REVISED PROJECT DESCRIPTION FREEPORT-MCMORAN OIL & GAS PHASE V DEVELOPMENT OF THE ARROYO GRANDE OIL FIELD

1.0 INTRODUCTION

Freeport-McMoRan Oil & Gas (FM O&G) (formerly Plains Exploration and Production Company [PXP]) proposes to expand its existing operations at the 1,480-acre Arroyo Grande Oil Field (AGOF) through a Phase V Development Plan. The proposed project, to commence following the completion of Phase IV development of the AGOF (Conditional Use Permit [CUP] D010386D), includes the following principal activities over a period of approximately ten (10) years:

- Addition of 8 new well pads (with access roads) and modification of 33 existing well pads;
- Drilling of approximately 450 wells (approximately 45 per year);
- An increase in production of marketable quality crude oil;
- Abandonment of wells no longer capable of production or operation;
- Installation of three 85 million British thermal units per hour (MMBtu/hr) steam generators;
- Installation of additional production and steam lines to support Phase V production, including two areas that would involve jack and boring underneath the Union Pacific Railroad (UPRR) and Price Canyon Road;
- Expansion of the existing electrical power system/lines; and
- Replacement of one existing pipe bridge over Pismo Creek (near existing well pad Signal 113A; herein referred to as the Northern Pipe Bridge).

1.1 Project Location

The AGOF is a State-Designated Oil Field located in Price Canyon approximately three miles northeast of Pismo Beach in San Luis Obispo County (SLO County), California (Figure 1). The project site is located on both the east and west sides of Price Canyon Road near the intersection of Ormonde Road, between Highways 101 and 227. The Phase V project lies entirely within the Price Canyon Unit as defined by the California Division of Oil, Gas & Geothermal Resources (DOGGR).

1.2 Project Objectives

The objective of the Phase V project is to increase the marketable produced crude oil from the AGOF. The anticipated production levels under the permitted Phase IV Development Plan for AGOF was approximately 5,000 barrels of oil per day (bopd) as evaluated in Section 2, *Proposed Project*, in the Phase IV EIR; Padre, 2004; page 2-1 (Conditional Use Permit [CUP] D010386D). The actual production levels anticipated under the Phase IV Development Plan are

Figure 1. Overview Map of Proposed Phase V Development

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FM O&G Phase V Project
FM O&G Arroyo Grande Oil Field
San Luis Obispo County
2013

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1,500 bopd. The Phase V project is anticipated to result in increased production levels to approximately 10,000 bopd.

The AGOF has been developed in phases. The increased production of crude oil proposed under Phase V is consistent with the overall goals of the long-term phased development of the field.

1.3 Background

According to historical records that pre-date DOGGR records, the AGOF has been an actively producing field since 1906. DOGGR records officially began recording oil and gas wells for the area in 1919. Since 1919, over 560 wells were drilled in the AGOF. The current facilities, well pads and access roads occupy over 80 acres of disturbed/graded land.

Several Environmental Impact Reports (EIRs) were prepared for the various phases of oil field expansion, including the following:

- *Final EIR for the Proposed Arroyo Grande Thermal Project*, Teal Production Company (Teal; 1978) for Phase I development;
- *Arroyo Grande Thermal Project, Phase II Operations* (ERCO, 1981) for Phase II development;
- *Final Supplemental Environmental Impact Report Shell Western Development Plan* (SAIC, 1994) for Phase III development;
- *Final Plains Exploration & Production – Phase IV Development Plan EIR* (Padre, 2004) for Phase IV development;
- *Addendum to Phase IV Development Plan FEIR* (Padre, June 2005) prepared to address appeal based on the groundwater issues*;*
- *Addendum to Final Phase IV Development Plan EIR* (Padre, 2005) for the addition of a water reclamation facility;
- *Addendum to Phase IV Development Plan FEIR* (Padre, Sept. 2008) for the addition of two water disposal wells (Pulas 5 and 6) outside of the Phase IV boundary; and
- *Addendum to Phase IV Development Plan FEIR* (Padre, Jan. 2009) for two additional water injection wells (Pulas 7 and 8) and equipment relocation.

In 1978, Teal Production obtained approval from the SLO County Planning Commission (Planning Commission) for the expansion of oil field operations (Phase I) which included drilling of 54 wells and the installation of associated equipment. Teal was absorbed by Grace Petroleum (Grace) shortly thereafter.

Grace proposed a Phase II expansion. The EIR for this Phase considered the potential environmental effects of the entire AGOF. In 1982, the Planning Commission certified the EIR and approved a Phase II project consisting of 40 wells and one steam generator. At that time, the Planning Commission conceptually approved an additional 160 wells and three steam generators.

The conceptual approval included a delineation of Phases III, IV, and V and the facilities that would be added during each phase; the areas that would be developed during each of these phases were not designated at that time. Subsequently, Grace was acquired by Shell Western Exploration and Petroleum, Inc. (Shell).

In 1994, Shell received approval from the Planning Commission for a Development Plan to allow expansion of the oil field by drilling 65 additional producing wells and to install three steam generators and accessory facilities with an extended phasing schedule (Phase III). In 1997, the AGOF was acquired by Stocker Resources, Inc. (Stocker). In 1998, Stocker underwent a change of name to PXP who operated the AGOF until May 31, 2013. On May 31, 2013, PXP became Freeport-McMoRan Oil & Gas (FM O&G).

