PART 2 PREVENTION PLAN [18 AAC 75.425(e)(2)]

2.1 PREVENTION, INSPECTION, AND MAINTENANCE PROGRAMS [18 AAC 75.425(e)(2)(A)]

2.1.1 Prevention Training Programs [18 AAC 75.007(d)]

Personnel involved in spill response or cleanup activities are thoroughly trained and are expected to be knowledgeable of safety, health, and environmental requirements, so that they fully understand the safety and health risks associated with their job, as well as the practices and procedures required to control their exposure to potential safety and health hazards. The level of training is based upon the duties and functions of each responder in the emergency response, and complies with the regulatory requirements for employee training. See Section 3.9 for additional training information.

All drilling personnel will be required to take additional training in key subjects, such as:

- Safety Orientation/Personal Protective Equipment (PPE)
- Environmental Handbook/Spill Prevention Guidelines
- Confined Space Entry
- Lockout/Tagout of Hazardous Energy Sources
- Safety and Health Accident Prevention
- Incident Command System (ICS) Basic Overview
- Hazardous Waste Operations and Emergency Response (HAZWOPER 8-Hour)
- First Aid/CPR Training

In addition, selected site personnel shall be fully aware of waste issues involving on-site generation, storage, segregation, manifesting, and transportation. They must be knowledgeable of exempt vs. nonexempt, and hazardous vs. non-hazardous materials, and the associated practices in managing the material in accordance with standard operating procedures.

Site personnel who are expected to participate in oil spill response activities will require training in a number of other subjects, including:

- HAZWOPER 24-Hour
- Fate and Transport of Oil Under Arctic Conditions
- Shell C-Plan Overview
- Oil Spill Response Equipment Overview and Oil Spill Response System Performance
- Specialized training as needed for oil spill response boat operations, lightering, spill containment and recovery, and in-situ burning operations

Shell Offshore Inc. (Shell) Drill Foreman and Contractor Toolpushers, Drillers, and Assistant Drillers are required to have formal well control training in accordance with Minerals Management Service (MMS) Code of Federal Regulations (CFR) requirements. In addition, MMS requires weekly pit and trip drill exercises designed to keep drill crew personnel alert to well control contingencies. Blowout prevention equipment is regularly pressure- and function-tested, again under MMS CFR requirements, and flow chart response plans are kept visible on the drill floor as decision aids to the driller should a well flow event occur.

2.1.2 Substance Abuse Programs [18 AAC 75.007(e)]

The Shell drug policy was established to ensure a safe working environment at all operations. Shell's company-wide policy covers all employees. All contractors and non-employees who work at Shell facilities must also obey this policy. Shell requires joint venture partners under its operational control to apply this policy, and uses its influence to promote it in other ventures.

The use, possession, distribution, or being under the influence of illegal drugs or alcohol is strictly prohibited on Shell-controlled premises. Entry onto Shell-controlled premises constitutes consent to and recognition of the right of the Company to random drug testing, as well as drug testing for cause.

Beyond these requirements, operators of designated critical equipment (such as company drivers, crane operators, work boat operators) are subject to daily alcohol testing.

Failure to cooperate, or repeated positive test results will result in termination for Shell personnel, and removal from Company premises for all others.

2.1.3 Medical Monitoring [18 AAC 75.007(e)]

Shell has a systematic approach to medical management designed to assure compliance with the law as well as achieve continuous performance improvement. All Shell and contract employees must meet the minimum physical requirements for their job classifications as determined by the Medical Department. For example, crane operators must undergo periodic vision examinations. These tests allow for a safe working environment and pursue Shell's international goal of safe working conditions.

At the onset of employment, personnel receive a physical examination, at which time they can voluntarily declare pre-existing medical conditions and current medications. This procedure allows for the accurate monitoring of all employees' health.

Subsequent physical examinations are available to employees, with frequency based on age.

2.1.4 Security Program [18 AAC 75.007(f)]

The primary safety and security concern relates to the transportation of Shell and contractor personnel via the Shell facility in Deadhorse.

Access to the two drill rigs is either by helicopter or by vessel. Personnel are primarily transferred to the platform by helicopter, which is strictly controlled at Shell's Deadhorse, Alaska warehouse and office facility, located along the airport runway at the Deadhorse Airport.

Purcell Security will provide security services for the Deadhorse facility. In 2006 Purcell also provided security for a series of communications centers, which were located in Barrow and Deadhorse under the terms of a Conflict Avoidance Agreement (CAA) with the Alaska Eskimo Whaling Commission, which governed the 2006 season. (Note: The CAA for 2007 activities is still pending as of the date of submission of this C-Plan, and the location of communication centers is premised to continue as per the 2006 program.)

Supplies will be loaded onto the drilling vessels prior to mobilization, and all oil spill response equipment will be mobilized directly to the Beaufort Sea onboard the oil spill response vessel and the *Arctic Endeavor*. A mid-season resupply consisting primarily of drilling water and fuel is expected to occur in September from Prudhoe Bay. Transport of any remaining supplies during the drilling season is expected to be minimal, mainly related to transfers of spare parts, drilling tools, and other unforeseen items which can be transported from the Deadhorse area to the drilling location by helicopter (or boat, if weather conditions preclude helicopter operations).

In the event of an actual spill, Rolligons may be used for supplemental transportation of equipment, personnel, and supplies in support of the Alaska Clean Seas shoreline recovery effort and, in all likelihood, temporary camps would be mobilized to available gravel pads and communities adjacent to the shoreline recovery effort.

Access to the drilling sites themselves will be very limited, given that they are in remote, offshore locations and subject to authorization by the on-site Drill Foreman who strictly controls transit and access to the drilling site. For safety reasons, access to the drilling vessels will be limited to authorized personnel only.

For further information regarding on-site security and regulations, see the Shell Security Plans on the respective drilling vessels.

2.1.5 Fuel Transfer Procedures [18 AAC 75.025]

At exploration sites, the following types of fuel transfers take place:

- Fuel transfers to or from either of the drilling vessels, including transfers from these vessels to other supporting vessels (e.g., anchor handler) or helicopters.
- Fuel transfers to or from either of the two oil spill response platforms (OSRV/OSRB) including transfers from these vessels to other supporting vessels such as work boats.

Fuel Transfer Procedures for the OSRV/OSRB, and for the *Kulluk* and *Frontier Discoverer* are in Appendix C.

The mobile offshore drilling drill rig transfers, and unit, the *Kulluk*, and the *Frontier Discoverer*, incorporate fuel transfer facilities for heli-support, fuel barge to fuel barge to support vessels.

Fuel transfers will be done in accordance with:

- Lease specific requirements including the pre-deployment of booming and OSR personnel.
- USCG regulations [33 CFR 154.1035(b)(2)(i)] and vessel response plans
- Alaska Department of Environmental Conservation (ADEC) regulations 18 AAC 75.025.

Manuals governing fuel transfers, including emergency shutdown, are strictly followed by maintenance personnel and can be found onboard the drill rigs. If a spill of any size is detected, immediate action will be taken to stop the source. Both drill rigs have shipboard oil pollution emergency plans that personnel adhere to, including immediate contact of the supervisor.

Fuel Transfers Within a Drilling Vessel

Internal fuel transfers include flow of fuel from the onboard storage tanks to settling tanks or to loading stations on deck. Onboard storage tanks include:

- Boiler day tank,
- Cold start compressor,
- Emergency generator day tank,
- Incinerator day tank,
- Deck cranes,
- Crude oil tank,
- Survival anchor windlass diesel, and
- Mud pits

The boiler day tank, emergency generator day tank, and the incinerator day tank are fitted with overflow pipes that return excess fuel back to the hull storage tanks. These transfers generally take place twice daily, once per shift, and are handled by maintenance personnel. Safety procedures include adherence to an internal fuel transfer checklist, direct communication among personnel, and visual inspection of the transfers. No internal fuel transfers take place during high-risk situations such as bad weather or alarm status.

If an alarm occurs, an emergency shutdown system at the pumps closes any valve in use and stops the transfer to avoid spill overflow.

Helicopter Fuel Transfer

Helicopter fuel transfers include storage, filtering, and transfer of fuel from the fuel pods located on drill rig decks through pumps and filters to the delivery skid on the heli-deck. An emergency shutdown valve at the control room is both manually and pneumatically operated. Preventive measures for fuel transfer to the helicopters include:

- Ensuring no helicopters are inbound/outbound,
- Discontinuing hot work on the heli-deck and starboard decks,
- Verifying operative firefighting system including extinguisher on the heli-pad, and
- Proper alignment of fueling facilities (including valves, motor, pump, and coalescing filter)

Only authorized personnel (either the Helicopter Landing Officer or one of three heli-deck crew members) will activate this system.

