UNITED STATES
ENVIRONMENTAL PROTECTION AGENCY
REGION 8

IN THE MATTER OF:	)	
	)	
Holly Refining & Marketing Company	)	**ADMINISTRATIVE COMPLIANCE ORDER ON CONSENT**
Woods Cross, LLC	)	
Woods Cross Refinery	)	
393 South 800 West	)	**DOCKET NO.: CAA-08-2013-0001**
Woods Cross, Utah 84087	)	
	)	
Respondent	)	
	)	

INTRODUCTION (JURISDICTION)

1. This Administrative Compliance Order on Consent (ACOC or Order) is issued to Holly Refining & Marketing Company – Woods Cross, LLC (Holly Refining or Respondent) pursuant to Title I, section 113(a)(3)(B) of the Clean Air Act (CAA), 42 U.S.C. § 7413 (a)(3)(B). Section 113(a)(3)(B) grants to the Administrator of the U.S. Environmental Protection Agency (EPA) the authority to make a finding of violation of a requirement or prohibition of Title I, and upon such a finding, to issue an order requiring a person to comply with such requirement or prohibition. This authority was delegated by the Administrator to the Regional Administrators on December 20, 1996, by EPA Delegation 7-6-A, and within Region 8, was redelegated to the Assistant Regional Administrator, Office of Enforcement, Compliance and Environmental Justice (ECEJ).

2. Section 112(r)(7) of the CAA, 42 U.S.C. § 7412(r)(7), authorizes the Administrator to promulgate regulations regarding the prevention and detection of accidental releases of designated chemicals. Section 112(r)(7)(B) of the CAA, 42 U.S.C. § 7412(r)(7)(B), requires the

Administrator to promulgate regulations requiring the owners or operators of stationary sources where a regulated substance is present above a threshold quantity to prepare a risk management plan (RMP) to prevent or minimize risks of accidental releases of those designated substances. The regulations promulgated by EPA pursuant to CAA § 112(r)(7) are set forth in 40 C.F.R. part 68.

3. The regulations at 40 C.F.R. part 68 separate the covered processes into three categories, designated as Program 1, Program 2, and Program 3. A covered process is subject to Program 3 requirements, under 40 C.F.R. § 68.10(d), if the process: a) does not meet the Program 1 eligibility requirements set forth in 40 C.F.R. § 68.10(b); and b) is in a specified NAICS code, including 32411, or is subject to the OSHA process safety management standard, 29 C.F.R. § 1910.119.

4. 40 C.F.R. § 68.12(c) requires that the owner or operator of a stationary source with a Program 3 process undertake certain tasks in addition to the submission of an RMP, including, but not limited to, development and implementation of a management system (pursuant to 40 C.F.R. § 68.15), conduct a hazard assessment (pursuant to 40 C.F.R. §§ 68.20-68.42), and the development and implementation of a prevention program (pursuant to 40 C.F.R. §§ 68.65-68.87).

5. Section 113(d) of the CAA, 42 U.S.C. § 7413(d) and 40 C.F.R. part 19, state that the Administrator may issue an administrative order against any person assessing a civil administrative penalty of up to $37,500 per day of violation whenever, on the basis of any available information, the Administrator finds that such person has violated or is violating any requirement or prohibition of the CAA referenced therein, including section 112(r)(1) and/or section 112(r)(7).

DEFINITIONS

6. 40 C.F.R. § 68.3 defines "stationary source" in the relevant part, as any buildings, structures, equipment, installations or substance emitting stationary activities which belong to the same industrial group, which are located on one or more contiguous properties, which are under the control of the same person (or persons under common control) and from which an accidental release may occur.

7. 40 C.F.R. § 68.3 defines "regulated substance" as any substance listed pursuant to section 112(r)(3) of the CAA, as amended, in 40 C.F.R. § 68.130.

8. 40 C.F.R. § 68.3 defines "threshold quantity" as the quantity specified for regulated substances pursuant to section 112(r)(5) of the CAA, as amended, listed in 40 C.F.R. § 68.130 and determined to be present at a stationary source as specified in 40 C.F.R. § 68.115.

9. 40 C.F.R. § 68.3 defines "process" as any activity involving a regulated substance including any use, storage, manufacturing, handling or on-site movement of such substances, or combination of these activities. For the purposes of this definition, any group of vessels that are interconnected, or separate vessels that are located such that a regulated substance could be involved in a potential release, shall be considered a single process.

10. 40 C.F.R. § 68.3 defines "covered process" as a process that has a regulated substance present in more than a threshold quantity as determined under 40 C.F.R. § 68.115.

11. 40 C.F.R. § 68.3 defines "accidental release" as an unanticipated emission of a regulated substance or other extremely hazardous substance into the ambient air from a stationary source.

FINDINGS OF FACT

EPA makes the following findings:

12. Respondent is the owner and/or operator of the Woods Cross Refinery located at 393 South 800 West, Woods Cross, Utah (the Refinery or the Facility).

13. The Facility uses, handles and/or stores a flammable mixture of propane, butane and propylene (Flammable Mixture), a regulated substance, pursuant to section 112(r)(2) and (3) of the CAA and 40 C.F.R. § 68.3, which is listed at 40 C.F.R. § 68.130. The threshold quantity requiring the submittal of an RMP for the Flammable Mixture, as listed in 40 C.F.R. § 68.130, Table 3, is 10,000 pounds.

14. On January 27, 2010, an RMP was submitted for the Facility which specified that Respondent had 28,560,000 pounds of the Flammable Mixture in the Frozen Earth Storage unit (FES) process at the Facility, and which identified the process as Program 3.

15. The Refinery stores over the threshold amount of a RMP regulated Flammable Mixture in the FES.

16. EPA conducted an inspection of the Facility on December 15 and 16, 2011, to assess compliance with section 112(r) of the CAA.

17. During EPA's inspection, EPA inspectors utilized a handheld FLIR infrared camera and observed and recorded releases from the FES.

18. The purpose of the RMP is to prevent or minimize risks of accidental releases of a regulated substance.

19. At the time of EPA's inspection, Respondent had not adequately met their obligations under 40 C.F.R. part 68 by failing to prevent releases of the Flammable Mixture, a regulated substance, from the FES.

20. On February 28, 2012, the EPA held a meeting with the Respondent. At this time, the Respondent notified the EPA that it will decommission the FES.

CONCLUSIONS OF LAW

EPA makes the following conclusions:

21. Respondent is, and at all times referred to herein was, a "person" as defined by section 302(e) of the CAA, 42 U.S.C. § 7602(e).

22. The Facility is a "stationary source" pursuant to section 112(r)(2)(C) of the CAA and 40 C.F.R. § 68.3.

23. The Facility is subject to the requirements of section 112(r)(7) of the CAA, 42 U.S.C. § 7412(r)(7), and 40 C.F.R. part 68, because it is an owner and operator of a stationary source that had more than a threshold quantity of a regulated substance in a process.

24. Based on information available to EPA, including information gathered during the inspection performed by EPA at the Facility and the Findings of Fact set forth above, EPA has determined that Respondent failed to satisfy the requirements outlined in paragraph 19 above.

ORDER

25. Based upon the foregoing Findings of Fact, Findings of Violations, Conclusions of Law, and other information available to EPA, it is hereby ordered that Respondent comply with the requirements set forth below. All activities specified below shall be initiated and completed as soon as possible even though maximum time periods for their completion are specified herein.

PARTIES BOUND

26. The provisions of this Order shall apply to Respondent and its officers, agents, servants, employees, and successors and to all persons, firms and corporations acting under, through or for Respondent.

WORK TO BE PERFORMED

27. The Facility has taken or shall take at least the following steps to come into compliance with section 112(r)(7) of the CAA, 42 U.S.C. § 7412(r)(7), and the regulations promulgated at 40 C.F.R. part 68:

a. Respondent submitted an FES Decommissioning Plan to EPA on August 1, 2012, which is attached hereto and incorporated herein as Exhibit 1 (the FES Decommissioning Plan). EPA has reviewed and approved the FES Decommissioning Plan, including MOC 1 (Standalone Operation of the Refrigeration Loop), and MOC 2 (Propane De-Inventory and Cavern Inerting), and their associated schedules within the FES Decommissioning Plan. These approved components of the FES Decommissioning Plan fully satisfy Respondents obligations to submit an FES Decommissioning Plan to EPA under this ACOC, and Respondent has no further obligations with respect to submittals to EPA for decommissioning of the FES and related activities. EPA understands that Respondent is coordinating with the Utah Department of Environmental Quality on groundwater and all other water related issues associated with the decommissioning of the FES.

b. Should any delays arise in the decommissioning process under the schedules in the Decommissioning Plan approved under this ACOC, Respondent shall submit a request for extension prior to exceeding the date in the approved work-plan and the timelines will be adjusted accordingly.

c. Within 60 days of completion of decommissioning the FES, Respondent shall submit a report to EPA, detailing the results of the decommissioning project approved under this ACOC, and any other activities conducted at the Facility directly related to the decommissioning of the FES. The report shall include a verification statement confirming that Respondent has complied with each of the requirements of paragraph 27. The verification shall include the following certification, signed by an officer of Respondent:

> *I certify under penalty of law that I have examined and am familiar with the information submitted in this document and all attachments, and that, based on my inquiry of those individuals immediately responsible for obtaining the information, and to the best of my knowledge, I believe that the information is true, accurate and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fines and imprisonment.*

d. The submissions required by the above subparagraphs shall be made to:

Greg Bazley
U.S. EPA Region 8
1595 Wynkoop Street (8ENF-AT)
Denver, CO 80202-1129

ENFORCEMENT

28. Section 113(a)(3) of the CAA provides that upon failure to comply with an order issued under section 113(a)(3)(B), the EPA Administrator may, inter alia, issue an administrative penalty order pursuant to section 113(d) for civil administrative penalties of up to $25,000 per day of violation; or bring a civil action pursuant to section 113(b) for injunctive relief and/or civil penalties of not more than $25,000 per day for each violation. Pursuant to the Debt Collection Improvement Act of 1996, 31 U.S.C. § 3701 note, and the Civil Monetary Penalty Inflation Adjustment Rule (effective January 12, 2009), this penalty maximum was increased to $37,500 per day. In addition, Respondent may be subject to an administrative or civil action for similar

penalties and/or injunctive relief, pursuant to sections 113(b) and (d) of the CAA, based on the violations addressed by this Order. Furthermore, any person who knowingly violates provisions of the CAA set forth in section 113(c) of the Act, can be subject to criminal penalties or imprisonment, or both.

29. This ACOC shall not relieve Respondent of its obligation to comply with all applicable federal, state, and local laws, regulations and other legal requirements, including but not limited to section 112(r)(1) of the CAA, nor shall it be construed to be a ruling on, or determination of, any issue related to any federal, state or local permit.

30. For the purposes of any EPA action to enforce this ACOC, Respondent consents to the terms of this ACOC; provided, however, that nothing herein shall be deemed an admission of the allegations, terms, conditions and/or any issues of law or fact set forth in this ACOC. Respondent reserves its right to contest any and all such allegations, terms, conditions, and/or any issues of law or fact, except in an EPA action to enforce this ACOC. Nothing in this ACOC shall constitute or be construed as an admission of liability or wrongdoing by Respondent, nor shall anything in this ACOC be deemed or construed to establish precedent for any other facility owned or operated by Respondent.

31. Nothing contained herein shall be deemed to waive or release any claims that Respondent may have against any persons or entities who are not parties to this ACOC. Nothing in this ACOC shall constitute or be construed as a waiver or release of any rights, causes of action, claims demands or defenses Respondent may have.

32. Nothing herein shall limit the power and authority of EPA or the United States to take, direct, or order all actions necessary to protect public health, welfare, or the environment or to prevent, abate, or minimize an actual or threatened release of a regulated substance, other

extremely hazardous substance, or other substance on, at, or from the Facility. Except with respect to those allegations that were raised in this ACOC or in the Combined Complaint and Consent Agreement (CCCA) entered into between EPA and Respondent, EPA reserves the right to bring an action against Respondent assessing or seeking penalties and/or other relief for any other conditions or violations. Except as provided in paragraph 33 below, this ACOC shall not constitute or be construed as a release of any liability that the Respondent or any other person has under the CAA or any other law. EPA also reserves all of its rights to obtain access to the Facility and require Respondent's submission of information to EPA in accordance with applicable law.