In 2005, PXP received approval for the Phase IV Development Plan to allow expansion of the oil field by drilling 95 additional producing wells and 30 injection wells, and by installing associated facilities including three steam generators with an extended phasing schedule. Five water disposal wells were subsequently approved under the Phase IV plan as Addenda to the EIR. In 2008, PXP received approval from the Planning Commission to install a water reclamation facility (WRF) to treat produced water from the AGOF (Conditional Use Permit [CUP] DRC2005-00252). As of May 2013, the WRF has been constructed and is operational.

2.0 CURRENT OPERATIONS

2.1 Production and Drilling

FM O&G currently operates between 150 and 165 active producing wells and between 37 and 40 active injectors in the AGOF on approximately 50 well pads. Production of the field employs thermally enhanced oil recovery via steam injection. The current oil and gas production facilities, well pads, and lease access roads occupy over 80 acres of disturbed/graded land within the 1,480-acre State designated oil field. More wells are being drilled in accordance with the County-approved Phase IV Development Plan. Other wells are formally plugged and abandoned with DOGGR oversight when they no longer are capable of commercial production levels or if mechanical well conditions preclude their future use.

Under the approved Phase IV development and drilling schedule, oil production was expected to reach approximately 5,000 bopd by August 2015, as was addressed in the Phase IV EIR (Padre, 2004; note Section 2.1 of the EIR). The actual production levels anticipated under the Phase IV Development Plan are approximately 1,500 bopd.

AGOF production facilities include a tank battery (including a dehydration unit), a gas plant, above-ground pipelines, five steam generators, and "steam headers" that distribute steam to the steam injection wells.

The production facilities and wells have permits to operate issued and enforced by the San Luis Obispo County Air Pollution Control District (APCD).

Grading of all four of the well pads approved for the Phase IV project has been completed. Eighteen existing pads were approved for expansion in Phase IV and 12 have been completed to date (Table 1). Plans for the remaining well pads are as follows: two will be expanded during the remainder of Phase IV, one is proposed to be expanded during Phase V, and one will not be expanded as planned.

Fifty of the 95 production wells and 18 of 30 injection wells, approved in Phase IV, have been drilled. Drilling the remaining approved wells under the Phase IV project are still planned to be drilled under Phase IV (Table 1). The maximum number of wells drilled in any given year was 36 (which occurred in 2007). After each well is drilled, a production rig is brought on to complete the well.

Current operations also include routine well maintenance (or “workovers” – using the same type of rig as a “production rig” also referred to as a “workover rig”) and well sidetracks using production rigs. The goal of the workovers is to maintain and/or repair existing wells to maintain mechanical integrity, assure safety, and/or maintain or optimize the level of production. The goal of well sidetracks is to re-enter an idle well’s surface location to drill a new bottomhole location in close proximity to the existing bottomhole location; this is typically conducted when repair of the well casing is more costly or technically infeasible. Approximately 20 to 30 well workovers and 6 to 10 sidetracks are conducted per year.

In addition, well abandonment also requires a production rig. As wells become no longer productive or their mechanical integrity becomes difficult to repair, those wells will be formally plugged and abandoned with DOGGR oversight. Other operational, environmental, and special considerations may necessitate well abandonment. It is difficult to predict the number of wells that would require abandonment per year given variations in production declines and the economics of each well. Wells are abandoned on an as needed basis. Approximately 10 to 12 well abandonments are conducted per year.

Routine well maintenance and repairs, and well abandonments using production or workover rigs are conducted year round and would operate up to 24 hours a day (although they are typically operated 12 hours during the day). Currently, three production or workover rigs operate at AGOF at one time.

Table 1 Activities and Equipment Approved in Phase IV

	Phase IV Item	Permitted in Ph. IV CUP	Completed to date	To be Completed in Ph. IV	Installation to Occur During Ph. V
Grading of New Well Pads					
1	Signal 113A	Grading of 4 new pads (total disturbance of ~ 2.69 acres)	✓		
2	Rock 85A		✓		
3	Signal 66C		✓		
4	Maino 16NW		✓		
Modifications of Previously Existing Well Pads (18 permitted in Phase IV CUP)					
1	Hyla 19H/Maino 1	Grading on 18 existing well pads (total disturbance of about 4.22 acres)	✓		
2	Maino 18L		✓		
3	Maino 19L			✓	
4	Maino 19N		✓		
5	Maino 21J (or 20K)		✓		
6	Maino 21L		✓		
7	Morehouse 303		✓		
8	Rock 4			✓	
9	Rock 86		✓		
10	Rock 401		✓		
11	Signal 10M		✓		
12	Signal 11L		✓		
13	Signal 101		✓		
14	Signal 102 (PG 406.5)		✓		
15	Signal 102 (PG 408.5)		✓		
16	Signal 105				✓
17	Signal 113D				
18	Signal 151		✓		
Drilling of New Wells					
	Producing wells	95	50	45	
	Injection wells	30	18	12	
Steam Generators					
	Three 62.5 MMBTU/hr Steam Generators			✓ (Two)	

2.2 Steam Injection

The primary method of steam injection utilized at the AGOF is “steam flooding” (with some supplemental cyclic steaming). During steam flooding, steam is injected into dedicated steam injection wells to raise the reservoir temperature, decrease the oil viscosity, and increase oil migration to associated oil production wells. Periodically, production wells are selected to be cyclic steamed, wherein injection of a relatively small steam volume (relative to the steam injector wells) into a production well is interchanged (cycled) with producing from the same well. Steam injection has been used as an enhanced oil recovery technique at AGOF since 1978.

