nine water injection, one gas injection, and seven oil producers). The base plan is for 18 wells including another gas injection well. The wells are manifolded together and connected to flowlines and flexible risers which terminate at the FPSO.

Oil production from the *SeaRose FPSO* is predicted to start to decline in 2008. As spare production capacity becomes available on the *SeaRose,* a subsea tie-back will make use of this future capacity, thereby maximizing utilization of the existing infrastructure and lowering the threshold for small field developments. To this end, in September 2006 an Amendment to the White Rose Development Plan was submitted to the C-NLOPB. The Amendment outlined plans for development of the South White Rose Extension

(SWRX) area located approximately four km south of the current Southern Drill Centre (SDC). This application is still under review by the C-NLOPB. Development of the North Amethyst Satellite Tie-back will also provide additional production to fill available capacity on the *SeaRose*. Figure 2.2 shows the location of the North Amethyst field.

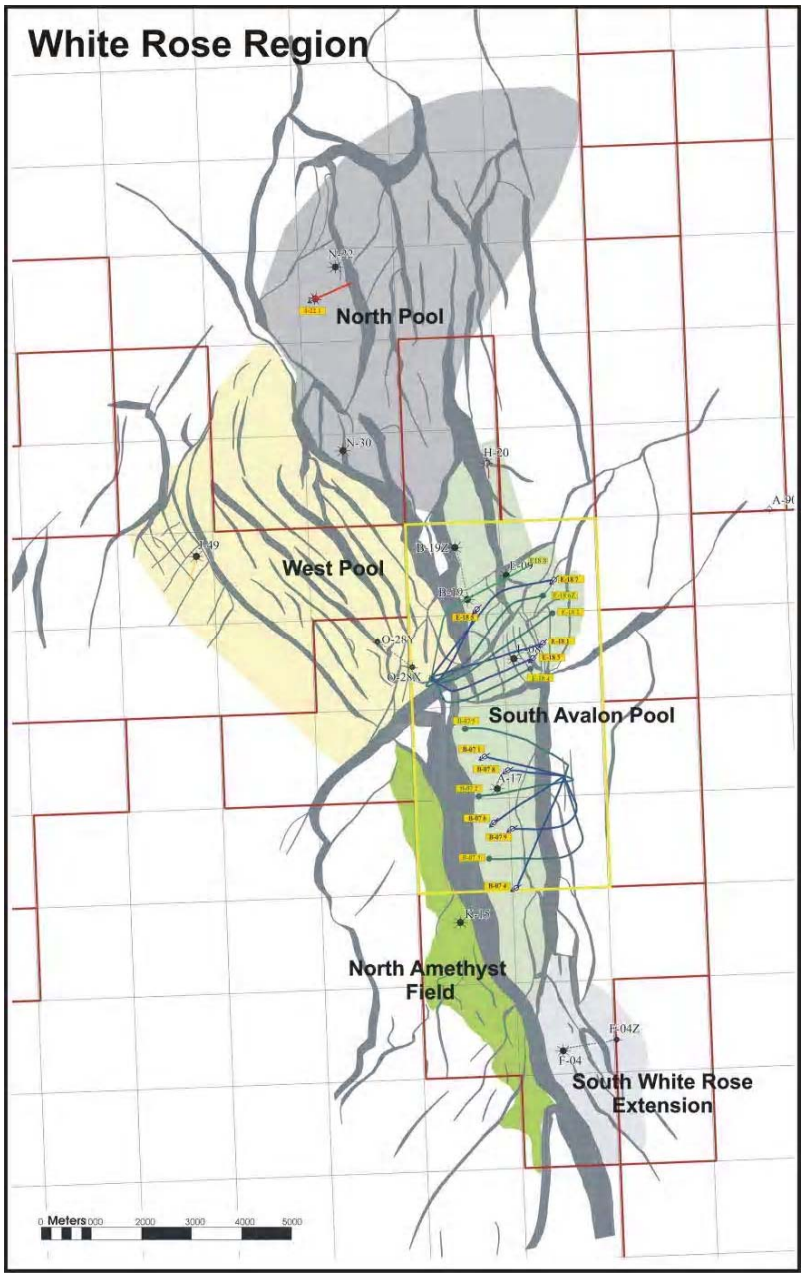


Figure 2-2 Location of North Amethyst Field

The North Amethyst Satellite Tie-back may be developed with wells tied back to the *SeaRose* via dedicated flowlines and risers terminating at the buoy (Option A) (Figure 2.3). However, pending further flow assurance studies and FEED engineering, North Amethyst may alternatively be tied back through existing subsea infrastructure (Option B) (Figures 2.4 and 2.5). If Option B is selected, the turret modifications as described in this Amendment will not be required, and the topsides modifications could be postponed to a later date.

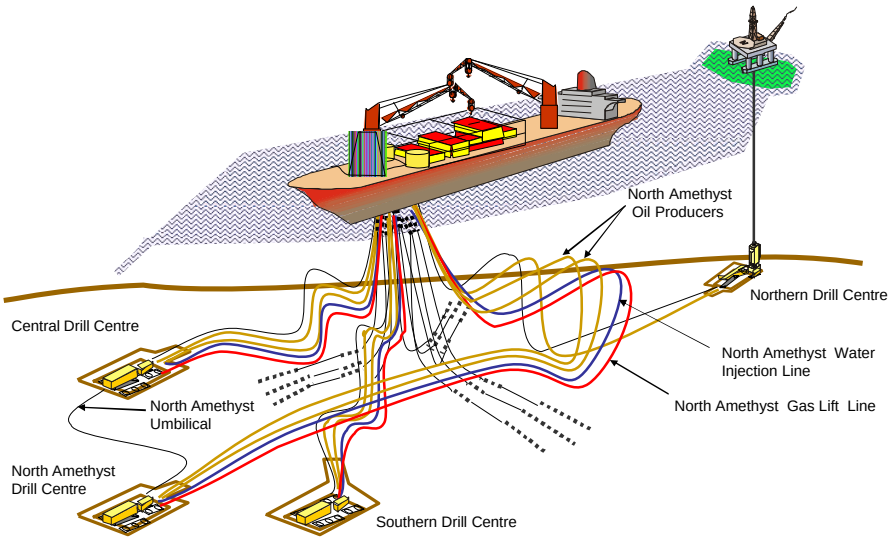


Figure 2-3 Option A North Amethyst Satellite Tie-back Direct to FPSO

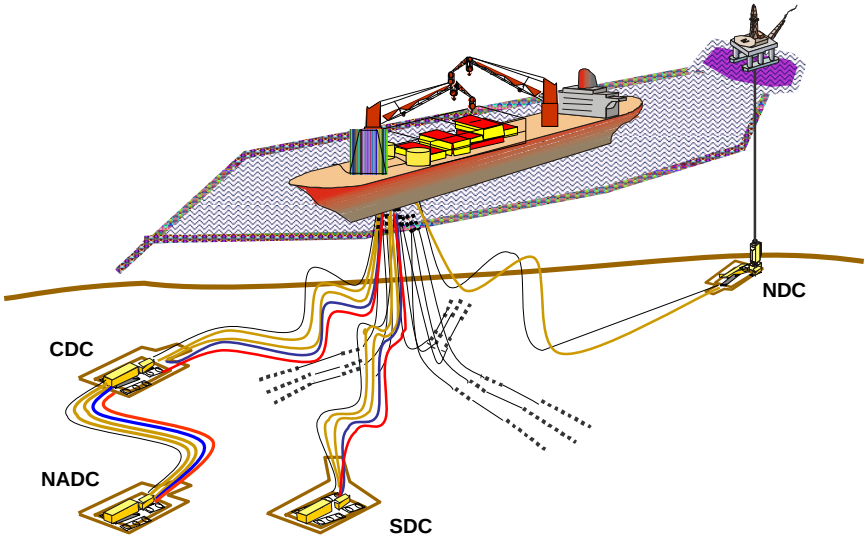


Figure 2-4 Option B North Amethyst Satellite Tie-back Via Central Drill Centre

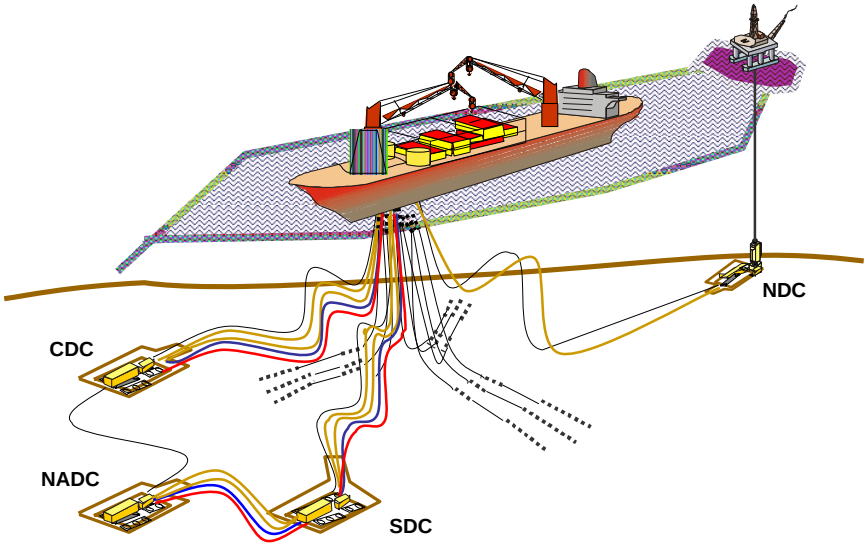


Figure 2-5 Option B North Amethyst Satellite Tie-back Via Southern Drill Centre

Should North Amethyst be tied directly back to *SeaRose* (Option A), modifications to the FPSO turret, buoy and topsides to accommodate the new flowlines, risers and umbilical from the NADC will be required.

Four spare turret riser slots currently on the *SeaRose* will be used for the North Amethyst drill centre. Internal to the buoy and turret, there will be installation of control valves, pipe work, and instruments and controls comprising:

- Two production risers from the buoy through the turret to module MO1 including two pig launchers;
- One water injection flowline from the turret base to the upper swivel stack;
- One gas lift flowline from the turret base to the upper swivel stack; and
- Chemical injection and subsea controls from the turret base to the upper swivel stack.

The *SeaRose* would be disconnected and brought to shore to implement these modifications. Currently it is envisioned that the *SeaRose* would come to shore in summer 2010. During this period subsea construction would take place at the White Rose field in preparation for first oil from North Amethyst in late 2010.