33. EPA releases and covenants not to sue or take administrative action against Holly Refining, its officers, directors, employees, representatives, successors and assigns, for and from any claims, causes of action, liabilities, penalties, demands, injunctive relief, costs and expenses ("claims") for the alleged violations set forth in this ACOC and/or the CCCA. This release and covenant not to sue is conditioned upon the satisfactory performance by Respondent of its obligations under this ACOC.

34. Nothing herein is intended to create or be construed to give rise to any claims, causes of action, liabilities, penalties, demands, injunctive relief, costs and expenses rights, and/or any claims for relief of any kind against Holly Refining, its officers, directors, employees, representatives, successors and assigns, by or on behalf of any third parties, persons or entities. Nothing herein creates or shall be construed to give rise to any third-party beneficiaries, or any duties, liabilities or obligations on the part of Respondent, its officers, directors, employees, representatives, successors and assigns, to any persons or entities who are not a party to this ACOC.

EFFECTIVE DATE;
OPPORTUNITY FOR CONFERENCE

35. Respondent may request a conference with EPA concerning the violations alleged in, and the requirements of, this ACOC. Respondent has the right to be represented by counsel at such a conference. If a conference is held, this ACOC shall become effective the day after the conference, unless the effective date is extended by EPA. If a conference is not timely requested, the ACOC shall become effective eleven (11) days after Respondent's receipt of the ACOC.

36. A request for a conference must be made in writing in time for EPA's receipt no later than ten (10) days after Respondent's receipt of this ACOC. The written request for a conference may be sent by fax or mail. The conference may be conducted in person or by telephone.

FOR THE U.S. ENVIRONMENTAL PROTECTION AGENCY:

By: _____ Date: 12/13/12

Andrew M. Gaydosh
Assistant Regional Administrator
Office of Enforcement, Compliance
and Environmental Justice

FOR HOLLY REFINING & MARKETING COMPANY – WOODS CROSS LLC
WOODS CROSS REFINERY

By: Lynn Keddington Date: 12/13/12

Lynn Keddington, Refinery Manager

In the Matter of:
For Holly Refining & Marketing Company – Woods Cross LLC
Woods Cross Refinery

CERTIFICATE OF SERVICE

The undersigned hereby certifies that the original and one copy of the ADMINISTRATIVE COMPIANCE ORDER ON CONSENT were hand-carried to the Regional Hearing Clerk, EPA Region 8, 1595 Wynkoop Street; Denver, Colorado 80202-1129, and that a true copy of the same was sent via Certified Mail, Postage Pre-Paid, to:

Woods Cross Refinery
393 South 800 West
Woods Cross, Utah 84087
Attn: Lynn Keddington, Refinery Manager

Robert W. Lawrence, Esq.
Davis Graham & Stubbs LLP
1550 17th Street, Suite 500
Denver, CO 80202-1500

Andrea Reed

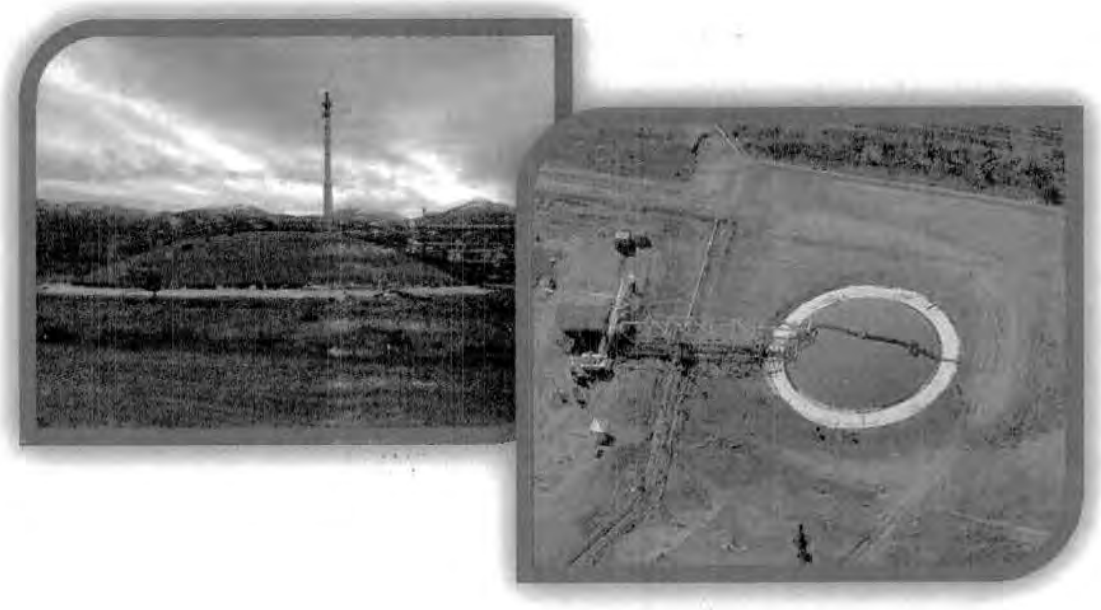
Exhibit 1

FES SYSTEM DECOMMISSIONING PLAN

MWH-ENG-PR-004

HOLLYFRONTIER
CORPORATION

FROZEN EARTH STORAGE
WOODS CROSS REFINERY
WOODS CROSS, UTAH



Performed by:

MWH

BUILDING A BETTER WORLD

July 26th, 2012

FES SYSTEM DECOMMISSIONING PLAN

MWH-ENG-PR-004

HOLLYFRONTIER
CORPORATION

FROZEN EARTH STORAGE
WOODS CROSS REFINERY
WOODS CROSS, UTAH

Performed by:

MWH

BUILDING A BETTER WORLD

Brian Chalmers, CEng, PMP
Senior Project Manager

John W. Jengo, PG
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David A. Socha, P.E., PMP
Principal Process Engineer

July 26th, 2012

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*NOTE: See section 1.2 for key reference documents for process, mechanical, hydrology and geotechnical information for the complete Decommissioning Plan background and definition

LIST OF ACRONYMS AND ABBREVIATIONS

DCR	Delaware City Refinery
DP	Decommissioning Plan
EHS	Environmental, Health and Safety
FES	Frozen Earth Storage
JSA	Job Safety Analysis
LEL	Lower Explosivity Limit
MOC	Management of Change
OPCC	Opinion of Probable Construction Cost
OSHA	Occupational Safety and Health Administration.
PHA	Process Hazards Analysis
PSM	Process Safety Management
SC	Subcontracts
SOP	Standard Operating procedure
VOC	Volatile Organic Carbon (Propane gas)
WCR	Woods Cross Refinery

Introduction

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1.0 INTRODUCTION

This document presents the Decommissioning Plan (DP) to decommission and close the Propane Frozen Earth Storage (FES) system at the Woods Cross Refinery (WCR), Utah. HollyFrontier has evaluated the long range business plans for the FES unit. On examination of the current business case of storage of propane in the summer months for resale in winter months, in early 2012 it was decided to close the FES unit, and to date $5M has been accrued to budget for the closure. HollyFrontier has contracted with MWH to develop the DP for the closure of the FES facility.

This DP is being submitted at the request of HollyFrontier Refining to enable development of detailed procedures and modifications to implement the closure methodology, capital planning, and overall schedule integration with the ongoing refinery operations and future growth plans. The DP is intended to provide a "Design Basis" and actual technical approach for each stage of the FES decommissioning and is considered to be Phase I of this decommissioning project, which will be followed by additional detailed engineering design and procedure development, designated as Phase II.

The FES system consists of a 165,000 bbl storage cavern, which is a 95 ft deep and 100 ft in diameter cavern. It is covered with a metallic dome roof, which along with wall integrity defined by frozen earth, provides and maintains the wall seal of the propane inside the cavern. The frozen condition of the walls is achieved by the use of two (2) concentric distribution headers and vertical supply/return pipes completed 165 ft below grade. This piping system receives refrigerated liquid propane (the same propane that is being accumulated in the cavern) from an external compressor system to keep the walls frozen.

MWH provided engineering, procurement, construction management and geotechnical services to support the Premcor Refining Group in the closure of their Propane FES at the Delaware City Refinery (DCR), Delaware City, Delaware. That facility was successfully decommissioned in 2010-2011 and met all EHS goals and regulatory requirements. The DCR FES was significantly larger than the WCR FES, but it utilized the same process design and technology developed by Philips Petroleum Company in the early 1960's.

An aerial view of the WCR FES is shown in *Figure 1.1*. The view shows the dome roof, the pipe-rack that connects to the adjacent refrigeration system, and the piping extending to flare and propane transfer lines.

Figure 1.1: Aerial View of WCR FES

1.1 HEALTH, SAFETY & ENVIRONMENTAL CONSIDERATIONS

There are some high level drivers for the project that set the methodology for the FES DP, and all associated sequences and procedures. These items will serve as the primary basis for all process and field activity safety studies and procedures, and maintained throughout the project.

Purging of the FES to "Propane Free" Conditions under PSM procedures, using an inert gas prior to any geotechnical and civil work

- Use of Nitrogen for liquid heel removal and final gas phase purging to flare
- Aeration of cavern to atmospheric conditions prior to civil work

Maintaining frozen wall conditions until backfill completed to suitable point to ensure integrity and proven installation of bottom grout seal

- Modifications of refrigeration compressors to "standalone" operation for freeze ring service, isolated from the cavern conditions
- Ensure appropriate protection of any aquifers that may be interconnected within the depth of the FES cavern.

Exclusion zone concepts around the dome until propane/nitrogen free, and freeze rings purged

- Entry permits, and basis for equipment staging and atmosphere monitoring
- Flare exclusion zone and downstreams studies for nitrogen dispersion and also radiation zones

The DP and subsequent schedule will ensure that key tools, practices and studies are utilized to maintain the following critical HSE drivers.

- Use of Management of Change (MOC) practices;
- Process Hazards Analysis (PHA) studies;
- Use of Job Safety Analysis (JSA) studies for construction work;
- Perimeter access/egress and work area controls; and,
- Flare heat and nitrogen dispersion review/modeling

1.1.1 PROCESS SAFETY MANAGEMENT PLANNING – MOC PACKAGE DEFINITION

The MWH approach to a project of this nature will follow all relevant OSHA standards and regulations with regard to the removal of the propane inventory, and up to a point when the system is considered propane and nitrogen free. The project is not a true engineering and design exercise, but rather a procedural-based project for a facility closure, with some temporary engineering modifications and operating/shutdown procedures. The most effective way to manage this will be to utilize a "management of change" (MOC) philosophy, and follow the site requirements for implementing any change to a process area covered under PSM requirements.

Utilizing a MOC approach, ensures that all relevant elements of OSHA PSM practices will be addressed, including engineering, safety studies, training, use of contractors, and all other relevant requirements. For each MOC phase, as identified later in this report, an index file will be created to cover all necessary drawing updates and procedures. The packages will be designed to provide documentation for the temporary closure conditions, and any final drawings for the site records. Typically the final drawings after closure would include:

- Modified site plans;
- Updated PFD's and P&ID's;
- Modified electrical single on-lines; and,
- Modified area equipment & instrument lists for deletion of decommissioned systems.

1.1.2 PROCESS & CONSTRUCTION SAFETY PLANS & STUDIES

Every phase of the FES closure will have suitable HSE reviews performed to ensure the decommissioning methodology is well understood by the project team and any subcontractors, and any appropriate actions resolved to the satisfaction of the facility engineering management and HSE team. The following are recommended to be performed within the FES decommissioning:

- Process Hazards Analysis (PHA) for modified propane refrigeration system and operation and purging arrangements; and,
- Job Safety Analysis (JSA) for nitrogen purging hose installation, backfilling and freeze ring abandonment (3 separate studies).

The PHA's would be performed utilizing a "what if" approach. The JSA's would list out key steps in field activities and identify all potential hazards and safeguards. Actions

generated from the studies would be resolved and back-checked, prior to work, as required by the MOC checklists utilized by the owner's PSM Coordinator or Project Engineer.

