STATE OF ALASKA

SEAN PARNELL, GOVERNOR

ALASKA OIL AND GAS
CONSERVATION COMMISSION

333 W. 7th AVENUE, SUITE 100
ANCHORAGE, ALASKA 99501-3539
PHONE (907) 279-1433
FAX (907) 276-7542

ADMINISTRATIVE APPROVAL AREA INJECTION ORDER 2B.044

ADMINISTRATIVE APPROVAL CONSERVATION ORDER 406B.009

David Jamieson
Supervisor, Reservoir Engineering
Greater Kuparuk Area Development
ConocoPhillips Alaska, Inc.
700 G Street
Anchorage, AK 99501

Dear Mr. Jamieson:

ConocoPhillips Alaska, Inc. (CPAI), by letter dated May 13, 2009 (VRWAG Application), requested the Alaska Oil and Gas Conservation Commission (Commission) administratively amend Area Injection Order (AIO) 2B and Conservation Order (CO) 406B to authorize a Viscosity Reducing Water Alternating Gas (VRWAG) pilot project in a portion of the West Sak Oil Pool (WSOP) in the Kuparuk River Unit (KRU). **The Commission hereby authorizes CPAI to conduct the pilot VRWAG project described in the VRWAG Application with the conditions specified below.**

The very large, shallow, and viscous West Sak oil accumulation is contained within several discrete sands. Early development attempts mainly utilized near-vertical producers and injectors, but multi-lateral wells that target individual sands using long, horizontal wellbores have proven to be the most effective means of recovering West Sak oil. Waterflooding is the primary enhanced oil recovery (EOR) method to date and combined with primary recovery is estimated to be capable of recovering approximately 20% of the original oil in place. A prior, small-scale EOR pilot project in the WSOP was attempted and showed some promise. The VRWAG pilot project was developed to explore additional methods to improve EOR recovery from the WSOP.

The proposed VRWAG pilot project will utilize four multi-lateral wells–each having at least two horizontal laterals–that are currently serving as water injectors at KRU Drill Sites 1E and 1J. The injectors are offset by horizontal producers completed in the same sands and thus would create a line drive injection pattern. The proposed plan calls for alternating water and gas injection (WAG) cycles of three months apiece for a total of 36 months (six cycles each of water and gas injection).

Laboratory analysis and reservoir simulation work indicate that a VRWAG process should provide substantial increases in oil recovery. Gas injected as part of the VRWAG process provides two benefits over water injection alone to increase oil recovery. First, viscosity of the fluid in the reservoir will decrease, making the oil more mobile. Second, the oil in the reservoir will swell, increasing oil saturation and allowing some of the swollen oil to flow to the production

wells. The amount of viscosity reduction and oil swelling is a factor of the richness of the injection gas. The richer the injection gas, the greater both effects will be, and the higher recovery will be. Laboratory results indicate that, at current reservoir conditions and with the gas expected to be available for the VRWAG pilot project, oil viscosity could be reduced by over 80% and oil volume could swell by more than 5%. The estimated incremental oil recovery in the VRWAG pilot project area due to these two effects is 4% of the original oil in place, or roughly 4 million barrels in the proposed project area.

Injecting energized and highly mobile fluids such as gas increases the potential for pressure communication or leakage that might not be evident while injecting water. As such, competent sealing strata and good mechanical integrity for all wells in the proposed VRWAG pilot project area are critical. Current water injection operations are being conducted at or above formation parting pressure, and there has been no indication that these activities have breached any confining intervals. Additionally, fracture stimulations have been performed in the West Sak at pressures much greater than would ever occur during WAG operations, and these have not shown any evidence of fractures induced from these activities propagating through the confining layers. These factors indicate that injected fluids will remain within the intended intervals. The mechanical integrity of the injection and surrounding wells will be evaluated when the operator applies to convert a water injection well to WAG service.

Rule 9 of AIO 2B provides that:

"Upon request, the Commission may administratively amend any rule stated above as long as the operator demonstrates to the Commission's satisfaction that sound engineering practices are maintained and the amendment will not result in an increased risk of fluid movement into an underground source of drinking water."

Rule 14 of CO 406B provides that:

"Unless notice and public hearing is otherwise required, the Commission may administratively waive or amend any rule stated above as long as the change does not promote waste or jeopardize correlative rights, is based on sound engineering and geoscience principles, and will not result in fluid movement outside of the confining zone."

The VRWAG Application demonstrates that the above criteria for administrative approval have been met. Therefore, the Commission authorizes CPAI to conduct the VRWAG pilot project as described in the VRWAG Application, with the following conditions:

1) This authorization expires **36 months** after the commencement of gas injection activities, or **24 months** after the date this order is entered if gas injection activities are not commenced by that time.
2) The VRWAG pilot project must be conducted in accordance with the plan described in the VRWAG Application (attached and incorporated into this administrative approval by reference) and all applicable regulations. No changes may be made to the plan without prior approval of the Commission.
3) The operator must notify the Commission at least 10 days before beginning the VRWAG injection program,
4) Prior to commencement of gas injection activities, the operator must submit an Application for Sundry Approvals (Commission Form 10-403) for each proposed VRWAG injection well and obtain approval from the Commission as to the mechanical

integrity of the proposed injection well and the nearby wells to ensure there are no conduits that would allow injected fluids to escape from the intended interval.

5) By September 30th of each year, beginning in 2010, the operator must provide to the Commission a report on the status of the VRWAG pilot project. The reporting period shall be July 1st through June 30th of the preceding year. The report shall include:
   a. a discussion of project performance and achievements during the reporting period;
   b. injection performance and EOR response;
   c. an analysis of any special monitoring or testing completed during the reporting period;
   d. a discussion of any matrix-bypass events occurring during the reporting period and what steps were or will be taken to address these events; and
   e. any other technical issues or anomalies observed during the reporting period.
6) Within 6 months of the completion of the VRWAG pilot project, the operator must submit to the Commission a report evaluating the effectiveness of the VRWAG process and comparing actual to predicted performance.
7) Any expansion of the pilot project shall require the issuance of a new area injection order after the opportunity for public comment and hearing.
8) If there is any indication of pressure communication or leakage in a pilot VRWAG injection well, the operator must immediately 1) discontinue gas injection in that well, and 2) notify the Commission.
9) If there is any evidence of repressurization of annuli in wells offsetting the VRWAG injectors, gas injection must be discontinued in all VRWAG injectors that could potentially be the source of the repressurization. If the source well(s) can not be readily identified, the operator must immediately cease all gas injection authorized by this administrative approval. The operator must notify the Commission that gas injection has been discontinued.
10) VRWAG injection in any well shut in under condition 8 or 9 above may not be recommenced without prior Commission review and approval.

ENTERED at Anchorage, Alaska, and dated September 9, 2009.

Daniel T. Seamount, Jr.
Chairman

John K. Norman
Commissioner

RECONSIDERATION AND APPEAL NOTICE

As provided in AS 31.05.080(a), within **20** days after written notice of the entry of this order or decision, or such further time as the Commission grants for good cause shown, a person affected by it may file with the Commission an application for reconsideration of the matter determined by it. If the notice was mailed, then the period of time shall be **23** days. An application for reconsideration must set out the respect in which the order or decision is believed to be erroneous.

The Commission shall grant or refuse the application for reconsideration in whole or in part within 10 days after it is filed. Failure to act on it within 10-days is a denial of reconsideration. If the Commission denies reconsideration, upon denial, this order or decision and the denial of reconsideration are **FINAL** and may be appealed to superior court. The appeal **MUST** be filed within **33** days after the date on which the Commission mails, **OR 30** days if the Commission otherwise distributes, the order or decision denying reconsideration, **UNLESS** the denial is by inaction, in which case the appeal **MUST** be filed within **40** days after the date on which the application for reconsideration was filed.

If the Commission grants an application for reconsideration, this order or decision does not become final. Rather, the order or decision on reconsideration will be the **FINAL** order or decision of the Commission, and it may be appealed to superior court. That appeal **MUST** be filed within **33** days after the date on which the Commission mails, **OR 30** days if the Commission otherwise distributes, the order or decision on reconsideration. As provided in AS 31.05.080(b), "[t]he questions reviewed on appeal are limited to the questions presented to the Commission by the application for reconsideration."

In computing a period of time above, the date of the event or default after which the designated period begins to run is not included in the period; the last day of the period is included, unless it falls on a weekend or state holiday, in which event the period runs until 5:00 p.m. on the next day that does not fall on a weekend or state holiday.

David P. Jamieson
Supervisor, Reservoir Engineering
Greater Kuparuk Area Development

ConocoPhillips Alaska, Inc.
700 G Street
Anchorage, AK 99501
Phone 907.265.6543

May 13, 2009

Daniel T. Seamount, Jr., Commission Chair
Alaska Oil and Gas Conservation Commission
333 West 7th Avenue, #100
Anchorage, Alaska 99501-3539

RE: West Sak Viscosity Reducing Water Alternating Gas Pilot Project Administrative Action Application

Dear Mr. Seamount:

Enclosed is the West Sak Viscosity Reducing Water Alternating Gas (VRWAG) Pilot Project Application for Administrative Action under Area Injection Order No. 2B (Rule 9) and Conservation Order No. 406 (Rule 13). The application was also prepared in accordance with 20 AAC 25.450 (Underground Injection Control Variances). ConocoPhillips Alaska, Inc., in its capacity as Operator of the Kuparuk River Unit and the West Sak Participating Area, seeks Alaska Oil and Gas Conservation Commission endorsement and authorization for the proposed project.

Please contact R. Scott Redman (263-4514), Chris Pierson (265-6112), or Bowen Roberts (265-6040) if you have questions or require additional information.

Sincerely,

David Jamieson
Supervisor, Reservoir Engineering
Greater Kuparuk Area Development

cc: King, Warwick
Roberts, Bowen
Seitz, Brian
Rodgers, James

ConocoPhillips

WEST SAK DS1E &DS1J VRWAG PILOT PROJECT

APPLICATION FOR ADMINISTRATIVE ACTION FOR INJECTION OF ENRICHED HYDROCARBON GAS

SECTION A - INTRODUCTION

ConocoPhillips Alaska, Inc., in its capacity as Operator of the Kuparuk River Unit and the West Sak Participating Area, hereby applies for Alaska Oil and Gas Conservation Commission ("Commission") administrative action, under Area Injection Order No. 2B (Rule 9) and Conservation Order No. 406 (Rule 13), to inject an enriched hydrocarbon gas in the West Sak Oil Pool at Drill Sites 1E ("DS-1E") and 1J ("DS-1J") for the purposes of demonstrating the viability of a Viscosity Reducing Water-Alternating-Gas ("VRWAG") enhanced oil recovery project in the West Sak Oil Pool. This project is referred to herein as the West Sak VRWAG ("WS-VRWAG") Pilot Project. This application has also been prepared in accordance with 20 AAC 25.450(b) (Underground Injection Control Variances).

The West Sak Oil Pool injection and production startup was achieved in December 1997. The original development consisted of vertical injectors and producers in a 5-spot pattern configuration on nominal 40-acre spacing. Because of low injectivity and productivity, caused in part by high oil viscosity, producer and injector designs have evolved to long, horizontal wells. The current development includes production and water injection wells drilled from drill sites 1B, 1C, 1D, 1E and 1J. As of December 31, 2008, 55 water injectors and 55 producers were in service. First production from DS-1E began in July, 2004 and from DS-1J in October, 2005. Produced water from the Kuparuk Central Processing Facility (CPF)-1 is currently used for the West Sak waterflood. The West Sak production is commingled with Kuparuk Pool produced fluids at the respective drill sites and ultimately processed at CPF-1. West Sak oil production is currently about 20,000 STB/Day.

The WS-VRWAG Pilot Project is an expansion of the current development plan for the West Sak Reservoir with potential to significantly increase the recovery of oil from that pool. Thus, the Kuparuk and West Sak Working Interest Owners have approved an enriched hydrocarbon gas EOR project at DS-1E and DS-1J, using Kuparuk River Unit existing enriched hydrocarbon gas. Facility modifications have been installed on DS-1E and DS-1J to include the West Sak wells slated for such service. Planned startup for enriched hydrocarbon gas injection is the third quarter of 2009.

The WS-VRWAG Pilot Project will initially target gas injection into the following four patterns:

1E-102: Dual Lateral Injector (D Sand Open to Injection)

1E-117: Tri Lateral Injector (D, B and A Sands Open to Injection)

1J-170: Tri Lateral Injector (D and A Sands Open to Injection)

1J-122: Tri Lateral Injector (D, B and A Sands Open to Injection)

Incremental oil recovery from the WS-VRWAG Pilot Project is expected to be about 4% of the Original Oil in Place (OOIP) of 102 MMSTBO, resulting in 4.0 MMSTB of additional West Sak oil recovery. The WS-VRWAG Pilot Project is expected to require, from KRU, a maximum annual average gas injection rate of 5 to 10 MMSCF/D of enriched hydrocarbon gas.