The total predicted recoverable oil from North Amethyst is 70 mm bbls on a P50 basis (estimated as of August 2007). The cost of modifications to the *SeaRose* to support the North Amethyst Satellite Tie-back is estimated to be approximately $75 million (CDN).

If the *SeaRose* is brought into port as a result of selecting Option A, the topsides may be enhanced to maintain oil production capacity when water cut increases and to enable more gas handling. As a result of the potential enhancements, gas handling capacity will increase from 4.2E+6 Sm^3/day (150 mmscfd) to 6.14E+6 Sm^3/day (217 mmscfd), water injection capacity will increase from 44,000 m^3/day (277,000 bpd) to 57,000 m^3/day (359,000 bpd), and produced water handling capacity will increase from 28,000 m^3/day (176,400 bpd) to 31,000 m^3/day (195,300 bpd). Total liquids handling capacity will increase from 33,000 m^3/day to 39,000 m^3/day. The cost of potential modifications to the topsides processing plant is estimated to be approximately $260 million (CDN).

As further information becomes available, plans will be modified and refined. Submission of this document does not commit Husky to proceed with the tie-back or facilities expansion. It should also be noted that this potential tie-back and facilities expansion work is currently in the preliminary front end engineering (FEED) phase and has not yet been sanctioned by the White Rose partners.

3.0 *SeaRose FPSO* Modifications for North Amethyst Satellite Tie-back

3.1 General

Should it be determined that the NADC will be tied directly back to the *SeaRose* (Option A), the topsides facilities on the *SeaRose* will require modification to accommodate the service requirements of the NADC. New risers would be installed requiring topside and turret piping (and ancillary equipment) from the buoy I-tube connections to the respective topside manifold /skids. Such risers would be connected via quick connect/disconnect (QCDC) valves in the buoy similar to the existing risers.

Subsea systems' equipment located in the turret, including the control systems, hydraulic power system, and chemical and methanol injection systems, would also require modification to tie-in the NADC.

The *SeaRose* was designed to accommodate these modifications and all safety systems and operational requirements will remain the same. Specifically, safety systems in the turret including active and passive fire protection systems and configuration of flowline and quick connect/disconnect (QCDC) blowdown systems will remain unchanged. Tie-ins to closed and open drains and emergency shutdown valves (ESDV) will also be installed as per existing configurations.

There will be no requirement for modifications to the hull of the *SeaRose* to accommodate the North Amethyst Satellite Tie-back.

3.2 Topsides – Turret Piping

Turret riser piping and associated ancillary equipment including QCDC valves, instrumentation tie-ins, and pig launcher/receivers (production lines only) would be required for flowlines 05, 06, 09 and 14 (production, production/test, water injection, and gas lift, respectively), to tie-in the NADC to new risers (refer to highlighted areas in Figure 3.1). All piping throughout the topsides and turret will be hard piping.

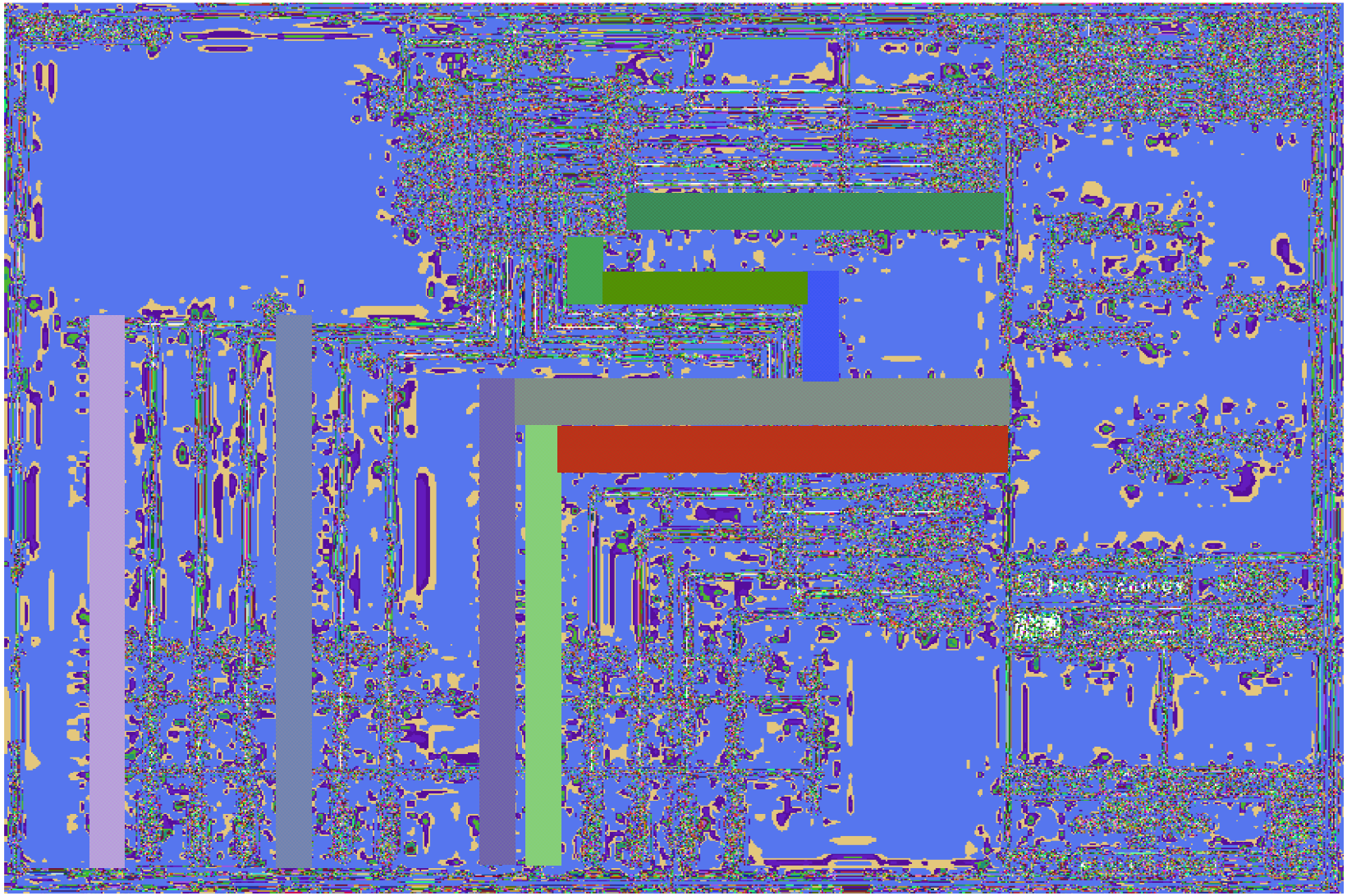


Figure 3-1 Topsides Tie-in Modifications for North Amethyst

3.2.1 Flow Control and Measurement

For each of the new production risers, a flow control device (choke valve), complete with ancillary equipment, will be located in the M01 module. Gas lift and water injection line meters will also be installed.

3.2.2 Swivel

There are no modifications required to the existing swivel as a result of the North Amethyst Satellite Tie-back. The existing spare production swivel passageways (two) will be utilized.

3.2.3 Quick Connect/Disconnect Assemblies

QCDC assemblies will be required to tie-in North Amethyst risers 05, 06, 09, and 14. The new QCDC assemblies will be the same design as those currently installed.

3.2.4 Manifold Piping

No modifications will be required to the production and test manifold piping. The existing manifolds include spare tie-in points for new production and test lines. The new lines will also tie into the flowline re-circulation system. The detailed procedures for manifold tie-in will be finalized during FEED.

3.2.5 Pig Launchers/Receivers

Two pig launcher/receivers will be required (one for each new North Amethyst production riser tie-in). The pigging system will be the same design as currently installed pigging systems.

3.2.6 FPSO Drain Systems

Piping will be required to tie in the new topsides and turret equipment to the existing closed drain systems (e.g. annulus bleed). Piping details and routing will be addressed during the FEED and detailed design phases of the project.

3.2.7 Topsides and Turret Subsea Systems Equipment

As a result of the increased distance to the NADC (approximately 7 km to the *SeaRose*), chemical and methanol injection systems will require modifications. Modifications are also required for the Subsea Production Hydraulic Power Unit (HPU), and the Integrated Control and Safety System (ICSS) and Subsea Master Control Station (MCS) software and simulators.

3.2.7.1 Chemical and Methanol Injection Systems

The North Amethyst production wells will require a supply of wax and scale inhibitor chemicals once water breakthrough occurs. Similarly, a supply of methanol will be required for hydrate prevention during start up and shutdown periods. Therefore, it is anticipated that this will increase the requirements for chemical and methanol injection and storage. Further definition of the topsides modifications required to support chemical and methanol injection to the NADC will be completed during FEED and detailed design.

3.2.7.2 Subsea Production Hydraulic Power Unit

The Subsea Production Hydraulic Power Unit (HPU) will require modifications including tubing runs from the skid to new equipment in the turret and subsea end users. The HPU filtration and return storage will also be upgraded to provide increased capacity in support of the additional umbilical tie-in. The HPU skid extension will house the additional supply/return reservoirs. A study of estimated fluid usage as well as clean up pump filtration maintainability will be optimized.

At this time, the following electrical, instrumentation and controls modifications are envisioned as a result of the HPU modifications:

- Addition of intrinsically safe inputs/outputs (I/O) and programming to the ICSS to allow control of the new clean up system and monitoring of the extension reservoir.

- Addition of cabling to connect the ICSS and Motor Control Centre (MCC) to the new filtration package.

At this time, new high pressure lines for the HPU are not envisaged. The HPU electrical, instrumentation, and controls scope will be finalized during FEED.

3.3 Control Systems

The topsides process and utility Integrated Control and Safety System (ICSS) incorporates the Process Control System (PCS), Emergency Shutdown (ESD) system,

Fire and Gas System (FGS) and Condition Monitoring System (CMS). The ICSS also has an interface with the subsea control system.

3.3.1 Process Control System (PCS) and Subsea Control System

The PCS is the principal operator interface for all topsides process control and monitoring functions and is directly interfaced to the Subsea Master Control Station (MCS). Addition of the NADC will require appropriate modifications to the PCS, MCS, and the Subsea simulator. Details of the required modifications will be determined during FEED.