Fuel Oil Transfer from Fuel Barge to MODUs *Kulluk* and *Frontier Discoverer*

No fuel transfers will occur during emergency weather conditions or alarms without the direct approval of the Maintenance Superintendent. Safety of fuel transfer procedures for the transfer of diesel fuel to the drill rigs is reliant on the direct communication between rig and fuel supply vessel personnel responsible for the transfer procedures. Preventive measures for ensuring a safe transfer will be reliant on pre-transfer procedures. Prior to transfer, these persons will identify:

- The product, rate of transfer, and sequence of operations;

- Critical stages of the transfer operation;
- Applicable federal, state, and local regulations; and
- Emergency procedures including shutdown operations.

Refer to Appendix C for the fuel transfer procedures for the *Kulluk* and *Frontier Discoverer*.

Fuel transfers will include the use of pre-deployed boom, visual inspection and open communication between the fueling facility and the drill rig personnel is the best preventive measure for avoiding an emergency situation. If radios are used for communication, they will be tested and ensured to be safe as required by 46 CFR 110.15-100 and 46 CFR 11.80.

Once the fuel transfer is complete, fill valves are closed and visual inspection of valves, flanges, pumps, and connection facilities ensures that no discharge is detected.

Fuel Oil Transfer to/from the OSRV/OSRB

In normal operation, the OSRV/OSRB will receive diesel fuel delivered from bunkers on the *Arctic Endeavor* storage tanker, or from either of the two drilling vessels. In both cases, the fuel transfer procedures will be based on the more stringent of either the vessel's own procedures (as part of the U.S. Coast Guard-approved Vessel Response Plan submitted by each vessel owner) or the similar procedures in place at either of the two drilling vessels.

Refer to Appendix C for the fuel transfer procedures for the OSRV/OSRB.

The OSRV/OSRB may also at times be used to provide diesel bunkering for OSR-related work boats (either 34-foot or 47-foot craft), in which case the transfer would always be conducted under the fuel transfer procedure of the respective OSRV/OSRB.

In the event that any oil spill response related work boats or support vessels have fuel delivered to them by a third-party fuel barge, the transfer would be conducted in accordance with the fueling procedure established by the owner of the fueling barge.

Where required as part of the approved Vessel Response Plan, fuel transfers will include the use of pre-deployed boom, visual inspection, and communication among the vessel personnel as the best preventative measures.

2.1.6 Maintenance Programs

The MODU *Kulluk* and *Frontier Discoverer* drill rigs have routine internal inspections and maintenance. Maintenance is an important tool for spill prevention because it monitors mechanical integrity and is documented daily by written reports. During the refurbishment phase, maintenance records are kept in log books. Under the operating phase, maintenance is performed according to a computerized maintenance program with records kept in the electronic maintenance database. The mechanical integrity of the drill rigs is upheld through the planned maintenance program initiated following rig refurbishment.

For malfunctioning or corroded materials, the maintenance department is notified and personnel are assigned the repair task by either the Chief Engineer or the Maintenance Supervisor. Equipment is inspected based on frequency intervals indicated in the maintenance program and in accordance with manufacturer and industry recommendations. For example, cranes are inspected daily per regulatory requirement, while the blowout preventer (BOP) gantry crane hydraulic system, which receives only sporadic use, is inspected weekly.

2.1.7 Operating Requirements for Exploration [18 AAC 75.045]

Flow Tests

Oil produced during a formation flow test or other drilling operations must be collected and stored in a manner that prevents the oil from entering state or federal land or waters. Oil produced for flow tests will be stored in internal tanks on the drilling vessel. Visual surveillance will be the primary means of overfill protection, as described in Section 2.5.1.

Drill Rig Integrity Inspections

During drilling, a visual inspection of major tanks and lines will be conducted daily. Shift inspections are conducted by personnel to detect leakage, damage, or serious deterioration of the storage tanks, fuel lines, piping, and associated facilities. Potential leaks will be properly reported in the daily tour report and the Toolpusher will be notified.

Piping between the storage tanks and boilers or engines is attached to the structure with brackets or double plates that protect the piping from damage. These brackets are visible for regular inspections. Much of the piping is routed by design to be out of the way and protected from impact or the environment.

Preventive measures include the installation of floor drains around the drill rigs to stop minor spills from flowing off the deck. Supplemental 1-inch drain lips at individual doorways are provided to contain potential spills to a single room. On the *Kulluk*, the drains flow to the disposal caisson from which oil or pollutants are subsequently skimmed and sent to the sludge tank. From the sludge tank, skimmed containment is sent through the oily water separator. After separation, water is routed overboard and contaminants are shipped ashore for proper disposal. Each sump is equipped with a level-sensing alarm.

2.1.8 Blowout Prevention and Emergency Shutdown [18 AAC 75.425(e)(1)(F)(III)]

Drilling Assurance

Well control is the process of maintaining positive pressures in the drilled wellbore in a manner that pressures in the geologic formations do not cause gas or fluids from the formations to escape from the it in an uncontrolled manner. This section provides information on the measures taken to maintain well control, preventing a blowout from occurring during drilling and testing operations. Recovery measures used to regain well control in the event of lost control are discussed in Section 1.6.3. The potential for discharge is discussed in Section 2.3.

Shell believes that no failure of a single barrier or a barrier element, whether caused by operational error or equipment failure, should lead to loss of well control. Therefore, Shell applies the following series of layers of prevention and response to well control issues:

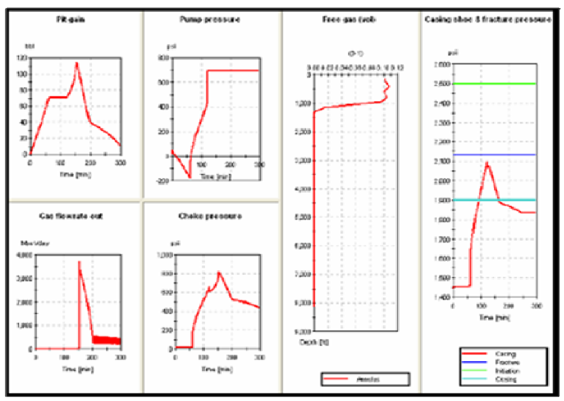
- Layer I includes proper well planning, risk identification, training, routine tests and drills on the rig (e.g., blowout prevention equipment [BOPE] tests, pit drills, and trip drills), which build a strong foundation.
- Layer II includes early kick detection and timely implementation of kick response procedures. Continuous monitoring including the use of Shell's Real Time Operations Center (see subsections below on Well Control During Drilling) provides early kick detection. When a kick is detected, the general response is to immediately shut down the pumps, perform a flow check, shut in the well, and kill the well.

- Layer III involves the use of mechanical barriers, including, but not limited to, blowout preventers, casing, and cement. Testing and inspections are performed to ensure competency.
- Layer IV represents relief well drilling, which would be implemented if a blowout were to occur, despite the first three layers of protection. Contingency plans include dynamic surface control measures and the methods of drilling a relief well.

Well Control During Planning and Preparation

The primary method of well control is properly designed casing/cementing programs to isolate and structurally support downhole formations and maintenance of drilling fluids of sufficient volume and density in the wellbore to counteract any experienced geologic pressures. Data from previous wells in the area have been used to anticipate formation pressures that might be experienced when drilling the proposed wells and the wells have been designed to handle the expected pressures. See Figure 2-1 for an example of this process.

FIGURE 2-1
MODELS FOR SITE-SPECIFIC WELL CONTROL



The primary causes of loss of well control are insufficient fluid density, fluid losses to the formation, swabbing, not keeping the wellbore full of drilling mud, charged formations, rapidly drilling a gas sand, dissolution of shallow gas hydrates. Loss of well control, an uncontrolled influx of formation fluids into the wellbore, is primarily prevented by properly designed casing strings and drilling fluid systems.

Shell's approach to reducing the risk of a well control incident includes proactive measures to maintain well control. This starts with the following key safeguards during well planning and preparation:

- Training key rig site personnel;
- Risk identification and mitigation, including writing Shell's Drill the Well on Paper (DWOP) exercise;
- Contingency planning, including operation-specific plans to mitigate all of the potential causes of loss of well control; and
- Flexible well design to accommodate a range of uncertainty in subsurface data.

The following training and drills support the proactive approach to well control in the well preparation phase.

- Onsite Shell and contractor supervisors maintain current well control certification.
- Prospect-specific well control scenarios and kill techniques are modeled and simulated using Shell's proprietary software and well control simulators at the Robert Training and Conference Center.
- Shell foreman, Shell engineers, contractor supervisors, and contracted rig skilled positions (e.g., drills and assistant drillers) are trained for prospect-specific well control situations.
- Pit drills and trip drills performed weekly.
- Secure well drills performed when applicable.
- Training on the Critical Operations Curtailment Plan and the associated daily status reporting conducted for appropriate personnel.
- Blowout prevention drills performed on a frequent basis ensure the well can be shut in properly and quickly. BOP service and inspection are performed throughout the drilling and off seasons.