The natural reservoir temperature is approximately 90°F and the corresponding oil viscosity is 3,500 centipoises (cp). Steam is injected at a wellhead pressure of 500 to 800 pounds per square inch gauge (psig) and raises the reservoir temperature in the vicinity of the steam injection well. This procedure reduces the oil viscosity, allows the oil and water mixture to flow and be pumped from the production wells more efficiently and facilitates recovery of a higher percentage of the original oil-in-place than would otherwise be possible.

2.2.1 Hydraulic Fracturing

Hydraulic fracturing is not conducted at AGOF and is not proposed as part of Phase V development of AGOF.

2.3 Steam Generators

At the end of Phase III development of AGOF, six steam generators were located in the AGOF, fueled by natural gas or gas generated from a nearby landfill. During Phase IV, PXP removed one existing steam generator, leaving five steam generators (three west of Price Canyon Road in “Facility Canyon” in the Edna Unit [AG-1, AG-2, AG-3]; two east of the road in the Hyla Unit [AG-4, AG-5]) (Figure 2). In Phase IV, it was planned and approved to construct three additional 62.5 MMBtu/hr steam generators (with 50 MMBtu/hr steam production capacity). FM O&G currently has plans to install two of these approved 62.5 MMBtu/hr steam generators in the Hyla Unit.

The five existing steam generators are connected to the steam distribution piping that transports steam to the wellheads. The existing steam generators are fueled with natural gas from a Southern California Gas Company (SoCal Gas) pipeline. Supplemental fuel is also obtained in the form of produced gas from the field and landfill gas from the nearby Cold Canyon Landfill, a renewable resource. Currently, approximately 28 percent of the fuel for the steam generators is supplied by the Cold Canyon Landfill and 72 percent is supplied by SoCal Gas.

2.4 Tank Battery Facilities and Oil Loading and Transportation

Producing wells produce oil, produced water, and gas. Produced water is a mix of the condensed steam pumped into the producing formations and naturally occurring reservoir water.

The tank battery currently operating at AGOF on the west side of Price Canyon Road (at the foot of “Facility Canyon”) (Figure 2) consists of four 1,000-barrel (bbl) storage tanks, six 2,000-

bbl storage tanks, a 2,000-bbl cone-bottom Desand Tank, two 10,000-bbl water clarification tanks, two free water knock-out vessels (FWKOs) (e.g., three-phase separators), two heater treaters, and a vapor recovery system.

The tank battery facilities are used to separate the heavy crude oil from produced water (dehydration) and to store the oil until sold. The oil and water mixture is pumped through pipes from the wells to the tank battery facilities and into the FWKOs. Approximately 80 percent of the produced water is removed from the oil and then sent to the WRF. The remaining oil and water mixture flows to the gas-fired heater treaters where the mixture is heated and remaining water is gravity separated and pumped to the WRF, while the oil is transferred to the storage tanks.

The produced oil that is stored in on-site tanks is eventually transferred to 160-bbl tanker trucks through either of the two loading racks for transportation offsite.

Oil is transported offsite by tanker truck to the ConocoPhillips Battles pump station in Santa Maria. Currently, approximately 7 trucks per day transport approximately 1,000 bopd outside of the peak traffic hours.

