APPENDIX I

DRAFT HORIZONTAL DIRECTIONAL DRILLING CONTINGENCY PLAN

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1. Introduction

The scope of the proposed Kinder Morgan (KM) Louisiana Pipeline project includes the installation of 132.2 miles of 42-inch diameter pipeline referred to as Leg 1, 1.2 miles of 36-inch diameter pipeline referred to as Leg 2, and 2.3 miles of 24-inch referred to as the FGT Lateral. Evaluation of the proposed pipeline right-of-way (ROW) has identified potential impacts to several features that could be mitigated by crossing using horizontal directional drilling (HDD) instead of conventional pipe installation methods, such as the open cut method. These features include wetlands, water bodies, canals, and some roads. HDD crossings have been identified only in Leg 1 of the Project. As described in Resource Report 1, HDD method provides minimal planned disturbance of the surface between the entry and exit points of the HDD. Within Resource Reports 1 and 2, Tables 1-10, 1-12 and 2-2 identify proposed HDD crossings by milepost. Some of these milepost sections contain multiple consecutive (i.e., back-to-back) HDD crossings. Table 1 presented in this contingency plan summarizes the HDD crossings for the KM Louisiana Pipeline project.

Table 1 Summary of HDD Crossings by Milepost

Milepost		Alternative HDD Location Relative to Original Borehole	Alternative Construction Method(s) (In Order of Attempted Application)
Begin	End		
3.93	4.83	50-foot offset	1. Conventional (open cut) water/land lay
17.96	18.62	50-foot offset	1. Reroute to shorten and re-drill
			2. Conventional (open cut) water lay around Shell Island
18.62	19.41	50-foot offset	1. Relocate entry hole to shorten and re-drill, conventional water lay to next HDD
19.41	20.01	50-foot offset	1. Relocate entry hole to shorten and re-drill, conventional water lay from previous HDD
			2. Open cut
21.17	22.11	50-foot offset	1. Relocate entry hole to shorten and re-drill, conventional water/land lay to next HDD

Table 1 Summary of HDD Crossings by Milepost			
Milepost		Alternative HDD Location Relative to Original Borehole	Alternative Construction Method(s) (In Order of Attempted Application)
Begin	End		
22.11	22.71	50-foot offset	1. Relocate exit hole to shorten and re-drill, conventional land lay to previous HDD
			2. Conventional (open cut) water/land lay
22.71	23.45	50-foot offset	1. Relocate exit hole to shorten and re-drill, conventional land lay to next HDD
23.45	23.95	50-foot offset	1. Relocate entry hole to shorten and re-drill, conventional land lay to previous HDD
25.26	26.03	50-foot offset	1. Relocate entry hole to shorten and re-drill, conventional land lay to next HDD
26.03	26.80	50-foot offset	1. Relocate entry hole to shorten and re-drill, conventional land lay to previous HDD
30.36	31.46	50-foot offset	1. Relocate entry hole to shorten and re-drill, marsh-buggy construction to next HDD
31.46	32.42	50-foot offset	1. Relocate entry hole to shorten and re-drill, marsh-buggy construction to previous HDD
			2. Marsh-buggy construction and conventional open cut (wet) waterbody crossing
43.69	44.48	50-foot offset	1. Conventional land lay and open cut (wet) waterbody crossing
49.57	50.45	50-foot offset	1. Relocate entry hole to shorten and re-drill, conventional land lay to next HDD
50.45	51.30	50-foot offset	1. Relocate exit hole to shorten and re-drill, conventional land lay to previous HDD
51.78	52.37	50-foot offset	1. Conventional (open cut) land lay

Table 1 Summary of HDD Crossings by Milepost			
Milepost		**Alternative HDD Location Relative to Original Borehole**	**Alternative Construction Method(s) (In Order of Attempted Application)**
Begin	**End**		
52.37	53.05	50-foot offset	1. Relocate exit hole to shorten and re-drill, conventional land lay and horizontal bore road remainder
			2. Conventional land lay and open cut (wet) waterbody crossing
77.65	78.40	50-foot offset	1. Relocate exit hole to shorten and re-drill, conventional upland construction remainder
			2. Horizontal bore highway, conventional upland construction remainder
99.02	99.76	50-foot offset	1. Relocate entry or exit hole to shorten and re-drill, conventional upland construction remainder

HDD has been used to successfully install pipelines in soils similar to those underlying the KM Louisiana Pipeline ROW and in similar conditions. Pipelines up to 42 inches in diameter are commonly installed by HDD today. Experienced HDD contractors will be utilized for the installation of the HDDs on the KM Louisiana Pipeline Project. The combination of experience and historical HDD success in the southern Louisiana area strongly suggests that the HDD method will be successful for this Project. In addition, HDD feasibility will be further evaluated using geotechnical data collected from soil borings to be collected at the individual crossings. This soils data will also be used to design the HDD parameters (e.g., entry and exit angles, depth of drill, depth of cover, mud mixture specifications, pullback load requirements) specific for each crossing.