Additional WS-VRWAG Pilot Project details are addressed in Section B through Section M.

SECTION B - PLOT OF PROJECT AREA

Exhibit B1 is a plot showing the proposed VRWAG Pilot Project boundaries. The boundaries of the West Sak Participating Area ("WSPA") and the proposed WS-VRWAG Pilot Project area are also displayed and are wholly within the Kuparuk River Unit. Exhibit B-2 is a plot showing the locations of all existing injection wells, ¼ mile buffer zones around the injection wells, production wells, abandoned wells, dry holes, and any other wellbores that penetrate the injection zone within the WS-VRWAG Pilot Project in the West Sak Oil Pool. Exhibit B-3 specifies the corners of the boundary of the proposed WS-VRWAG Pilot Project area. Exhibit B-4 specifies the quarter sections wholly or partially in the VRWAG Pilot Project area. The current West Sak water injectors and potential enriched hydrocarbon gas injector locations impacted as part of the WS-VRWAG Pilot Project are identified in Exhibit B-5. Specific approvals for any new injection wells or existing wells to be converted to injection service will be obtained pursuant to 20 AAC 25.005, 25.280 and 25.507, or any applicable successor regulation.

SECTION C - OPERATOR & SURFACE OWNERS

20 AAC 25.402(C)(2)

The WS-VRWAG Project is targeting the West Sak Oil Pool, which is within the Kuparuk River Unit/West Sak Participating Area (WSPA) and is operated by ConocoPhillips Alaska, Inc. The surface owners within one-quarter of a mile radius of the proposed injection area are listed in the following table.

Surface Owners:

State of Alaska
Department of Natural Resources
Division of Oil and Gas
Attention: Ms. Temple Davidson
550 West Seventh Avenue, Suite 800
Anchorage, Alaska 99501

Kuparuk Transportation Company (ADL402294)
Attention: Mr. Bill Sargent
P.O. Box 100360
Anchorage, AK 99510-0360

SECTION D - AFFIDAVIT

20 AAC 25.402(C)(3)

Exhibit D-1 is an affidavit showing that the operators and surface owners within a one-quarter mile radius of the proposed injection area have been provided a copy of this application for injection and Area Injection Order No. 2B.

SECTION E – PROJECT DESCRIPTION

Enhanced recovery injection wells are used for the introduction of additional fluids into the reservoir to increase the ultimate recovery of oil. Currently at DS-1E and DS-1J, one type of injection well is in operation at West Sak Oil Pool; these wells inject produced water providing pressure support to the reservoir. As of December 31, 2008, 7 water injectors and 6 producers were in service at DS-1E and 14 water injectors and 17 producers were in service at DS-1J. Produced water from CPF-1 is used for the West Sak waterflood.

The two West Sak producing drillsites, DS-1E and DS-1J, have production, water injection, and gas lift facilities in place, in conjunction with existing Kuparuk Participating Area ("KPA") facilities.

Exhibit E-1 identifies the objectives, injection wells, scope, schedule, and the data gathering surveillance programs for each of the four injection wells of the WS-VRWAG Pilot Project. Implementation of the WS-VRWAG Pilot Project involves converting 4 existing water injectors to VRWAG service. The four patterns all contain offset production wells in gas lift service with packers and surface casing.

Enriched hydrocarbon gas and water will be injected into the West Sak injectors in a VRWAG process. The enriched hydrocarbon gas will be manufactured and supplied from the existing CPF-1 KRU enriched gas hydrocarbon injection facility. DS-1E and DS-1J both have injection lines from CPF-1 and on pad injection facilities for the 4 VRWAG injectors.

SECTION F - POOL DESCRIPTION

20 AAC 25.402(C)(5)

The D, B, & A-sand intervals of the West Sak Formation, within the Kuparuk River Unit, will be affected by the WS-SSEOR Project. The West Sak Pool is defined by Rule 2 of Conservation Order No. 406 as the strata that are common to, and correlate with, the accumulation found in the Atlantic Richfield Company West Sak River State No. 1 Well between the depths of 3,742 and 4,156 feet, measured depth. Exhibit F-1 shows a type log of the WS-VRWAG Pilot Project area.

SECTION G –FORMATION GEOLOGY

The D, B, and A-sand intervals of the West Sak Formation, within the Kuparuk River Unit, will be affected by the WS-VRWAG Pilot Project. The West Sak Pool is defined by Rule 2 of Conservation Order No. 406 as the strata that are common to, and correlate with, the accumulation found in the Atlantic Richfield Company West Sak River State No. 1 Well between the depths of 3,742 and 4,156 feet, measured depth. The type log is that provided in Area Injection Order No. 2B and is derived from a wellbore within the WS-VRWAG Pilot Project area.

SECTION H – INJECTION WELL CASING DESCRIPTION

Currently, 55 water injectors are in service in the West Sak Oil Pool. At DS-1E and DS-1J, there are six and fourteen injectors, respectively.

API casing specifications are included on each drilling permit application. All casing is cemented in accordance with 20 AAC 25.52(b) and tested in accordance with 20 AAC 25.030(g) when completed. In wells converted to injection, the casing is retested in accordance with 20 ACC 25.412(c).

In newly drilled wells, the casing is pressure tested in accordance to 20 AAC 25.030(g). The casing pressure annulus is then monitored on a daily basis and recorded by the drill site operator.

Injection well tubing sizes in the West Sak Oil Pool injectors may be either 3-1/2" or 4-1/2", with the most common size being a 4-1/2" tubing string. All West Sak water injection wells are completed with L-80 grade steel.

Injection wells within the WS-VRWAG Pilot Project area utilize casing designs as detailed below.

Exhibits H-1 and H-4 show typical wellbore schematics for the four basic completion designs.

The casing program used for injection wells within the WS-VRWAG Pilot Project utilizes three strings of casing:

1E-102 (see Exhibit H-1)

1. 20", 94 lb casing from surface to 80 ft measured depth;
2. 10-3/4", 45.5 lb casing from surface to 3186 ft measured depth;
3. 7-5/8", 29.7 lb casing from surface to a measured depth of 6498 ft.
4. 4-1/2", 12.6 lb slotted liner from top of West Sak Formation to TD.
5. 4-1/2", 12.6 lb tubing from surface to 4-1/2" liner.

1E-117 (see Exhibit H-2)

1. 20", 94 lb casing from surface to 80 ft measured depth;
2. 13-3/8", 68 lb casing from surface to 4537 ft measured depth;
3. 9-5/8", 40 lb casing from surface to a measured depth of 10,572 feet.
4. 5-1/2", 15.5 lb liner from top of West Sak Formation to TD.
5. 4-1/2", 12.6 lb tubing from surface to 5-1/2" liner.

1J-122 (see Exhibit H-3)

1. 20", 94 lb casing from surface to 80 ft measured depth;
2. 13-3/8", 68 lb casing from surface to 3640 ft measured depth;
3. 9-5/8", 40 lb casing from surface to a measured depth of 11,928 feet.
4. 5-1/2", 15.5 lb liner from top of West Sak Formation to TD.
5. 4-1/2", 12.6 lb tubing from surface to 5-1/2" liner.

1J-170 (see Exhibits H-4)

1. 20", 94 lb casing from surface to 108 ft measured depth;
2. 10-3/4", 45.5 lb casing from surface to a measured depth of 3041ft.
3. 7-5/8", 29.7 lb casing from surface to a measured depth of 11,928 feet.
4. 4-1/2", 11.6 lb slotted liner from top of West Sak Formation to TD.
5. 4-1/2", 12.6 lb tubing from surface to 4-1/2" liner.

SECTION I – INJECTION FLUIDS

The WS-VRWAG Pilot Project will initially use existing KRU enriched hydrocarbon gas from CPF-1 and CPF-2 and be managed in conjunction with the existing KRU EOR patterns. The expected enriched hydrocarbon gas composition is shown in Exhibit I-1. The pilot could move to a leaner gas injection blend based on changes in Kuparuk WAG injectors at 1D and 1E and future NGL imports from Prudhoe. The WS-VRWAG Pilot Project is expected to inject 5 to 10 MMSCF/D of enriched hydrocarbon gas into the West Sak reservoir.

Produced water is currently used for the West Sak waterflood. The WS-VRWAG Pilot Project will involve water injection alternating with enriched hydrocarbon gas injection to improve the enriched hydrocarbon injectant sweep in the reservoir.

Injection fluid information pertaining to the WS-VRWAG Pilot Project is given below.

Type of Fluid: Kuparuk lean gas to KRU enriched hydrocarbon gas injectant.

Composition Of Fluid: See Exhibit I-1.

Source Of Fluid: KRU lean gas enriched with KRU indigenous NGLs and imported NGLs from Prudhoe Bay.

Estimated Maximum Gas Injection: 5 to 10 million standard cubic feet per day.

Compatibility With Formation And Confining Zones: Enriched hydrocarbon gas injected into the West Sak Oil Pool will be manufactured at CPF-1 and CPF-2 according to the specifications of KRU Large Scale EOR Project. Given that the hydrocarbon components in the injectant are also found in the West Sak crude oil at a lower concentration, no compatibility problems between the enriched hydrocarbon gas and the minerals in the formation are anticipated.

SECTION J – INJECTION PRESSURES

The estimated wellhead and bottomhole injection pressures for the WS-VRWAG Pilot Project are listed in the following table.

Injection Type	Estimated Wellhead Pressure (PSIG)		Estimated Bottomhole Pressure (PSIG)	
	Average	Range	Average	Range
West Sak Water Injection	750	500-1000	2,300	2,050-2,550
West Sak Enriched Hydrocarbon Gas Injection	2,050	1,700-2,400	2,300	1,950-2,650

SECTION K – FRACTURE INFORMATION

The estimated maximum injection rates for the WS-VRWAG Pilot Project wells will not initiate or propagate fractures through the confining strata and, therefore, will not allow injection or formation fluid to enter any freshwater strata. There are no indications of injection out of zone for the current water injectors at West Sak.

Existing water injection operations in the West Sak Oil Pool have been at or above formation parting pressure to improve recovery of oil. In no instance have such injection pressures breached the integrity of the confining zone. The West Sak Formation is overlain by a 100-140 foot thick mudstone and clay formation (K13 Shale). This confining sequence tends to behave as a plastic medium and can be expected to contain significantly higher pressures than the West Sak formation sandstones. Extensive fracture testing confirmed that even at bottom hole pressures significantly above the initial parting pressure, the fluids continued to be confined by a relatively thin (~15-20 ft) shale/mudstone interval, provided that an adequate casing cement bond is present. All injectors that are currently online have had a cement bond log to confirm adequate cement isolation between the West Sak formation and the above strata prior to commencing water injection service.

Fracture stimulation data from the West Sak Formation indicate a fracture gradient of between 0.6 and 0.7 psi/ft under initial reservoir conditions. Proppant injection pressures as high as 7,000 psig (about 2.0 psi/ft injection gradient) showed no fracture growth across any confining shale zones. In addition, long-term water injection above 0.9 psi/ft in the West Sak sands tend to part the formation horizontally, rather than fracture vertically, thus keeping all injection fluids within the intended interval.

The West Sak Formation in the DS-1E and DS-1J area is underlain by the Colville Group, a sequence of impermeable inter-bedded mudstones and shales over 1000 feet in thickness. The Colville Group lithologies have similar confining properties as the overlaying K13 Shale sequence, and no injection or fracture propagation below the West Sak is anticipated.

SECTION L – HYDROCARBON RECOVERY

The proposed VR-WAG process consists of the injection of enriched hydrocarbon gas into a nearly-saturated oil reservoir alternated with the injection of water. Injection of enriched gas results in a modification of reservoir oil that promotes improved recovery (by swelling the oil and reducing oil viscosity) and provides energy and drive mechanisms to force the oil to a production well.

VR-WAG is an enhanced oil recovery method. Reservoir simulation studies and laboratory testing under field conditions have verified that recovery can be substantially increased when compared to the injection of water alone.

This method is not appropriate for all applications, but has been proven effective where the following conditions prevail:

1) The crude oil-in-place is sufficiently viscous that it leaves behind an abnormally high residual oil saturation to waterflood;
2) The injected gas can significantly swell the oil and reduce the viscosity of the oil in place.

Three multi-contact experiments were performed on D Sand oil samples from West Sak Pilot Well 8I at a Commercial Laboratory (Westport). The first experiment used composition of Viscosity Reducing Injectant ("VRI") injection gas shown in Exhibit L-1 and the experiment was run at 1600 psig and 74 deg F, which are representative reservoir conditions for the VRWAG Pilot Project. The second and third experiments used West Sak solution gas, which has a composition shown in Exhibit L-1.

Laboratory tests on West Sak 8I D Sand showed that multiple gas contacts can significantly improve West Sak oil properties at reservoir conditions. In the first experiment, enriched gas condensed into the oil and increased the amount of gas in solution from 191 scf/stb to 515 scf/stb over four contacts.