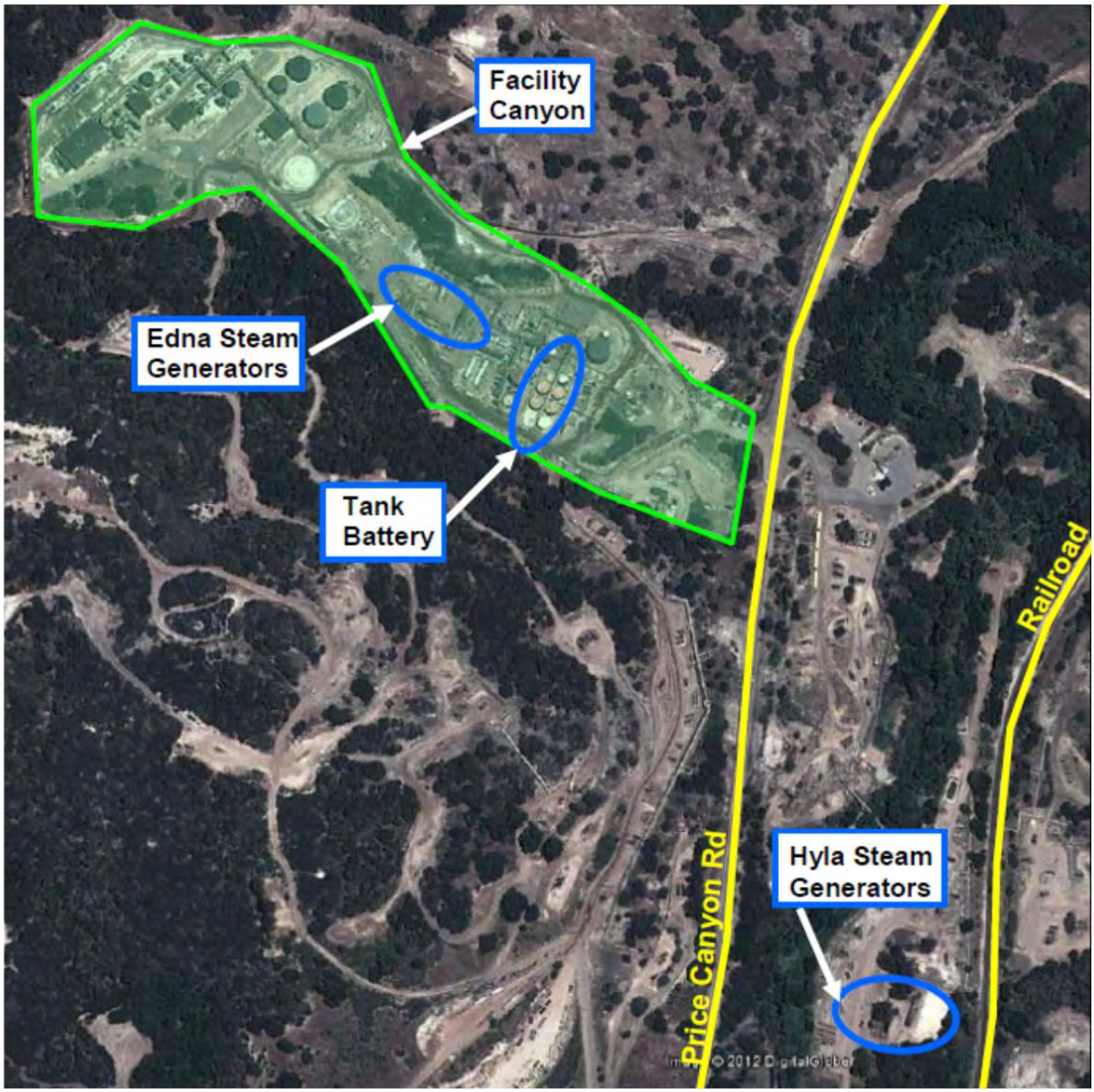
Produced water is treated at the WRF according to the strict requirements of a National Pollutant Discharge Elimination System (NPDES) Permit issued by the Central Coast Regional Water Quality Control Board (RWQCB). Treated produced water is sent to the steam generators to generate steam and a maximum of 20,000 barrels (bbls) (approximately 0.84 million gallons per day) is discharged to Pismo Creek. Waste streams from the water reclamation process are also injected into approved water disposal wells that are regulated under DOGGR's Underground Injection Control (UIC) program.

All tank facilities are connected to a vapor recovery system that captures hydrocarbon vapors. The vapor recovery system currently collects approximately 0.0025 million standard cubic feet per day (MMscfd) of gases from the producing wells and tank facilities.

The gas plant at the AGOF can process 2.8 MMscfd of produced gas. The produced gas contains carbon dioxide (CO_2) and hydrogen sulfide (H_2S) that is removed using a patented absorption process. The gas plant is currently not in operation, but is planned to be in operation before August 2015 (although this installation timeframe may change).

Because the gas plant is not currently in operation, the entire gas stream from the vapor recovery system is currently sent to disposal (re-injection). When the gas plant is operational, gas is sent from the vapor recovery system to the gas plant. The gas plant has two gas streams: approximately 50 percent sweet gas (where hydrogen sulfide [H_2S] and CO_2 has been removed) and 50 percent waste gas. The sweet gas can be used as fuel in the steam generators while waste gas is re-injected. FM O&G plans to efficiently burn the waste gas stream through a new thermal oxidizer unit or through a scrubber/wet electrostatic precipitator (WESP) installed on two steam generators, thereby avoiding the need to continue reinjecting the waste gas. The thermal oxidizer or scrubber/WESP on the steam generators is planned to be operational prior to the initiation of Phase V (although the installation timeframe for this may change).

Figure 2 Arroyo Grande Oil Field Production Units



2.5 Pipeline System, Flowlines, and Vapor Recovery System

The flowline system moves oil, produced water, killwater, and steam throughout the facility. The flow is controlled through headers for switching the flow of produced water and steam from one well to another and directing the oil flow to the tank battery. The killwater pipelines are connected to all the wells through the production headers that can backflow to the wellhead. In most cases, existing steam, killwater, and production piping are installed above ground. Exceptions are where piping is laid in casing under the railroad or under the road.

The vapor recovery system comprises a closed pipeline and compression system that maintains suction on the wellheads, loading rack, tanks, and other vessels, maintaining an oxygen-free atmosphere on tanks and vessels. This system is designed to capture over 99 percent of the vapors that would otherwise be sent to the atmosphere.

2.6 Public Utilities

Natural gas is provided to AGOF by SoCal Gas, supplemented by produced gas from AGOF, and landfill gas from the Cold Canyon Landfill.

Electricity is provided to AGOF by Pacific Gas & Electric Company (PG&E). There is also an on-site 1.4-Megawatt (MW) cogeneration unit, with a natural gas turbine, that provides supplemental electricity to AGOF. The cogeneration unit is currently not in operation but is planned to be in operation prior to August 2015 (although this installation timeframe may change). The cogeneration unit is powered by natural gas provided by SoCal Gas; gas from the vapor recovery system is not used to power the cogeneration unit.

All of the water needed for steam production is treated produced water from the WRF. There are a total of three groundwater wells located in the northeastern portion of the AGOF that have historically been used to provide non-potable freshwater to the field. Only water from one of the on-site groundwater well W-1 is currently used, and it is used for dust suppression, landscape irrigation, hydroseeding, fire protection, flushing toilets, and for drilling activities. Water from this well is also temporarily stored in two stock ponds lined with a bentonite clay liner totaling 30,000 bbls on AGOF. Water well W-2 historically was used and could be used in the future. Water well W-3 is unlikely to be used in the future as it likely would require significant repair. Bottled water is used as drinking water at AGOF.