FES Decommissioning Execution Summary

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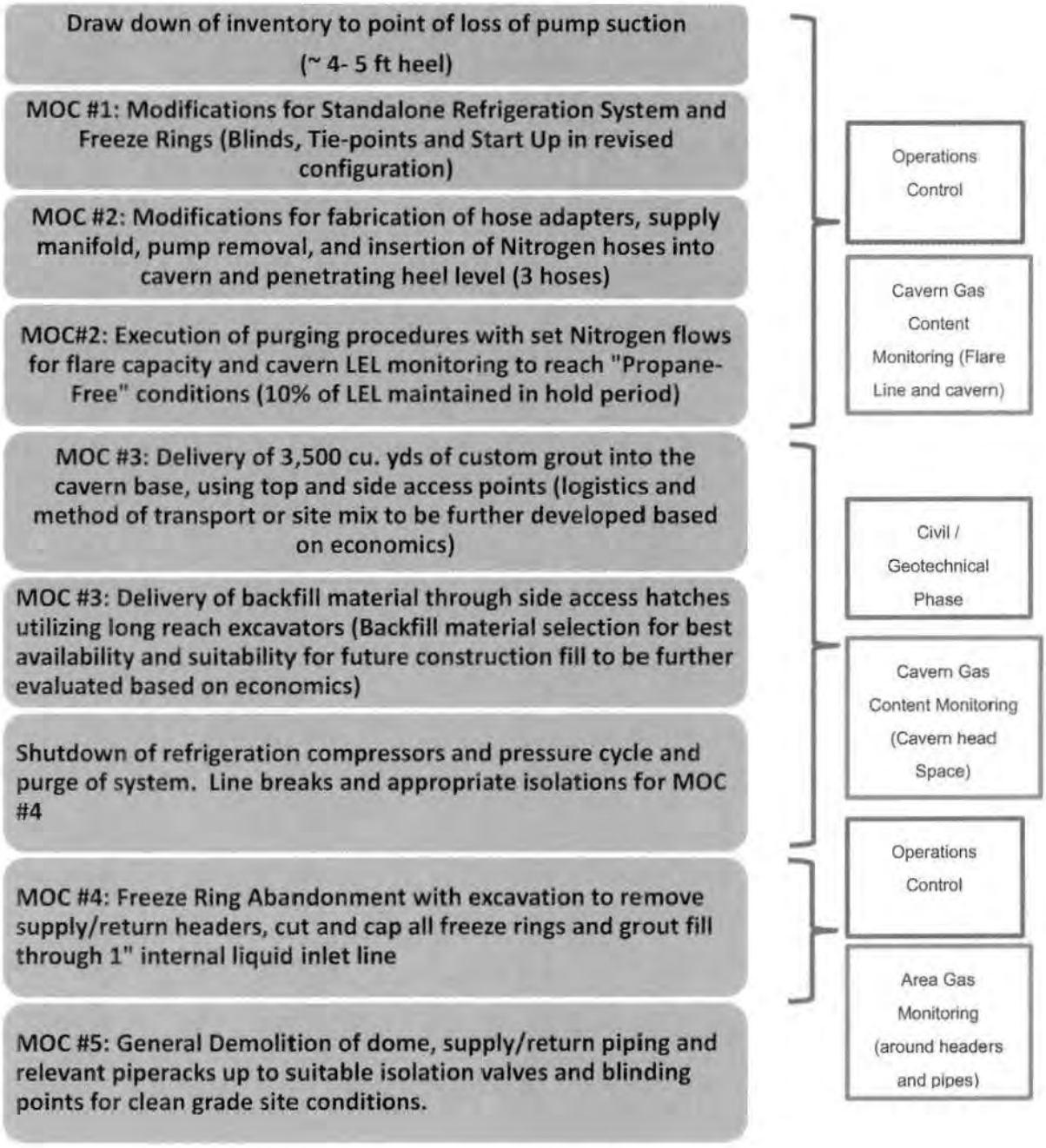
HOLLYFRONTIER
COMPANIES

Frozen Earth Storage Decommissioning Plan
July 26th, 2012

2.0 FES DECOMMISSIONING EXECUTION SUMMARY

The recommended DP closure sequence for the FES includes the following steps:



Execution Phase Detailed Descriptions

MWH

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3.0 EXECUTION PHASE DETAILED DESCRIPTIONS

3.1 MOC 1: STANDALONE OPERATION OF THE REFRIGERATION LOOP

The key element that is crucial for the success of the decommissioning is to maintain structural integrity of the pit walls by keeping them frozen. In order to maintain freezing conditions in the walls, it's imperative to sustain consistent heat removal from the ground, and the most efficient method to do that is to use the existing freeze rings and associated refrigeration system. However, in order for this approach to be compatible with the rest of the decommissioning activities, the refrigeration system needs to be completely isolated from the pit.

To isolate the operation of the freeze rings and the complete refrigeration system from the cavern, the following actions will need to be implemented:

- Installation of blinds will be required in several locations where these two systems currently connect (e.g., loading pump discharge, freeze rings return line, etc.);
- Reconfigure the operation of some instruments and control valves (e.g., hot gas by pass pit pressure control, freeze rings feed control valve, etc.);
- Add new piping (e.g., freeze rings return line to flash tank, freeze ring feed line, etc.); and,
- Isolate the pit from other external sources of hydrocarbons (e.g., propane from above ground storage tanks).

SOP's will be developed for the new operating condition of the refrigeration loop, running isolated from the pit, and will reflect all the changes associated with the modifications that were implemented to allow the refrigeration system to run as a closed loop. PHA's and relevant action resolution will support the development of the SOP's into final approved documents for the commissioning and operation of the refrigeration circuit in the revised configuration. Refer to MWH-ENG-PR-002, Preliminary Evaluation of the FES C3 Refrigerant System Modifications for Standalone Freeze Ring Operation (MOC #1), for further detailed information.

3.2 MOC 2: PROPANE DE-INVENTORY AND CAVERN INERTING

3.2.1 FINAL DRAW DOWN OF THE FES

Final liquid propane draw down will be conducted by the HollyFrontier Refinery operations group using the WCR Standard Operating Practice (SOP) for this activity. According to the present understanding of the particular conditions and history of this unit, the loading pump should be able to remove product down to approximately 4 feet

above the pit's bottom level, although the actual level transmitter may read nearly 0 (zero) because it has been calibrated to a minimum propane pool level.

It is important to note that the final liquid propane draw down will leave a propane liquid "heel" at the bottom of the FES cavern of nearly 1,000 bbl. This number will be further refined once the actual final liquid level is known and if better information of the shape of the pit's bottom becomes available. The lower heel of Propane may be contaminated with low level hydrocarbon heavy components, and as a precaution, the operations team can select a pit level from which point the recovered propane heel can be sent to a separate isolated storage vessel, until a proper quality certification of this product can be obtained, and if found to be off-specification, to have the ability to send it out for re-processing or disposal to flare.

3.2.2 REMOVAL OF PROPANE LIQUID HEEL

Removal of the liquid heel is an important consideration during the pit's decommissioning process because of the unusual limitations found in this design. Normal decommissioning procedures used for most other storage tanks are not applicable here, because of limitations in temperature, liquid depth from grade level, pressure rating of the dome, and hazardous atmosphere, thus a non-traditional approach is recommended, namely vaporization by inert gas.

Natural weathering-off of the propane would take a very long period of time, because the equilibrium condition present inside the pit would not provide a significant driving force to facilitate the propane vaporization, mainly due to a saturated vapor phase and very limited heat loads into the liquid pool or "propane heel." Therefore, injection of an inert gas is proposed as a feasible alternative to promote propane vaporization by breaking the equilibrium in the vapor phase.

The mechanism by which this procedure works is adding another component to the vapor phase, and thus reducing the propane's vapor pressure in that phase, providing a gradient in concentration that promotes the propane vaporization. Additionally, the injection of an external stream helps increase the pressure inside the pit, which is compensated by release of part of the gases in the vapor phase to the Flare. This maintains the desired pressure in the pit, thereby promoting heat transfer from the dome (main source of heat into the pit) and also removing part of the vaporized propane to help maintain the induced propane gradient concentration between the liquid and vapor phase. Additionally, the use of warm nitrogen, if injected in the right places, will help provide some of the heat required for the propane vaporization.

To avoid any effect on the frozen wall integrity due to introduction of the warm inert gas, the nitrogen hose injection points, as well as a controlled increase in flow rates, and frequent wall temperature monitoring are required to optimize the inert gas use and

avoid transferring heat to the pit walls. Injection points into the pit are limited by the availability of openings left after the isolation of the refrigeration system and the pit, and it is not recommended to attempt creating new openings in the dome while hydrocarbons are still present in the pit.

Nitrogen will be injected into the liquid heel via the use of cryogenic hoses. Custom adapters will be installed onto selected dome nozzles to insert and seal the hose entry points. Two hoses will be installed on the dome roof, and one into the pump shaft casing, after pump removal.

Figure 3.2.1 Nitrogen hose and fitting into top of cavern, one location shown with vertical adapter and hose connected

Figure 3.2.2 Removal of pump to shaft to be able to install nitrogen hose

Details about the recommended piping, fittings and hoses to be used for this application, the recommended nitrogen conditions, required nitrogen supplier equipment, and other mechanical details, in addition to monitoring procedures and required laboratory analysis to determine the end of this activity, are included within MWH-ENG-PR-003, Preliminary Evaluation of Modifications Required for Purging and Inerting the C3 Pit (MOC #2), May 14th.

3.2.3 PIT INERTING

Once all liquid hydrocarbons have been vaporized from the bottom of the pit, it is necessary to proceed with the removal of all hydrocarbons from the vapor phase, referred to as "inerting".

Figure 3.2.3 Primary nitrogen feed hose from outside of the exclusion zone to the hose manifold.

The basic process configuration required for this process is essentially the same used for the liquid heel vaporization; however, there is one important difference. This main variation is that there is no longer any liquid vaporization, and therefore heat provided by the use of a warm inert gas would no longer be absorbed; as such, it could affect the structural integrity of the cavern walls because these will be the closest surfaces for heat rejection. Therefore, at the beginning of this phase, the temperature of the inert gas being used throughout this process will be significantly reduced. Gas temperature can be controlled from the nitrogen source, *per figure 3.2.5.*

The mechanism being used in this inerting process is basically the reduction of the hydrocarbons concentration in the vapor phase by dilution with the inert gas, and by displacement of the hydrocarbon saturated vapors to the flare by pressure control.

Figure 3.2.4 Primary feed hose to the nitrogen manifold, feeding to cavern entry hoses with isolation valves

Although it should be self-evident, it is important to state that during the execution of both the liquid vaporization as well as the pit inerting phases, it is absolutely crucial to maintain proper operation of the refrigeration system (freeze rings included) to control the surrounding ground temperature within the desired operating window.

Figure 3.2.5 Nitrogen temperature control unit connected to rear of bulk liquid truck

During both liquid vaporization and inerting phases, vapors will leave the pit via the flare, thus particular care will have to be placed on maintaining a minimum heating value to sustain stable burning conditions, until a point is reached where it's decided that to keep the flare lit is no longer required. Additionally, and it will be of particular importance in this case because of the very limited height of the pit's flare stack, a suitable exclusion area is recommended to avoid exposing personnel to potentially hazardous nitrogen concentrations and thermal radiation to ground levels, associated with the flaring conditions (to be reviewed in PHA study).

3.2.4 PIT AERATION

After achieving low hydrocarbons concentrations in the pit, well below the LEL, the pit will be considered inert, and will be placed in a hold mode, to assess further appearance/detection of hydrocarbons. Once the final concentration of hydrocarbons at the end of a holding period is within the recommended levels, the pit will be considered inert, and aeration activities will follow. The target for acceptable inert conditions is 10% of the LEL for Propane as a maximum, and was lower than this on past experience.

Aeration of the pit will be through air injection on specific points and with the use of fans and compressed air. A portable air compressor unit will be installed outside of the exclusion zone and connected to the original nitrogen feed manifold, and all hoses will then be converted to air supply points for the aeration, in addition to top nozzles removed and air movers installed.