Adding additional gas into the crude oil affects oil properties in two ways:

1) It significantly reduces the viscosity of the crude oil. When gas in solution increases from 191 to 515 scf/STB, laboratory test show that oil viscosity at reservoir conditions decreases from 60 to 10 centipoises. This is an 83% reduction compared to the initial oil viscosity (See Exhibit L-2).

2) It causes the reservoir oil to swell. The specific oil volume increases from 1.10 cc/g with 191 scf/STB dissolved in the oil up to 1.17 cc/g when the oil contains 515 scf/STB. This is a 6% increase over the initial oil volume (see Exhibit L-3). This oil swelling increases the oil saturation in the reservoir, which allows some of the swollen oil to flow to the production wells and increases the recovery factor in the proposed water-alternating-gas process.

The laboratory experiments were simulated with an existing 15 component equation of state (EOS) for West Sak. The original viscosity prediction for West Sak 8I D Sand oil was adjusted to match experimental initial oil viscosity. After this adjustment, the tuned Equation of State accurately predicted the experimental viscosity decrease with multiple gas contacts for West Sak 8I D Sand oil (see Exhibit L-2) and the increase in specific oil volume with multiple gas contacts (see Exhibit L-3).

Four multi-contact EOS predictions were made for the WSP 8I D sand oil and four alternative gas compositions: 100% Methane (0% C2+), West Sak Solution Gas (4% C2+), Kuparuk Lean Gas (16% C2+),

VRI (22% C2+), VRIx2 (28% C2+), and KRU MI (34% C2+). The viscosity reduction increases with increasing hydrocarbon enrichment (see Exhibit L-2). The specific oil volume increase is also larger with increasing hydrocarbon enrichment (see Exhibit L-3).

Additional numerical simulations have been used to estimate the incremental oil recovery expected from implementing the VR-WAG process in the West Sak reservoir. This simulation employed a finely-gridded, three-dimensional geostatistical representation of the West Sak stratigraphy, which has been used extensively to predict waterflood recovery. This simulation employed a fully compositional representation of the properties of the reservoir and injected fluids. Results for the West Sak D Sand oil recovery versus time are shown in Exhibit L-4 and for oil recovery versus hydrocarbon pore volume of gas and water injection are shown in Exhibit L-5. The type pattern model recoveries shown have been multiplied by a 67% de-rate factor to account for reservoir conformance, matrix bypass events and throughput uncertainties. The incremental oil recoveries increased from 3% to 6% OOIP as the Enriched Fluid loading increased from 0 BBL/MSCF of gas injectant for the CPF-1 Lean Gas Composition to 150 BBL/MSCF for the Kuparuk Miscible Injectant composition (Exhibits I-1 shows gas compositions and L-6 shows incremental oil recovery as the Enriched loading increased from 0 to 150 BBL/MSCF).

Current West Sak operations at DS-1E and DS-1J involve pattern waterflooding, which is expected to yield an estimated total oil recovery of approximately 15% to 20% OOIP in the West Sak Oil Pool. The planned WS-VRWAG Pilot Project is estimated to nominally increase oil recovery by an additional 4.0 MMSTB of oil, or approximately 4% OOIP of the targeted oil column at DS-1E and DS-1J, based on a total enriched hydrocarbon gas injection of 20% of the area's hydrocarbon pore volume (see Exhibits L-6).

SECTION M – CONFINEMENT IN OFFSET WELLS

The wells within, and in close proximity, of the WS-VRWAG Pilot Project area are shown in Exhibit B-2. To the best of ConocoPhillips Alaska Inc.'s knowledge, the wells within the area were constructed, and where applicable, abandoned to prevent the movement of fluids into freshwater sources.

The WS-VRWAG Pilot Project area was selected to ensure the injection of fluid into the West Sak Formation would not result in an increased risk of fluid movement into underground sources of drinking water or other hydrocarbon bearing formations. The initial selection criterion included an evaluation of the drilling and completion of all West Sak, Kuparuk and exploration wells in the proposed DS-1E and DS-1J area. Wells were evaluated for initial cement placement information, cement tops and cement integrity data, including bond logs. A further evaluation of all the mechanical integrity tests of the injection wells was then conducted, and all problem wells were also excluded.

Exhibit M-1 provides details on the mechanical integrity of all wells within ¼ mile of the injectors in WS-VRWAG Area I (defined in Exhibit B-1). Summaries of the mechanical integrity of the four injection wells and the offset wells within ¼ mile of the injectors for the VRWAG Pilot Project are provided in Exhibits M-2 to M-5.

LIST OF EXHIBITS

LIST OF EXHIBITS (CONTINUED)

M-1 WEST SAK VRWAG PILOT PROJECT – CONFINEMENT IN OFFSET WELLS

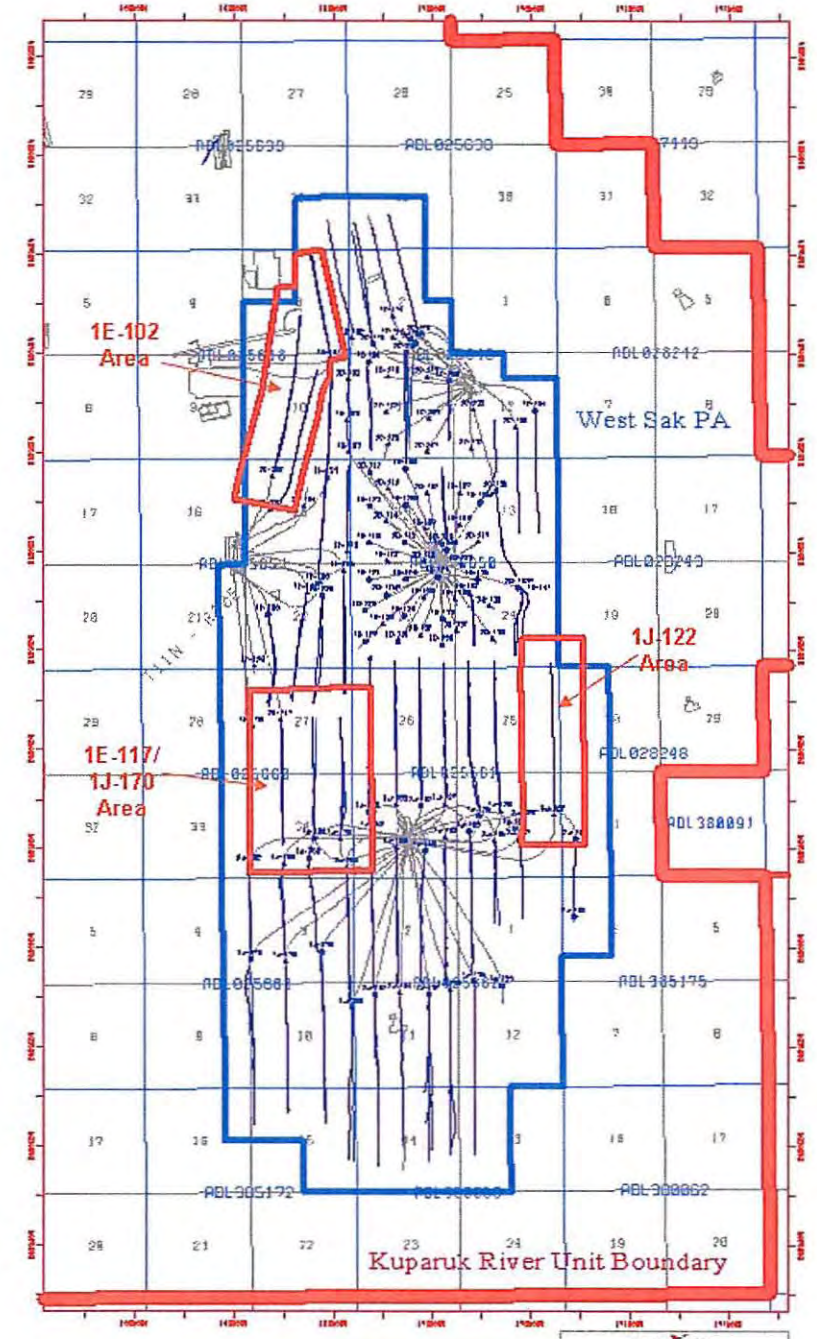
M-2 WEST SAK VRWAG PILOT PROJECT – INJECTOR 1E-102

M-3 WEST SAK VRWAG PILOT PROJECT – INJECTOR 1E-117

M-4 WEST SAK VRWAG PILOT PROJECT – INJECTOR 1J-170

M-5 WEST SAK VRWAG PILOT PROJECT – INJECTOR 1J-122

EXHIBIT B-1: PLOT OF THE WEST SAK – VRWAG PILOT PROJECT



~~CONFIDENTIAL~~

AS 38.05.035

per CPA 9/11/09

EXHIBIT B-2: PLOT OF THE WEST SAK – VRWAG PILOT INJECTION WELLS

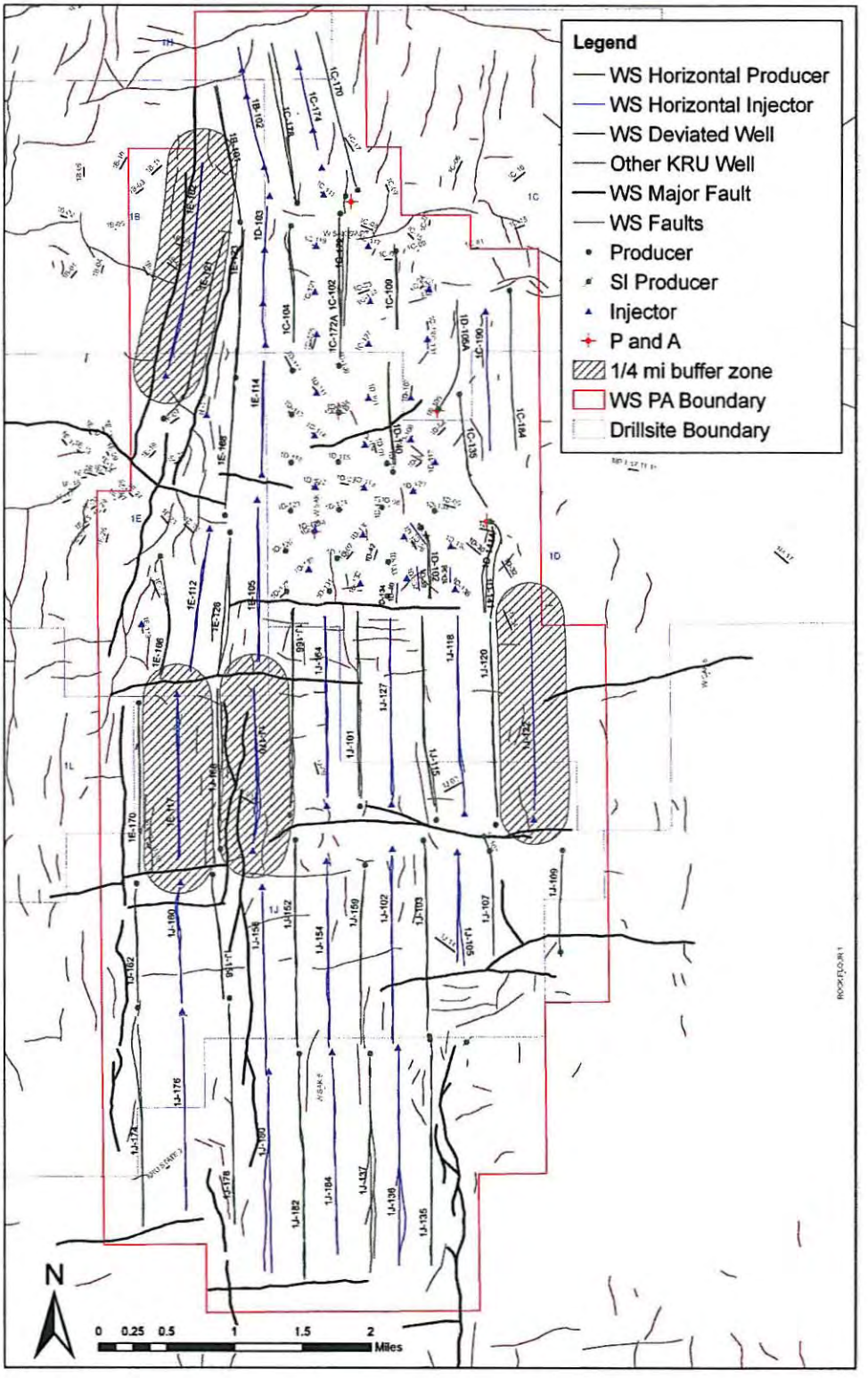


EXHIBIT B-3: WEST SAK VRWAG PILOT PROJECT AREA

AREA	X - ASP4 NAD83	Y - ASP4 NAD83
1E-102 Area	1693038	5974932
1E-102 Area	1693810	5975134
1E-102 Area	1694416	5975153
1E-102 Area	1695601	5969768
1E-102 Area	1694828	5969655
1E-102 Area	1694847	5968807
1E-102 Area	1694602	5968411
1E-102 Area	1694413	5967978
1E-102 Area	1694131	5966658
1E-102 Area	1693509	5964133
1E-102 Area	1693056	5962324
1E-102 Area	1693038	5962079
1E-102 Area	1690023	5962663
1E-102 Area	1690438	5964434
1E-102 Area	1691418	5968166
1E-102 Area	1692134	5973330
1E-102 Area	1693038	5973330
1E-102 Area	1693038	5974932
1E-117_170 Area	1690757	5952922
1E-117_170 Area	1696848	5953236
1E-117_170 Area	1696949	5943992
1E-117_170 Area	1690791	5943774
1E-117_170 Area	1690826	5951206
1E-117_170 Area	1690757	5952922
1J-122 Area	1704570	5955664
1J-122 Area	1707586	5955705
1J-122 Area	1707752	5945270
1J-122 Area	1704528	5945187
1J-122 Area	1704694	5946468
1J-122 Area	1704611	5948369
1J-122 Area	1704487	5952916
1J-122 Area	1704446	5954196
1J-122 Area	1704570	5955664