3.3.2 Turret Equipment Room (TER) HVAC

The potential addition of further ICSS and MCS equipment to the turret will increase the heat dissipation within the Turret Equipment Room (TER). Details of TER Heating, Ventilation, and Air Conditioning (HVAC) system upgrades will be determined during FEED.

4.0 Modifications to *SeaRose FPSO* to Increase Produced Water and Gas Handling Capacity

Pending FEED engineering, flow assurance studies, and further economic evaluation, the topsides facilities on the *SeaRose* may be enhanced to maintain oil production capacity by modifications that will result in increased produced water and gas handling capacity. Maximum oil production will remain at 22,261 m^3/day (140,000 bpd). However, as a result of the potential enhancements, gas handling capacity may increase from 4.2E+6 Sm^3/day (150 mmscfd) to 6.14E+6 Sm^3/day (217 mmscfd), water injection capacity will increase from 44,000 m^3/day (277,000 bpd) to 57,000 m^3/day (359,000 bpd), and produced water handling capacity will increase from 28,000 m^3/day (176,400 bpd) to 31,000 m^3/day (195,300 bpd). Total liquids handling capacity will increase from 33,000 m^3/day to 39,000 m^3/day.

The following modifications may be made to the *SeaRose*:

- Increase HP Separator capacity and operate as three phase separation rather than the current two phase separation;
- Upgrade/replace the existing glycol regeneration package;
- Modify produced water hydrocyclones for HP feed;
- Strengthen roof steelwork to accommodate equipment and chemical storage;
- Replace produced water recycle pumps;

- Replace oxygen scavenger pumps and increase storage;
- Additional chemical injection skid for new wells and production centres;
- Replace cooling medium circulation pumps, pipework and filters;
- Add a fourth gas turbine driven power generator;
- Relocate existing hypochlorite skid and jet fuel skid to another location;
- Change out gas compression coolers;
- Replace glycol contactor inlet cooler with higher capacity unit;
- Replace glycol contactor packing and inlet knock out drum internals;
- Modify HP gas compressor to limit of re-rated driver;
- Modify flash gas compressor to limit of re-rated driver;
- Modify LP/IP compressor to limit of re-rated driver (including pipework);
- Change packing in existing de-aerator tower;
- Upgrade vacuum pump system; and
- Install new water injection pumps with separate booster pumps.

Modifications that may be made to the Main Equipment Room (upper and lower levels) include:

- Install turbine control panel;
- Relocate UPS distribution panels from lower level;
- Extend 13.8kV switchboard;
- Escape hatch to be installed in north wall of lower level; and
- Access door in lower level to be relocated east and bracing modified.

Refer to Appendix A for diagrams depicting the locations and scope of the above noted modifications to the *SeaRose*.

As a result of the water/oil/gas processing capacity increase, the cooling duty also increases requiring system modifications such as replacement of the cooling medium circulation pumps and filter with larger units and amendment of the operating philosophy to run three of three heat exchangers. The operating philosophy for seawater lift will also change to continuously run two of three lift pumps.

Note that the above modifications are indicative and subject to further development and refinement during the FEED process.

5.0 Marine Systems

Allowance was made in the original mooring design of the *SeaRose* to allow for the addition of new risers.

A pre-FEED weight review has predicted that the total topside dry weight will increase by approximately 1,037 tonnes in total, inclusive of 402 tonnes for additional piping within the turret area. Loading due to the addition of new risers and topsides modifications will be validated during FEED. Following modifications at shore, an inclination test will be conducted and updates to the Trim and Stability Booklet and Marine Operating Procedures will be implemented as required.

6.0 Schedule

A high level preliminary conceptual schedule for modifications to the *SeaRose* FPSO is provided in Figure 6.1.

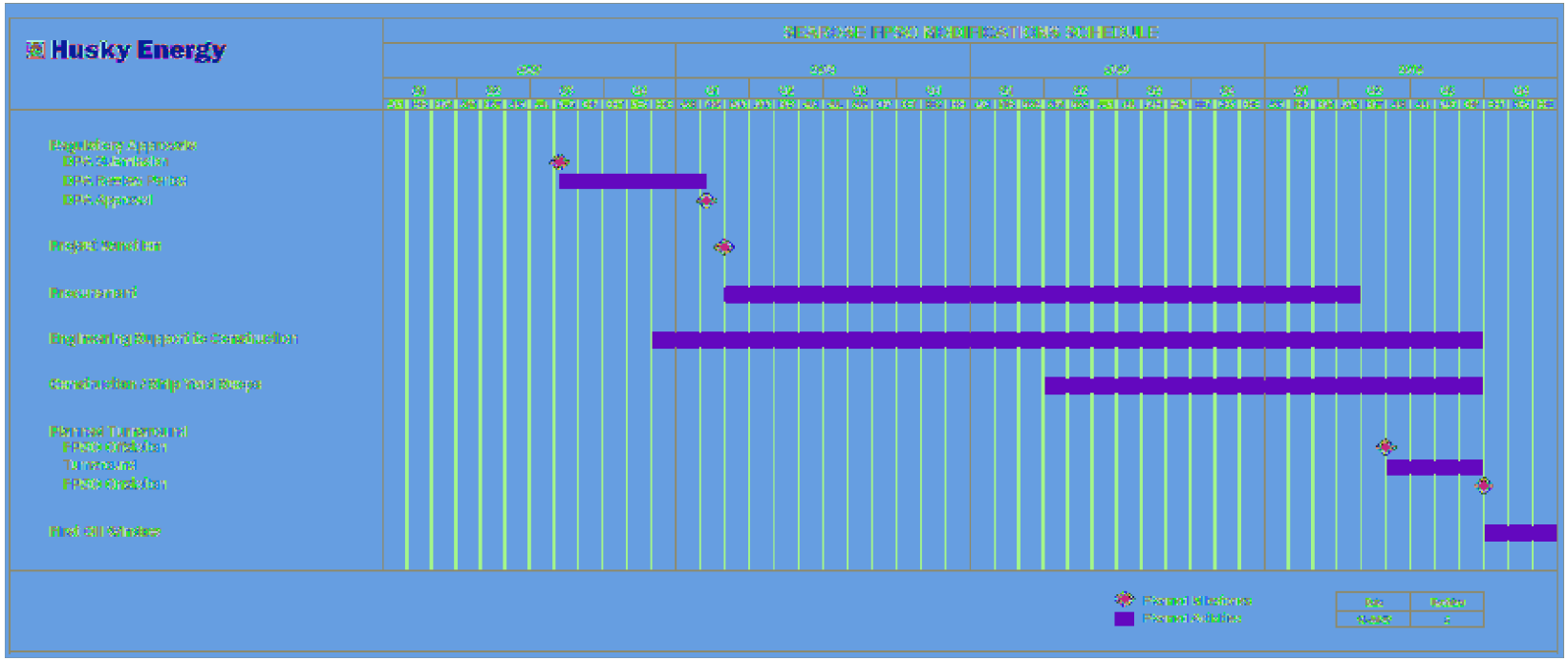


Figure 6-1 Preliminary Conceptual Schedule for Implementation of *SeaRose* FPSO Modifications

7.0 Management

Husky, as the White Rose Field Operator, will manage the modifications to the *SeaRose FPSO*. The Operator's authority, role, responsibility and reporting requirements are outlined in the White Rose Exploration, Appraisal, Development and Operating Agreement that is already in place.

8.0 Canada-Newfoundland and Labrador Benefits Commitments

As with the core White Rose Development, Husky's *Canada-Newfoundland and Labrador Benefits Guidelines* will continue as a governing document to guide how Husky and its contractors conduct business. A Benefits Plan for the North Amethyst Satellite Tie-back (Husky Document No. SR-SRT-RP-0006) which addresses both the White Rose Development Plan Amendment for the *SeaRose FPSO* modifications and the North Amethyst Development Plan has been prepared and submitted to the C-NLOPB as a separate report.

9.0 Facilities Design Criteria

9.1 Regulations, Codes and Standards

The modifications to the *SeaRose* will be designed such that they comply with codes and standards, and regulatory requirements outlined in the following sub-sections.

9.1.1 Codes and Standards

Engineering and design practices will be common across the existing White Rose *SeaRose* and all designs will conform to the codes and standards referenced in the legislation and/or appropriate Canadian standards. Generally accepted international standards, such as ANSI / ASME specifications, International Standards Organization (ISO) standards and American Petroleum Institute (API) recommended practices, will be applied as appropriate and in cases where they are considered equal to or exceed the requirements of the Canadian equivalent.

9.1.2 Regulatory Requirements

The *SeaRose* modifications will conform to the requirements of the following Canadian Federal and Provincial regulations that include, but are not limited to:

- Canada-Newfoundland Atlantic Accord Implementation Act (S.C. 1987, c.3);

- Canada-Newfoundland and Labrador Accord Implementation Newfoundland and Labrador Act (R.S.N.L. 1990, c. C-2).
- Newfoundland Offshore Certificate of Fitness Regulations 1995 (SOR/95-100);
- Newfoundland Offshore Area Petroleum Production and Conservation Regulations 1995 (SOR/95-103);
- Newfoundland Offshore Petroleum Installations Regulations 1995 (SOR/95-104);
- Draft Newfoundland Petroleum Occupational Safety and Health Regulations (posted on C-NLOPB website on May 3, 2004);
- Newfoundland Offshore Petroleum Drilling Regulations 1993 (SOR/93-23);
- Canada Shipping Act (R.S., 1985, c. S-9);
- Offshore Waste Treatment Guidelines (August 2002); and
- Newfoundland Offshore Area Guidelines for Drilling Equipment (March 1993).

9.2 Overall Design Requirements

The design of facilities modifications will meet the following additional requirements:

9.2.1 Fatigue

Target fatigue life for topsides equipment will be in accordance with the regulations listed in Section 9.1.2 and the requirements of ASME, API, DNV and CSA guidelines and practices.

9.2.2 Design Life Requirements

The modifications to the *SeaRose* will be designed for a 20-year minimum service life.

9.2.3 Hydrogen Sulphide Potential

All topsides equipment exposed to produced fluids from North Amethyst, including turret piping and pig launchers/receivers will be designed for sour service according to NACE, MR-01-75.