3.3 MOC 3: CAVERN BACKFILLING

The backfill methodology for the cavern is based on a detailed hydrology and geology study to reestablish the hydraulic separation between the aquifer units. As part of the primary planning phase, the following data was acquired and evaluated:

- Overall regional groundwater flow and quality conditions surrounding the WCR facility;
- Site-specific contaminants in the aquifers; and,
- Aquifer/confining unit regional/local designations, descriptions, and regulatory status/classification (e.g., drinking water aquifer; beneficial or protected surface water discharge to Great Salt Lake, etc.)

3.3.1 WCR FES BACKFILL RECOMMENDATIONS

Complete details and summaries can be found within MWH-ENG-GE-001, FES Geology & Hydrology Findings & Recommendations, May 7th 2012. In summary, the excavation of the cavern removed most of a regional confining unit (called the C-2 confining unit) that isolates the upper and middle zone of the shallow artesian aquifer. It appears that there may be several feet of the C-2 confining unit remaining beneath the FES cavern; however, there may be no way of definitively determining whether any portion of the FES cavern was excavated deeper than 95 ft bgs or whether the thin sands penetrated between 87-93 ft are connected to the middle aquifer zone. For this reason, and to ensure hydraulic separation between the aquifer units it is recommended that the base of the FES cavern be grouted from 83.5-95 ft bgs (approximately 3,500 CY) with low permeability grout. This grouting would serve to restore the C-2 confining unit to its original thickness. The permeability parameters of the grout, how it will be delivered or mixed on-site, and the method of emplacement into the cavern will be determined in the design phase of the FES closure. The remainder of the FES cavern from 83.5 ft bgs to ground surface would be backfilled with sand and gravel because it will not be necessary to re-constitute the numerous semi-confining beds that are present in the upper aquifer zone.

3.3.2 BACKFILL METHODOLOGY

Detailed descriptions for all required backfilling pre-requisites will be included in MOC 3. These pre-requisites include, but are not necessarily limited to, purging of all propane from the FES cavern using N_2, displacement of N_2 purge gas with a final air purge, and final ventilation to atmosphere, certifying that the FES cavern is propane-free and at atmospheric conditions, and the continued monitoring of frozen earth temperatures surrounding the cavern using the existing thermocouple network. In addition, MOC 3 will include a discussion of FES cavern stability corrective actions that will be developed in consultation with WCR prior to the commencement of the decommissioning in the event

that subsurface earth temperatures rise significantly following the purging/inerting phases.

Based on the FES dimensions, the volume of the cavern is approximately 35,000 yd^3. The base of the cavern will be grouted with 3,500 yd^3 of custom low permeability grout. Due to the relatively low volume compared to the past FES closure, it is not anticipated that a grout plant will be erected at the WCR, instead pre-mixed material will be shipped to the site. This approach will be further evaluated during the next phase of the decommissioning plan development.

Grout will be pumped into the available nozzles, with the supply hoses resting on the dome. Past methodology used a crane to support the feed hose and supply pipe in the center of the cavern, and in order to have no load on the dome. The "flowability" of the grout was well proven, and side entry points will be suitable. Grout volumes will be validated from known shipping quantities as well as manual tape measure readings.

Figure 3.3.1 Manual grout level readings through open nozzle and air mover.

Once the grout phase has been completed, the remaining cavern volume, 31,500 yd^3, will be filled using a sand/gravel mixture; the source and delivery of this material will be determined during detailed development of the MOC procedures. The backfill material will be selected based on cost, availability, and to allow use of the land for future construction and location of tankage and potential process plant units.

Figure 3.3.2 View inside cavern after grout phase to validate "flowability" from supply points.

The MOC package will detail mobilization of a temporary stockpile of sand and gravel, if unconsolidated sand and gravel has been selected as part of a backfill strategy. Backfill equipment descriptions and staging plans, utility and water requirements, productivity rates, and backfill emplacement methodologies, general sedimentation and erosion controls procedures, and logistics will be described after review and approval with the WCR operations team.

Depending on the evaluation of the emplacement methodology, backfill material may be loaded into the cavern using top or side entry points which will likely require modification to be large enough to maintain an adequate loading rate of backfill material. If needed, insulation will be removed from the dome roof, and the metal skin removed inside of the primary steel support lattice, which will not compromise the structural integrity of the dome. Maintaining mechanical integrity of the pit walls is critical during this phase as it is for the previous phases. Therefore, continued operation and control of the refrigeration system is required, associated with a proper temperature monitoring, to maintain ground temperatures within the desired operating window. Although not recommended by MWH, if for economic or other reasons, WCR decides to interrupt the operation of the refrigeration system at any time during the backfilling, suitable operational and HSE preventive measures should be taken because ground thawing will commence, followed by possible dome subsidence or inversion, and consequent disruption of the planned backfilling process

Figure 3.3.3 Backfill loading using long reach excators into dome hatches

3.4 MOC 4: ABANDONMENT OF FREEZE RING PIPING

The integrity of the FES cavern was maintained by two concentric rings of "freeze pipes," extending to a total depth of 155 feet, and positioned at diameters of 111 ft and then 117 ft. Because these pipes have penetrated several water-bearing zones, they must be properly abandoned by Utah-licensed well driller to seal off a potential conduit between these aquifers.

Evaluation of as-built drawings of the FES, particularly Drawing No. RWCD-62, Sheet No. 400-4, indicate the following inventory of freeze pipes and thermocouples:

Freeze Ring Position	Number of Pipes	Outside Diameter of Pipes (in.)	Total Depth of Pipes (ft bgs)
Freeze Pipes			
111-ft Diameter Ring	64	4.5	155*
117-ft Diameter Ring	70	4.5	155
123-ft Diameter	1	4.5	155
Thermocouples			
107.3-ft Diameter	1	2	155
~119-ft Diameter	1	2	155
127-ft Diameter	1	2	160
197-ft Diameter	1	2	155
TOTAL	**139**		

* One freeze pipe in the 111.3-ft diameter ring is 80 feet deep.

Additionally, the 10-inch diameter pump well for the loading pump, which was drilled to a depth of approximately 150 ft bgs within the freeze rings on the extreme southern edge of the cavern, will also require proper abandonment by a Utah-licensed well driller.

The four thermocouple pipes are filled with thermocouple wires and bentonite drilling mud. These pipes will be evaluated to verify that they are still filled with drilling mud and will not act as potential conduits for cross-contamination between aquifers. If their current condition is not adequately protective, these thermocouple pipes will also be properly abandoned.

The FES freeze pipes, thermocouples, and pump well will be treated in the same manner as a monitoring or water production well; as such, the MOC 4 will follow the guidance and specifications outlined in Rule R655-4-14 - *Abandonment of Wells*, particularly with regards to the abandonment requirements to seal each pipe "to prevent vertical movement of water within the borehole as well as preventing the annular space

surrounding the well casing from becoming a conduit for possible contamination of the groundwater supply."

Figure 3.4.1 Uncovered freeze pipes disconnected from supply/return headers

The freeze rings will be decommissioned in the following sequence:

- Shutdown of the refrigeration compressors and purge to flare
- Nitrogen purging of the freeze rings to flare
- Cavern apron material and soil excavated to uncover supply/return header rings
- Removal of supply/return headers and all sub-headers and capping of each freeze ring to avoid water ingress with suitable fittings added to the 1" liquid inlet line
- Grouting of each individual vertical pipe, with connection into the 1" liquid inlet line, and confirmation of complete grouting, after grout returns upwards in the 4" outer pipe, and visibly discharges out of the vapor return line. (see Fig. 3.4.2)

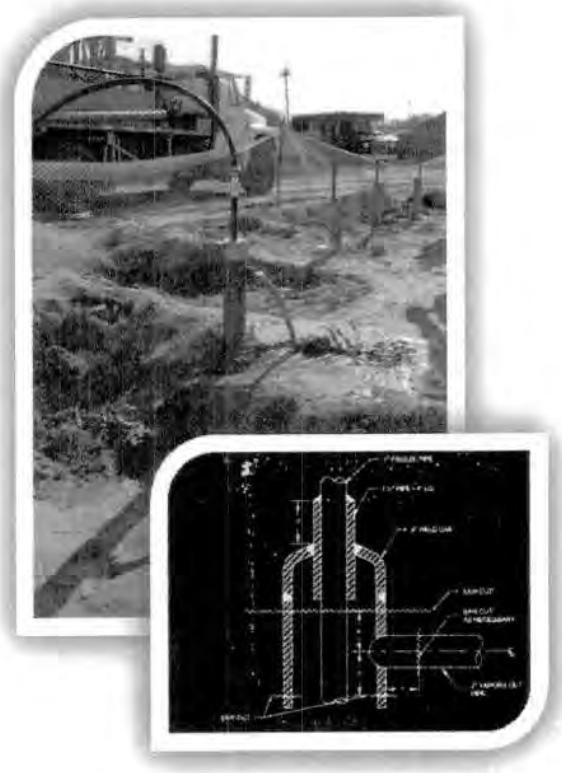

Figure 3.4.2 Abandonment of freeze pipe by pumping grout through 1" liquid inlet pipe and grout returning to surface through vapor return verifying successful abandonment.

3.5 MOC 5: FES EQUIPMENT AND DOME DEMOLITION AND REMOVAL

3.5.1 DOME REMOVAL

Once the backfill process has been completed to the extent practicable with the FES dome in place, the dome will be removed following the guidelines outlined in MOC 5. The actual techniques used to remove the dome will be determined during the development of the Decommissioning Construction Execution Plan. Structural analysis of the dome and the supporting equipment may be performed to determine how the dome covering, dome skin, and supporting lattice work can be removed safely.

Figure 3.5.1 Removal of dome steel following insulation removal.

The primary drivers for the dome removal are safety, for both the workers and surrounding structural elements of the FES system, and minimizing removal costs if the dome infrastructure is intended for scrap. To ensure a safe working environment, a forced aeration system may be installed and dome head space vapor samples will be collected for gas chromatography analysis to confirm the levels of propane are safe prior to starting the removal of the dome and during the dome deconstruction and demolition. At a minimum, the dome and lattice work will be removed, and depending on the future site use (to be determined by WCR), the ring wall, piping laterals, and supply/return rings for the freeze pipes will be also be excavated and removed.

Figure 3.5.2 Managing dome steel for scrap recycling.

3.5.2 REFRIGERATION SYSTEM DECOMMISSIONING

Once the backfilling process has been completed, and confirmation that the operation of the refrigeration system is no longer required, then it should be taken out of service and

a decommissioning of the system executed, according to suitably updated SOP, which will be part of MOC 5 package.

Decommissioning plans for the refrigeration system will include procedures for taking each separate system out of service (e.g., holding and loading refrigeration systems, utilities, flare, etc.), and will be consistent with their planned final condition, including partial or total demolition of the piping and equipment.

3.5.3 AS-BUILT DRAWINGS

During construction, all modifications to the design drawings will be documented. At the completion of the decommissioning activities, a set of final as-built drawings will be generated in order to document FES components that are remaining in place, particularly any infrastructure (e.g., grouted freeze pipes) that could potentially interfere with redevelopment of the site. P&ID's and site plans would be updated as final, to fully update the site's PSM program and document library.

Closure and Post Closure Monitoring

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Frozen Earth Storage Decommissioning Plan
July 26th, 2012

4.0 CLOSURE AND POST CLOSURE AIR MONITORING

4.1 VOC AIR MONITORING DURING DECOMMISSIONING WORK

VOC monitoring will be performed within the exclusion zone on a defined frequency, and to support any permit to work activities. This is all external to the process unit and the FES Cavern. Gas detection monitors will be placed around the exclusion zone, and be monitored by the project safety management team.

During the inerting phase, samples will be taken from the flare feed line to monitor the propane concentration, and once the samples have reached 10% of the LEL, as a maximum, the cavern will be considered ready for aeration. There will be a hold point for several days, where gas levels will be checked prior to aeration. Modified monitors can also be lowered into the cavern for validation of flare feed data.

After the cavern has been aerated, and back at atmospheric conditions, hatches will be cut into the dome roof inside of the structural lattice elements. Gas monitors will be placed at the hatches in the event any residual propane is released from the frozen walls. Past experience showed this to be negligible, and if any propane was detected, the aeration system can be used to ensure safe limits of work areas.