Although not anticipated for this Project, there is always a potential for failure of any HDD pipeline crossing. This contingency plan identifies typical modes of failure associated with HDD installations, including frac-out or loss of drilling fluid (Section 5). Mitigation and/or remedial procedures are identified for these typical issues.

In the event that the mitigation and/or remedial procedures do not result in a successful HDD crossing, this contingency plan presents a decision process to evaluate the continuation of the HDD method or the adoption of alternative pipeline design or installation methods. Generally, if the HDD fails at the original HDD location, KMLP will attempt to move to a second, immediately adjacent (50-foot offset), HDD location. However, the KM Louisiana Pipeline project ROW is, at some locations, narrowly situated between subsurface obstructions, such as other pipelines, or surface obstructions, such as rivers and canals. Consequently, a second HDD location may not always be available. The anticipated presence or absence of a second HDD location offset by 50 feet is identified in Table 1. In the event that HDD method fails at the first and, if available, the second HDD location, an alternative design and/or construction method is suggested in Table 1. A typical alternative design for a long HDD would be to shorten the HDD length, reducing the stress on the equipment and borehole, and completing the distance with a more conventional construction method. When identifying the alternative method, KMLP considered engineering restrictions, ROW restrictions, and potential environmental impacts.

Pre-construction approval of these procedures should expedite the response time for alternative decisions, ensure that appropriate actions are taken that have been pre-approved by the agencies, and minimize adverse environmental impacts that may arise as a result of frac-outs. HDD installations are typically a 24-hour per day, 7 days per week operation, and the objective is to complete each drill in a timely manner with the least adverse impacts to the environment.

2. HDD Technique

There are three major processes associated with the HDD installation of a pipeline crossing: installation of a pilot hole; incremental reaming of the pilot hole followed by swabbing the borehole; and pipe pullback. This section discusses each of these steps.

2.1. Pilot Hole Installation Process

The pilot hole is drilled along a predetermined alignment in which the entry and exit points are located using traditional survey methods. The drill path is monitored by an electronics package housed in the non-rotating pilot drill string near the cutting head. Where possible, a TruTracker® survey system is used to survey the location of the drill path. A wire coil on the surface creates a magnetic field that is detected by the electronic housing. Data from the electronic housing is evaluated by the HDD Operator and adjustments are made to the drill pathway.

Initially, the pilot hole, generally a 9-7/8-inch diameter bore, is installed beneath the proposed crossing using a jetting assembly in non-consolidated sediments, such as those anticipated along the proposed KM Louisiana Pipeline ROW, or a downhole displacement mud motor connected to a tri-cone rotary bit in consolidated sediments. Drilling fluid, pumped through the annulus of the drill stem, performs multiple functions. It aids the mud motor or jetting assembly in cutting the soil, lubricates the drill stem, suspends and carries the drilled cuttings to the surface and forms a wall cake on the interior of the borehole to maintain the integrity of the borehole.

Installation of the pilot hole is closely monitored to provide data necessary to complete the crossing. These data, including the expected penetration rate and geotechnical strata confirmation, are used by the HDD Operator to plan the reaming process

2.2. Reaming and Swabbing Processes

Beginning at the exit point of the crossing, a reamer is attached to the drill stem and passed through the pilot hole to the entry point. For each section of drill stem removed from the entry point of the crossing, a section of drill stem is attached to the reamer and successive sections of drill stem at the exit point. This newly attached drill stem is used to guide the equipment during the return pass of the reamer from the entry side back to the exit side of the crossing. Several passes of a 24-inch reamer are used to initially enlarge the pilot hole from 9-7/8 inches to 24 inches. Once completed, incrementally larger reamers are passed through the borehole until the pilot hole has been enlarged to the final diameter appropriate for insertion of the pipe.