9.2.4 Sand

Early samples collected from the North Amethyst reservoir indicated that risk of significant sand production might be higher than that defined in the original White Rose

design specification. Subsequent detailed analysis indicated that sand production from North Amethyst is not expected to exceed the current White Rose design specification. However, further sensitivity analysis is continuing. At this time, no additional protection or monitoring equipment is planned for installation on the FPSO. However, sand detection capability may be incorporated into the subsea production system to further monitor against sand production.

9.3 Environmental Criteria

The design of facilities modifications will utilize the same environmental criteria developed during the initial White Rose Development including data on wind, waves, currents, ice, seismic, and seawater properties and ambient temperatures.

Modifications to the *SeaRose* will comply with all applicable government legislation, corporate policy, industry standards, existing Husky procedures, and best practices. Appropriate plans/work will be completed to address any specific environmental concerns. The environmental effects of developing the North Amethyst Satellite Tie-back were assessed in the *Husky White Rose Development Project: New Drill Centre Construction and Operations Program Environmental Assessment* (Husky Document No. WR-HSE-RP-4003) and the *Husky White Rose Development Project: New Drill Centre Construction and Operations Program Environmental Assessment Addendum* (Husky Document No. WR-HSE-RP-0167), approved April 19, 2007.

As a result of increasing produced water handling capacity, the *SeaRose* will be able to process 31,000 m^3/day produced water. This is 1,000 m^3/day above the produced water disposal rate of 30,000 m^3/day approved for the White Rose Development. Husky will be reviewing the feasibility of re-injecting produced water as well as options for improving treatment of produced water should re-injection prove unfeasible.

9.4 Quality Assurance and Quality Control

Quality assurance and quality control will be achieved utilizing existing processes for similar White Rose activities. The CAN3-Z299 series of standards have been superseded by the CAN/CSA-ISO 9000-00 series standards. Therefore, the topsides modifications will be executed in accordance with the requirements of CAN/CSA-ISO 9000-00.

9.5 Certification

Certifying Authority (CA) services will include activities during design, fabrication, installation, and commissioning as required for activities related to the modifications to the *SeaRose*, including review and approval of the equipment design, audit fabrication, witness of factory tests, and participation in commissioning.

9.6 Decommissioning and Abandonment

Decommissioning and abandonment of the *SeaRose* and associated facilities will be in accordance with the established White Rose Decommissioning and Abandonment Plan.

10.0 Operations and Maintenance

Should North Amethyst be tied back directly to *SeaRose (*Option A), there will be a requirement to shut down production to implement the FPSO modifications. Alternatively, if North Amethyst is tied back through existing infrastructure (Option B), onshore modifications to *SeaRose* will not be required. However, *SeaRose* may still be brought to shore to implement the modifications to increase produced water and gas handling capacity.

Should any onshore modifications be required, the *SeaRose* will be taken off station and brought to a facility in Newfoundland. It is anticipated that the *SeaRose* would be at shore for a maximum of four months during which time there would be no production from the White Rose Development. However, offshore subsea installation activities in the NADC would proceed during the period that the *SeaRose* was at shore. Following return of the *SeaRose* to the White Rose field, the NADC drill centre would be commissioned and brought on line.

Husky intends to conduct a design review of the use of subsea multi-phase flow meters in the design of the NADC. This technology will be considered for use in conjunction with the existing test separation facilities as a means of conducting well testing and allocation on a well/ drill centre basis. Whenever well testing is not ongoing, it is anticipated that the test line will continue to be used for production to optimize production flow and mitigate wax formation in the line.

The existing organizational structure (offshore and onshore) will not be impacted as a result of the modifications to the *SeaRose*. The existing Operating and Maintenance Procedures will be reviewed and revised as required to include the operation and maintenance requirements of the new modifications. Logistics, Communications and Contingency Plans should not be impacted as a result of the new modifications that will be made to the *SeaRose*.

11.0 Safety Analysis

The *SeaRose FPSO* Safety Plan approved by the C-NLOPB details the approach to and results of the risk assessment process for the *SeaRose*. Activities associated with development of the North Amethyst Satellite Tie-back, including all topsides modifications to the *SeaRose*, will utilize Husky's formal safety assessment process.

Existing Husky systems and processes for assessing risks of planned operations, modifications or changes will be used in assessing any identified risks related to the North Amethyst Satellite Tie-back and the modifications to increase produced water and gas handling capacity. These processes include the Husky Management of Change Process and the Husky East Coast Risk Management Process. These processes will ensure that the risk profile is not compromised and the Target Levels of Safety continue to be met.

A review of the impact of the North Amethyst Satellite Tie-back, including the potential modifications to the *SeaRose*, on safety studies and plans and the mitigation measures that will be implemented has been submitted to the C-NLOPB as a separate report (Husky Document No. SR-HSE-RP-0003).

12.0 Development Costs

12.1 Capital Cost Estimates

This section discusses the capital cost estimates for *SeaRose* modifications. All costs presented are in 2007 Canadian dollars.

12.1.1 Assumptions for Capital Cost Estimates

The capital cost estimates have been prepared under the following set of assumptions:

- The modifications will be executed in accordance with the management philosophies and schedule described in this document.
- All facilities, goods, and services will be acquired on a competitive basis in accordance with the approved Canada-Newfoundland and Labrador Benefits Plan.
- Regulatory approval and Project Sanction will be achieved in accordance with the timelines set out herein.

12.1.2 Capital Cost Estimates

The capital cost estimate for components of the FPSO modifications are as follows:

- FPSO modifications to support North Amethyst Satellite Tie-back assuming Option A is selected: $75 million
- FPSO modifications to increase total liquids and gas handling: $260 million

12.1.3 Operating Cost Implications

The proposed modifications to the *SeaRose* will not significantly increase White Rose operating costs. However, in addition to fixed OPEX, increased production and injection levels and extended plateau production will result in intensified use of existing production, processing and utility facilities, and will result in higher costs for maintenance, repairs and critical spares.

13.0 West White Rose Extension (WWRX)

Following drilling of the O-28 well in the West Avalon Pool, it was estimated that this part of the White Rose field has recoverable oil resources of 120 million barrels on a P50 basis. At the present time Husky plans to develop this pool as a subsea tie-back to the *SeaRose*. Further delineation results, flow assurance studies and FEED, will determine the optimum flow line routings for the WWRX tie back.

Installation of WWRX subsea equipment will likely occur during the summer of 2010, concurrent with subsea installation at the NADC. A White Rose Development Plan Amendment for WWRX will be submitted in due course.

14.0 Reports Used in Preparation of the Development Plan Amendment

- Preliminary *SeaRose* Topsides Tie-in Design Basis Memorandum (SR-G-99-G-SP-00002-001).
- White Rose Functional Specification (WR-ENG-SP-001).

15.0 Acronyms

Term	Description
ANSI	American National Standards Institute
API	American Petroleum Institute
ASME	American Society of Mechanical Engineers
CA	Certifying Authority
CMS	Condition Monitoring System
C-NLOPB	Canadian-Newfoundland Labrador Offshore Petroleum Board
CSA	Canadian Standards Association
DA	Development Application
DNV	Det Norske Veritas
ESD	Emergency Shutdown
FEED	Front End Engineering Design
FGS	Fire and Gas System
FPSO	Floating Production Storage and Offloading
HP	High Pressure
HPU	Hydraulic Power Unit
HVAC	Heating, Ventilation, and Air Conditioning
ICSS	Integrated Control and Safety System
I/D	Internal Diameter
I/O	Inputs/Outputs
IP	Intermediate Pressure
ISO	International Standards Organization
LP	Low Pressure
MCC	Motor Control Centre
MCS	Master Control Station
MO1	Module 1
NADC	North Amethyst Drill Centre
PCS	Process Control System
QCDC	Quick Connect – Disconnect Valve
SWRX	South White Rose Extension
TER	Turret Equipment Room
UPS	Uniterruptible Power Supply
WWRX	West White Rose Extension

Appendix A

Pictorials of Modifications to *SeaRose FPSO* to Increase Produced Water and Gas Handling Capacity

Figures 1 and 2 show the locations of the modules on the *SeaRose FPSO*. Figures 3 to 10 pictorially outline the modifications on each module that will be made to the *SeaRose* to increase produced water and gas handling capacity.