EXHIBIT B-4: VRWAG PILOT PROJECT – QUARTER SECTIONS WHOLLY OR PARTIALLY IN THE PROJECT AREA

Area	Meridian	Township	Range	Section	Portions
1E-102 Area	Umiat	11N	10E	3	All
1E-102 Area	Umiat	11N	10E	10	All
1E-102 Area	Umiat	11N	10E	15	N 1/2
1E-102 Area	Umiat	11N	10E	16	NE 1/4
1E-117_170 Area	Umiat	11N	10E	26	W 1/2
1E-117_170 Area	Umiat	11N	10E	27	All
1E-117_170 Area	Umiat	11N	10E	34	All
1E-117_170 Area	Umiat	11N	10E	35	W 1/2
1J-122 Area	Umiat	11N	10E	24	SE 1/4
1J-122 Area	Umiat	11N	10E	25	E 1/2
1J-122 Area	Umiat	11N	10E	36	E 1/2
1J-122 Area	Umiat	11N	11E	19	SW 1/4
1J-122 Area	Umiat	11N	11E	30	W 1/2
1J-122 Area	Umiat	11N	11E	31	W 1/2

EXHIBIT B-5: PROPOSED WEST SAK-VRWAG INJECTION WELLS

Proposed WS-VRWAG Injectors
1E-102 – Dual Lateral Horizontal Injector
1E-170 – Tri Lateral Horizontal Injector
1J-122 – Tri Lateral Horizontal Injector
1J-170 – Tri Lateral Horizontal Injector

EXHIBIT D-1: AFFIDAVIT

STATE OF ALASKA

THIRD JUDICIAL DISTRICT

I, David P. Jamieson, declare and affirm as follows:

1. I am the Supervisor of Greater Kuparuk Area Satellite Development for ConocoPhillips Alaska, Inc., the designated operator of the Kuparuk River Unit, and as such have responsibility for West Sak operations.

2. On May 13, 2009, I caused copies of the Application for Injection and Area Injection Order No. 2B with regard to the West Sak Viscosity Reducing Water Alternating Gas Pilot Project in the West Sak Oil Pool to be provided to the following surface owners and operators of all land within a quarter-mile radius of the proposed injection areas:

Operator:

ConocoPhillips Alaska, Inc.
Attention: Mr. David P. Jamieson
P.O. Box 100360
Anchorage, AK 99510-0360

Surface Owners:

State of Alaska
Department Of Natural Resources
Division of Oil and Gas
Attention: Ms Temple Davidson
550 West Seventh Avenue, Suite 800
Anchorage, Alaska 99501

Kuparuk Transportation Company
P.O. Box 100360
Anchorage, AK 99510-0360

Dated: May 13, 2009.

D Jamieson

David P. Jamieson

KRISTIE D. ARMBRUST
My Commission Expires
NOTARY PUBLIC
May 6, 2010
STATE OF ALASKA

Declared and affirmed before me this 13th day of May, 2009.

Kristie D. Armbrust

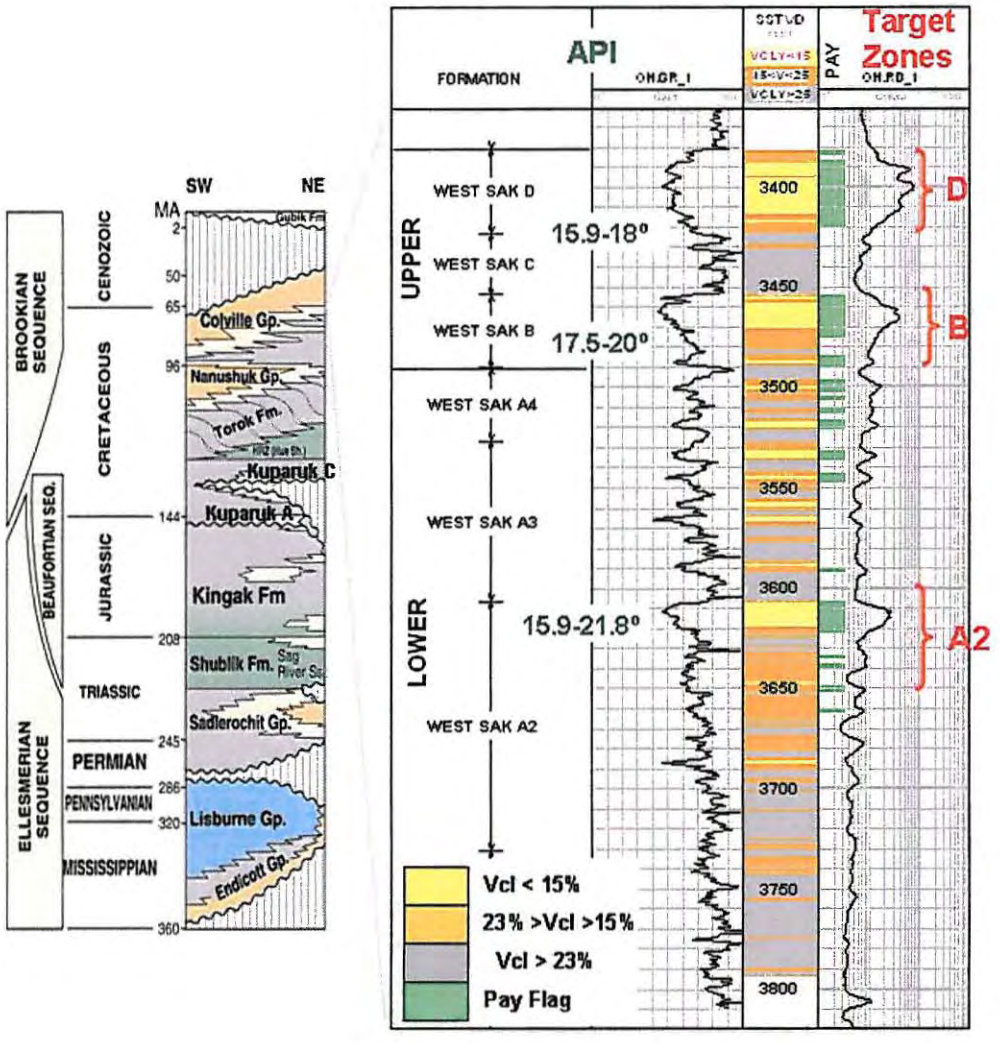
Notary Public in and for Alaska

My commission Expires: May 6, 2010

Exhibit E-1 – VRWAG PILOT PROJECT SCOPE, SCHEDULE, AND SURVEILLANCE DATA

Objectives	• Determine initial gas breakthrough times for horizontal injectors.
Injection Well(s)	• 1E-102, 1E-117, 1J-122 and 1J-170 (existing wells). • Currently active water injection wells in the West Sak Oil Pool waterflood project. • 1E-102 is a D-sand only injector • 1E-117 and 1J 122 are D/B/A2 sand horizontal injectors. • 1J-170 is a D/A-sand horizontal injector
Scope	• Injection of gas injection into 1E-102, 1E-117, 1J-122 and 1J-170 for a nominal period of three months. • Upon completion of gas injection place 1E-102, 1E-117, 1J-122 and 1J-170 on water injection for a nominal period of three months. • Repeat the process for an additional five gas and five water cycles. • Expected total volume of gas and water injected per well is 1700 MMSCF and 550 MBW, respectively, over 36 months.
Expected Schedule	***1E-102/1E-117*** • Start up of first VRWAG cycle in 2nd Qtr 2009. • Complete last VFWAG cycle in January 2012. ***1J-122/1J-170*** • Start up of first VRWAG cycle in 3rd Qtr 2009. • Complete last VFWAG cycle in January 2012. • Completion of objectives by April 2012.
Surveillance Data	Injection Wells • Injection rates – Daily • Wellhead injection pressures - Daily Offset Production Wells • Well test (total liquid production, watercut, gas production) – twice monthly

EXHIBIT F-1 - WEST SAK TYPE LOG



West Sak Reservoir in Core Area

- **Upper Cretaceous shallow marine sandstones**
- **Single and amalgamated Hummocky Cross Stratified Beds (HCS)**
- **Good lateral continuity**
- **Net Pay: 80 – 90 feet**
- **D, B and A2 sands are horizontal targets**
- **Very Fine grained, poorly consolidated**
- **Porosity 25% - 32%, Permeability 150 md (10 -3000 md)**
- **Biodegraded Prudhoe Type Oil (16°-22° API)**