4.2 POST CLOSURE AIR MONITORING

Based on experience with the DCR FES, once the propane is removed from the FES and the freeze pipes, the amount of hydrocarbon emissions will decrease dramatically from previously measured levels, making post-closure air monitoring unnecessary unless work is immediately commencing on tank construction or other infrastructure work at the former FES site. The post closure monitoring at grade for the DCR FES has shown zero detection of any propane emissions at grade, and the WCR FES would be assumed to be the same case.

Schedule

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5.0 SCHEDULE

The schedule for the decommissioning activities described in this DP is presented in *Attachment 4*. The schedule assumes that the project moves into PHA study phases in early August 2012, and then works on suitable material for the procurement of subcontracts, and fabrication of any custom hose fittings and piping elements.

Key elements of the schedule are:

- 6-8 weeks duration for liquid heel removal and inerting of the cavern
- 3 weeks for grouting and curing
- 4 weeks for secondary backfill, not including all stockpiling durations
- 8 weeks for freeze ring abandonment

These key elements, and with assuming the PHA phase is implemented as planned, result in the following end milestones.

- Cavern backfill completed in late March 2013
- Freeze rings abandoned in late May 2013

At this time, we believe that standalone refrigeration circuits on the freeze rings will be successful; however the schedule as currently devised does have the key project elements in the winter months of December through February, which is good timing in the event of any refrigeration system issues.

The schedule presented herein documents the "as experienced" sequence of events for the DCR FES, modified to the WCR FES scenario, and specific elements have been adjusted on a parametric analysis basis to account for the significant difference in the cavern sizes from the DCR to WCR situation.

Construction Subcontract Procurement Strategy

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July 26th, 2012

6.0 CONSTRUCTION SUBCONTRACT PROCUREMENT STRATEGY

Based on MWH's experience in the FES decommissioning, the planning and selection of subcontractors is critical to its success because of the required safety performance, and specialized geotechnical elements. MWH recommends the following minimum level of subcontract procurement strategy to execute the MOC 1 through MOC 5 packages. The MOC packages and procedures will define the subcontractor scope of work and suitable engineering document definition and a schedule of values, which would allow WCR to bid and evaluate the received proposals for best value.

Because of the significant uncertainties involved in closure of such a complex process and geotechnical project, it is recommended that all contracts be based on a time and materials basis, using agreed-upon unit rates. Lump sum contracts would present significant risk to all parties involved, because of the inherent subsurface and mechanical uncertainties and unknowns on these type projects, and thus should be avoided. The Subcontracts (SC) listed, are in a number sequence to match the MOC package of relevant work.

SC-01	Blinding, pipe spool fabrication, modifications, installation and testing, and all shutdown/turnaround support (MOC#1)
SC-02A	Site preferred Mechanical Contractor for working within N_2 and propane environments for purge equipment installation (MOC #2)
SC-02B	Competitive bid for N_2 supply contract (Covering two stages, one for cavern inerting, MOC #2, and then later freeze pipe inerting, MOC#4)
SC-03A	Competitive bid geotechnical base grouting subcontract. (MOC #3)
SC-03B	Competitive bid geotechnical backfill subcontract above base grout plug. (MOC #3)
SC-04A	Site preferred Mechanical Contractor for freeze ring header removal and freeze pipe modifications up to point of grouting and abandonment. (MOC #4)
SC-04B	Licensed Well Driller to abandon freeze pipes (MOC #4)
SC-05	Site preferred Mechanical & Electrical Contractor for demolition needs.

Conclusions & Recommended Actions

7.0 CONCLUSIONS AND RECOMMENDED ACTIONS

This decommissioning plan is based on past and proven methodology. Detailed procedures and studies will be completed to further define the methodology. . Additional material pertaining to the decommissioning and closure are listed as reference drawings. MWH provides the following recommendations based on the current project status, our current knowledge of the WCR FES, and our past experience with the DCR FES.

- As MWH has demonstrated with the DCR FES, the WCR FES system can be effectively and safely closed via the refinery MOC process, using this decommissioning plan, along with diligent PHA and JSA efforts by the project team. The closure requires a strong team of Engineering, Procurement and Construction Management staff, with specialized hydrogeological and geotechnical engineering support and qualified subcontractors within the unique elements of the closure plan.

- The DCR experience has also proven that a design of this nature, with almost 50 years of life cycle, has inherent risk to dome subsidence and overall integrity based on maintaining frozen earth conditions.

- Operation of the standalone refrigeration and freeze rings is a critical step to define how the frozen earth conditions will be maintained, and a key cost factor in the event of refrigeration circuit operability issues.

- Determination of the environmental and hydrogeology data for the area was critical to develop appropriate closure plans, and is a key cost factor.

- Should alternate ground freezing be required, aside from current Propane system, then the schedule must be closely examined to ensure key aspects of the execution phase are completed within cold climate periods. At time of issue of this decommissioning plan, the attached schedule still maintains key aspects of work in the colder winter months.

- The primary actions moving forward are:

    - ✓ Confirm all grouting logistics, supplier and site utilities/infrastructure required for chosen methodology of grout supply.

    - ✓ Study and review secondary backfill material and logistics, looking for local suppliers and best cost material suitable for future construction in the FES area.

    - ✓ Implement PHA's for MOC #1 and #2 and then move to detailed procedures.

    - ✓ Develop work scope documents for competitive bidding of nitrogen supply contract, grouting and backfill work.

- ✓ Review of specifications provided by HollyFrontier for the soil compaction requirements to support future construction plans for the FES area, and development of compaction strategy during secondary backfill after grouting

ATTACHMENTS

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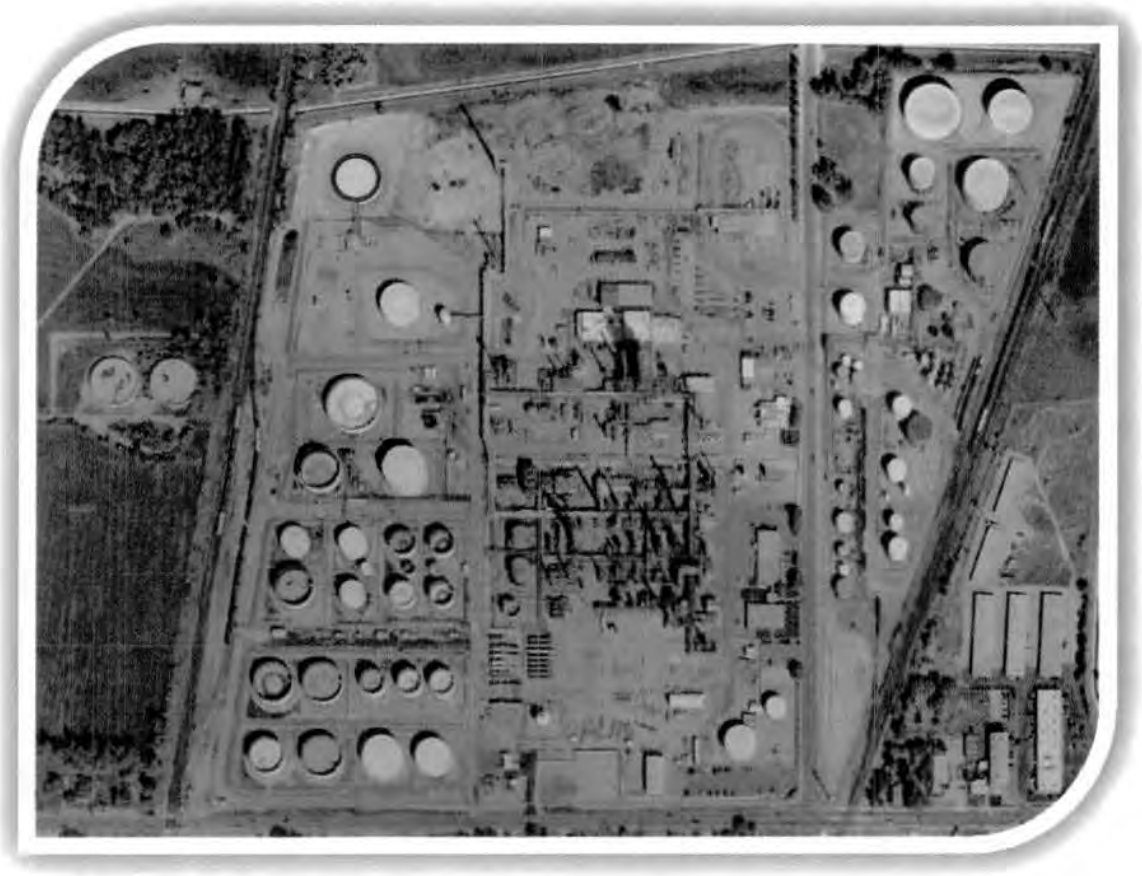
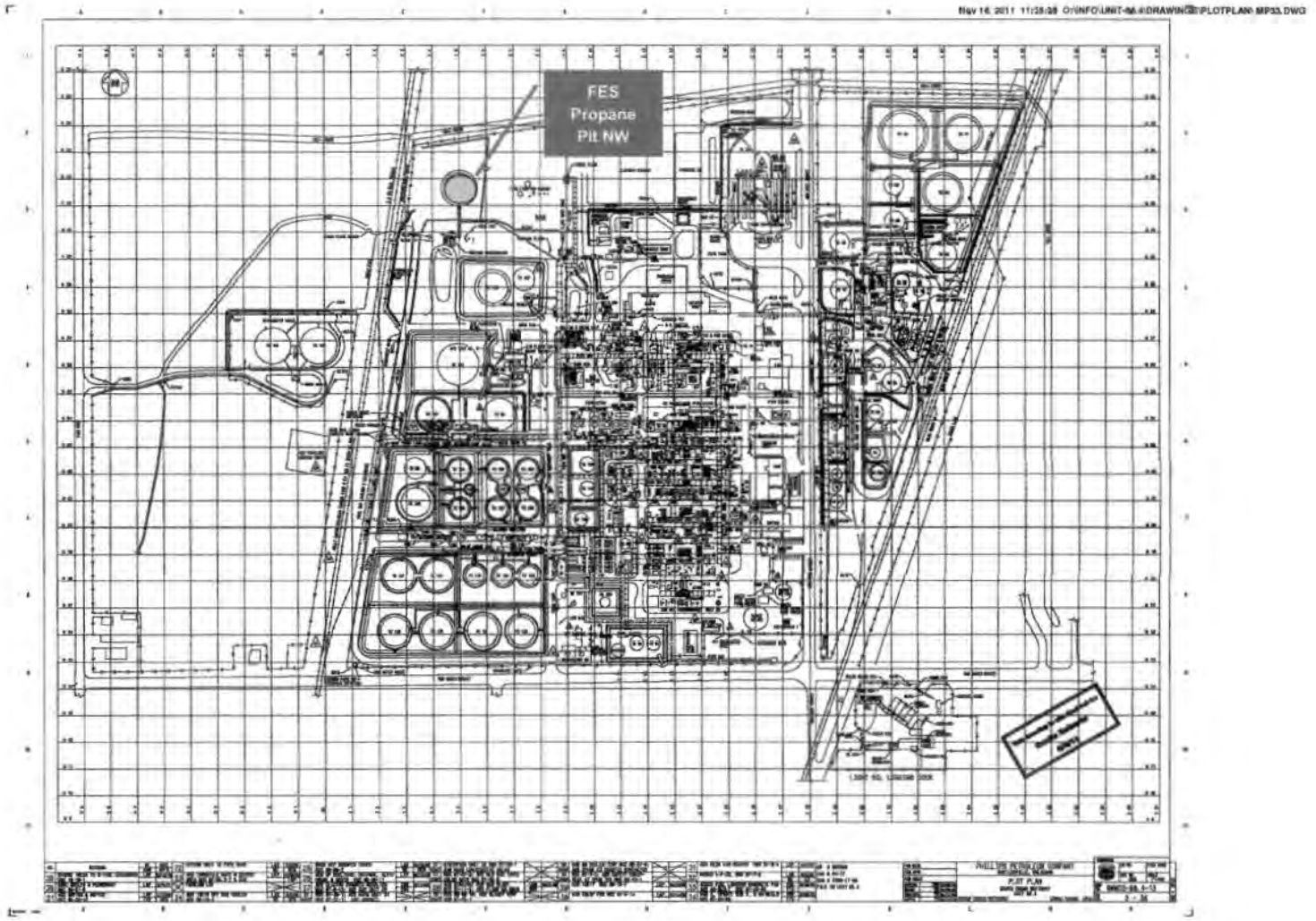
8.0 ATTACHMENTS