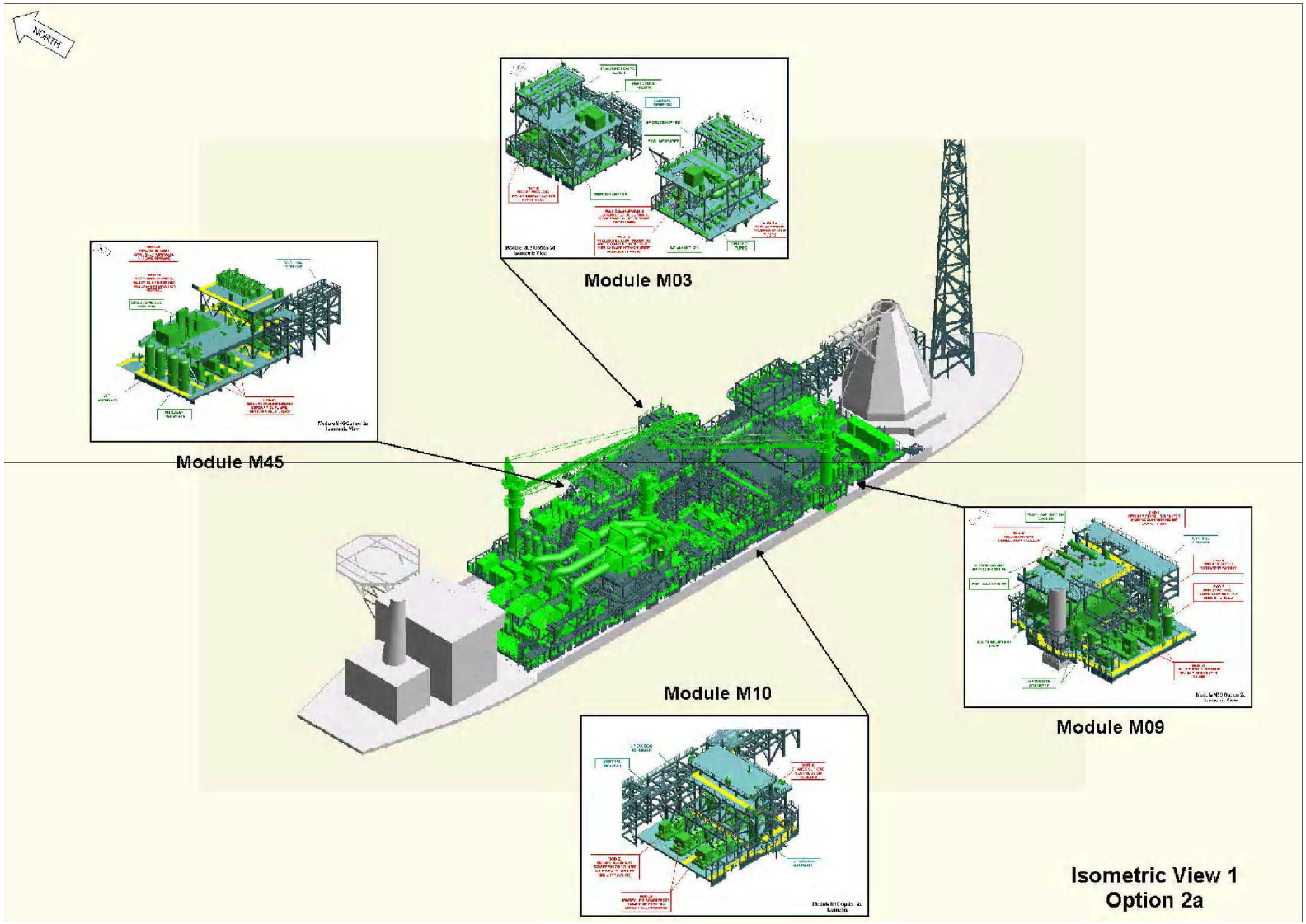

NORTH
Module M03
Module M45
Module M10
Module M09
Isometric View 1
Option 2a

Figure 1

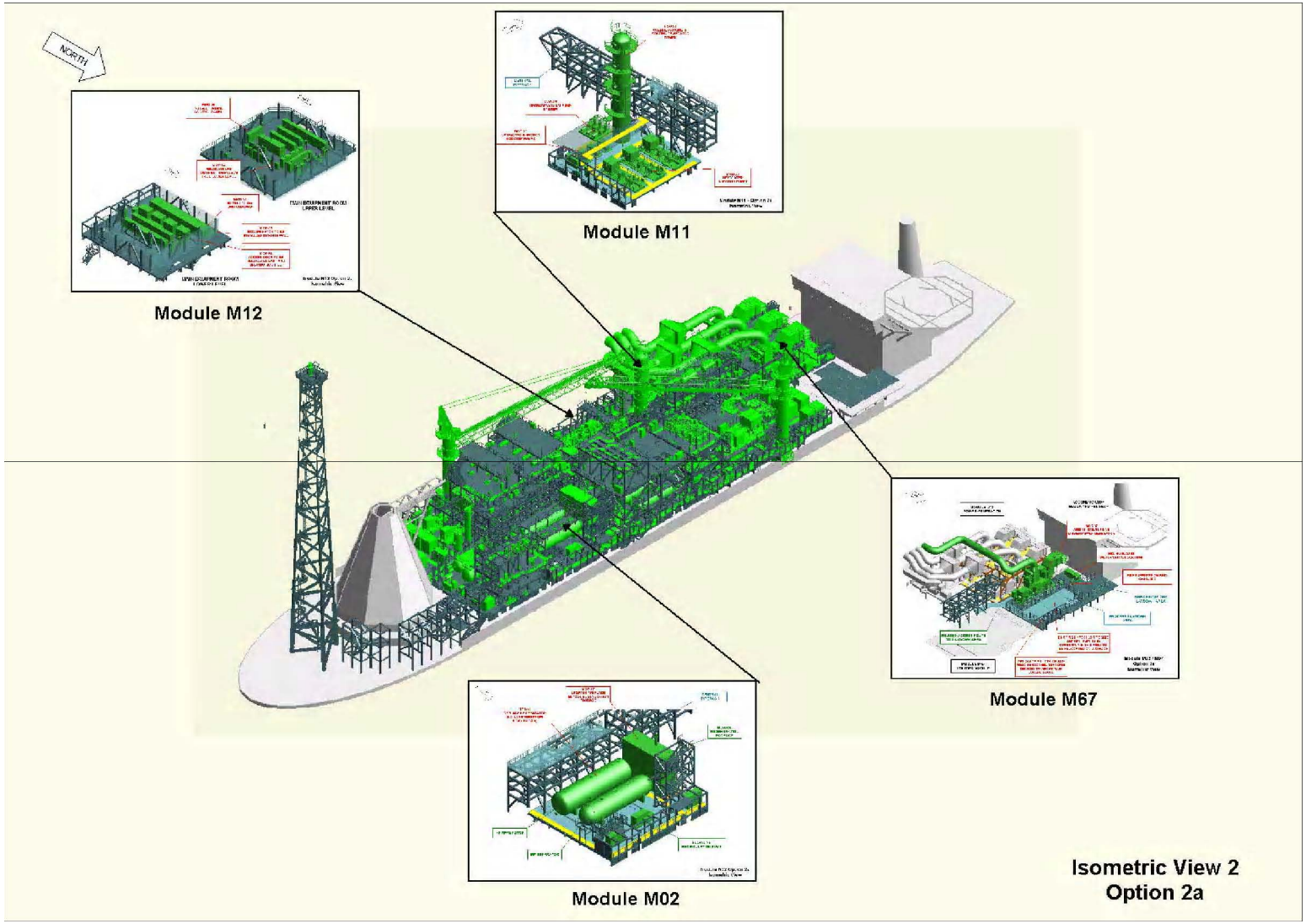

NORTH
Module M12
Module M11
Module M67
Module M02
Isometric View 2
Option 2a

Figure 2

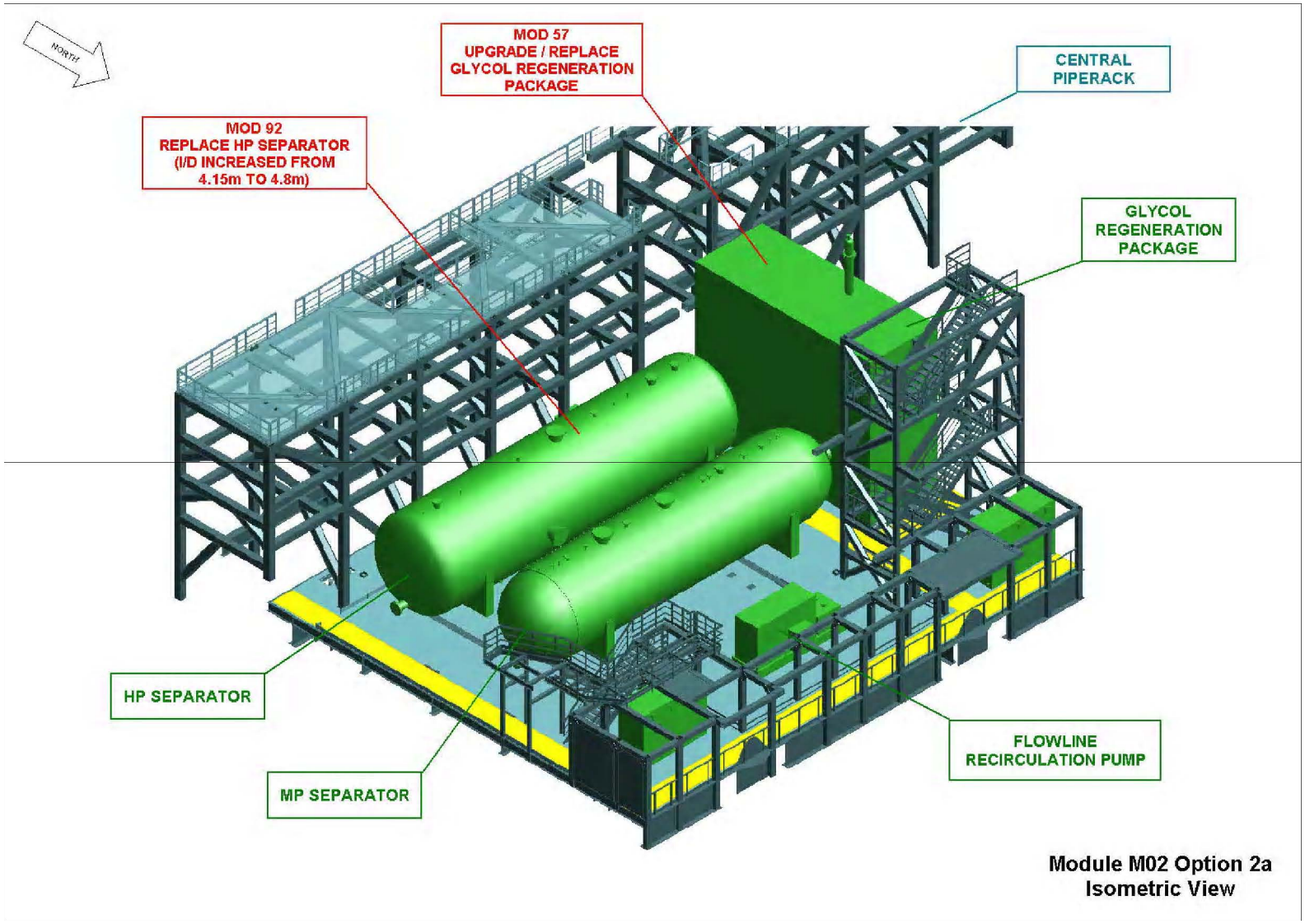

NORTH
MOD 57
UPGRADE / REPLACE
GLYCOL REGENERATION
PACKAGE
CENTRAL
PIPERACK
MOD 92
REPLACE HP SEPARATOR
(I/D INCREASED FROM
4.15m TO 4.8m)
GLYCOL
REGENERATION
PACKAGE
HP SEPARATOR
MP SEPARATOR
FLOWLINE
RECIRCULATION PUMP
Module M02 Option 2a
Isometric View