EXHIBIT H-1 WEST SAK 1E-102 DUAL LATERAL HORIZONTAL INJECTOR

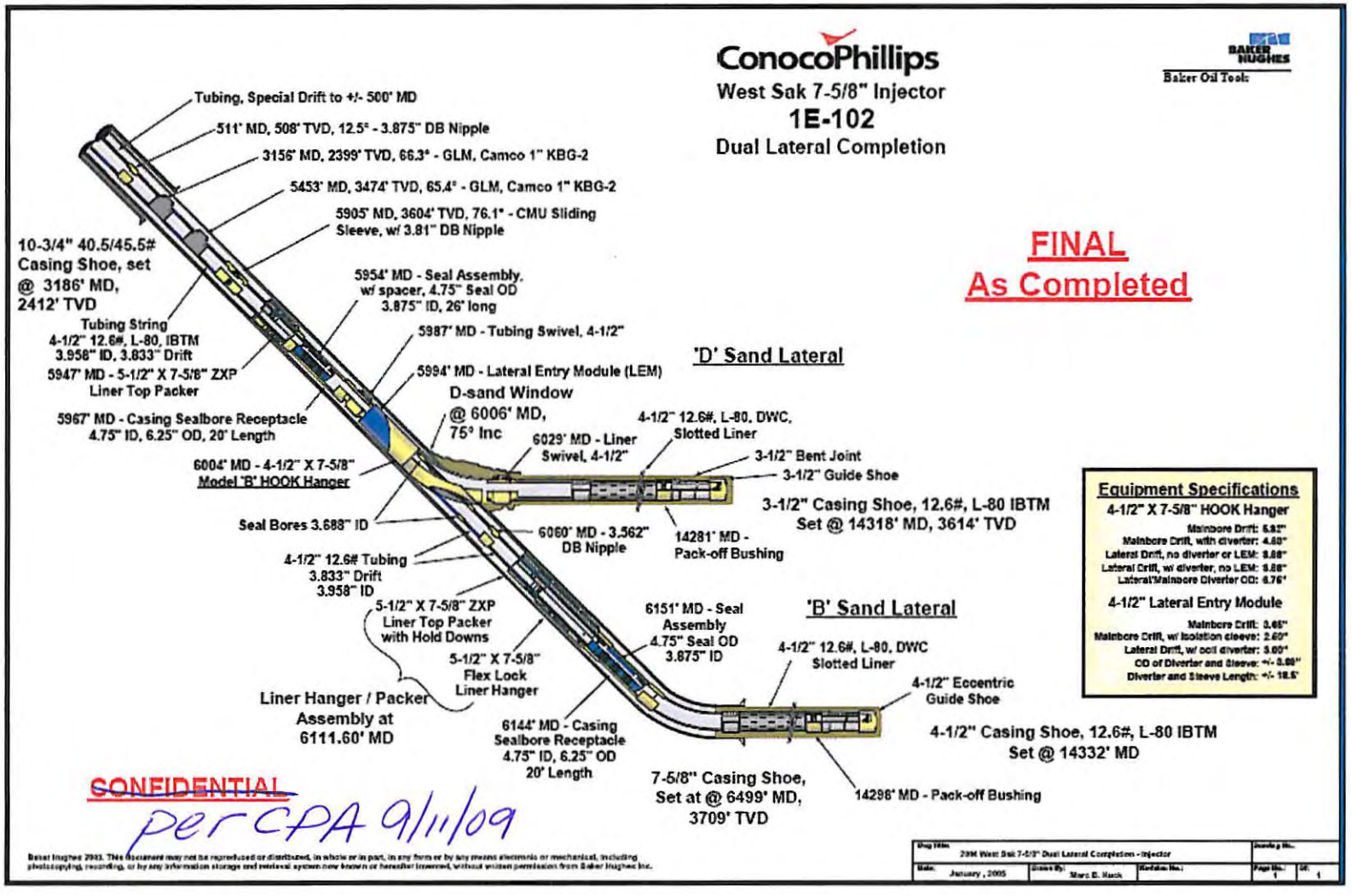


EXHIBIT H-2 WEST SAK 1E-117 TRI LATERAL HORIZONTAL INJECTOR

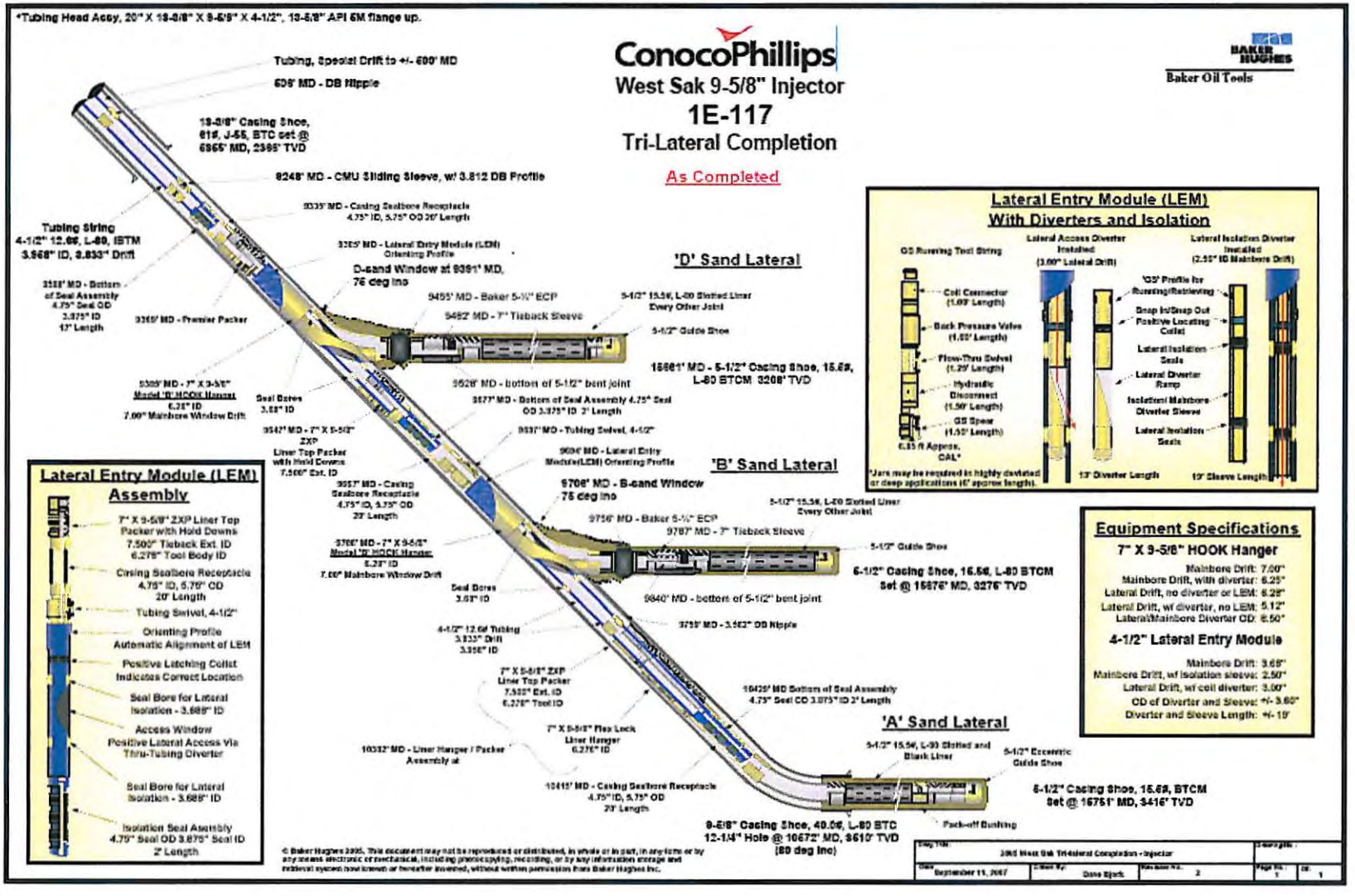


EXHIBIT H-3 WEST SAK 1J-122 TRI LATERAL HORIZONTAL INJECTOR

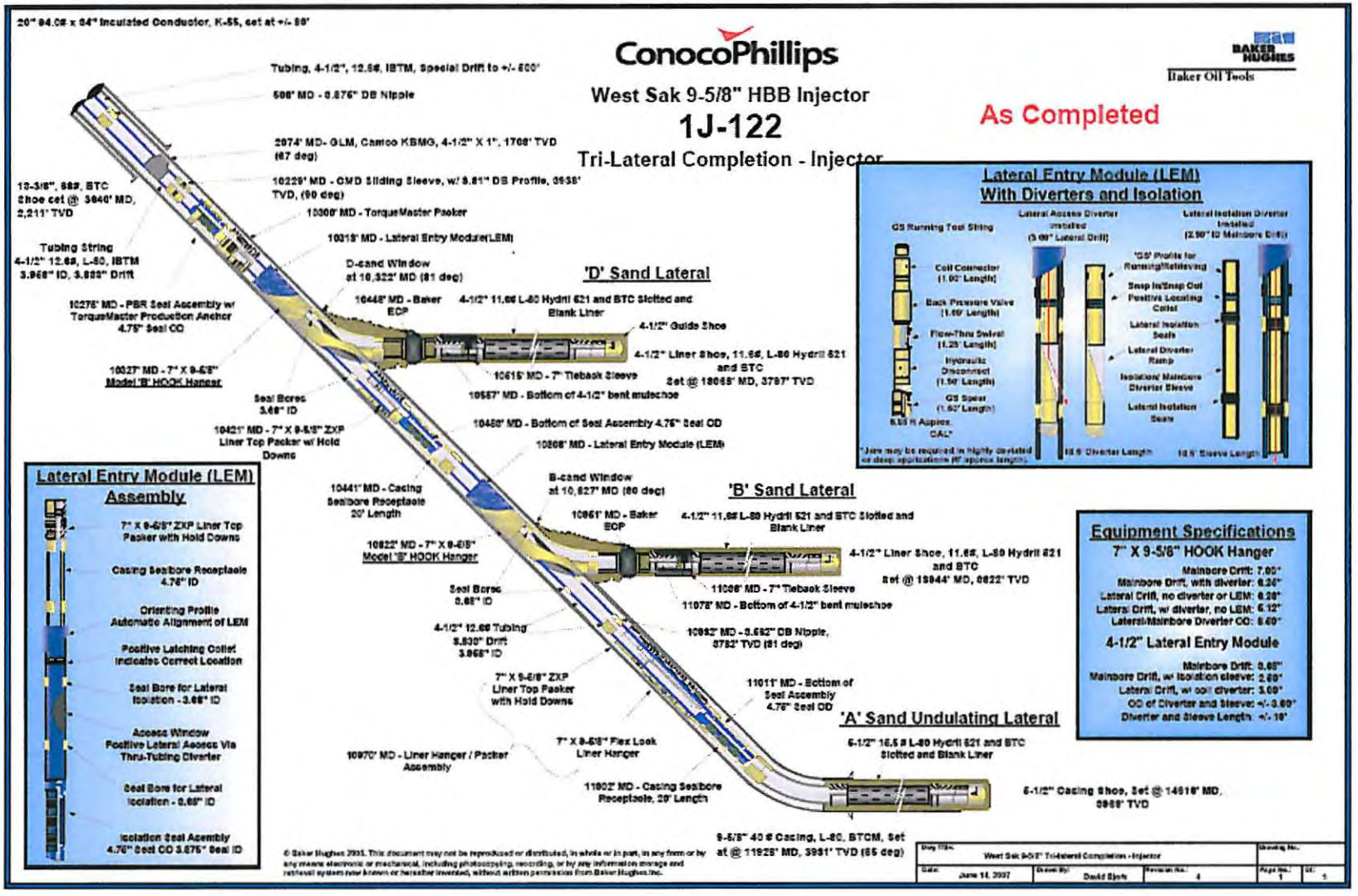


EXHIBIT H-3 WEST SAK 1J-170 TRI LATERAL HORIZONTAL INJECTOR

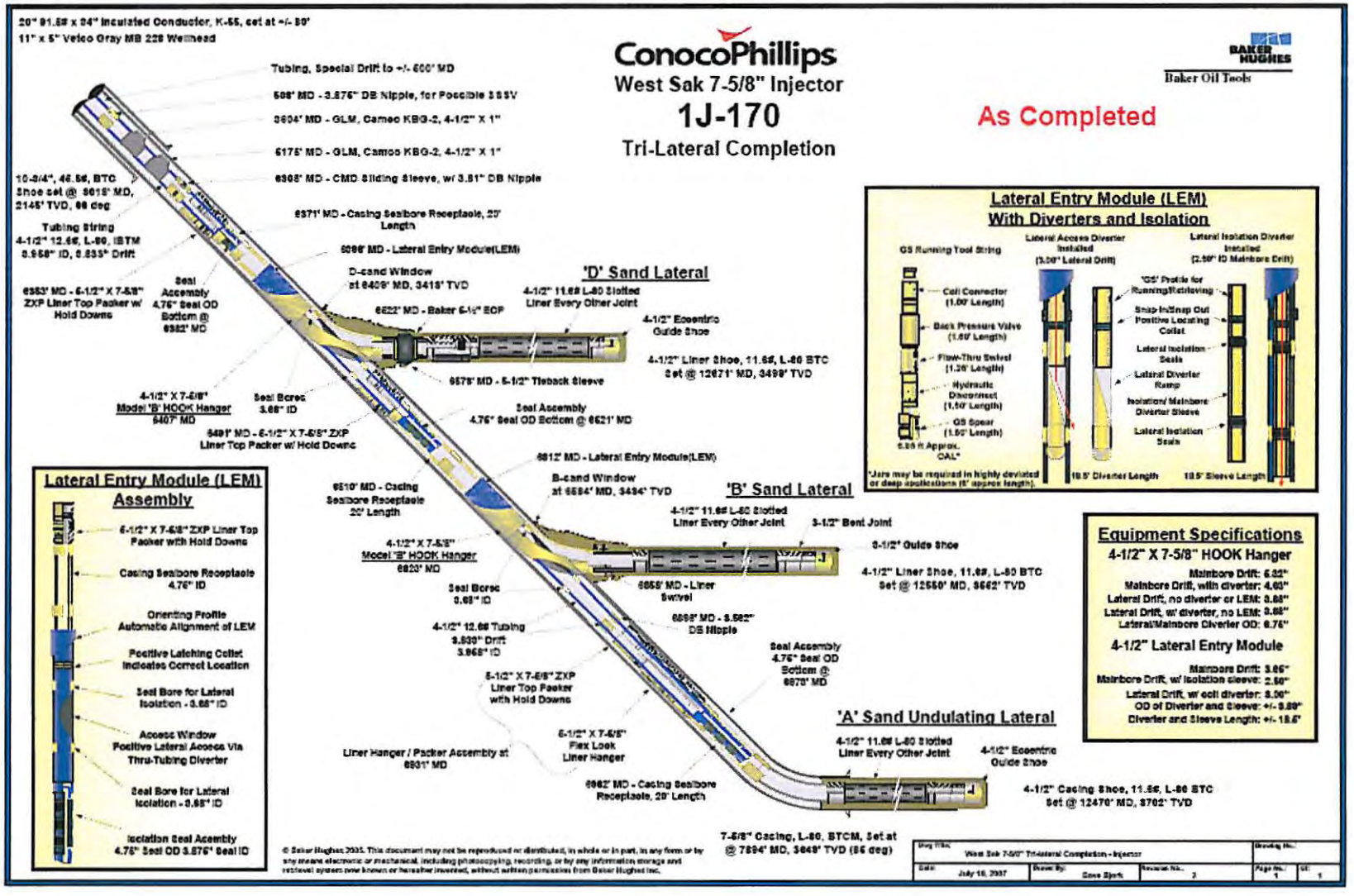


EXHIBIT I-1: WEST SAK VRWAG PIILOT PROJECT, GAS INJECTANT COMPOSITIONS (MOLE %)

	CPF-1 Lean Gas	Enriching Liquid	West Sak VRI	West Sak VRIx2	Kuparuk MI
Nitrogen	0.39%	0.11%	0.34%	0.28%	0.32%
CO2	1.17%	1.40%	1.21%	1.26%	0.73%
Methane	84.47%	53.65%	78.06%	71.66%	69.67%
Ethane	7.45%	14.56%	8.93%	10.41%	6.90%
Propane	3.76%	13.99%	5.88%	8.01%	5.44%
i-Butane	0.72%	3.70%	1.34%	1.96%	2.30%
n-Butane	1.46%	8.37%	2.90%	4.33%	6.27%
i-Pentane	0.25%	1.73%	0.56%	0.87%	1.81%
n-Pentane	0.23%	1.69%	0.54%	0.84%	2.16%
n-Hexane	0.08%	0.68%	0.21%	0.33%	1.90%
n-Heptane	0.01%	0.10%	0.03%	0.05%	1.61%
n-Octane	0.00%	0.02%	0.01%	0.01%	0.74%
n-Nonane	0.00%	0.00%	0.00%	0.00%	0.08%
n-Decane	0.00%	0.00%	0.00%	0.00%	0.07%
	100.00%	100.00%	100.00%	100%	100.00%

Notes:

1. Initial gas injectant is planned to be Kuparuk MI
2. Potential leaner gas injectant blends are possible based on changes in Kuparuk 1D and 1E WAG Injection and future NGL imports from Prudhoe.
3. Enriched Fluid Loading for the potential VRWAG gas injection blends are 0 BBL/MSCF for CPF-1 Lean Gas, 50 BBL/MSCF for West Sak VRI, 100 BBL/MSCF for VRIx2 and 150 BBL/MSCF for Kuparuk MI.