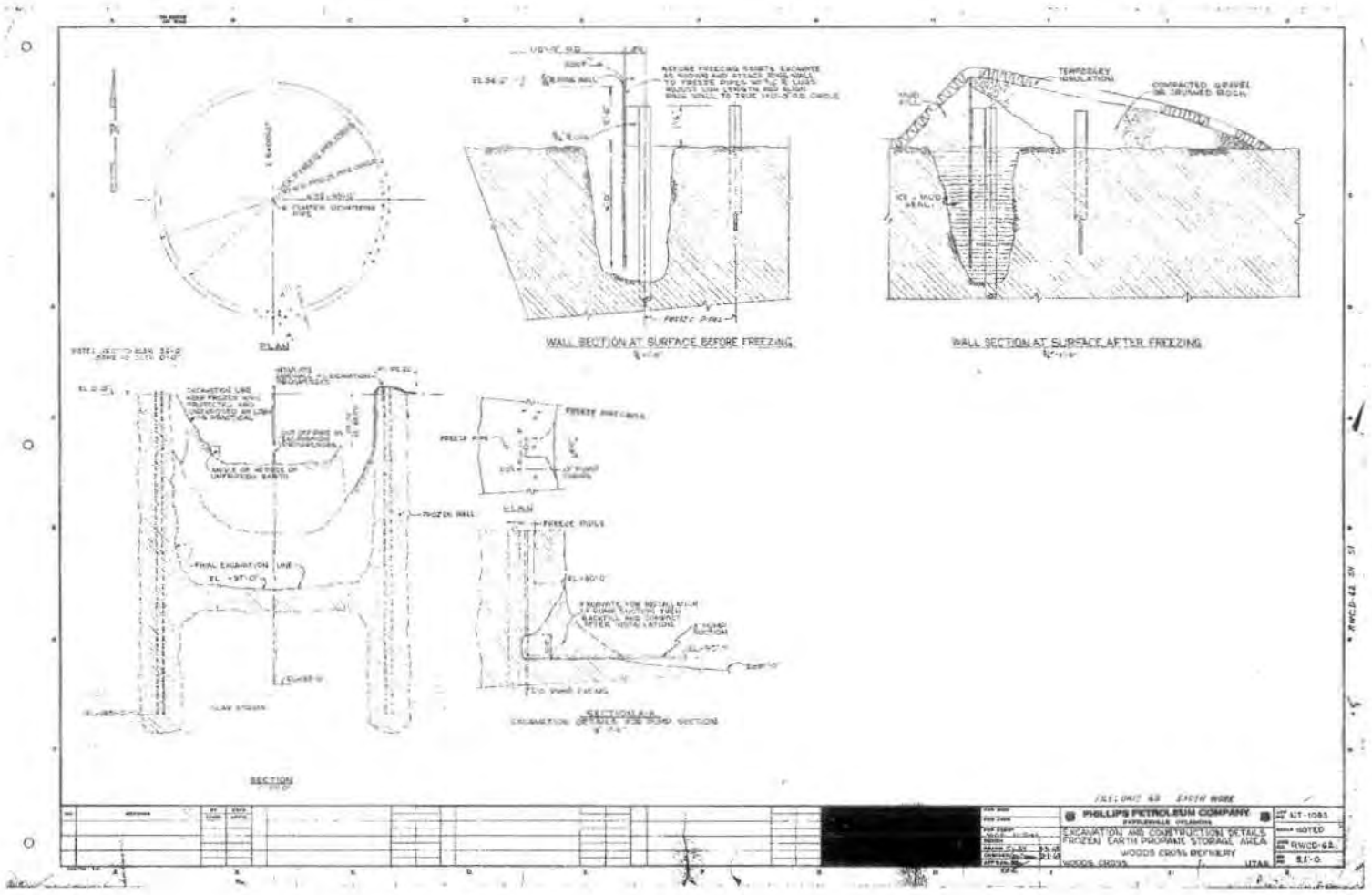
Attachment 1: Woods Cross Refinery Site Plan and FES Location



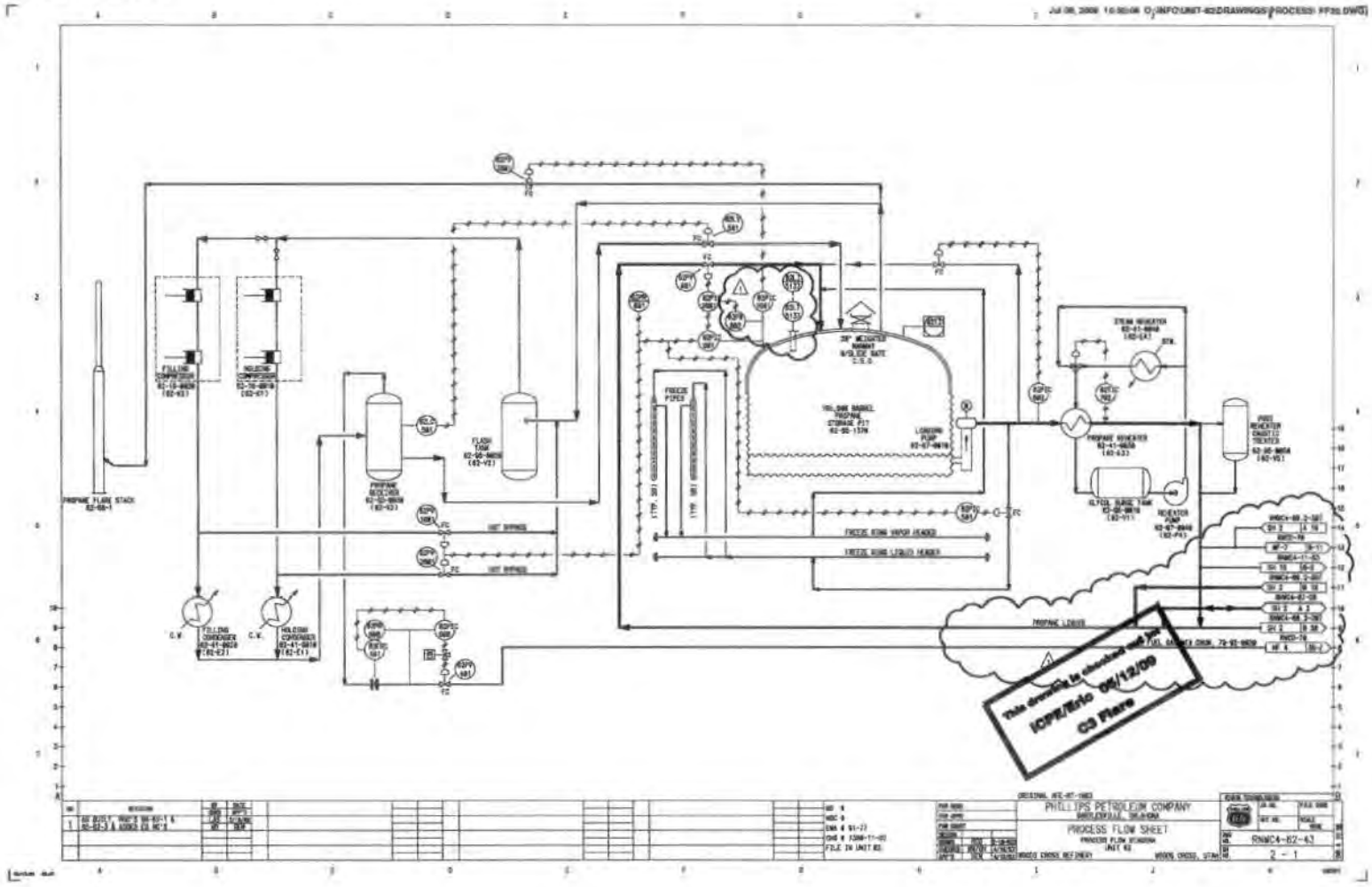
Undated aerial photograph of the WCR; the FES is located in the upper left (northwest) of the photograph, highlighted.