Figure 3

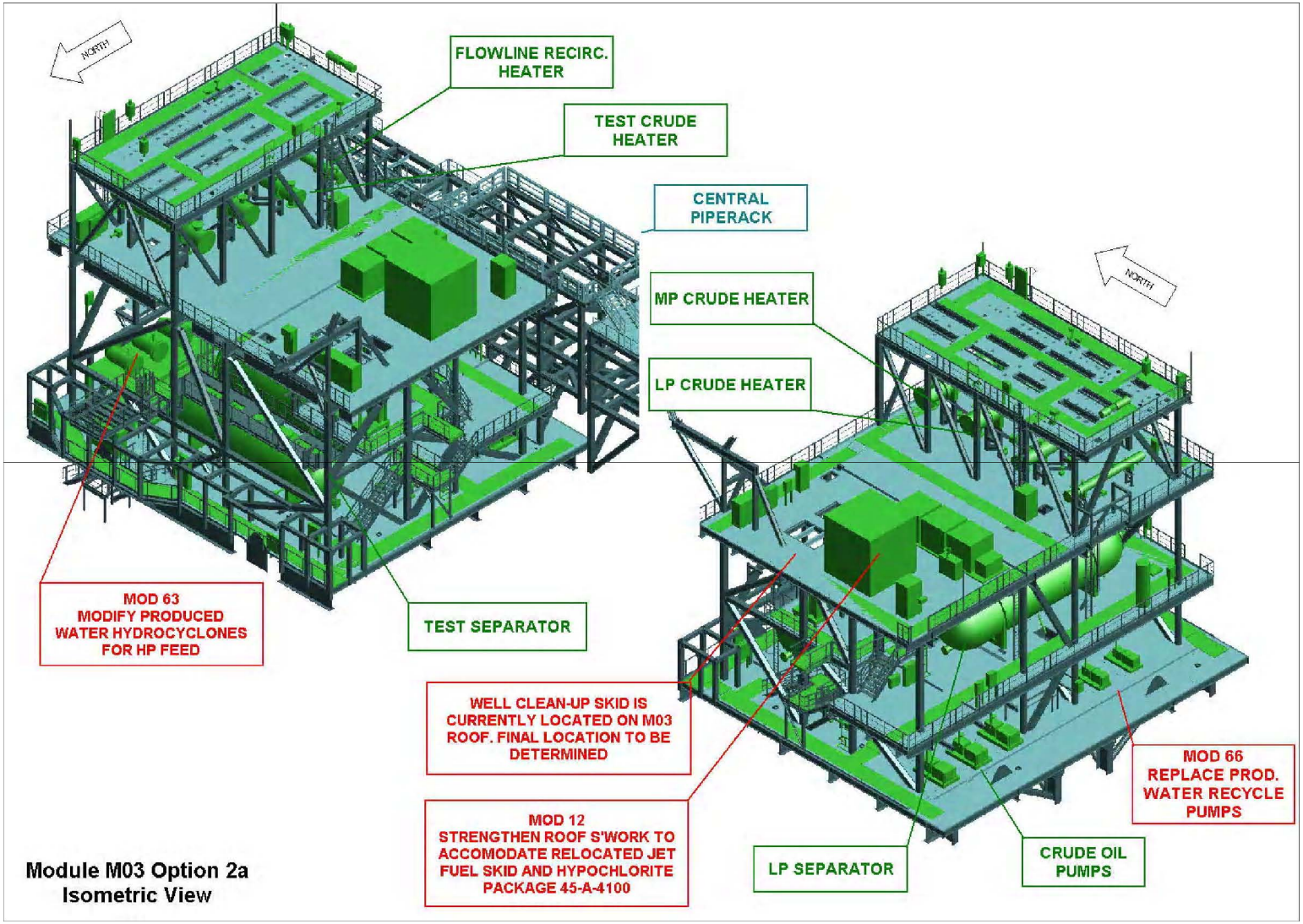

NORTH
FLOWLINE RECIRC. HEATER
TEST CRUDE HEATER
CENTRAL PIPERACK
MP CRUDE HEATER
LP CRUDE HEATER
NORTH
MOD 63
MODIFY PRODUCED WATER HYDROCYCLONES FOR HP FEED
TEST SEPARATOR
WELL CLEAN-UP SKID IS CURRENTLY LOCATED ON M03 ROOF. FINAL LOCATION TO BE DETERMINED
MOD 66
REPLACE PROD. WATER RECYCLE PUMPS
MOD 12
STRENGTHEN ROOF S'WORK TO ACCOMODATE RELOCATED JET FUEL SKID AND HYPOCHLORITE PACKAGE 45-A-4100
LP SEPARATOR
CRUDE OIL PUMPS
Module M03 Option 2a
Isometric View

Figure 4

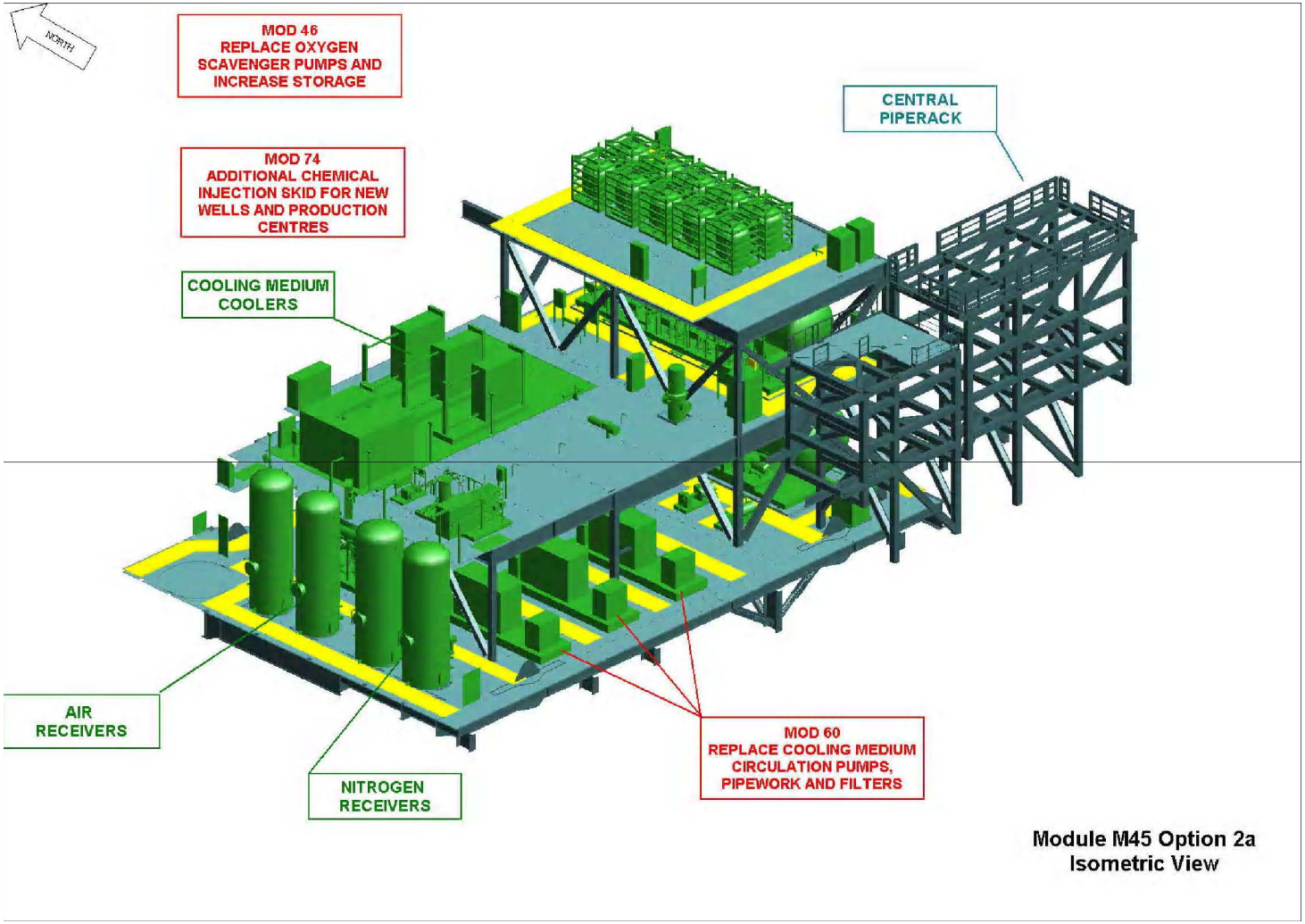

NORTH
MOD 46
REPLACE OXYGEN SCAVENGER PUMPS AND INCREASE STORAGE
CENTRAL PIPERACK
MOD 74
ADDITIONAL CHEMICAL INJECTION SKID FOR NEW WELLS AND PRODUCTION CENTRES
COOLING MEDIUM COOLERS
AIR RECEIVERS
NITROGEN RECEIVERS
MOD 60
REPLACE COOLING MEDIUM CIRCULATION PUMPS, PIPEWORK AND FILTERS
Module M45 Option 2a
Isometric View