The HDD borehole is then swabbed to clean out remaining soil cuttings and prepare the borehole for the pipe. A swab is constructed by welding caps onto a section of pipe the same diameter as that to be installed in the borehole. The swab is connected to the drill stem and the drilling rig pulls the swab through the borehole. Again, for each section of drill stem removed at the entry side of the crossing, a section of drill stem is attached to the swab and successive sections of drill stem at the exit side. Depending on the borehole, more than one swab may be required to clean the borehole. At completion, the swab will be removed from the exit side of the crossing so that the drill stem can be attached to the prefabricated 42-inch pipe laid out at the exit side of the borehole.

2.3. Pullback Process

After the reaming and swabbing processes have enlarged the borehole to a diameter sufficiently large enough to allow the insertion of the prefabricated pipe, a reinforced pullhead is attached to the leading end of the pre-fabricated pipe segment in preparation for the pullback process. The pullhead is connected by way of a swivel head to the drill stem at the exit side of the crossing. Using the drilling rig, the pipe is pulled through the borehole to the entry side of the crossing. Since the air-filled pipe will float in the drilling fluids, a calculated volume of water is added to the pipe sufficient to maintain a neutral buoyancy while pulling the pipe.

3. Potential Modes of HDD Failure

The potential for failure exists during each process described in Section 2. These modes of failure are detailed in the following discussions. In addition, loss of drilling fluids or frac-out can occur, typically during the pilot hole installation process. Failure due to frac-outs and procedures to handle frac-outs are described in Section 5.

3.1. Failure Modes during Pilot Hole Installation Process

The equipment associated with the pilot hole installation process is subject to a large amount of stress. If the equipment has not been maintained appropriately, the equipment could break. While HDD surface equipment is easily accessed for repair, the equipment is very specialized. Equipment that fails down hole must be retrieved in order to be repaired or to continue installation of the pilot hole.

During the pilot hole installation, the borehole can collapse on the drill stem pipe if sufficient bentonite cake is not maintained on the walls of the hole, or if stratum containing highly fractured rock, glacial till, noncohesive material, or cobbles is encountered. If the pilot hole collapses, the torque required to rotate or advance the drill pipe increases due to additional friction from the collapsed material. This increased friction can freeze the drill pipe in the borehole. Usage of additional torque and tension in an attempt to free the equipment can shear or twist the drill pipe into pieces. Multiple changes in strata or excessively long drill lengths contribute to the probability of this type of failure.

During pilot hole installation, the horizontal position of the hole is located using TruTracker®. When the HDD is below a water body or wetland area that does not allow positioning of the surface cable necessary to operate the TruTracker® system, the pilot hole may deviate from the designed path. The potential for this failure mode increases during long drill lengths. In addition, metal objects located near the pilot hole pathway can interfere with the magnetic field generated by the surface cables resulting in inaccurate TruTracker® locations.

3.2. Failure Modes during Reaming and Swabbing Processes

Caving of the borehole can be a result of insufficient bentonite cake on the walls. This failure type is exacerbated during the reaming process. During each pass, a large volume of drilling fluid is jetted through the reamer. In nonconsolidated soils, the jetting energy can carve out caverns causing the hole to become unstable and cave. The caved material may prevent recirculation of the drilling fluids causing a build up of cuttings in the base of the hole.

In addition to the problem of the caved material obstructing the borehole, both soil collapsed from the borehole and cuttings built up due to poor recirculation of drilling fluids increase the friction on the drill pipe. The increased friction could increase the potential for pipe failure by shearing or twisting into pieces and consequently for the equipment to become lost in the hole.

3.3. Failure Modes during Pullback Process

Failure during the pullback process is identified by pipe refusal in either direction. This may be due to an insufficiently reamed or swabbed borehole, caving due to lack of good bentonite cake on the walls, increased friction on the pipe wall due to positive or negative buoyancy, increased friction on the wall of the pipe due to an excessively long run, or deterioration of the borehole due to a time lag while the pipe lays idle.

4. HDD Failure Mitigation

Generally, the modes of failure identified in Section 3 can be avoided or mitigated prior to complete failure of the HDD technique.

4.1. Mitigation during Pilot Hole Installation Process

KMLP will implement procedures to avoid failure well before commencement of construction. Soil samples collected from borings located near the crossings will be evaluated to verify the subsurface geology and to identify a soil layer depth and type that will minimize the potential for caving during pilot hole installation. A drilling contractor will be identified with experience in HDD installations in similar geology and of similar design to the Project. Proper selection of equipment and well maintained equipment will minimize the potential for equipment failure during the drilling process.