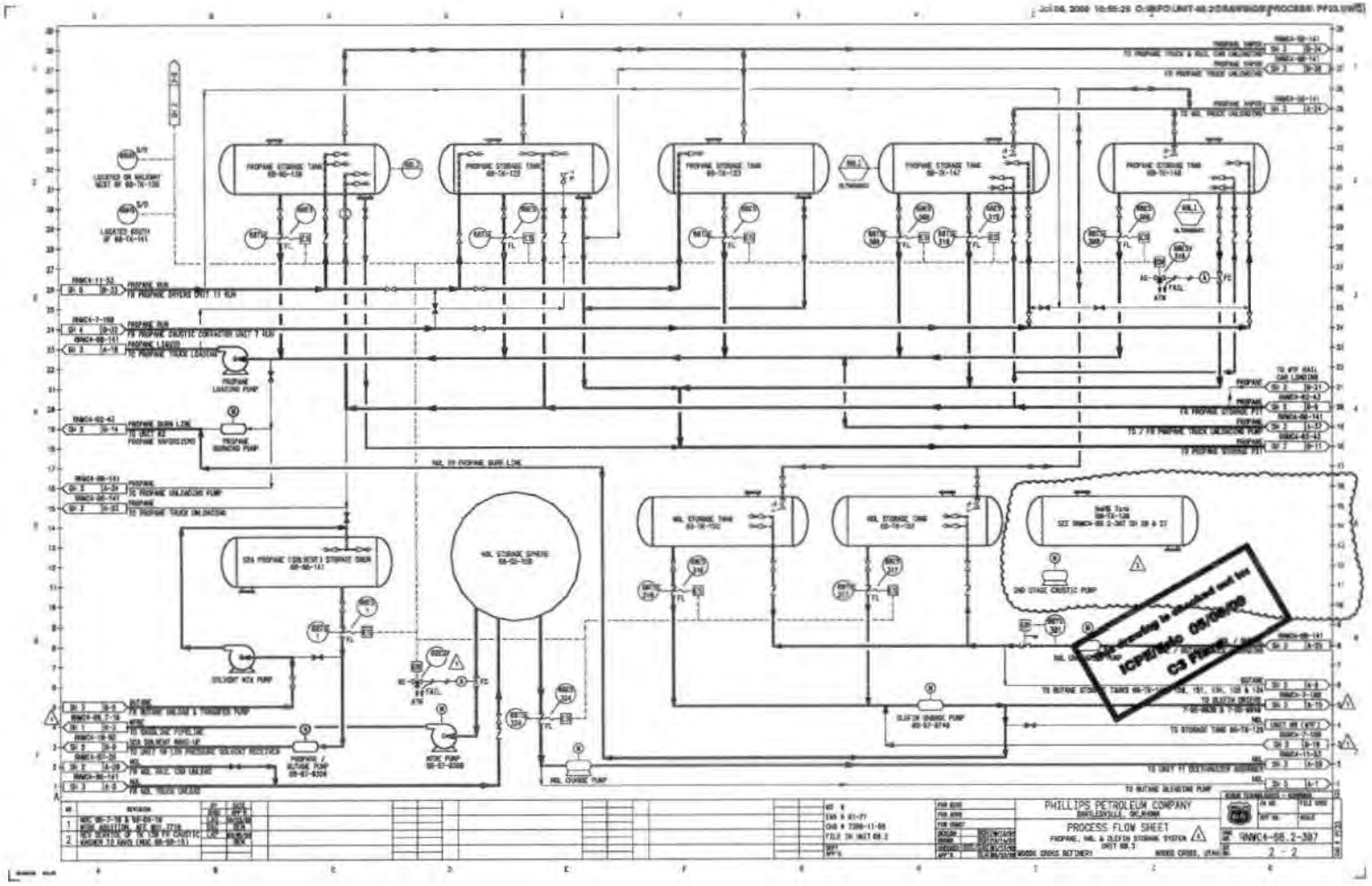

FES
Propane
Pit NW

Attachment 2 – FES Dimensions and Cross Section

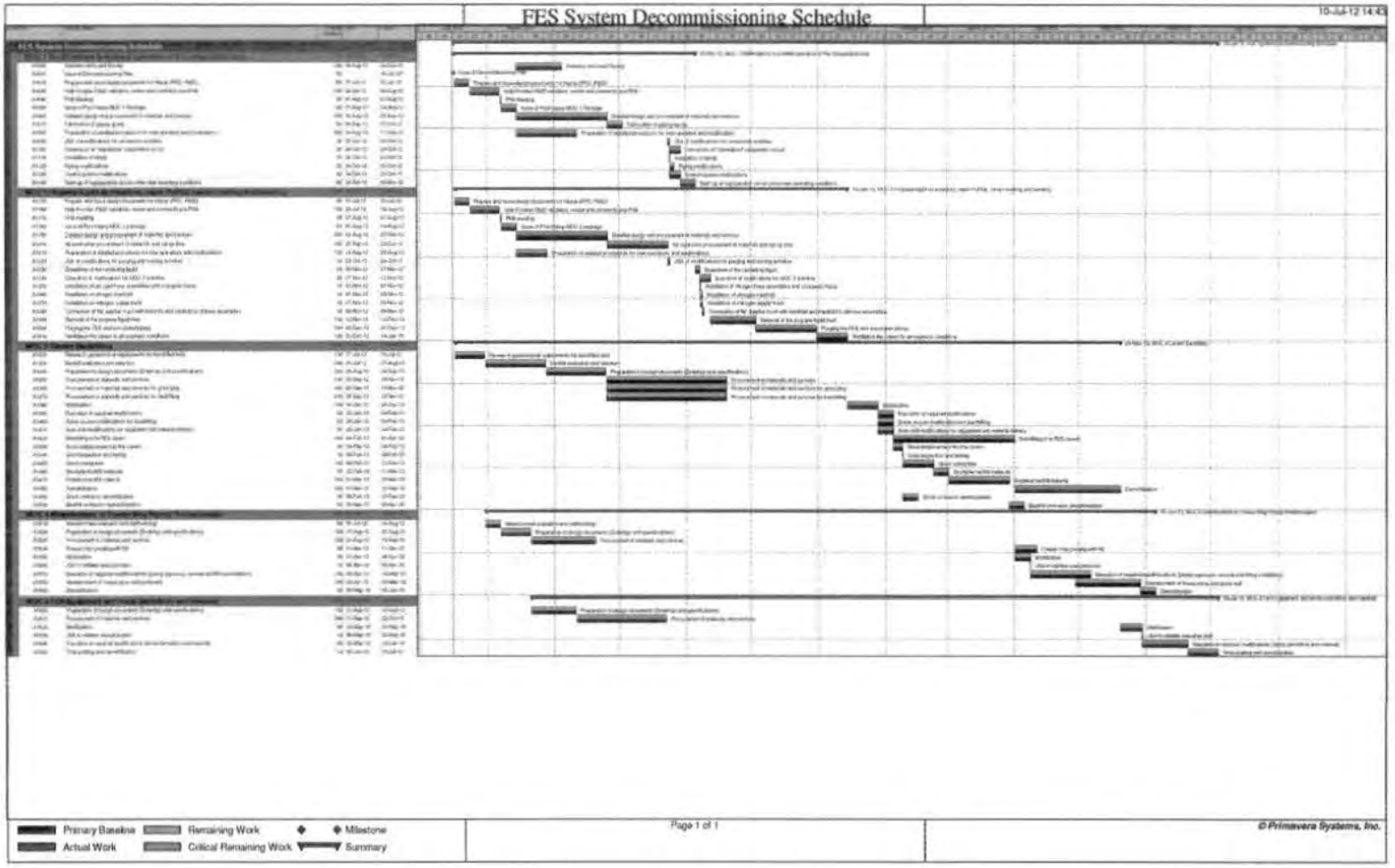


Attachment 3 – Process Flow Diagram



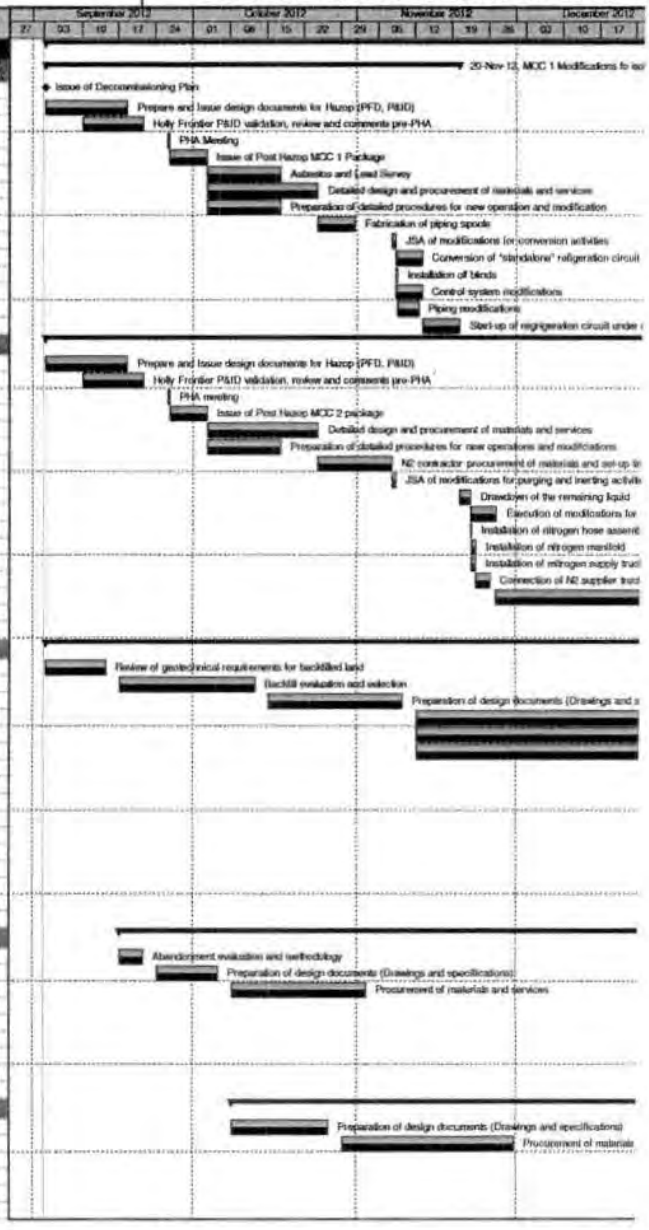

PHILLIPS PETROLEUM COMPANY
BARTLESVILLE, OKLAHOMA
PROCESS FLOW SHEET
PROPANE, NGL & OLEFIN STORAGE SYSTEM
UNIT 68.2
WOODS CROSS REFINERY
WOODS CROSS, UTAH
68-PWC4-68.2-307
2 - 2
PROPANE STORAGE TANK 68-TK-138
PROPANE STORAGE TANK 68-TK-137
PROPANE STORAGE TANK 68-TK-133
PROPANE STORAGE TANK 68-TK-142
PROPANE STORAGE TANK 68-TK-140
PROPANE LOADING PUMP
PROPANE BURNERS PUMP
SOLVENT MIX PUMP
PROPANE / BUTANE PUMP 68-67-6304
NGL STORAGE SPHERE 68-62-109
NGL STORAGE TANK 68-TK-152
NGL STORAGE TANK 68-TK-153
2ND STAGE CAUSTIC PUMP
CAUSTIC CHARGE PUMP
NGL CHARGE PUMP
TO PROPANE TRUCK & RAIL CAR UNLOADING
TO PROPANE BURNERS UNIT 11 HDA
TO PROPANE CAUSTIC CONTACTOR UNIT 7 HDA
TO PROPANE TRUCK LOADING
TO PROPANE UNLOADING PUMP
TO PROPANE TRUCK UNLOADING
TO PROPANE STORAGE PIT
TO BUTANE BLENDING PUMP
TO BUTANE TRUCK & RAIL CAR UNLOADING & TRANSFER PUMP
TO GASOLINE PIPELINE
TO UNIT 18 LOW PRESSURE SOLVENT RECEIVER
TO NGL RAIL CAR UNLOADING
TO STORAGE TANK 68-TK-129
TO UNIT 11 DEETHANIZER ASSEMBLY
TO BUTANE BLENDING PUMP
NGL TO PROPANE BURN LINE
ICPE/RAG 05/08/09
C3 Fleet

Attachment 4 – Detailed FES Decommissioning Schedule



FES DECOMMISSIONING S

Activity ID	Activity Name	Original Duration	Start	Finish
FES System Decommissioning Schedule		205d	03-Sep-12	26-Jul-13
MOC 1 Modifications to isolated operation of the refrigeration loop		34d	03-Sep-12	20-Nov-12
A1010	Issue of Decommissioning Plan	0d		03-Sep-12*
A1020	Prepare and Issue design documents for Hazop (PFD, P&ID)	12d	03-Sep-12	18-Sep-12
A1030	Holly Frontier P&ID validation, review and comments pre-PHA	10d	10-Sep-12	21-Sep-12
A1040	PHA Meeting	1d	25-Sep-12	25-Sep-12
A1050	Issue of Post Hazop MOC 1 Package	5d	26-Sep-12	03-Oct-12
A1060	Asbestos and Lead Survey	10d	03-Oct-12	17-Oct-12
A1070	Detailed design and procurement of materials and services	15d	03-Oct-12	24-Oct-12
A1080	Preparation of detailed procedures for new operation and modification	10d	03-Oct-12	17-Oct-12
A1090	Fabrication of piping spools	5d	24-Oct-12	31-Oct-12
A1095	JSA of modifications for conversion activities	1d	07-Nov-12	08-Nov-12
A1100	Conversion of "standalone" refrigeration circuit	3d	08-Nov-12	13-Nov-12
A1110	Installation of blinds	1d	08-Nov-12	08-Nov-12
A1130	Control system modifications	3d	08-Nov-12	13-Nov-12
A1120	Piping modifications	2d	09-Nov-12	12-Nov-12
A1140	Start-up of regrigeration circuit under new operating conditions	5d	13-Nov-12	20-Nov-12
MOC 2 Propane liquid de-inventory, vapor PURGE cavern inerting and aerating		111d	03-Sep-12	05-Feb-13
A1150	Prepare and Issue design documents for Hazop (PFD, P&ID)	12d	03-Sep-12	18-Sep-12
A1160	Holly Frontier P&ID validation, review and comments pre-PHA	10d	10-Sep-12	21-Sep-12
A1170	PHA meeting	1d	25-Sep-12	25-Sep-12
A1180	Issue of Post Hazop MOC 2 package	5d	26-Sep-12	03-Oct-12
A1190	Detailed design and procurement of materials and services	15d	03-Oct-12	24-Oct-12
A1210	Preparation of detailed procedures for new operations and modifications	10d	03-Oct-12	17-Oct-12
A1200	N2 contractor procurement of materials and set-up time	10d	24-Oct-12	07-Nov-12
A1220	JSA of modifications for purging and inerting activities	1d	07-Nov-12	08-Nov-12
A1230	Drawdown of the remaining liquid	2d	20-Nov-12	22-Nov-12
A1240	Execution of modifications for MOC 2 activities	3d	20-Nov-12	27-Nov-12
A1250	Installation of nitrogen hose assemblies and cryogenic hoses	1d	22-Nov-12	22-Nov-12
A1260	Installation of nitrogen manifold	1d	22-Nov-12	23-Nov-12
A1270	Installation of nitrogen supply truck	1d	22-Nov-12	23-Nov-12
A1280	Connection of N2 supplier truck with manifold and manifold to all hose assemblies	1d	23-Nov-12	26-Nov-12
A1290	Removal of the propane liquid lines	25d	27-Nov-12	01-Jan-13
A1300	Purging the FES and associated piping	15d	01-Jan-13	22-Jan-13
A1310	Ventilation the cavern to atmospheric conditions	10d	22-Jan-13	05-Feb-13
MOC 3 Cavern Backfilling		174d	03-Sep-12	23-Apr-13
A1320	Review of geotechnical requirements for backfilled bed	10d	03-Sep-12	14-Sep-12
A1330	Backfill evaluation and selection	20d	17-Sep-12	12-Oct-12
A1340	Preparation of design documents (Drawings and specifications)	20d	15-Oct-12	09-Nov-12
A1350	Procurement of materials and services	40d	12-Nov-12	04-Jan-13
A1360	Procurement of materials and services for grout plug	40d	12-Nov-12	04-Jan-13
A1370	Procurement of materials and services for backfilling	40d	12-Nov-12	04-Jan-13
A1380	Mobilization	10d	05-Feb-13	19-Feb-13
A1400	Dome access modifications for backfilling	5d	19-Feb-13	26-Feb-13
A1410	Area civil modifications for equipment and material delivery	5d	19-Feb-13	26-Feb-13
A1430	Grout emplacement into the cavern	4d	26-Feb-13	04-Mar-13
A1440	Grout inspection and testing	1d	04-Mar-13	04-Mar-13
A1450	Grout curing time	10d	04-Mar-13	18-Mar-13
A1490	Grout contractor demobilization	5d	04-Mar-13	11-Mar-13
A1480	Stockpile backfill materials	5d	18-Mar-13	25-Mar-13
A1470	Emplace backfill material	20d	25-Mar-13	22-Apr-13
A1500	Backfill contractor demobilization	5d	22-Apr-13	29-Apr-13
MOC 4 Abandonment of Freeze Ring Piping/Thermocouples		218d	17-Sep-12	26-Jul-13
A1510	Abandonment evaluation and methodology	5d	17-Sep-12	21-Sep-12
A1520	Preparation of design documents (Drawings and specifications)	10d	24-Sep-12	05-Oct-12
A1530	Procurement of materials and services	20d	08-Oct-12	02-Nov-12
A1540	Freeze rings purging with N2	8d	22-Apr-13	02-May-13
A1550	Mobilization	5d	22-Apr-13	29-Apr-13
A1560	JSA to validate execution plan	1d	29-Apr-13	30-Apr-13
A1570	Execution of required modifications (piping exposure, removal and fitting installation)	25d	29-Apr-13	03-Jun-13
A1580	Abandonment of freeze pipes and pump well	20d	21-May-13	18-Jun-13
A1590	Demobilization	5d	18-Jun-13	25-Jun-13
MOC 5 FES Equipment and Dome Demolition and Removal		129d	08-Oct-12	26-Jul-13
A1600	Preparation of design documents (Drawings and specifications)	15d	08-Oct-12	26-Oct-12
A1610	Procurement of materials and services	25d	29-Oct-12	30-Nov-12
A1620	Mobilization	8d	11-Jun-13	21-Jun-13
A1630	JSA to validate execution plan	1d	21-Jun-13	24-Jun-13
A1640	Execution of required modifications (dome demolition and removal)	15d	21-Jun-13	12-Jul-13
A1650	Final grading and demobilization	10d	12-Jul-13	26-Jul-13