EXHIBIT L-1 WEST SAK MULTICONTACT EXPERIMENTS – GAS INJECTION COMPOSITIONS

	West Sak VRI	WS Solution Gas
Nitrogen	0.35%	0.21%
CO2	1.30%	0.10%
Methane	76.82%	96.66%
Ethane	9.53%	0.71%
Propane	6.09%	0.19%
i-Butane	1.41%	0.59%
n-Butane	3.04%	0.37%
i-Pentane	0.62%	0.58%
n-Pentane	0.59%	0.10%
n-Hexane	0.22%	0.22%
n-Heptane	0.04%	0.27%
n-Octane	0.00%	0.01%
n-Nonane	0.00%	0.00%
n-Decane	0.00%	0.00%
	100.00%	100.00%

Notes:
1. West Sak Viscosity Reducing Injectant (VRI) composition used for 1st Multi-contact Experiment
2. West Sak Solution Gas composition used for the 2nd and 3rd Multi-contact Experiments

EXHIBIT L-2 WEST SAK MULTICONTACT EXPERIMENTS – VISCOSITY VS NUMBER OF GAS CONTACTS

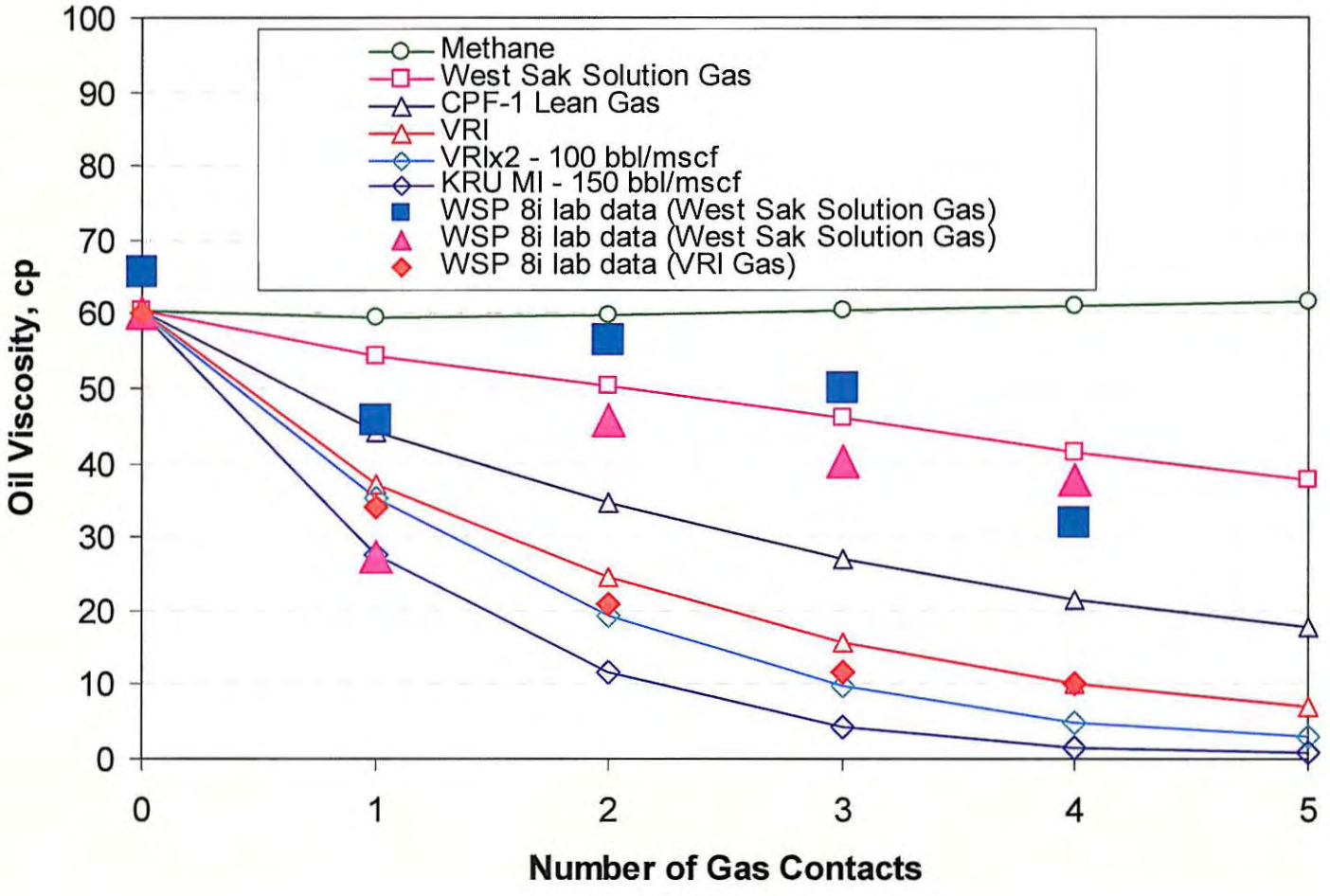


EXHIBIT L-3 WEST SAK MULTICONTACT EXPERIMENTS – VISCOSITY VS NUMBER OF GAS CONTACTS