Available data from seismic operations and neighboring exploration wells, such as rock types and subsurface pressure profiles, are interpreted to ensure a design that permits effective control of the well. Drilling engineers predict downhole pressures and interpret existing datasets to design a safe and productive drilling program.

Shell performs a site-specific hazardous operations analysis for each prospect. In addition, Shell's DWOP exercise is performed for each prospect. DWOP is a systematic method to 1) identify and prioritize a set of actions to optimize the drilling program, considering all areas of activity; 2) identify and prioritize key operational and Health, Safety, and Environment (HSE) risks and associated mitigation opportunities; and then 3) use this information to develop the optimum drilling program. Shallow hazard surveys have also been conducted to assess the shallow areas of the planned wellbore for potential pockets of shallow gas that could result in loss of control.

In addition to site-specific hazardous operations analyses and the DWOP exercise for each prospect, the following additional risk identification and mitigation measures are taken:

- Site-specific well control modeling for anticipated hydrocarbon intervals
- Site-specific dynamic well control modeling for any prospects with possible shallow gas or hydrae accumulations
- Virtual ice management using shipboard marine radar combined with satellite RADARSAT ice imagery to permit advanced and accurate warning of ice hazards.

Well Control During Drilling

General

The primary means of controlling well pressure utilizes hydrostatic pressure exerted by drilling fluid of sufficient density to prevent flow from the formation into the wellbore. The condition of the drilling fluid is continuously monitored using both manual and automated means, and adjusted as necessary to meet the actual wellbore requirements. Monitored parameters include mud weight into and out of the well, mud flow rate into and out of the well, and presence and analysis of any gases in the return mud flow. The majority of those monitoring duties are performed by the staff of the drilling crew. A mud logging unit, staffed by experienced personnel, will be in continuous use during drilling operations.

Should a kick occur, kick identification and detection, and timely kick management are the primary tools used to prevent a blowout. Latest generation Measurement-While-Drilling (MWD) and Pressure-While-Drilling (PWD) tools are used, allowing real-time monitoring of downhole pressures and drilling parameters. This allows rapid identification of the onset of abnormal pore pressures, swabbing, or the influx of hydrocarbons near the drilling bit.

The drilling operations are supported by Shell's Real Time Operations Center (RTOC), where technical experts in Houston or New Orleans can assist by monitoring on-going operations, analyzing penetrated formations, and analyzing pressure trends. Data can be transferred from the rig to the RTOC in real-time. See Figure 2-2. This service augments the mud logging capabilities at the drilling rig and allows Shell to easily make the people with the right skills available to support the drilling operation.

FIGURE 2-2
REAL TIME OPERATIONS CENTER

Early kick detection is critical to maintaining well control. The drillers, drill crews, mud engineers, mud loggers, and logging engineers are all trained on kick detection and rapid response procedures. In addition, all drilling breaks are treated as potential kick situations, taking all necessary precautions until the situation has been determined to be stable.

Well Control While Drilling at the Mudline

There is risk for a shallow gas blowout while drilling a hole at the mudline, before the subsea BOPs or surface casing have been installed. Large volumes of high-pressure gas can escape from shallow formations, into the wellbore, and then into the water. It should be noted that shallow gas blowouts do not contain oil and, therefore, no spill of oil would be expected at the surface. However, such an incident would be critical from a worker safety standpoint.

Should a shallow gas blowout occur, no attempt would be made to shut in the well to contain the gas because the shallow formations exposed at these depths generally would not have enough strength to control the gas. Instead, the gas would be directed away from the rig floor using a diverter valve and diverter line.

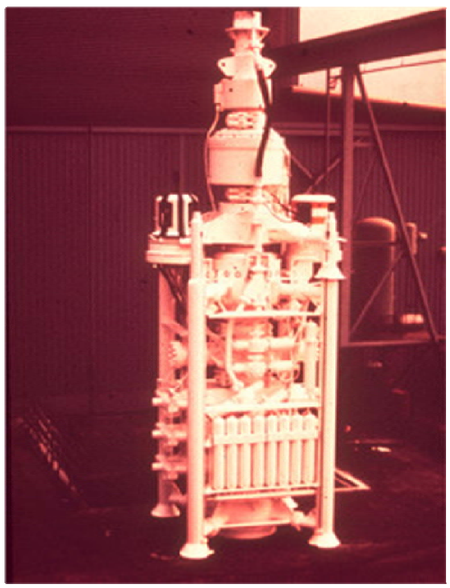
Free gas accumulations in shallow permafrost have been encountered in the course of drilling permafrost intervals. To avoid liberation of this gas and the potential loss of structural integrity of the wellbore, the drilling fluid is cooled to ensure that the wellbore remains frozen, with the gas trapped, and the integrity of the hole is intact.

Well Control While Drilling Below the Conductor Casing

Each well is drilled according to a detailed location-specific well plan, based on expected downhole conditions at that location. Such plans are part of the first layer of protection, proper planning and risk identification. Isolating formations with casing and appropriately maintaining the drilling fluid properties, including density, are critical to preventing loss of well control during drilling.

Once the conductor casing has been set across the shallowest formations, blowout prevention equipment (BOPE) provides a mechanical barrier to loss of well control, key to the third layer of protection. See Figure 2-3 for an example of a blowout preventer. Although rarely needed, this equipment is available as a back-up means (secondary to the mud system) to secure well pressure. In the unlikely event that primary well control is lost; the BOPE can be used to safely halt an uncontrolled flow from the wellbore.

FIGURE 2-3
EXAMPLE OF A BLOWOUT PREVENTER



In the event the well kicks, the BOPE will be used immediately to shut-in the well and confine the pressure within a closed system. The casing program will be designed so that any anticipated formation pressure can be shut-in at the subsea BOPE without rupturing the casing. Shell representatives assigned to the drilling unit have MMS-approved blowout prevention training and actual experience in controlling and killing kicks. Training of this nature is a continual program with Shell. Drilling crews will be trained to a standard sufficient to satisfy both the MMS and Shell.

All surface-mounted BOPE meets the MMS standards as defined in 30 CFR 250.440 through 30 CFR 250.451.

The BOPE is installed after the conductor casing is run and cemented. The BOPE for the *Kulluk* consists of:

- Four 18 ¾-inch 10,000 pounds per square inch (psi) WP ram-type preventers,

- Two 18 ¾-inch 10,000 psi annular preventers,
- 3 -inch 10,000 psi choke and kill lines,
- Hydraulic control system with accumulator back-up closing capability

For a diagram of the *Kulluk* BOPE, refer to Figure 2-4.

The BOPE for the *Frontier Discoverer* consists of:

- Four 18 ¾-inch 10,000 pounds per square inch (psi) WP, ram-type preventers (Cameron).
- Two 18 ¾-inch 5,000 pounds per square inch (psi) annular preventers (Hydril).
- 2 ¾-inch 10,000 psi choke and kill lines.

For a diagram of the BOPE for the Frontier Discoverer, refer to Figure 2-5

After installation, the BOPE will be tested in accordance with MMS and Shell specifications. Tests will be conducted at least weekly and prior to drilling out casing.