Figure 5

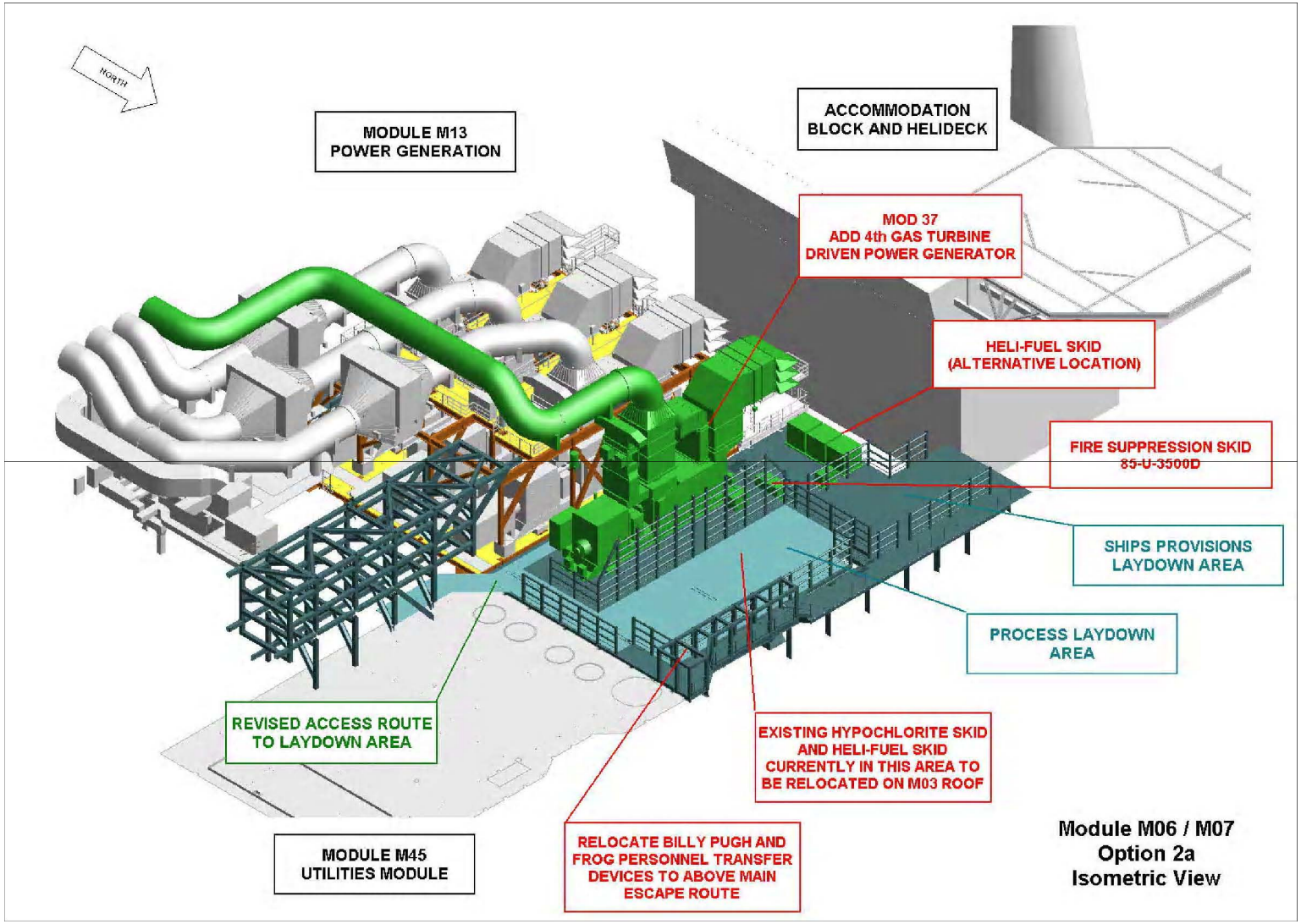

NORTH
MODULE M13
POWER GENERATION
ACCOMMODATION
BLOCK AND HELIDECK
MOD 37
ADD 4th GAS TURBINE
DRIVEN POWER GENERATOR
HELI-FUEL SKID
(ALTERNATIVE LOCATION)
FIRE SUPPRESSION SKID
85-U-3500D
SHIPS PROVISIONS
LAYDOWN AREA
PROCESS LAYDOWN
AREA
REVISED ACCESS ROUTE
TO LAYDOWN AREA
EXISTING HYPOCHLORITE SKID
AND HELI-FUEL SKID
CURRENTLY IN THIS AREA TO
BE RELOCATED ON M03 ROOF
MODULE M45
UTILITIES MODULE
RELOCATE BILLY PUGH AND
FROG PERSONNEL TRANSFER
DEVICES TO ABOVE MAIN
ESCAPE ROUTE
Module M06 / M07
Option 2a
Isometric View

Figure 6

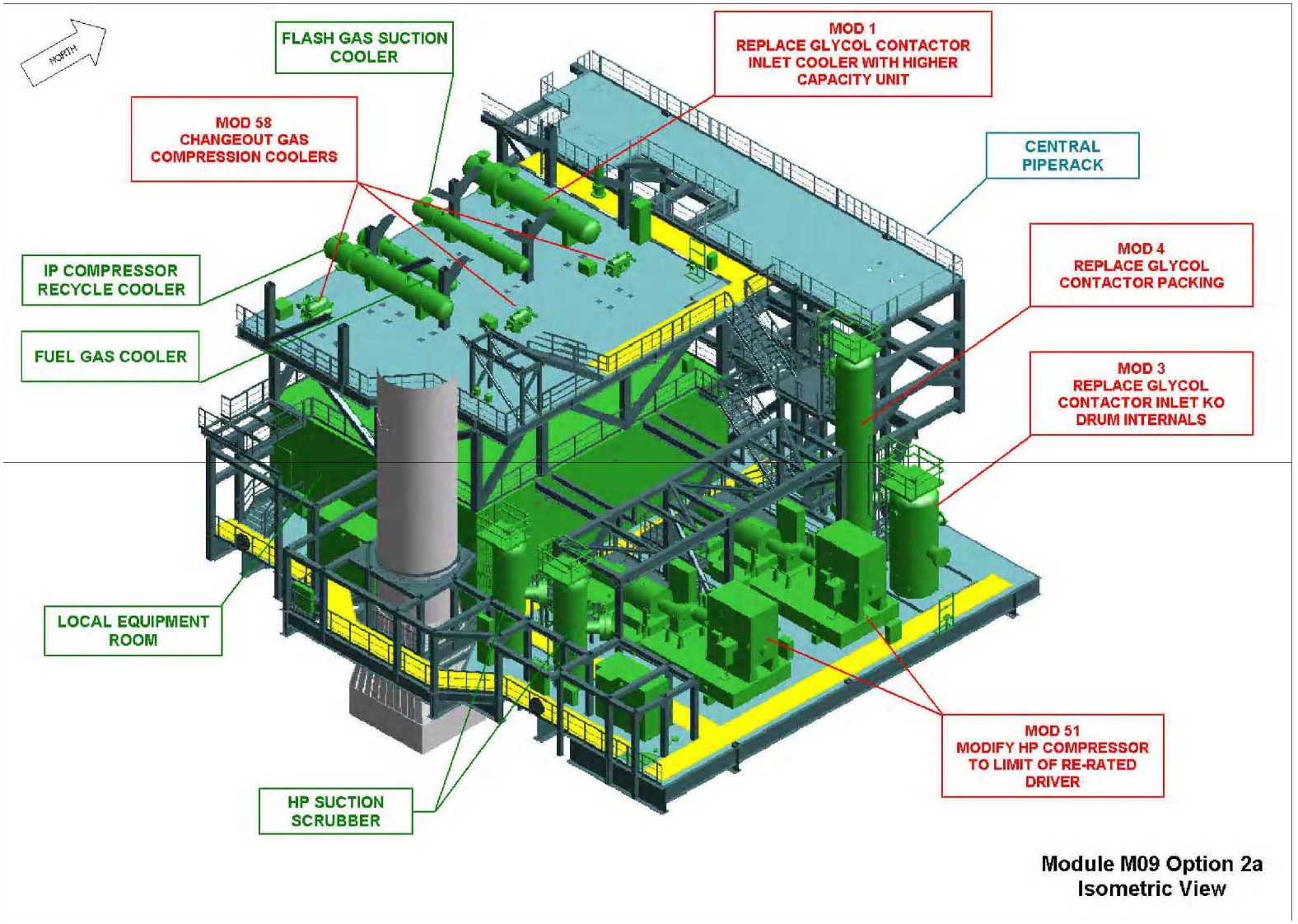

NORTH
FLASH GAS SUCTION COOLER
MOD 1
REPLACE GLYCOL CONTACTOR INLET COOLER WITH HIGHER CAPACITY UNIT
MOD 58
CHANGEOUT GAS COMPRESSION COOLERS
CENTRAL PIPERACK
MOD 4
REPLACE GLYCOL CONTACTOR PACKING
IP COMPRESSOR RECYCLE COOLER
FUEL GAS COOLER
MOD 3
REPLACE GLYCOL CONTACTOR INLET KO DRUM INTERNALS
LOCAL EQUIPMENT ROOM
MOD 51
MODIFY HP COMPRESSOR TO LIMIT OF RE-RATED DRIVER
HP SUCTION SCRUBBER
Module M09 Option 2a
Isometric View