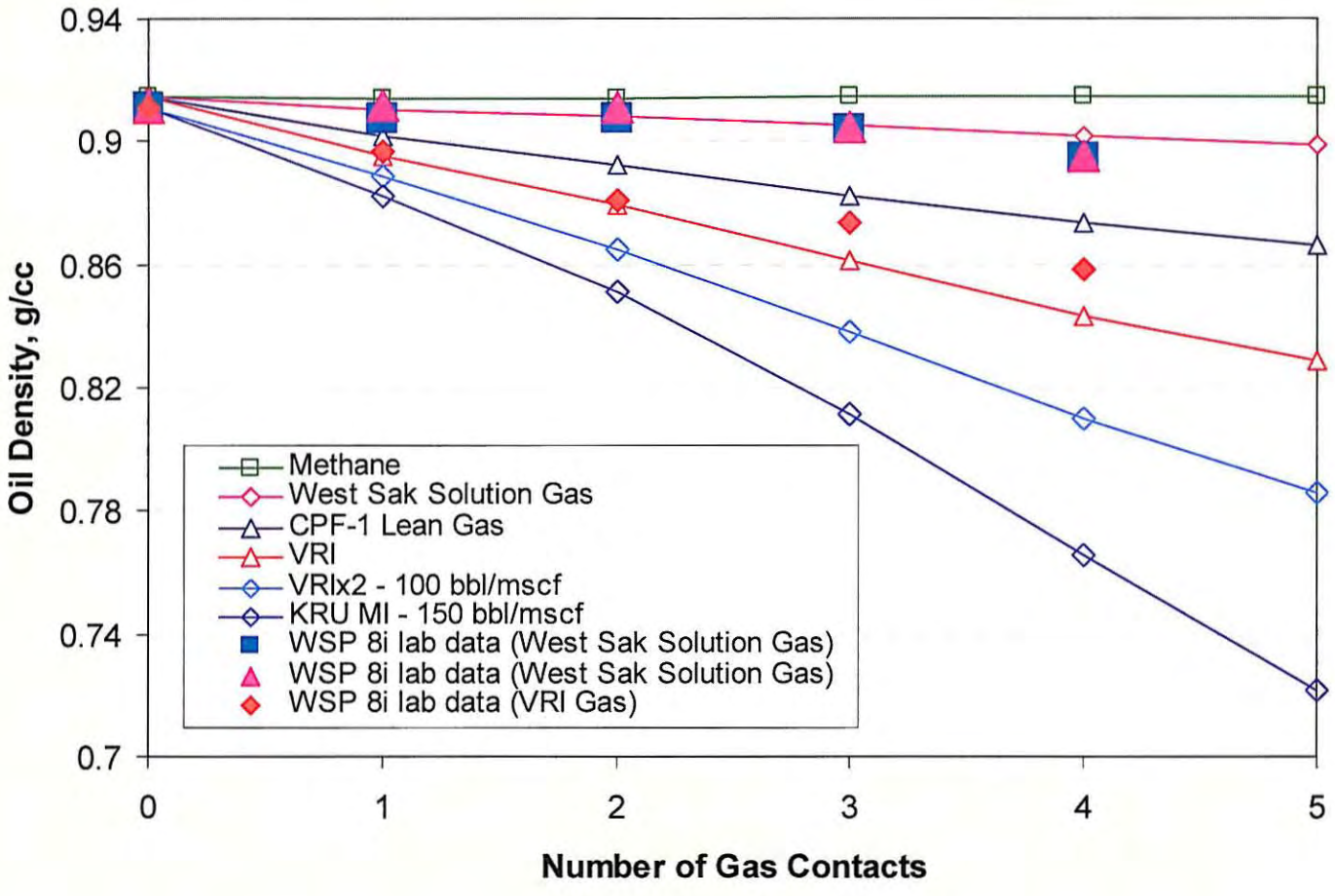


EXHIBIT L-4 WEST SAK D SAND TYPE PATTERN MODEL – OIL RECOVERY VS TIME

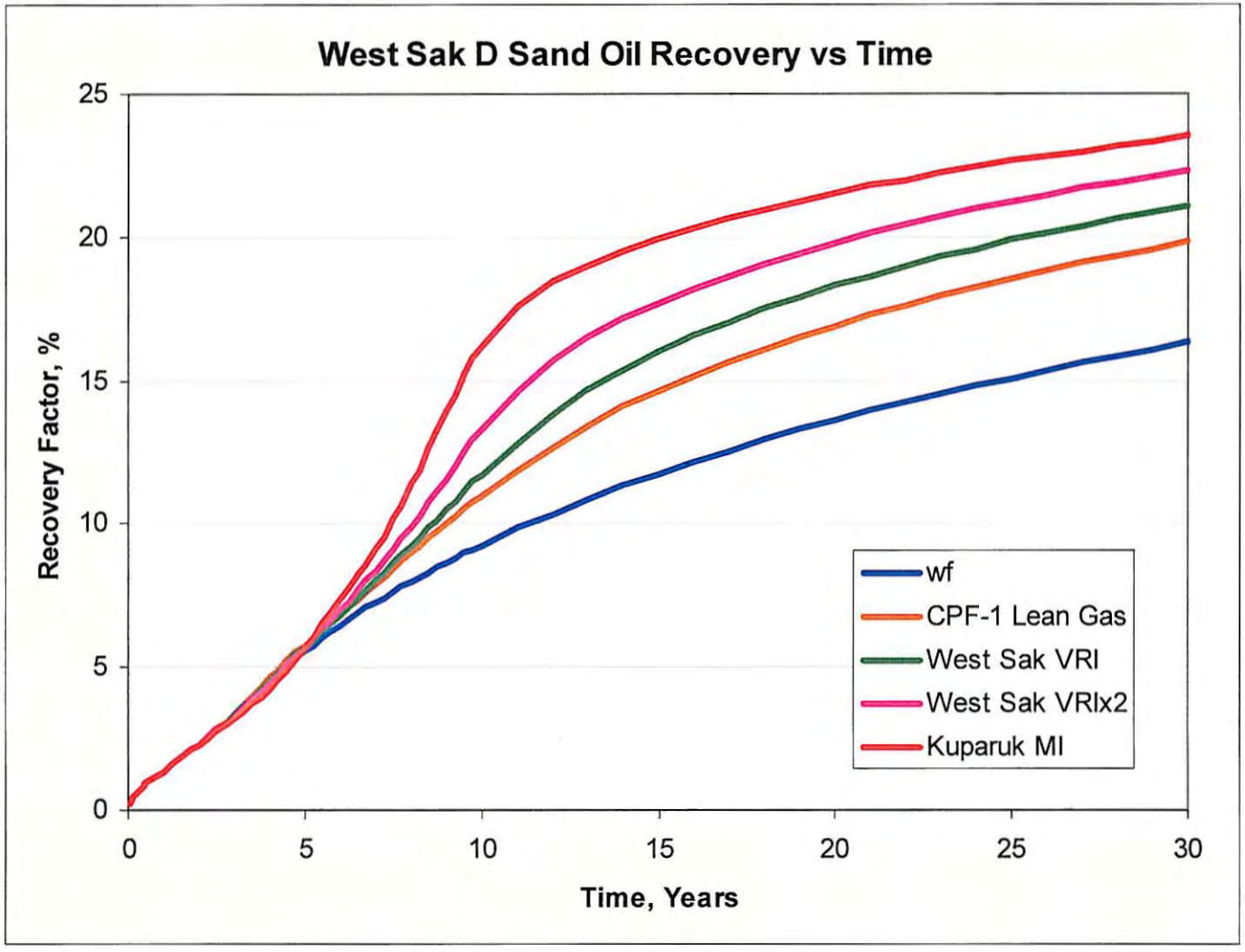


EXHIBIT L-5 WEST SAK D SAND TYPE PATTERN MODEL – OIL RECOVERY VS HPVI

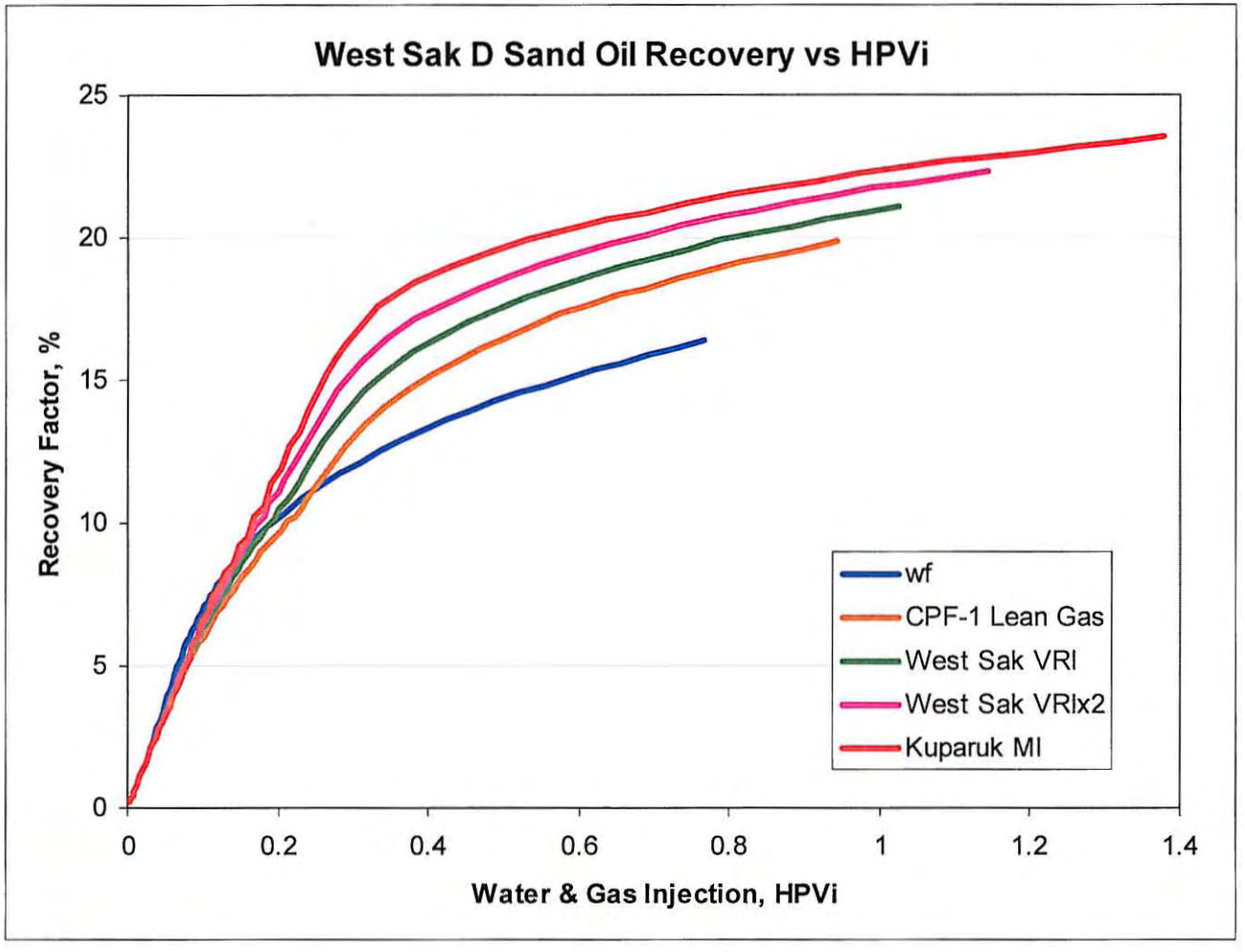
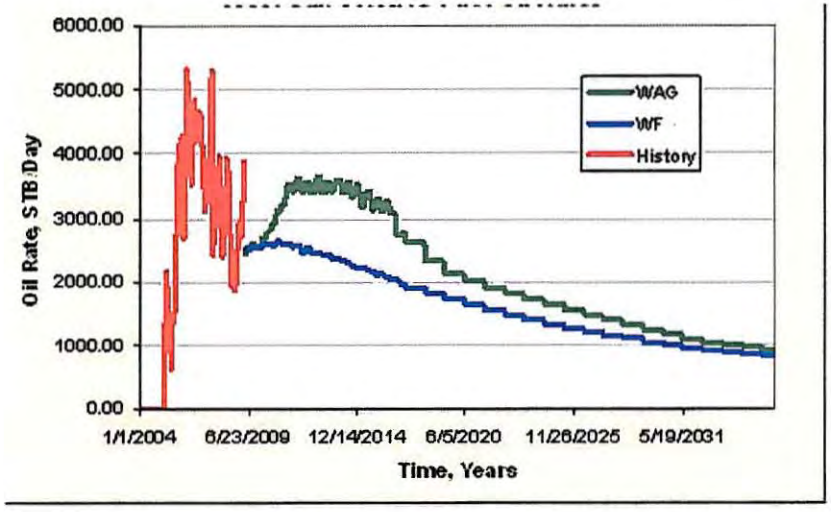
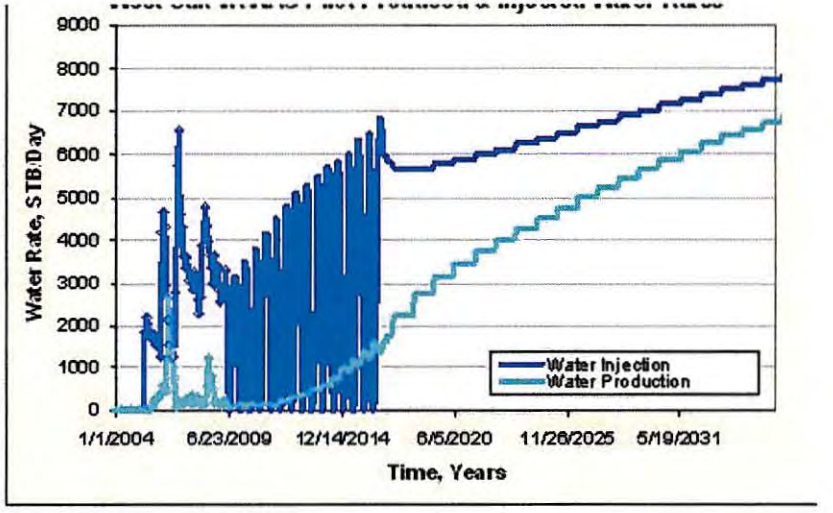
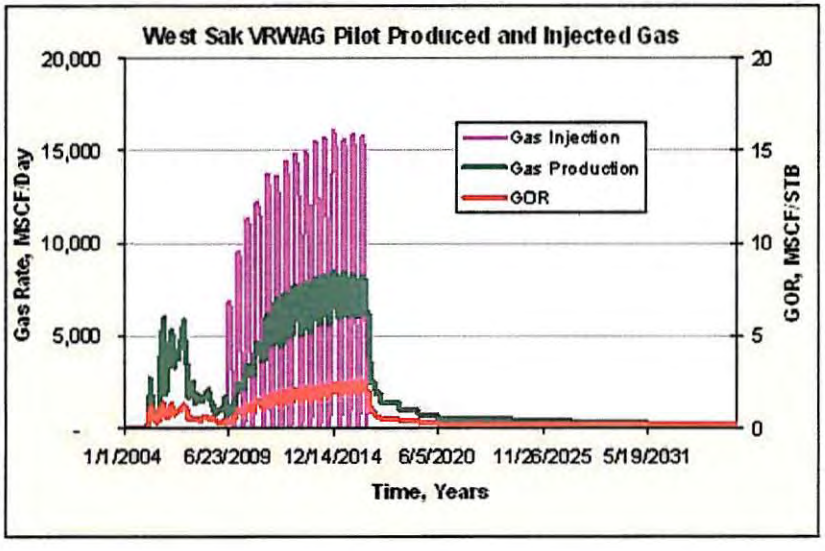


EXHIBIT L-6 WEST SAK VRWAG PILOT PROJECT PRODUCTION AND INJECTION FORECAST







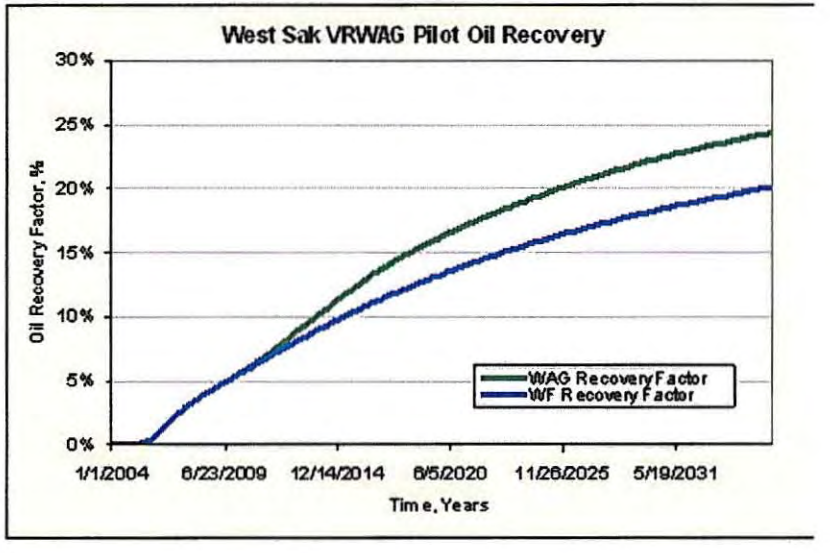


EXHIBIT L-7 WEST SAK AREA MAP AND EOR RECOVERY ESTIMATE

- Patterns 1E-102, 1E-117, 1J-122, 1J-170
- 102 MMTB OOIP total
- 20 MMSTB Waterflood Recovery
  - 20% OOIP RF
- 4 MMSTB Incremental EOR Recovery
  - 4% OOIP RF
  - 20% Increase in Recovery