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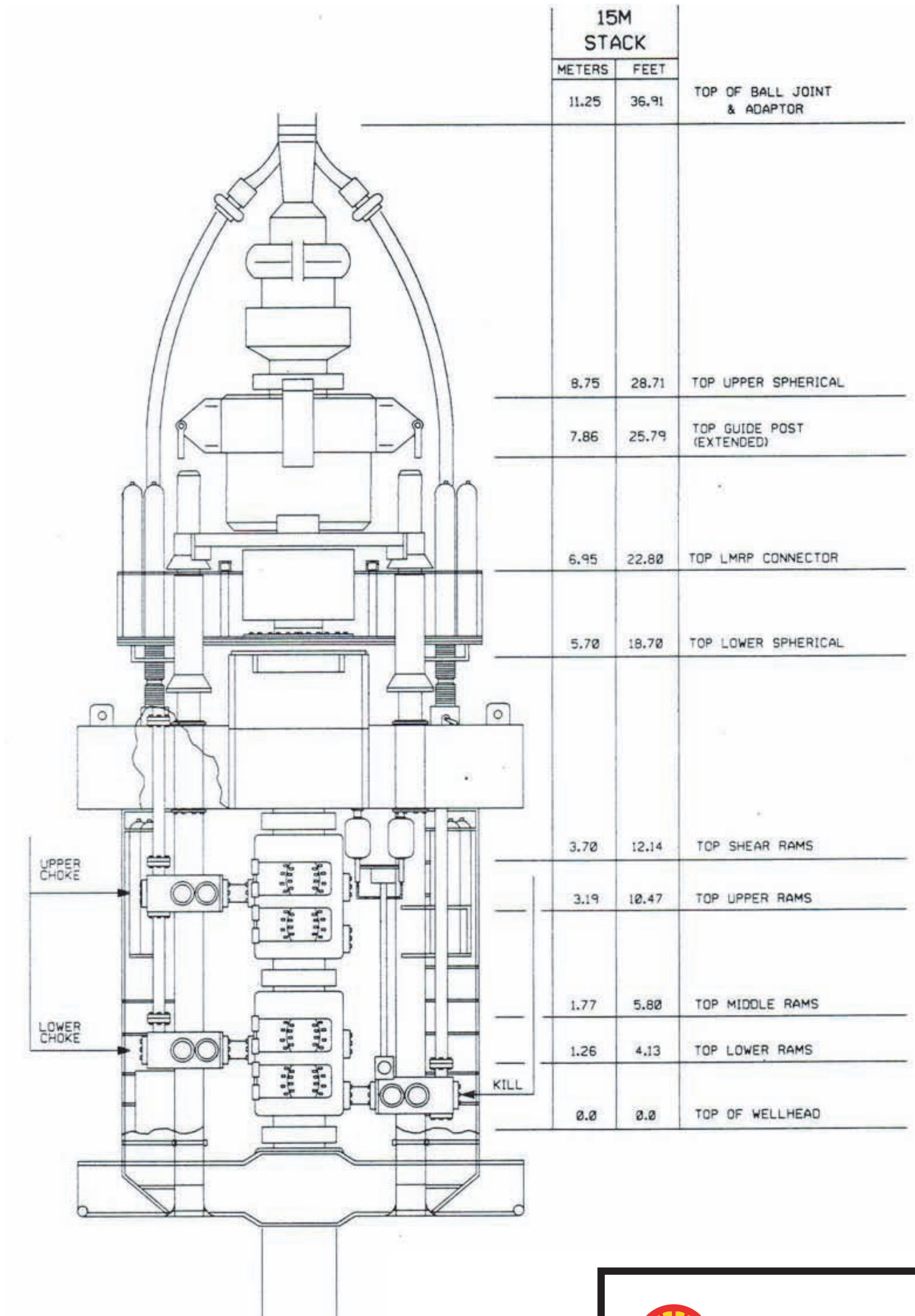
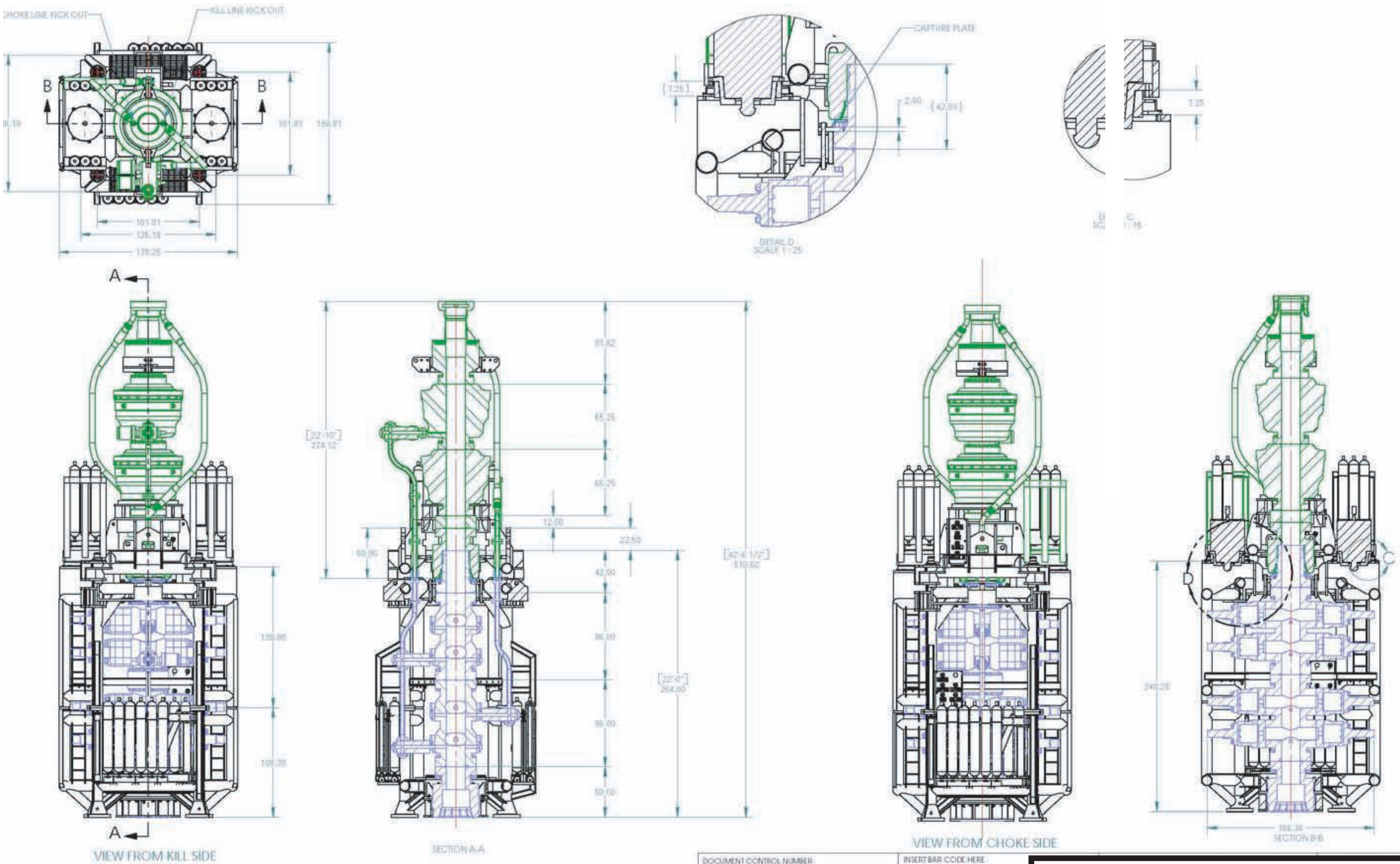


SHELL OFFSHORE, INC.

KULLUK BOPE

December 2006

Figure 2-4



SHELL OFFSHORE, INC.

FRONTIER DISCOVERER BOPE

December 2006

Figure 2-5

Well Suspension or Abandonment

Upon completion of drilling operations, the well will be properly plugged and abandoned following MMS requirements. Procedures include setting cement across hydrocarbon intervals. All plug and abandonment operations will be conducted per 30 CFR 250 Subpart D and with prior approval from MMS.

Spill Prevention Practices and Training

Blowout prevention drills are performed on a frequent basis to ensure the well is shut in properly and quickly. Blowout prevention testing intervals are within the standard of MMS regulations. Blowout preventers will be pressure-tested every 14 days and function-tested every 7 days. In addition, drilling personnel are MMS-certified in well control, and weekly pit/trip drills will be conducted.

2.1.9 Oil Storage Tanks [18 AAC 75.065]

Section 3.1 contains information about the major tank facilities on the two drill rigs. During drilling, a visual inspection and soundings of the major tanks will be conducted twice daily during shift inspections to allow leak or damage detection, or to identify questionable mechanical integrity of the storage tanks and their associated fuel lines, piping, and valves. Leak detection will be recorded in a daily tour report and the Offshore Installation Manager (OIM) in charge of each drilling vessel will be notified in order to ensure that repairs are completed safely and in a timely manner.

Inspections of Elevated and Portable Tanks [18 AAC 75.065(a)]

The storage tanks to be used in Shell exploration are integral parts of the respective Mobile Drilling Units (*Kulluk* and *Frontier Discoverer*) which will undertake the drilling program. Neither the *Frontier Discoverer* nor the *Kulluk* MODU contain non-integral bulk storage oil tanks equal to or greater than 10,000 gallons, which are regulated under 18 AAC 75.065.

The largest non-integral tanks on the *Frontier Discoverer* are less than 5,000 gallons and are used for well testing purposes. The largest elevated tanks (on deck or in containment) on the *Kulluk* are two aviation fuel bowsers that are 600 gallons each.

Inspection Records [18 AAC 75.065(d)]

Inspection records are maintained by the drilling rig or well testing contractor.

Repair or Alteration [18 AAC 75.065(e)]

Shell will notify MMS of any major repair or alteration.

Leak Detection [18 AAC 75.065(h)(1)]

See Section 2.5.

Overfill Prevention [18 AAC 75.065(j), (k)]

Overfill protection is primarily through high-level alarm enunciations where incorporated (fueling), in conjunction with visual observation and mechanical and remote soundings during transfer operations. Containment coaming is in place around the fuel tank vent outlet.