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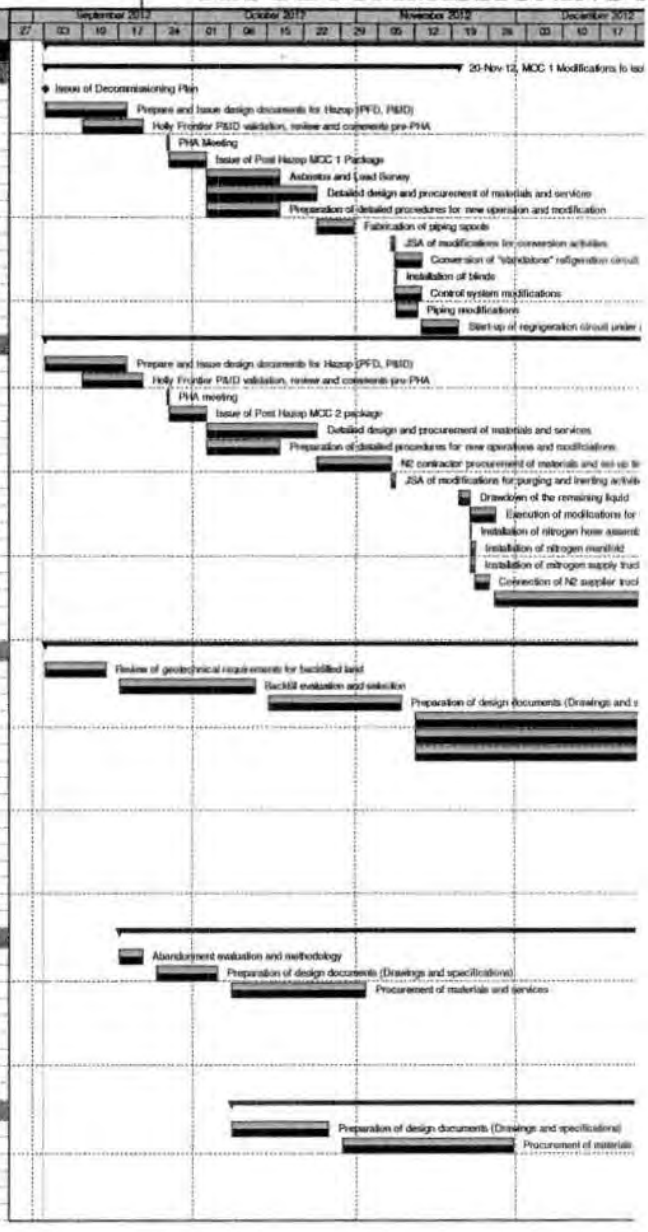
FES DECOMMISSIONING S

Activity ID	Activity Name	Original Duration	Start	Finish
FES System Decommissioning Schedule		206d	03-Sep-12	26-Jul-13
MOC 1 Modifications to isolated operation of the refrigeration loop		58d	03-Sep-12	20-Nov-12
A1010	Issue of Decommissioning Plan	0d		03-Sep-12*
A1020	Prepare and Issue design documents for Hazop (PFD, P&ID)	12d	03-Sep-12	18-Sep-12
A1030	Holly Frontier P&ID validation, review and comments pre-PHA	10d	10-Sep-12	21-Sep-12
A1040	PHA Meeting	1d	26-Sep-12	26-Sep-12
A1050	Issue of Post Hazop MOC 1 Package	5d	26-Sep-12	03-Oct-12
A1060	Asbestos and Lead Survey	10d	03-Oct-12	17-Oct-12
A1080	Detailed design and procurement of materials and services	15d	03-Oct-12	24-Oct-12
A1085	Preparation of detailed procedures for new operation and modification	10d	03-Oct-12	17-Oct-12
A1070	Fabrication of piping spools	5d	24-Oct-12	31-Oct-12
A1090	JSA of modifications for conversion activities	1d	07-Nov-12	08-Nov-12
A1100	Conversion of "standalone" refrigeration circuit	3d	08-Nov-12	13-Nov-12
A1110	Installation of blinds	1d	08-Nov-12	09-Nov-12
A1130	Control system modifications	3d	08-Nov-12	13-Nov-12
A1120	Piping modifications	2d	08-Nov-12	12-Nov-12
A1140	Start-up of regrigeration circuit under new operating conditions	5d	13-Nov-12	20-Nov-12
MOC 2 Propane liquid de-inventory, vapor PURGE cavern inerting and aerating		111d	03-Sep-12	05-Feb-13
A1150	Prepare and Issue design documents for Hazop (PFD, P&ID)	12d	03-Sep-12	18-Sep-12
A1160	Holly Frontier P&ID validation, review and comments pre-PHA	10d	10-Sep-12	21-Sep-12
A1170	PHA meeting	1d	26-Sep-12	26-Sep-12
A1180	Issue of Post Hazop MOC 2 package	5d	26-Sep-12	03-Oct-12
A1190	Detailed design and procurement of materials and services	15d	03-Oct-12	24-Oct-12
A1210	Preparation of detailed procedures for new operations and modifications	10d	03-Oct-12	17-Oct-12
A1200	N2 contractor procurement of materials and set-up time	10d	24-Oct-12	07-Nov-12
A1220	JSA of modifications for purging and inerting activities	1d	07-Nov-12	08-Nov-12
A1230	Drawdown of the remaining liquid	2d	20-Nov-12	22-Nov-12
A1240	Execution of modifications for MOC 2 activities	3d	22-Nov-12	27-Nov-12
A1250	Installation of nitrogen hose assemblies and cryogenic hoses	1d	22-Nov-12	23-Nov-12
A1260	Installation of nitrogen manifold	1d	22-Nov-12	23-Nov-12
A1270	Installation of nitrogen supply truck	1d	22-Nov-12	23-Nov-12
A1280	Connection of N2 supplier truck with manifold and manifold to all hose assemblies	1d	23-Nov-12	26-Nov-12
A1290	Removal of the propane liquid heel	25d	27-Nov-12	01-Jan-13
A1300	Purging the FES and associated piping	15d	01-Jan-13	22-Jan-13
A1310	Ventilation the cavern to atmospheric conditions	10d	22-Jan-13	05-Feb-13
MOC 3 Cavern Backfilling		171d	03-Sep-12	24-Apr-13
A1320	Review of geotechnical requirements for backfilled land	10d	03-Sep-12	14-Sep-12
A1330	Backfill evaluation and selection	20d	17-Sep-12	12-Oct-12
A1340	Preparation of design documents (Drawings and specifications)	20d	15-Oct-12	09-Nov-12
A1350	Procurement of materials and services	40d	12-Nov-12	04-Jan-13
A1360	Procurement of materials and services for grout plug	40d	12-Nov-12	04-Jan-13
A1370	Procurement of materials and services for backfilling	40d	12-Nov-12	04-Jan-13
A1380	Mobilization	10d	05-Feb-13	19-Feb-13
A1400	Dome access modifications for backfilling	1d	19-Feb-13	26-Feb-13
A1410	Area civil modifications for equipment and material delivery	5d	19-Feb-13	26-Feb-13
A1430	Grout emplacement into the cavern	4d	26-Feb-13	04-Mar-13
A1440	Grout inspection and testing	1d	04-Mar-13	04-Mar-13
A1450	Grout curing time	10d	04-Mar-13	18-Mar-13
A1490	Grout contractor demobilization	5d	04-Mar-13	11-Mar-13
A1460	Stockpile backfill materials	5d	18-Mar-13	25-Mar-13
A1470	Emplace backfill material	20d	25-Mar-13	22-Apr-13
A1500	Backfill contractor demobilization	5d	22-Apr-13	29-Apr-13
MOC 4 Abandonment of Freeze Ring Piping/Thermocouples		202d	17-Sep-12	25-Jun-13
A1510	Abandonment evaluation and methodology	5d	17-Sep-12	21-Sep-12
A1520	Preparation of design documents (Drawings and specifications)	10d	24-Sep-12	05-Oct-12
A1530	Procurement of materials and services	20d	08-Oct-12	02-Nov-12
A1540	Freeze rings purging with N2	8d	22-Apr-13	02-May-13
A1550	Mobilization	5d	22-Apr-13	29-Apr-13
A1560	JSA to validate execution plan	1d	29-Apr-13	30-Apr-13
A1570	Execution of required modifications (piping exposure, removal and filling installation)	25d	29-Apr-13	03-Jun-13
A1580	Abandonment of freeze pipes and pump well	20d	21-May-13	18-Jun-13
A1590	Demobilization	5d	18-Jun-13	25-Jun-13
MOC 5 FES Equipment and Dome Demolition and Removal		154d	08-Oct-12	26-Jul-13
A1600	Preparation of design documents (Drawings and specifications)	15d	08-Oct-12	26-Oct-12
A1610	Procurement of materials and services	25d	29-Oct-12	30-Nov-12
A1620	Mobilization	8d	11-Jun-13	21-Jun-13
A1630	JSA to validate execution plan	1d	21-Jun-13	24-Jun-13
A1640	Execution of required modifications (dome demolition and removal)	15d	21-Jun-13	12-Jul-13
A1650	Final grading and demobilization	10d	12-Jul-13	26-Jul-13



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