The drilling fluid characteristics will be monitored to minimize the potential for caving due to insufficient mud cake on the borehole wall. Cuttings will be monitored to ensure that circulation has not failed. If the HDD Operator identifies increased stress on the drilling equipment due to poor cuttings return or partial collapse of the pilot hole, he can adjust the drilling fluid consistency or decrease the drilling rate to allow the drilling fluid more time to penetrate the borehole wall and to transport the cuttings from the annulus to the surface. In the event that a decrease in drilling fluid or cutting return is noted, the

HDD Operator can also partially pull out of the boring to ream out the pilot hole and flush the collected cuttings before they completely plug the borehole. These preventive methods minimize stress on the drilling equipment and decrease the potential for equipment failure.

If the pilot hole deviates from the designed pathway, the HDD Operator can correct the pilot hole prior to returning to the surface or if the deviation is significant, he can pull back, grouting the abandoned section of the pilot hole with bentonite, correct the pathway and re-drill that section of the pilot hole so that the pilot hole exits at the correct location.

4.2. Mitigation during Reaming and Swabbing Processes

During the pilot hole installation, the HDD Operator will monitor soil cuttings, rate of advancement, and torque on the drill bit to help identify the characteristics of the underlying strata. Referring to this information, he can adjust pump pressure as he reams the pilot hole to minimize the potential for caving due to high jetting pressure while also adjusting the rate of advancement to maximize the opportunity for the cuttings to exit the borehole. However, if caving does occur, the HDD Operator will remove the reamer and re-attach the drill bit to re-drill the pilot hole. The reaming process can be re-started adjusting for the location of the cave-in as needed.

4.3. Mitigation during Pullback Process

Equipment selection is again very important in the pullback process. The drilling rig must have sufficient power to not only pull the weight of the longest section of pipeline through the borehole but to overcome potential resistance associated with minor cave-ins during the pullback process. KMLP will ensure that the pipe is prefabricated, tested, and ready to be pulled at the completion of the swabbing process. This will decrease the potential for lag time and decrease the likelihood of caving associated with extended lag time.

Knowing the density of the drilling fluids and the weight of the pipe, the volume of water needed to maintain neutral buoyancy will be calculated and gradually added to the pipe as it enters the borehole. The HDD Operator will monitor the drilling equipment for an increase in tension that signifies increased friction on the pipe and possible imminent refusal. At that time, pulling is halted and the buoyancy is adjusted or, if necessary, the pipeline can be removed and the borehole reamed and swabbed.

If the pipeline does become stuck during the pullback process, the HDD Operator can attach an air hammer to the end of the pipeline segment and either hammer the pipeline past the obstruction and through the borehole or hammer the pipeline back towards the exit side, freeing the pipe from the obstruction allowing the drilling rig to again move the pipeline.

5. Frac-Out Failure and Mitigation

This section establishes the procedures for preventing, monitoring, and responding to frac-outs of drilling fluids that may occur during the HDDs. The intent of this section is to set forth a plan of the actions to be taken, under various conditions and for various sizes of frac-outs, should frac-outs occur. There are duplications between the mitigation methods described in Section 4 and in this section; however, since frac-out occurrences are relatively common during HDD, the duplications were permitted in order to make this section as complete as possible.

5.1. Frac-out Definition

For the purposes of this procedure, a “frac-out” shall be defined as the unintentional or inadvertent loss of drilling fluids from the HDD borehole to the ground surface, other than at the borehole entry or exit points. Loss of drilling fluids to the subsurface geological formation may result in an apparent reduction in the return of fluids and cuttings, but will not be considered a frac-out under this plan unless drilling fluids are observed in surface waters or at the ground surface.

5.2. Drilling Fluid Characteristics

“Drilling fluids” (often referred to as “drilling mud”) to be used on this Project will be a mixture of liquids (mostly fresh water) and solids used in a circulating system in the drilling process for the removal of soil cuttings from the borehole, while filling the void left by the cuttings, lubricating and cooling the drill string, and sealing the borehole wall to eliminate fluid loss and maintain borehole stability.