2.7 Personnel

There are typically eight FM O&G employees, 12 contractors who work on the production or workover rigs, and 50 additional contractors involved in routine operation and maintenance of the AGOF, including the WRF. In addition, there are a number of deliveries and oil shipping truck trips to and from AGOF. The number of onsite personnel and contractors increases during construction and maintenance activities (e.g., mechanical/electrical/flow-line construction, etc.). The estimated representative “worst-case” number of existing personnel (i.e., round trips) at AGOF is shown in Table 2, based upon known operations and recent traffic counts. Because drilling activities were not being conducted at the time that the Phase V application was

submitted, staff associated with drilling is not included in the existing personnel count. However, when drilling occurs, the number of staff equal what is proposed under Phase V.

Table 2 Summary of Existing and Phase V Project Workforce and Traffic Generation

Annual Activities	Existing Daily Round Trips	Phase V Increase from Existing Setting No. of Vehicles (= No. Personnel) = Daily Round Trips	Typical Season	No. of Days Per Year	A.M. Peak Hour Trips (7:00-9:00 am)	P.M. Peak Hour Trips (4:00-6:00 pm)	Existing + Phase V Daily Round Trips
CONSTRUCTION[1]							
Construction Activities[2]	86	0	Year round	260	0	0	86
Well Drilling & Solids Disposal[3]	0	48	Aug. 15-Mar. 28	225	0	19	48
Subtotal Construction:	**86**	**48**			**0**	**19**	**134**
OPERATIONS							
Operation Staff which include:							
FM O&G Staff	8	6	Year round	260	6	6	14
Operations Contractors[4]	50	5	Year round	260	5	5	55
Production or Workover Rig Staff	12	4	Year round	365	0	0	16
Subtotal Operation Staff:	**70**	**15**			**11**	**11**	**85**
Sludge Disposal from Water Treatment Facility	2	0	Year round	365	0	0	2
Oil Shipping[5]	7	57	Year round	365	0	0	64
Deliveries of Non-Construction Related Materials and Supplies	4	0	Year round	260	0	0	4
Visitors (e.g., agencies, meetings etc.)	4	0	Year round	260	0	0	4
Subtotal Operations:	**87**	**72**			**11**	**11**	**159**
TOTAL CONSTRUCTION + OPERATION	**173**	**120**			**11**	**30**	**293**

Notes:

[1] Trips associated with material deliveries are included in the no. of vehicles shown.

[2] Construction activities include well pad construction, installation of steam generators, deliveries of construction materials and equipment, and mechanical, electrical, and flowline installation for wells. Construction activities would involve 10-hour working days (with a 1 hour lunch break) from 7:00 am to 6:00 pm, weekdays only. Traffic numbers are provided from actual traffic counts conducted during typical construction activities within the Arroyo Grande Oil Field. This activity is expected to remain consistent through Phase V.

[3] Well drilling involves use of a drill rig only (as opposed to a workover rig); well drilling activities would occur 24 hours a day, 7 days a week, with two shifts that change at 6:00 am and 6:00 pm. This includes trips associated with solids disposal and deliveries of materials and equipment for the well drilling task. After drilling, well completions are conducted by a workover rig and production or workover hoist operations staff. Well drilling activities were not occurring at the Arroyo

Table 2 (Continued) Summary of Phase V Project Workforce and Traffic Generation

Grande Oil Field at the time the Phase V application was submitted, therefore, trips associated with drilling were counted as "new" trips under Phase V. It is assumed that 19 trips would occur during the pm peak hour as the night crew comes on. It is estimated that each well would take 5 days to drill.

[4] Operations contractors include 20 staff working at the Water Reclamation Facility, and contract operators, contract roustabouts, and tree trimmers/landscape maintenance crews.

[5] Number of truck trips necessary to ship 10,000 bbls of oil per day. This is an addition of 57 truck trips over the existing 7 truck trips per day for production of approx. 1,000 bbls of oil per day.

3.0 PROPOSED PROJECT

3.1 Construction

Construction of the proposed project would entail the following activities as described in more detail below:

- Well pad construction;
- Construction of mechanical, electrical, and flow-line connections with new wells including lease road undercrossings, one railroad undercrossing, one Price Canyon Road undercrossing, replacement of one pipe bridge (the Northern Pipe Bridge), and installation of new electrical lines to connect to the existing 12-kV (kilovolt) system;
- Drilling of new wells and use of production rigs to complete the new wells; and
- Installation of the new steam generators.

An overview map of the proposed project components is presented on Figure 4.

3.1.1 Well Pad Construction

FM O&G plans to maximize use of the approximately 50 existing graded pads and previously disturbed areas as much as possible. Eight new well pads would require grading and construction of new access roads. Additionally, five existing pads that currently do not house oil wells would be used for some of the proposed wells; these pads may need surface grooming. The proposed project would also include expansion of 33 existing pads to accommodate more wells. Phase V would involve approximately 257,710 cubic yards (cy) of cut and 198,900 cy of fill, for a total of 456,610 cy of grading. As a worst-case scenario, it is estimated that this would occur over the first 6 years of the project. The 58,810 cy of excess soil would be re-spread onsite. The estimated total disturbance for the Project is 67.2 acres of which approximately 53.2 acres would be newly graded; this acreage also accounts for drainage improvements associated with the new and modified pads.