The on-board tanks are equipped with high- and low-level alarms for overfill protection. There are 19 tank level indicators on the central control console on the *Kulluk* drill rig. There are 11 temperature indicators on 11 of the 19 tanks, and there are 11 high- or low-alarm lights associated with nine of the tank levels. The alarms and indicators on the tanks are listed below.

The 19 tank level indicators on the central control console are located on:

- Fuel Oil Tanks (3)
- Ballast Water Tanks (7)
- Drill Water Tanks (2)
- Portable Water Tanks (2)
- Brine Storage Tanks (3)
- Waste Oil Tank, (1)
- Water Glycol Storage Tank (1)

The 11 temperature indicators associated with 11 of the 19 tanks with level indicators are located on:

- Ballast Water Tanks (7)
- Drill Water Tanks (2)
- Potable Water Tanks (1)

Eleven high- or low-alarm lights are associated with nine of the tank levels. They are located on:

- Fuel Oil Tanks (2)
- Potable Water Tanks (2)
- Drill Water Tanks (2)
- Water Glycol Tank (low-level alarm) (1)
- Waste Oil Tank (high-level alarm) (1)

The four draft gauges are located on the *Kulluk* in the Forward, Aft, Port, and Starboard locations.

The Frontier Discoverer's fuel tanks are integral to the vessels hull. Therefore all loading stations and vents are provided with save-alls or high coamings as per the requirements of SOLAS, MARPOL and DNV requirements.

Bulk oil storage tanks located on the drill rigs will be lined with appropriate impermeable liners. Tanks will be visually inspected daily for the presence of oil leaks or spills.

Debris Removal [18 AAC 75.075 (c)]

The tank areas will be maintained free of debris and other material that might interfere with the effectiveness of the system.

Drainage [18 AAC 75.075(d)]

Deck drains including coamed drainage will be routed to a facility designed for oily water separation. This drainage system and the separation process will be inspected to ensure that separated oily water may safely be disposed of.

2.1.10 Emergency Tow and Escort Vessels Program

Each of the two drilling vessels will have two dedicated ice-class vessels assigned to support them for the purpose of anchor handling and ice management (see Appendix A). These two vessels are the primary escort and emergency vessels for each rig.

2.2 DISCHARGE HISTORY (>55 GAL) [18 AAC 75.425(e)(2)(B)]

Not applicable.

2.3 ANALYSIS OF POTENTIAL DISCHARGES [18 AAC 75.425(e)(2)(C)

This section contains a summary of potential discharges and their impact. Based on a spill history of the Beaufort Sea, there is a low probability of an event causing oil to enter into an open-water environment. However, there is a chance that a blowout could occur.

A response scenario addresses the potential immediate release of crude oil to the environment by a loss of well control during drilling operations in open water conditions. The probability of a major oil spill occurring during drilling operations is extremely low. Comprehensive flow histories are generally not available for exploration areas. For planning purposes, the flow rate from a blowout is 5,500 barrels of oil per day (bopd) for the duration of the event.

2.3.1 Potential Areas for Discharge

Table 2-1 contains a summary of potential discharges.

TABLE 2-1
SUMMARY OF POTENTIAL DISCHARGES

TYPE	CAUSE	PRODUCT	SIZE	DURATION	ACTIONS TAKEN TO PREVENT POTENTIAL DISCHARGE
Transfer from fuel barge to drill rig	Hose rupture	Diesel	Approximately 2,000 gallons (Section 1.6)	5.5 minutes (Section 1.6)	Transfer procedures in place; Note: This scenario will be addressed as part of USCG approval of Vessel Response Plans by individual vessel owners.
Diesel	Tank rupture	Diesel	1,555 bbl	Minutes to hours	Note: The diesel tanks are internal to each drilling vessel rather than deck-mounted, where the potential for marine spills is much greater. As a result, a scenario involving tank rupture has not been included in the oil spill response plan, but will be monitored as part of an ongoing tank inspection program.
Blowout	Uncontrolled flow at the mudline	Crude oil	287,100 bbl including emulsion and free water	30 days (Section 1.0)	Blowout prevention equipment and related procedures for well control.

Fuel Transfers

A potential source of discharge occurs during fuel transfers of any kind. This discharge is minimized by the weather restrictions of transfer procedures, which prevent transfers during unfavorable wind or sea conditions. Transfers are announced in advance and verbal communication, in combination with visual inspection, is the best method of discharge detection.

If discharge is detected, the fuel would most likely be contained immediately on deck. If fuel overflow of the containment dikes occurs, edge coaming would prevent flow of fuel off the vessel into open water.

Blowouts

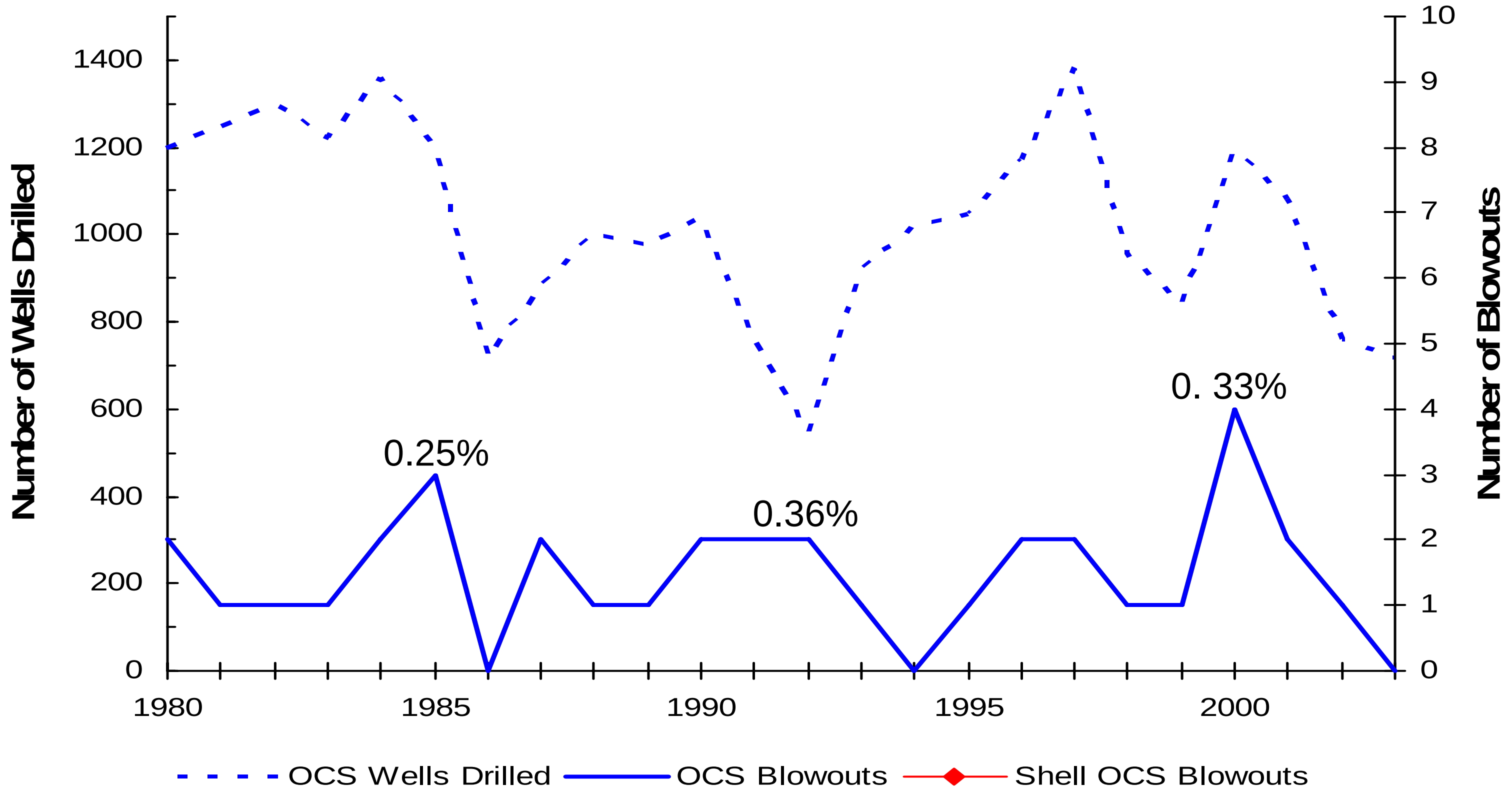
The uncontrolled release of oil during a blowout is discussed in Section 1.6. Table 2-2 provides a summary of potential discharge volumes for wells drilled in the outer continental shelf and in Alaska state water since 1997.

Given the use of modern prevention and control techniques, actual blowouts are extremely rare and of relatively short duration. See Figures 2-6 through 2-8.