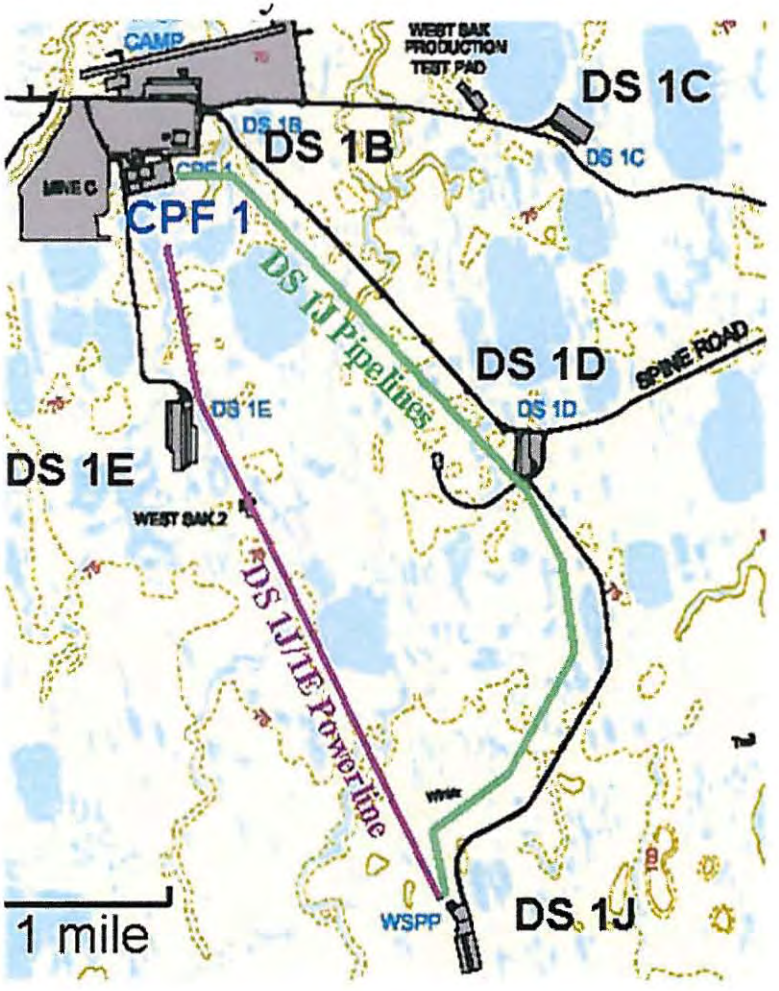
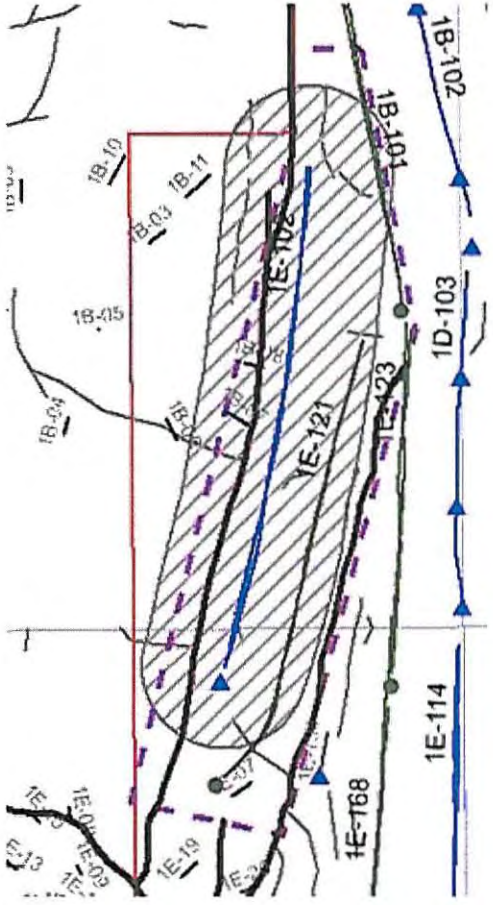


EXHIBIT M-1: WEST SAK VRWAG PILOT PROJECT, CONFINEMENT IN OFFSET WELLS

Well	Field	Well Type	Status	FORMATION _TOP_MD	FORMATION _TOP_TVD	X_LOC	Y_LOC	Cement quality above WSAK	Cement Top (CBL)	Cement Top (Cement Rpt.)	Cement Top (Calc.)	LAST MIT/PPPOT
1E-102	West Sak	Injector	Active	6,009	3,631	1,691,909	5,963,791	Good	3630	N/A	713	6/4/2006
1B-07	Kuparuk	Injector	Active	4,472	3,567	1,691,985	5,968,119	Poor	8660	N/A	2526	7/30/2007
1B-08	Kuparuk	Injector	Active	4,443	3,566	1,692,300	5,968,871	Poor	8130	3200	2364	9/25/2007
1B-101	West Sak	Producer	Active	6,848	3,656	1,694,796	5,969,705	No CBL	N/A	4500	5120	9/5/2005
1E-121	West Sak	Producer	Active	4,805	3,598	1,691,834	5,962,122	No CBL	N/A	2790	3625	11/3/2005
1E-117	West Sak	Injector	Active	9,391	3,342	1,692,337	5,951,521	Good	5520	N/A	7549	6/4/2006
1E-112	West Sak	Injector	Active	5,834	3,409	1,693,621	5,957,895	Poor	< 4910	N/A	3370	6/4/2006
1E-166	West Sak	Producer	Active	4,794	3,279	1,691,691	5,956,816	No CBL	N/A	3600	4263	N/A
1E-170	West Sak	Producer	Active	9,401	3,273	1,690,856	5,951,168	Good	6800	6305	7334	11/12/2005
1J-160	West Sak	Injector	Active	8,387	3,223	1,692,471	5,944,279	Good	5450	N/A	6151	6/27/2007
1J-168	West Sak	Producer	Active	6,783	3,214	1,694,019	5,945,555	No CBL	N/A	N/A	5583	9/29/2005
KUP 34-11-10 1		Exploration	P&A	3,488	3,172	1,691,247	5,945,588	No CBL	N/A	N/A	2798	N/A
1J-170	West Sak	Injector	Active	6,410	3,401	1,695,292	5,945,507	Marginal	3040	4167	5363	10/22/2006
1E-105	West Sak	Injector	Active	7,261	3,529	1,695,474	5,959,011	Marginal	5052	5035	5654	6/4/2006
1J-10	Kuparuk	Producer	Active	5,588	3,404	1,695,331	5,947,306	No CBL	N/A	0	0	2/27/2005
1J-166	West Sak	Producer	Active	5,010	3,416	1,696,723	5,946,876	No CBL	N/A	3355	4380	2/9/2007
1J-122	West Sak	Injector	Active	10,295	3,684	1,706,151	5,946,726	Good	6490	N/A	6677	8/16/2008
1J-120	West Sak	Producer	Active	8,240	3,601	1,704,665	5,946,511	No CBL	N/A	4301	N/A	2/29/2008
1D-34	Kuparuk	Producer	Active	7,865	3,615	1,704,952	5,954,778	No CBL	N/A	0	N/A	5/10/2005

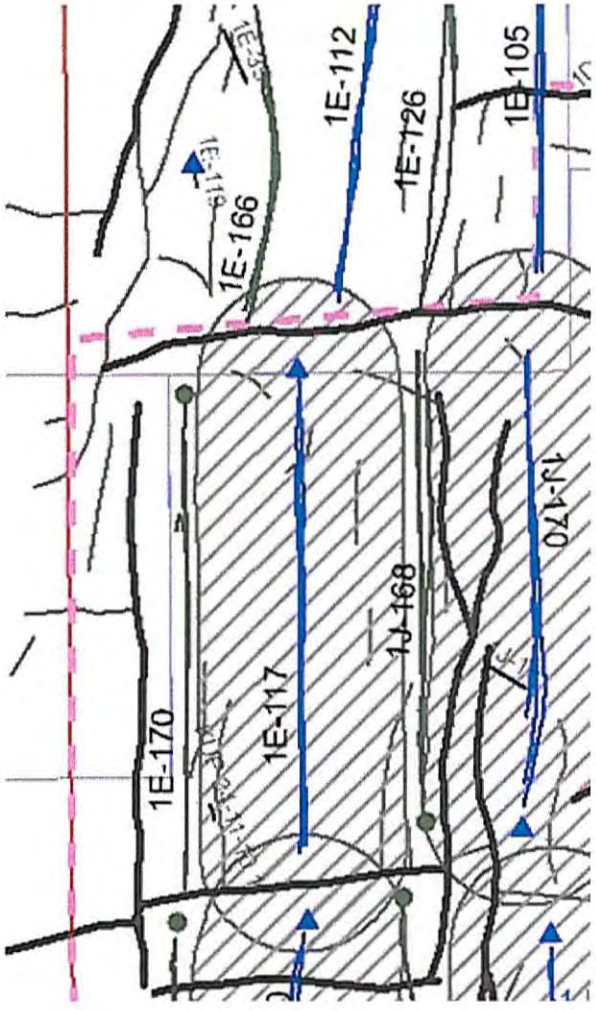


Wells within ¼ mile of 1E-102

- 1E-121, 1B-101, 1B-07, and 1B-08

Well Integrity Summary

- 1E-102 West Sak Injection Well with packer and surface casing
  - 1E-102 - 343' of cumulative good cement bond
  - Injecting into the D Sand with B Sand Isolated
- 1E-121 West Sak Gas Lift Producer with packer and surface casing
- 1B-101-West Sak Jet Pump Producer with packer and surface casing
- 1B-07,1B-08- OA's to be monitored
  - These wells have no cement across the West Sak and Ugnu Intervals
  - These wells are on downthrown side of sealing fault from a oil column charge perspective

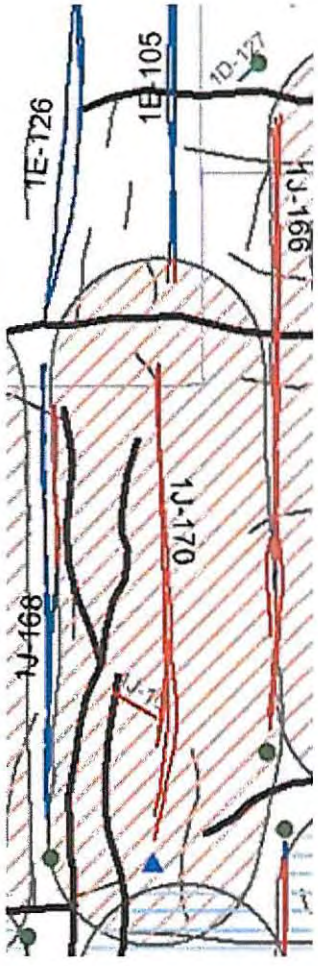


Wells within ¼ mile of 1E-117

- 1E-170, KUP 34-11-10, 1J-168, 1E-112, 1E-162 and 1E-166

Well Integrity Summary

- 1E-117 West Sak Injection well with packer and surface casing
  - Injecting into the D, B and A2 Sands
- 1J-168 West Sak Gas Lift Producer with packer and surface casing
- 1E-170 West Sak Gas Lift Producer with pack and surface casing
- 1E-166 West Sak Gas Lift Producer with packer and surface casing
- Kup 34-11-10 is a PA'd-Off Tundra Exploration Well
  - -Primary cement job should have covered the West Sak
- 1J-162 West Sal Injection well with packer and surface casing
  - Injector south of 1E-117
- 1E-112 West Sak Injection well with packer and surface casing
  - Injector north of 1E-117

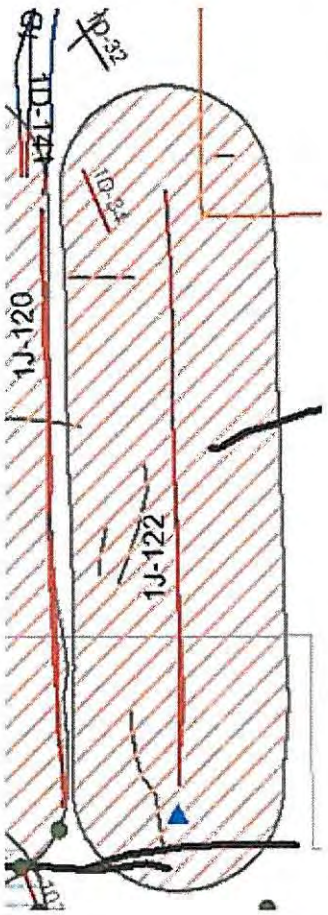


Wells within ¼ mile of 1J-170

- 1J-168, 1J-10 and 1J-166, and 1E-105

Well Integrity Summary

- 1J-170 West Sak Injection Wells with packer and surface casing
  - 570' of cumulative good cement bond
  - Injection into the A and D sands only-B sand isolated
- 1J-166 West Sak Gas Lift Producer with packer and surface casing
- 1J-168 West Sak Gas Lift Producer with packers and surface casing
- 1J-10 Kuparuk gas lift production well
  - Surface casing set below the West Sak
  - Cemented to surface-good returns
  - Well will have monitored OA upon start up
- 1E-105 West Sak Injection Well with packer and surface casing



Wells within ¼ mile of 1J-170

- West Sak Penetration of 1D-34

Well Integrity Summary

- 1J-122 West Sak Injection well with packer and surface casing
  - The surface job didn't have good circulation and plug didn't bump for the intermediate job. However, USIT shows ~550' of good cement bond
  - Well will test both D, B and A2 sands
- 1D-34 Kuparuk Gas Lift Producer with packer and surface casing below West Sak
  - 1st Stage on 1D-34 surface job lost returns but 2nd stage had cement returns to surface
- 1J-120 West Sak Gas Lift Producer with packer and surface casing
- 1D-141A West Sak Gas Lift Producer with packer and two strings of production casing
  - Only completed in the D Sand