In addition, CalFire would require clearing of vegetation within 13 feet on either side of all new roads constructed under Phase V. Because new wells are typically located in the center of well pads, no additional fuel modification would be needed around new or modified well pads, according to CalFire. The area of fuel modification would be approximately 5.2 acres which is included in the 67.2 acres of total disturbance. It is acceptable by CalFire to remove vegetation in a mosaic pattern, which would result in thinning the vegetative cover rather than clearing 100 percent; therefore, this would be implemented to the maximum extent possible in order to minimize biological impacts.

Sites to be graded would first be cleared of vegetation between January 1 and February 15, to avoid the bird nesting period to the maximum extent feasible. Then pads are planned to be graded between April 15 and October 15, to avoid the rainy season to the maximum extent feasible. Activities would be completed in 10-hour work days between 7:00 am and 6:00 pm

(with an hour lunch break). Well pad construction under Phase V would not require any additional construction workers from the number of construction workers currently working at the Arroyo Grande Oil Field (Table 2).

An equipment staging and laydown area for Phase V construction activities is proposed to be located at an equipment laydown area located south of the operations office trailers that was used during construction of the WRF, called the “AFE Yard” as shown in the Preliminary Grading Plans. In addition, existing well pads would be used as equipment staging and laydown areas for work performed nearby as well.

Cut and fill slopes associated with well pad construction activities would be revegetated with native species. Additional landscaping would be installed along Price Canyon Road to provide screening of the facilities. A National Pollutant Discharge Elimination System (NPDES) Permit Associated with Construction Activities would be required for well pad construction. Erosion control measures would be implemented in compliance with the Storm Water Pollution Prevention Plan (SWPPP) prepared in compliance with this requirement. Proposed drainage improvements associated with well pad construction are shown in the Preliminary Grading Plans.

3.1.2 Mechanical/Electrical/Flow-Line Construction

Tank battery and WRF facilities would remain unchanged, and are sized adequately to accommodate additional production from Phase V.

As new wells are installed, new oil, gas, and steam gathering lines would be installed to the new wells, and electricity supplied to the pumps. The flowlines would be placed mostly above ground on pipe supports (pipe-racks) constructed along the existing or proposed access roads (Photo 1 in Attachment 1 shows a representative pipe-rack). The approximate routes of the new (proposed) flowlines are shown in the Preliminary Grading Plans. The flowlines from the wells would be routed into new and existing headers feeding the existing tank battery.

To avoid impacts to traffic, flow lines are proposed to cross roads underground in certain areas (shown in the Preliminary Grading Plans). These crossings include access road crossings, a Price Canyon Road crossing, and a railroad crossing (Photo 2 in Attachment 1 shows an example of such crossings). Undercrossings would be installed by jack and boring underneath roads and the railroad.

Replacement of one existing pipe bridge is also proposed over Pismo Creek (the pipe bridge near well pad Signal 113A, herein referred to as the Northern Pipe Bridge). Replacement of the pipe bridge footings, pipe conductor, and associated pipes is proposed. Construction of the new pipe bridge would be implemented without disturbance to the bed or banks of Pismo Creek.

New power poles from PG&E’s 12-kilovolt (kV) system supplying electricity to AGOF would be needed to connect electricity to new wells. New 12-kV connections would be made to the existing system on AGOF. Removal of vegetation within a 10-foot radius of each new power pole would be required for fire protection. New power poles can and would be installed to avoid sensitive species and sensitive habitat. New power poles would be installed either by helicopter

or by ground equipment that can operate from previously disturbed graded areas. Stringing of new lines can and would be implemented from previously disturbed graded areas in the AGOF.

Because drilling of the Phase V wells would be spread over an approximate 10-year period, new connections would be constructed throughout Phase V. These activities would occur intermittently year round, during 10-hour work days between 7:00 am and 6:00 pm (with a one hour lunch break). The number of construction workers for this task would not exceed the number of existing construction workers working at the AGOF. Construction materials and equipment staging areas would be the same as for well pad grading discussed above.

3.1.3 Drilling

Approximately 450 wells are proposed under Phase V development, or approximately 45 new wells on average per year for 10 years, consisting of production, and steam and water injectors. These new wells would be drilled on existing pads, pads graded or expanded during Phase IV development, or pads proposed for new grading or for expansion in Phase V.

Of the 450 wells, 10 new wells per year are anticipated to be needed to replace wells that “expire” and are subsequently plugged and abandoned (formerly called “replacement” wells). These wells are typically drilled in close proximity to the surface locations of the wells that are plugged and abandoned.

Drilling would involve use of a drill rig (as opposed to a production or workover rig described under Operations). Only one drill rig would operate at a time at AGOF. Once drilling of a well begins, it would continue 24 hours per day (with two 12-hour shifts from 6:00 am to 6:00 pm), typically 4–5 days per well, with some wells taking up to 6 days (5 days per well on average is assumed). Consistent with past drilling activity, the “worst-case” number of people at the drill site would be approximately 38 per day (two shifts with 19 people), including the crew and support personnel. Drill crews and other personnel would typically be drawn from the local area, Santa Maria and/or Bakersfield area. The majority of the workers would be lodged in nearby hotels/motels, bringing income to the local economies.

Approximately 10 roundtrips to and from the site per day would be required for material and supply delivery and disposal of solids offsite. These deliveries would be made during non-peak traffic periods (Table 2).