TABLE 2-2
POTENTIAL DISCHARGE FOR ALASKA OFFSHORE DRILLING (1997-2003)

PLAN NAME	PRODUCTION OR EXPLORATION	OPERATOR	18 AAC 75.425(e)(1)(f) SCENARIO WELL BLOWOUT WORST CASE DISCHARGE VOLUME (bbl/day)	18 AAC 75.425(e)(2)(C) POTENTIAL DISCHARGE ANALYSIS BLOWOUT VOLUME (bbl/day)	MMS WORST CASE DISCHARGE VOLUME (bbl/day)
McCovey Exploration	Exploration	AEC Oil & Gas, Inc.	5,500 (March 2002)	5,500 (March 2002)	5,500 (March (2002)
Warthog #1	Exploration	ARCO	5,500 (August 1997)	5,500 (August 1997)	5,500 (August 1997)
Northstar Operations	Production	BPXA BP Exploration (Alaska) Inc. (BPXA)	7,220 (May 2003)	10,000 (July 2005)	8,872 (January 2005)
Milne Point Unit (F Pad)	Production	BPXA	2,000 (June 2002)	142,800 gpd = 3,400 bbl/day (March 2003)	N/A
Greater Prudhoe Bay	Exploration	BPXA	3,000 (September 2006)	6,005 (September 2003)	2,000 (September 2003)
Endicott	Production	BPXA	2,000 (December 2003)	2,250 (December 2003)	2,000 (December 2003)
Badami	Production	BXAP	1,100 (May 2005)	1,045 (May 2005)	N/A
Alpine Dev. Participating Area	Production	CPA	7,500 (January 2004)	7,500 (August 2004)	N/A
Thomson Gas Cycling	Exploration	Exxon Mobil	517 (May 2003)	517 bbl/day (May 2003)	N/A
Kuparuk Field	Production	Phillips 66	1,000 (March 2003)	N/A	N/A
Cook Inlet Area Exploration Program	Exploration	Phillips 66	1,500 (July 2001)	5,500 (February 2001)	N/A
Tyonek Platform	Exploration	Phillips 66	5,500 (September 1998)	5,500 (September 1998)	5,500 (April 1998)
North Slope Exploration Program	Exploration	Pioneer Natural Resources	5,500 (September 2005)	5,500 (September 2005)	N/A
Kitchen Prospect	Exploration	Escopeta Oil	4,675 (June 2006)	4,353 (June 2006)	4,675 (June 2006)
Cook Inlet Production Facilities	Production/Exploration	Unocal 76	300 (December 2006)	1,200 (December 2006)	300 (December 2006)
Oil & Gas Production Operations	Production	Kerr-McGee	1,000 (September 2005)	N/A	1,000 (April 2006)
Northwest Milne Point Exploration Operations	Exploration	Kerr-McGee	5,500 (January 2004)	5,500 (January 2004)	5,500 (January 2004)
Oogurik Development Project	Exploration	Pioneer Natural Resources Alaska Inc.	2,500 (April 2006)	2,500 (April 2006)	2,500 (April 2006)
Cook Inlet Area Production Operations	Production/Exploration	Forest Oil Corporation	1,500 (February 2002)	1,500 (August 2004)	1,500 (January 2002)

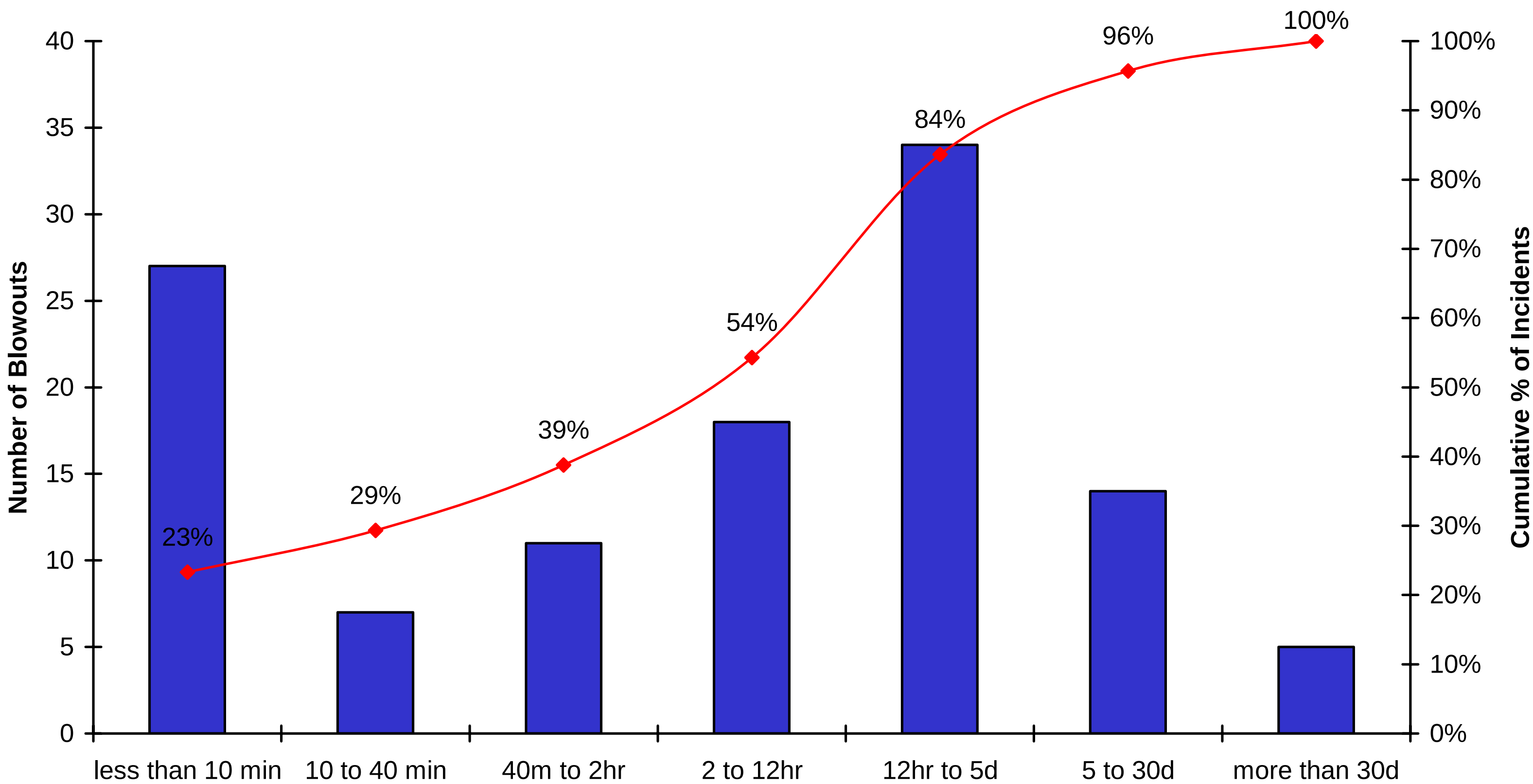
FIGURE 2-6
HISTORICAL INFORMATION ON OFFSHORE BLOWOUTS IN THE US OCS (1980 – 2003)



Key Points:

- **Across the period, only 0.14 percent of wells drilled have blown out.**
- **No Shell blowouts have occurred in the OCS during the period (Troll in UK 1983**)