Figure 7

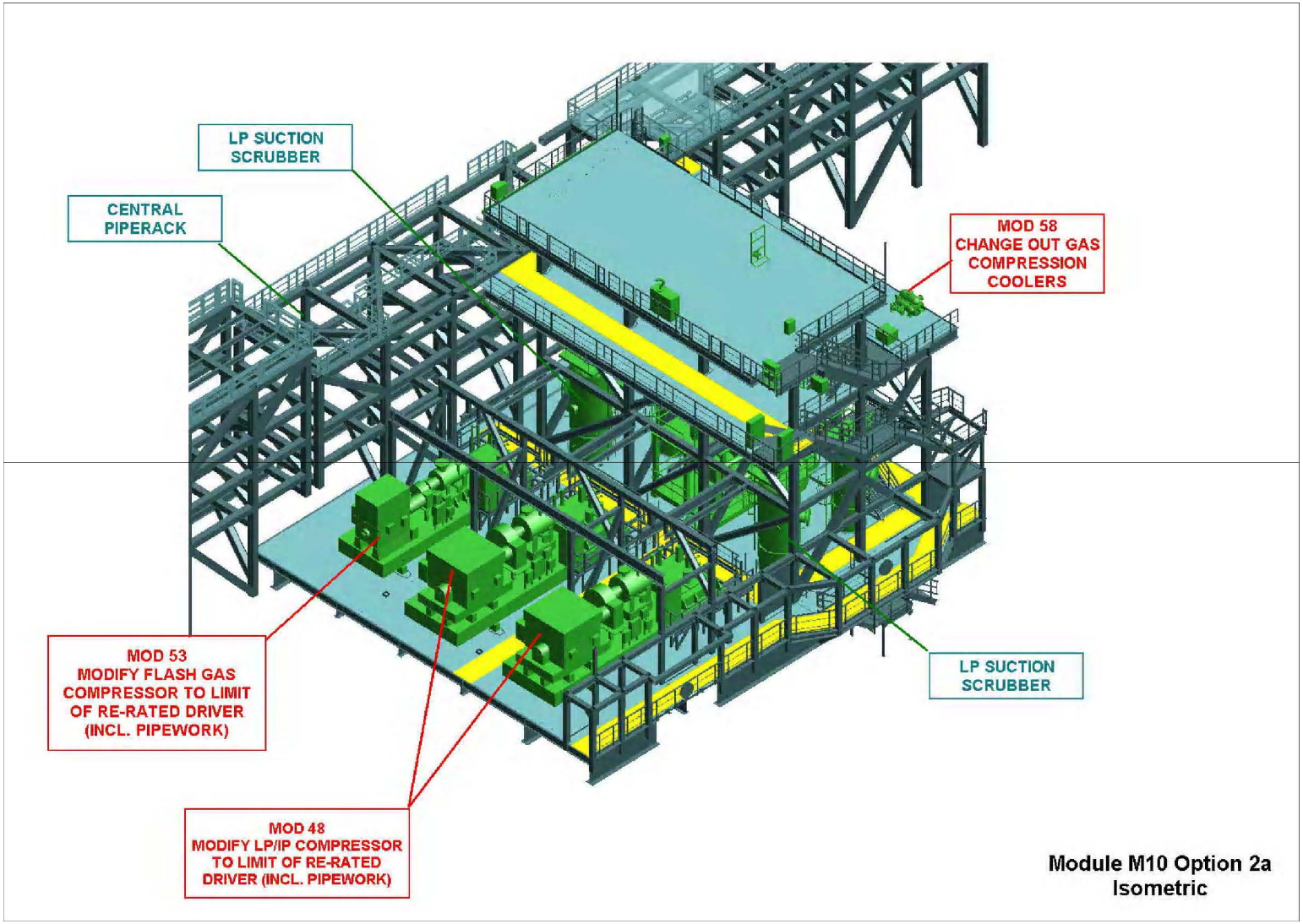

LP SUCTION SCRUBBER
CENTRAL PIPERACK
MOD 58 CHANGE OUT GAS COMPRESSION COOLERS
MOD 53 MODIFY FLASH GAS COMPRESSOR TO LIMIT OF RE-RATED DRIVER (INCL. PIPEWORK)
LP SUCTION SCRUBBER
MOD 48 MODIFY LP/IP COMPRESSOR TO LIMIT OF RE-RATED DRIVER (INCL. PIPEWORK)
Module M10 Option 2a Isometric

Figure 8

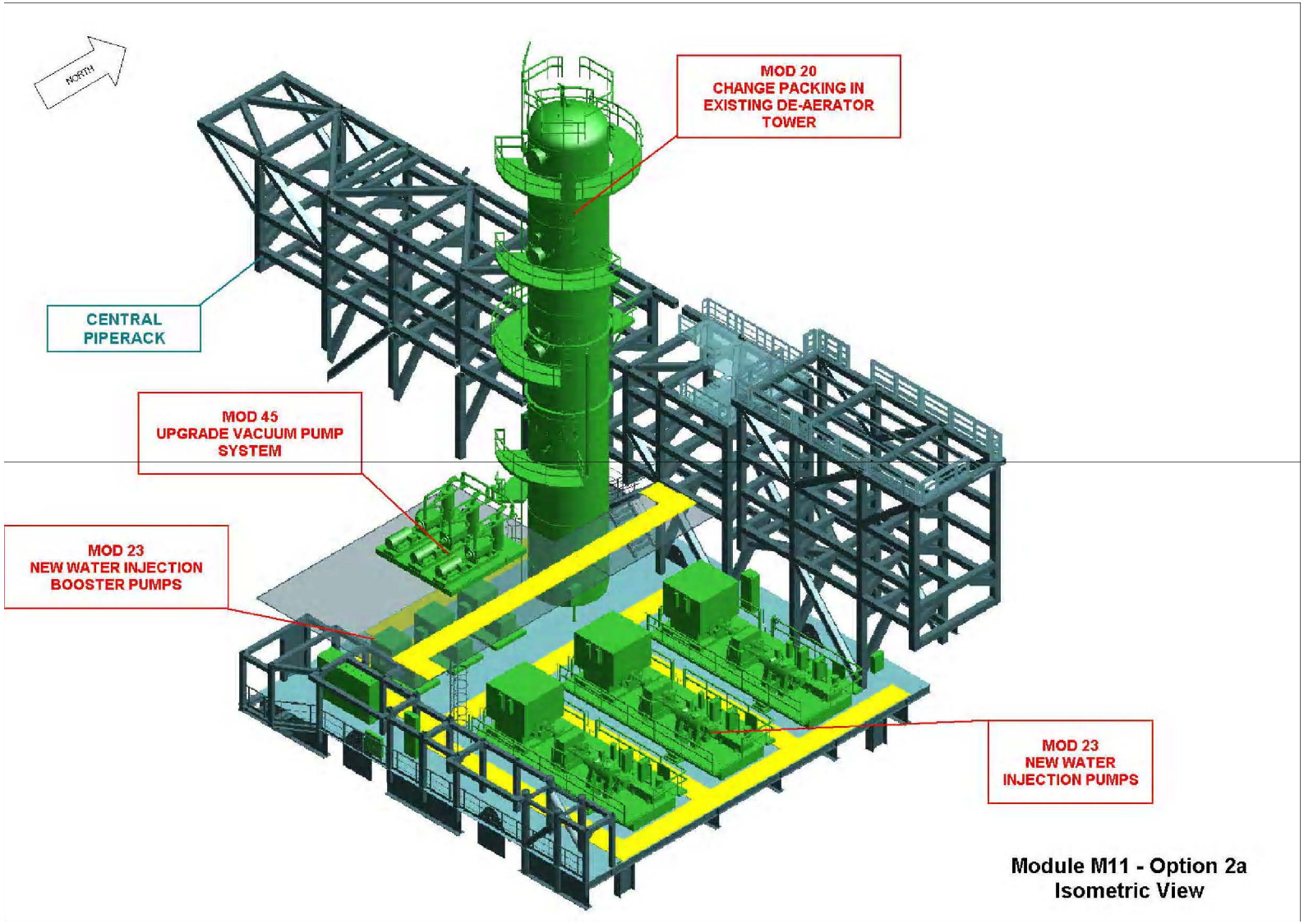

NORTH
MOD 20
CHANGE PACKING IN
EXISTING DE-AERATOR
TOWER
CENTRAL
PIPERACK
MOD 45
UPGRADE VACUUM PUMP
SYSTEM
MOD 23
NEW WATER INJECTION
BOOSTER PUMPS
MOD 23
NEW WATER
INJECTION PUMPS
Module M11 - Option 2a
Isometric View

Figure 9

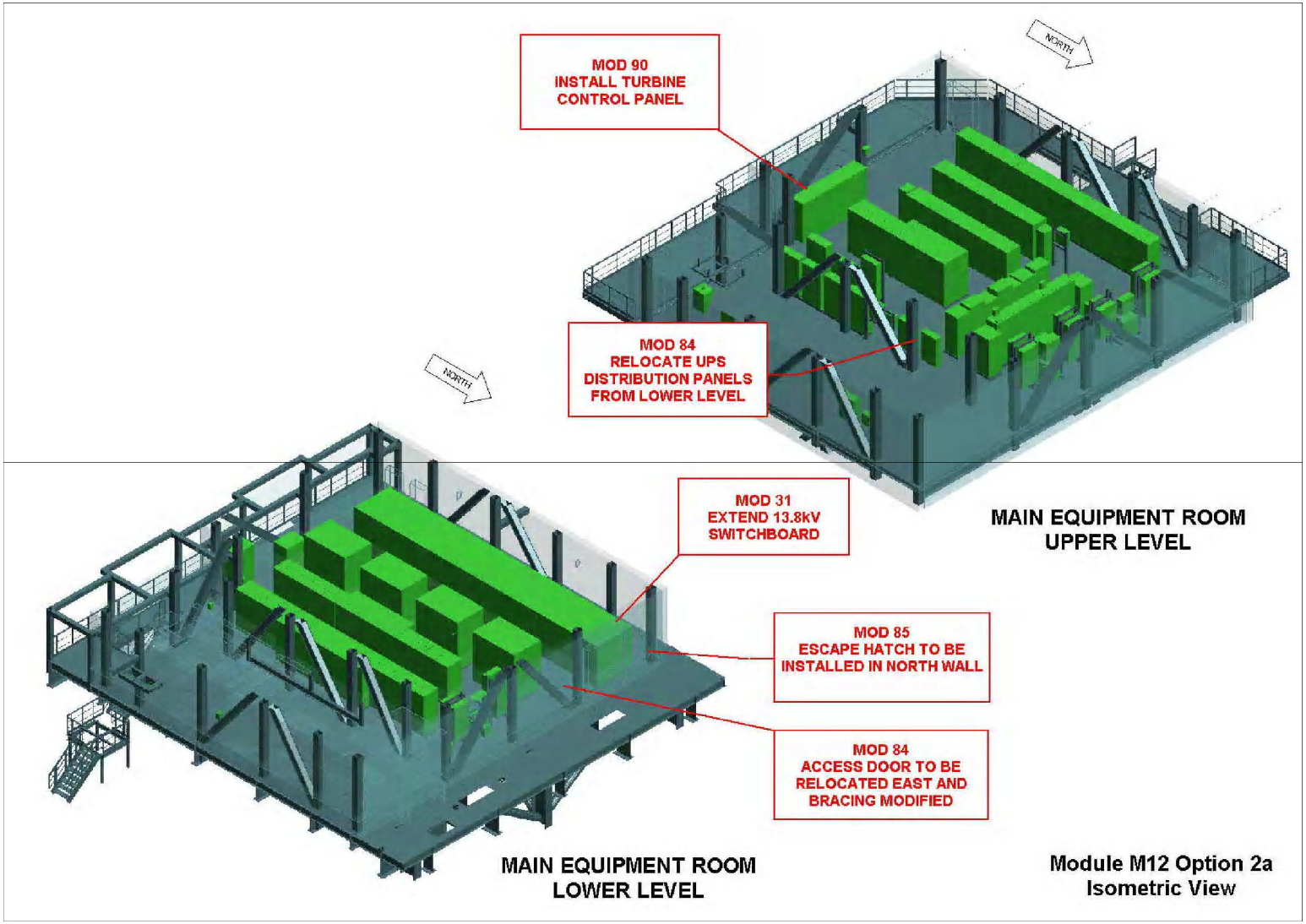

MOD 90
INSTALL TURBINE
CONTROL PANEL
NORTH
MOD 84
RELOCATE UPS
DISTRIBUTION PANELS
FROM LOWER LEVEL
MAIN EQUIPMENT ROOM
UPPER LEVEL
NORTH
MOD 31
EXTEND 13.8kV
SWITCHBOARD
MOD 85
ESCAPE HATCH TO BE
INSTALLED IN NORTH WALL
MOD 84
ACCESS DOOR TO BE
RELOCATED EAST AND
BRACING MODIFIED
MAIN EQUIPMENT ROOM
LOWER LEVEL
Module M12 Option 2a
Isometric View

Figure 10