Well drilling would typically occur only between mid-August and the end of March each year assuming that approximately 45 wells would be drilled per year at 5 days per well.

New wells would be drilled using a drill rig with a maximum height of approximately 110 feet. The minimum security lighting would be used during drilling operations at night. Lighting would be directed downward in the immediate vicinity of the drilling operations. A typical light tower used during drilling would be approximately 30 feet in height and would have four 1,250-watt metal halide lamps.

Diesel engines of the drill rig would have California Air Resources Board (CARB) portable engine certifications. Diesel particulate filters would be used for the rigs. Rig Ensign 501 is a typical rig likely to be used for Phase V drilling.

After a new well is drilled with a drill rig, a production rig is typically used to complete the well. This activity takes approximately two days per well. New equipment and a new crew are brought in for this activity as summarized in Table 2 below. The use of a production rig in this manner is considered a construction activity. Production rigs are also used to sidetrack wells, and to abandon wells; these activities are considered operational activities and are described below. A workover rig (the same rig as a production rig, just performing a different activity) is used to conduct routine maintenance on wells which is also considered an operational activity. Hours of operation for production or workover rigs are typically from 7:00 am to 7:00 pm, however, operation of these rigs could occur over a 24 hour period. Minimum security lighting may be used during production or workover rig operations, if dark. Lighting would be directed downward in the immediate vicinity of the operations. A typical light tower used during drilling would be approximately 30 feet in height and would have four 1,250-watt metal halide lamps.

Typical true-vertical drilling depths (i.e., the maximum depth of the bottomhole location even if directionally drilled) would range from 1,000 to 1,500 feet; but could be deeper. Drilling would be conducted within DOGGR-approved zones. Directional drilling allows for placement of the surface locations for several wells on one pad, thereby minimizing ground disturbance. Wherever possible, twinning would occur where existing well pads with existing wells would be used for new wells so that more than one pumping unit can be safely and economically placed on the pads.

Approximately 1,000 bbls of fresh water total per well would be required for drilling activities. Drill cuttings and waste muds would be mostly recycled and reused on site reducing waste and traffic. Liquids would be separated from solids through a dewatering and centrifugation process and injected into an approved waste disposal well. The solid part of the muds and cuttings, if non-hazardous, would be used on site for berm construction (as a means of secondary containment) under a Waste Discharge Requirement (WDR) permit from the Central Coast (RWQCB) and any excess solids would be disposed of offsite. It is estimated that approximately 556 bbls and 380 bbls of solids would need to be disposed of offsite, for each producing well and each injection well, respectively. Disposal of solids offsite typically occurs twice a week during drilling operations.

3.1.4 Steam Generator Installation

Installation of three new 85 MMBtu/hr steam generators is proposed under Phase V. This activity would occur over 10-hour work days and is assumed to occur between March 1 and August 15. One steam generator would likely be installed in 2015, and two steam generators would likely be installed in 2016 and 2017, respectively, although these installation timeframes may change. Installation of the steam generators would not require any more construction workers than the number of construction workers already working at AGOF.

One steam generator would be installed at the Edna Unit and two would be installed at the Signal 150 Pad (see Figure 4). The locations of the new steam generators are also shown in the

Preliminary Grading Plans. The generators would consist of prefabricated equipment. No grading would be required other than minor surface grooming and for installation of foundations. The new generators would be fitted with low- nitrogen oxides (NOx) burners that would minimize NOx emissions.

3.2 Operation

3.2.1 Production and Injection

If all approved wells are drilled, oil production is expected to increase to approximately 10,000 bopd from AGOF. The existing tank battery and WRF have adequate capacity to handle this increase in production.

Additionally, the proposed wells would result in an increase in produced gas volume, which would be processed through the existing gas plant, as described in Section 2.1 above, incinerated by the thermal oxidizer or scrubber/WESP, or would be reinjected (in the event that the gas plant or incineration process is not operational). The total gas flow would be within the capacity limits of the existing gas plant.

Currently, 6 bbls of steam are required to produce 1 bbl of oil. FM O&G would continue to inject steam to utilize enhanced oil recovery; therefore, with the increased number of producing wells, demand for steam would increase. Because FM O&G would continue to improve the steam injection oil recovery methods, aimed at reducing the amount of steam required per barrel of oil produced, the demand for steam is not likely to increase proportionately to the oil production increase.

3.2.2 Operation Staff, Well Workovers, Deliveries, and Visitors

Approximately 15 additional operational FM O&G personnel and contractors (Table 2) are anticipated to be required during Phase V. This includes six additional FM O&G staff, five additional contractors, and four additional crew members to work on the production or workover rigs.

The number of routine well workovers, sidetracks, and well abandonments conducted per year would be the same under Phase V, as currently conducted. Use of one additional production rig, for a total of four production or workover rigs operating at any one time, is proposed.

Other activities performed under routine operation of the AGOF include sludge disposal from the WRF, deliveries of non-construction related materials and supplies, and visitors.

3.2.3 Oil Shipping

The Phase IV EIR assumed that approximately 32 trucks per day would be required to transport 5,000 bopd. Currently, approximately 7 truck trips are needed to ship approximately 1,000 bopd; transport is conducted during non-peak hours. It is currently estimated that a total of up to 64 tanker trucks per day would be required to transport 10,000 bopd under Phase V; trucks would continue to ship oil during non-peak traffic hours only.