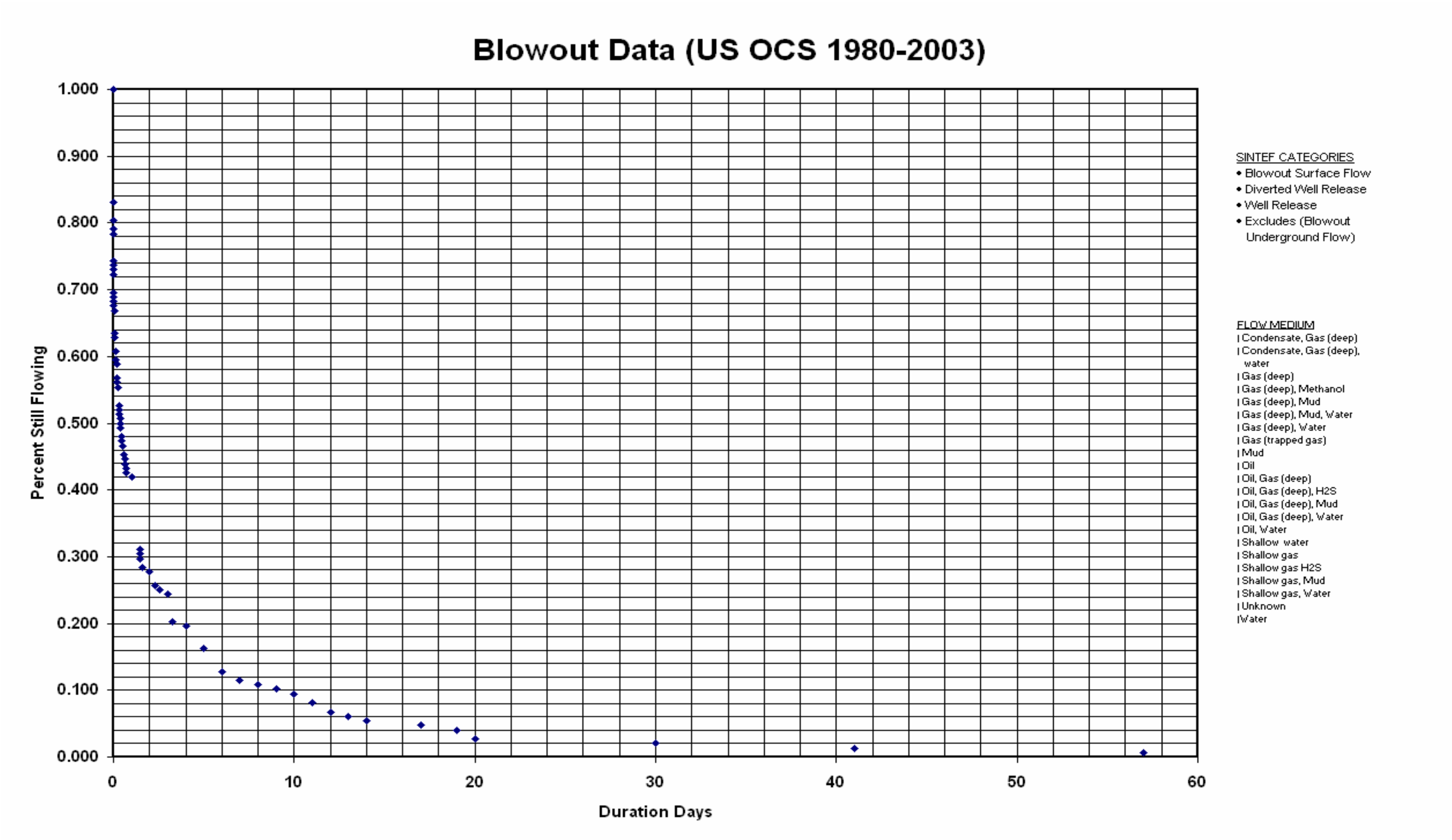
FIGURE 2-7
DURATION OF OFFSHORE BLOWOUTS IN THE U.S. AND NORWAY (1980-2003)



Notes:

- 116 Blowout events between 1980 – 2003
- Surface and Underground Blowouts in US and Norway (1980 – 2003)

FIGURE 2-8
DURATION OF BLOWOUTS IN THE U.S. OCS (1980 – 2003)



2.4 OPERATIONAL CONDITIONS INCREASING RISK OF DISCHARGE [18 AAC 75.425(e)(2)(D)]

Severe weather and ice conditions are the primary factors most likely to curtail operations and increase the potential for accidental discharge. The key measure that has been taken to reduce the risk of a discharge attributable to these conditions is the Critical Operations Curtailment Plan (COCP) for the drilling operations. Conditions specific to Shell's Beaufort Sea operations that potentially increase the risk of discharge, and actions taken to eliminate or minimize identified risks, are summarized below:

- Temperature: Cold temperatures pose a threat to personnel and equipment. Heat may cause gases to expand and increase the likelihood of discharge. The drill rigs are near the Alaska Arctic coastline, which is marked by arctic air masses with relatively harsh temperatures throughout the year.
- Weather Conditions: The operation most likely to be affected by adverse weather conditions is the drilling support operation, such as transportation activities between the drill site and Prudhoe Bay or other staging areas. Strict adherence to air safety will be enforced.
- Sabotage or Vandalism: Potential for any sabotage or vandalism is minimal. Security and special-interest training by Shell and its contractors should deter any damage from these acts at any of the drill sites. Air safety is essential.

These characteristics can affect the movement of discharge as well as deployment of equipment and efforts to contain and recover the oil.

2.4.1 Severe Weather

In general, meteorological and oceanographic conditions at the project site during the summer season are relatively mild. Intensity and frequency of storms increase as the open water season progresses into the late September-October time frame. Generally, storms follow a northeast-southwest track, moving fairly rapidly, and influence the area for a relatively short period of time.

Environmental parameters such as wind speed and wave height do not directly influence drilling operations. Rather it is the drilling unit’s response to environmental conditions, coupled with the drill crew’s ability to handle equipment safely, that affects curtailment of critical operations. Conditions of curtailment due to heavy weather are therefore determined in accordance with the drilling vessel’s responses to heave, pitch, roll, horizontal displacement, and anchor tension as a function of the corresponding environmental parameters.

Since heavy weather will clearly influence vessel response, environmental conditions will be regularly monitored at the drill units and regional wind and wave forecasts will be received on each drilling unit two times a day with two updates between each forecast. Meteorologists with the weather forecasting service will provide weather consultation services on a 24-hour basis.

Shell has developed a COCP (see Section 2.4.4 for more information on the plan), which has procedures to aid operations personnel in determining the correct procedures to follow when storm conditions are anticipated. Implementing the procedures will ensure the safety of any personnel on board, minimize the risk of damage to equipment, and minimize the chance of a discharge attributable to the severe weather conditions.

On an ongoing basis once on location, the drilling vessel and key personnel will monitor weather conditions using a variety of data, including aerial ice reconnaissance, third party forecasts from weather services, and on-board weather surveillance and motion monitoring. Critical operations will be managed in accordance with the Critical Operations Curtailment Plan, which sets forth allowable operating parameters based on the use of T-time. T-time is the time required to trip or recover the drill pipe and associated equipment and complete the operations required to leave the well in a secured state. In heavy weather conditions, when vessel heave and horizontal displacement exceed pre-set levels, drilling operations cease, the drill string is pulled into the protective casing of the well, the drill pipe is hung-off the drilling unit, and the drilling unit prepares to recover its anchor equipment. If conditions continue to deteriorate, the lower marine riser package is disconnected and anchor equipment is recovered (or released if necessary). If weather severity reaches specified levels, the drilling unit moves off location and is positioned to ride out the storm.

2.4.2 Ice Conditions

The start of on-site project activities will coincide with the northward retreat of the ice edge possibly as early as July. At any time during the drilling season, occasional incursions of ice floes are expected, and so a mitigation plan is in place. On-site activities will conclude prior to freeze-up, which is not anticipated until the latter half of October, based on the average historic freeze-up dates.

Shell’s ice management system is a combination of ice monitoring and forecasting techniques, along with icebreaking operations. Ice monitoring techniques include satellite-based Synthetic Aperture Radar (SAR), airborne and icebreaker reconnaissance, ice forecasting, and weather forecasting. Forecasting incorporates data from the federal services of Canadian Ice Service and National Oceanographic and Atmospheric Administration. Shell also intends to use specialized software to integrate ice speed and direction data from vessels’ radar, aerial reconnaissance, and satellite imagery in order to predict individual ice floe movement, allowing modification of icebreaking operations on a real-time basis. Shell’s ice management team at Shell's Bellaire Technical Center will be fully engaged to support the collection and use of ice-related information.

Two icebreakers will be used for each drilling unit. Typically, one icebreaker will deflect or break up large ice floes farther away by circling updrift or upwind (“upstream”) in the flowing sea ice, while another icebreaker protects the drilling unit by further breaking nearer ice floes into smaller and smaller pieces so that the drilling unit is able to hold station.

Shell has developed two sets of protocols for responding to potentially hazardous ice conditions, one for typical summer drilling when ice can move in with wind and currents, and another in anticipation of winter freeze-up. These two sets of procedures utilize T-time estimates for establishing alert stages and associated operational and communication protocols.

In general, drilling operations will cease and preparations will be made to disconnect drill pipe when hazardous ice conditions are anticipated within the T-time plus 4 hours. If the ice management strategy is not capable of preventing a large ice floe from impacting the drilling unit or reducing ice buildup, then the drilling unit begins preparing in stages to disconnect from the lower marine riser package, recover anchor equipment, and vacate the drilling location.

The Ice Alert Procedures spell out specific responsibilities for personnel aboard the drilling vessels and aboard their support vessels. The conditions necessary to achieve a given alert level are described, along with the corresponding tasks for each of the key individuals assigned to Drilling Operations, Marine Operations, and Helicopter Support Base Operations. The conditions for each alert level relates to a time value “T” which is defined as “the time required to stop the current operations safely and efficiently so that the riser can be disconnected and the anchors retrieved or disconnected to move off location.” All estimates of operations closure time include safety margins that guarantee that the well will be completely secured in the best possible way by the end of the period, “T.”