3.2.4 Public Utilities

AGOF would continue to be served by PG&E and the cogeneration unit for electricity, and natural gas from SoCal Gas, landfill gas from the Cold Canyon Landfill, and produced gas from AGOF.

The existing on-site water well (W-1), possibly water well W-2, as well as treated produced water from the WRF, would be used to supply water for drilling activities, landscape irrigation, hydroseeding, fire protection, dust suppression during construction, and water to flush toilets.

Bottled water would continue to be used as the drinking water for onsite personnel at AGOF.

3.2.5 Hazardous Materials Management

Drilling and operating an oil field involves inherent hazards such as high pressures, hydrogen sulfide gas, and potential for leaks and spills. Several hazardous materials are handled at the AGOF such as oil, natural gas, various chemicals that are used to assist in efficient oil production and diesel fuel. FM O&G maintains a Hazardous Materials Business Plan where the inventory of all hazardous materials is maintained, along with spill response procedures. FM O&G maintains and trains its personnel and contractors on its Integrated Contingency Plan which contains an Emergency Response Plan, a Fire Protection Plan, and a Spill Prevention, Control and Countermeasures (SPCC) Plan, which outline actions required to mitigate any emergency or spills. FM O&G also maintains three Spill Response Trailers located on site for emergencies.

3.3 Summary of Project Workforce and Traffic Generation

A summary of the total projected workforce and traffic generation rates that would typically be associated with implementation of Phase V is provided in Table 2.

3.4 Equipment List

A list of equipment associated with construction and operations under Phase V is provided in Table 3.

Table 3 Phase V Construction and Operations Equipment List

Activity	Fuel Type	Power Rating (horse-power [hp])	No. of Equipment
CONSTRUCTION			
Well Pad Construction:			
D-8 Cat Dozer	Diesel	285	1
12-G Cat Motor Grader	Diesel	135	1
Compactor	Diesel	185	1
Water Truck	Diesel	185	1
Dump Truck	Diesel	185	1
Pickup Truck	Diesel	185	1
Mechanical/Electrical/Flow-Line Connections:			
Welding Truck			
Truck Engine	Diesel	185	2
Welding Machine	Diesel	70	2
Hydrocrane	Diesel	185	1
580 Cat Backhoe	Diesel	55	1
Electrical Line Truck	Diesel	185	1
Water Truck	Diesel	185	1
Pickup Truck	Diesel	185	1
Railroad and Price Canyon Road Undercrossings:			
Power Cutter Head (PCH 36) (Tunnel Boring Machine)	Diesel	79	1
Cat 450F Backhoe Loader	Diesel	127	1
Dirt, Concrete, and Water Trucks (Freightliner 108SD)	Diesel	200	3
Welding Truck			
Truck Engine	Diesel	185	1
Welder Generator (Lincoln SAE-300)	Diesel	70	1
Support, Welding, Testing Pickup Trucks (Ford F150)	Gas	302	3
Northern Pipe Bridge Replacement:			
Crane (Liebherr 1080)	Diesel	173	1
Cat 450F Backhoe Loader	Diesel	127	1
Dirt, Concrete, and Water Trucks (Freightliner 108SD)	Diesel	200	3
Support, Welding, Testing Pickup Trucks (Ford F150)	Gas	302	3
Welding Truck			
Truck Engine	Diesel	185	1
Welder Generator (Lincoln SAE-300)	Diesel	70	1
Well Drilling & Mud Disposal:			
Drawworks	Diesel	500	1
Mud Pump	Diesel	685	1
Drill Rig Generator	Diesel	685	1

Table 3 (Continued) Phase V Construction and Operations Equipment List

Activity	Fuel Type	Power Rating (horse-power [hp])	No. of Equipment
Backup Rental Generator	Diesel	685	1
Crane	Diesel	500	1
Super Sucker (2009 Model 6227 Sterling, Engine Cat C13)	Diesel	380	1
Cement Truck	Diesel	500	1
Bit Delivery Truck	Diesel	500	1
Truck for Delivery of Water Tank & Mud Disposal	Diesel	500	1
Hole Digger			
Truck Engine	Diesel	185	1
Winch	Diesel	70	1
580 Cat Backhoe	Diesel	55	1
Pickup Truck	Diesel	185	1
Well Completions:			
Nabors Rig No. 350 (CAT DPF System muffler)	Diesel	500	1
Steam Generator Installation:			
Welding Truck			
Truck Engine	Diesel	185	4
Welding Machine	Diesel	70	4
Hydrocrane	Diesel	185	1
580 Cat Backhoe	Diesel	55	1
Pickup Truck	Diesel	185	3
OPERATIONS			
Well Workovers, Well Sidetracks, and Well Abandonments:			
Nabors Rig No. 350 (CAT Diesel Particulate Filter [DPF] System muffler)	Diesel	500	1
Cement Truck (for Abandonments)	Diesel	500	1

4.0 MINIMIZATION MEASURES

In order to minimize the environmental effects, FM O&G is committed to implementing the recommended mitigation measures listed in the various technical study reports prepared for this Project by URS Corporation. Mitigation measures are recommended in the following technical studies which have been submitted to the County of San Luis Obispo by URS Corporation:

- ·Air Quality;
- ·Biological Resources;
- ·Archaeological Resources;
- ·Noise; and
- ·Traffic.

ATTACHMENT 1
PROJECT PHOTOS

Photo 1. Example of a pipe-rack along an access road

Photo 2. Existing railroad undercrossing. Supply lines are set through a larger pipe

Photo 3. Low Profile Pumping unit