2.4.3 Structural Icing

Meteorological data for the project area indicate that structural icing is most prevalent in September, when open water, subfreezing air temperatures, and wind are all present. The severity of icing conditions is a function of surface water temperature, air temperature, and wind speed. Structural icing can be enhanced by the occurrence of atmospheric icing due to freezing fogs and by snow.

Accumulations of ice on the drilling vessel’s superstructure will be thickest on windward surfaces between 10 and 50 meters above sea level. Heavy structural icing will raise the vessel's vertical center of gravity and affect its heeling and righting moments.

The *Kulluk* was designed for Arctic conditions and the *Frontier Discoverer* has been Arctic strengthened. Both vessels have pre-established ice load limits. If icing for either rig approaches the allowable amount and raises the allowed vertical center of gravity, critical operations will be curtailed until sufficient ice has been removed and the loading is acceptable.

The *Kulluk* has been designed to minimize the accumulation of spray ice. All work areas are enclosed and heated, piping is enclosed or heat traced and wrapped with insulation. In addition, on-deck equipment, such as anchor windlasses, is wrapped with tarps and blower-heated to minimize spray ice accumulations. Heating and wrapping greatly reduces icing and facilitates ice removal when spray ice conditions are present. The *Frontier Discoverer* will, upon conversion, incorporate features to minimize the accumulation of spray ice, such as enclosed work spaces and enclosed or heat-traced piping.

When icing conditions exist, crew vigilance will be essential to preventive accumulation. At the start of each tour, crewmembers will inspect their work areas for icing. Roustabouts will remove ice, snow, and standing water from decks, equipment, railings, and the superstructure to prevent ice accumulation in any of these areas. If ice builds up on the derrick, steps will be taken to see that it is removed. Removal onboard the vessel will be accomplished by means of portable heaters, steam hoses, steam lances, wooden ice bats, and picks.

2.4.4 Critical Operations and Curtailment Plan

MMS requires that offshore operators in the Alaska OCS Region develop procedures and maintain an MMS-approved COPC. The plan deals largely with potential problems associated with severe weather and unexpected levels of ice. The procedures identify ice conditions, weather, and other constraints under which the exploration activities will either be curtailed or stopped. Shell’s COCP provides a series of procedures for monitoring and responding to various ice conditions and weather/wave conditions at the drilling sites. The focus of the COCP is to prevent personnel injury, equipment damage, and any accidental discharges to the environment. The main objective is to secure the well in an orderly manner when facing adverse environmental conditions.

A prerequisite to safe and efficient Arctic offshore operations is an environmental monitoring and forecasting system. A comprehensive system has been established to support Shell’s drilling activities in the Beaufort Sea. Components of the monitoring and forecasting system include meteorological observations, onsite weather forecasts, oceanographic observations, sea state forecasts, ice monitoring, and ice forecasting. In addition to the environmental monitoring and forecasting system, real time measurements of the drill ships performance in ambient conditions is obtained from a performance monitoring system installed onboard. An alert status system has been established onboard each drill ship to anticipate hazardous ice and weather events and to assign pre-determined responses to all responsible personnel.

The COCP describes the comprehensive effort that Shell and the drill ship contractors are providing to ensure that drilling operations are conducted in a safe and prudent manner in the unique environment of the Beaufort Sea. The COCP is a component of the Applications for Permit to Drill submitted for approval to the MMS. The COCP is also readily available onboard the drill ships and in Shell's offices.

The COCP defines standards and guidelines for the conduct of operations on the drill ships to minimize any hazard to personnel or the environment. In the Alaskan Beaufort Sea, the two primary factors that can cause curtailment of critical operations and that potentially increase the risk of discharge while drilling are sea ice and heavy weather. The objective of the COCP is to detail the critical drilling operations and the conditions under which such operations will be curtailed.

The COCP will be strictly followed to mitigate ice forcing the rig off location in an uncontrolled fashion.

2.4.5 Hours of Light at 70°N

In addition to severe weather and ice conditions described above, reduced hours of daylight during the end of the drilling operations could increase the risk of a discharge during some activities. The average number of daylight hours for the Beaufort Sea at 70°N are as follows:

- January 0.0
- February 4.9
- March 9.5
- April 14.0
- May 18.9
- June 24.0
- July 24.0
- August 21.2
- September 15.5
- October 11.2
- November 6.1
- December 0.0

Drilling operations will be aided by rig lights and portable lighting as necessary.

2.5 DISCHARGE DETECTION [18 AAC 75.425(e)(2)(E)]

2.5.1 Drilling Operations

Discharge detection will rely on visual surveillance. Visual inspections are an important component of leak and spill detection because automated systems may not detect small leaks and spills. The drill rigs and fuel transfer operations will be closely monitored at all times (see Section 2.1.6). The drill site will be staffed 24 hours a day by drilling personnel. Once a day, facility personnel will visually inspect tankage, sumps, and drains for indications of oil leaks. Piping, valves, pumps, and other machinery will also be visually inspected as part of the daily routine. Any oil leaks or spills will be noted, the source of the spill will be located and corrected, and the oil spill will be cleaned up. During drilling, drillers are continually monitoring the drilling equipment and will stop drilling if unsafe conditions are observed.

2.5.2 Automated Methods

In the drill rigs' ballast control rooms, automated control systems and visual monitoring of instrumentation are used to control flow rates, pressures, and distribution. Various systems in exploration operations are continuously monitored with a microprocessor-based control system. Rounds are documented daily. Incidents are recorded using the incident reporting and investigation process recognized and approved by the company.

Several independent emergency shutdown systems limit the scope of any single failure. An emergency shutdown can be initiated by process conditions outside set limits or manually initiated by operators at the instrument/control panels and by personnel at strategic emergency shutdown punch-button locations on the facility.

The *Kulluk* Drill Rig Discharge Detection

On the *Kulluk* drill rig, service alarms are tied to the unit service master alarm panel of the Central Control Console. This allows the operator the ability to notify personnel when an equipment alarm occurs. There is also a section on the Central Control Console for emergency shutoff valves on storage tanks.

Located on the bottom left side of the Central Control Console is a graphic display showing water lines, pumps, and valves to the ballast tanks. The ballast pumps (4) can be stopped or started by the stop/start switches located in the graphics. The ballast valves may be opened or closed from the graphics, by pushing the desired open or closed push buttons. Each push button has an indicator light displaying the valve status. By opening the appropriate valves and starting the appropriate pump, each ballast tank level may be raised or lowered. Located on both sides of the graphics are six meters. There are four pumps and three meters for each pump. The meters read suction pressure, discharge pressure, and flow for each pump.

The unit service master alarm panel includes an audible alarm buzzer, flicker stop, and buzzer stop for the unit service alarms located on the console.

To activate an alarm, devices of pressure switches, float switches, and electrical relays are engaged. Some equipment has local alarm panels that contain more than one alarm condition (e.g., high temperature, low oil pressure).

Emergency Equipment Stops are located on the console. A common plastic door protects these push buttons so they cannot be accidentally pushed. When a switch is depressed, it will illuminate and shut down the equipment in the room corresponding to the switch nameplate. There are also emergency shutdown push buttons on the console for saltwater service pump, winch cooling water pump, and open/close push buttons for the saltwater inlet supply valve.

Emergency shut off valve indicators are illuminated when storage tanks are shut.

The console contains an inclination detector that signals a calculation unit. The calculation unit determines the angle of inclination and the X-Y coordinates (0-360°) of the drill rig. If the rig is level, the inclination detector is lit. If the rig is off-center, an indicator light will be lit in the direction in which the rig is tilted.

The Frontier Discoverer Drill Rig Discharge Detection

The *Frontier Discoverer* drilling rig has a system of controls, monitors, and procedures to assist in the early detection of potential discharges. For both downhole and surface operations, these detection systems include standard operating procedures governing the monitoring, handling, and containment of fluids. Specifically, visual and manual detection in combination with drilling policies and procedures allow for ample discharge detection.

Further discharge detection is allowed by the continuous monitoring of the ship's bilge systems. Potential discharge collects in system where it eventually travels to the pump room. Visual surveillance of this bilge system's piping, valves, and pumps allows for early detection of a spill.

2.6 RATIONALE FOR CLAIMED PREVENTION CREDITS 18 AAC 75.425(e)(2)(F)]

Although Shell considers its well prevention and control measures "best in class," it will not be claiming any prevention credits to offset oil spill response planning requirements, based on exploration well operations as specified in 18 AAC 75.430 through 18 AAC 75.434.

The recovery equipment provided in support of this plan (see Tables 1-8 and 1-9) substantially exceed the mechanical recovery capability needed to contain the worst case discharge (see Section 1.0).

2.7 COMPLIANCE SCHEDULE 18 AAC 75.425(e)(2)(G)]

Compliance schedule and waivers have not been requested at this time.