Relatively small proportions of approved “additives,” identified in Table 2, may be mixed with the drilling fluids. These additives will modify the physical and chemical properties of the drilling fluids in order to improve drilling performance or in response to a frac-out. The additives will be used when deemed necessary and appropriate by the On-Site Mud Engineer, approved by the HDD Superintendent, and in the concentrations recommended by the manufacturers and the On-Site Mud Engineer. Other additives may be added to the list by the Mud Engineer, if approved by KMLP.

Table 2 Approved Drilling Fluid Additives

Additive	Manufacturer	Description	Purpose or Use	Approximate and Typical Concentration (% by volume)
Pargel 220®	Parchem Mining & Waterwell, a division of Smith/Schlumberger Company	A naturally occurring Wyoming bentonite clay with low sand content	Lubrication, stabilization of the borehole walls, and the suspension and removal of soil cuttings from the borehole	3.6
Polypac R®	A business unit of M-I L.L.C.	100 percent carboxymethylcellulose sodium salt, a polyanionic cellulose polymer	To control fluid loss and increase the viscosity of the drilling fluid	0.02
Soda Ash	A business unit of M-I L.L.C.	100 percent sodium carbonate	To increase the pH of the drilling fluids to precipitate calcium	0.06
Ringfree®	A business unit of M-I L.L.C.	60 to 100 percent acrylic polymer	To eliminate or cut mud bridging and free up borehole circulation; helps free stuck pipe because it dissolves sticky clays.	0.02 (as a single 60-gallon slug)
FSF Polyswell®	A business unit of M-I L.L.C.	100 percent acrylamide polymer or copolymer	Primarily as a lost circulation material.	0.02
My-Lo-Jel®	A business unit of M-I L.L.C.	100 percent pre-gelantized starch	Fluid loss agent and viscosifier.	0.02

Refer to the Material Safety Data Sheets (MSDS) in Appendix A for more details on the physical, chemical, and environmental characteristics of these non-toxic additives. KMLP must approve the use of any additional additives that the HDD Contractor may deem necessary to resolve specific drilling difficulties, prior to their use.

5.3. Potential Environmental Impacts from Frac-outs

5.3.1. Frac-outs to Water

Drilling fluids released from an HDD frac-out directly into a surface water body at the mud line will be dissipated by the natural currents or blended with the existing solids, primarily clay, suspended in the water column. The solids in the drilling fluids are also primarily clay, but at low concentrations (no more than 5 percent by volume). Inadvertent discharges of the nontoxic drilling fluids may result in a very localized and transient increase in suspended solids concentrations, but these increases pose no significant threat to public health and safety or to aquatic resources. If an underwater frac-out is located in the existing turbid conditions, containment and recovery of the drilling fluids would be impractical due to mixing with the surface water. Frac-outs under water are a greater impediment to the successful completion of an HDD, due to lost circulation, than they are a significant impact on the environment. In the event of a frac-out, the HDD Contractor will employ measures described herein to regain proper circulation in order to complete the borehole, which in turn should reduce or eliminate the frac-out to surface water. As directed by KMLP in consultation with the regulatory agency representative, containment may be attempted if sensitive resources, such as oyster beds or marsh, are threatened and conditions permit.

5.3.2. Frac-outs to Marsh

Several of the HDDs will cross under salt and brackish marsh; in fact, many of the HDDs are being performed in order to eliminate direct impacts to marsh from conventional pipe installation by trenching. Because of the low concentration (less than 5 percent) of solids in the drilling fluids, and the natural tendency of the fluid to seek a uniform elevation equal to the water level in the marsh, a measurable or permanent increase in any ground surface elevation is not likely. If the drilling fluid has a particularly high viscosity and the tide is low, a temporary rise might be visible, but this will quickly dissipate. On the other hand, the settlement of fines, if of sufficient volume, in the marsh may suffocate existing vegetation or affect surface hydrology. Efforts by the HDD Contractor to contain and recover frac-out fluids in marsh will also cause disturbance of the marsh surface and vegetation by equipment and personnel, and depending upon its location, such disturbance could offset the benefit gained in removing the released fluids. Because it is difficult to predict the net effect of a frac-out and attempts to recover the fluids, any frac-outs to the marsh must be evaluated on a case-by-case basis and an appropriate level of response mounted as described herein.

5.3.3. Frac-outs to Uplands

Uplands crossed by HDD on this project are limited to some road and railroad crossings including the I-10 HDD crossing. Environmental impacts will be limited to possible surface runoff of fines into adjacent surface waters. Typically the upland crossings are readily accessible by conventional construction equipment, so the HDD Contractor will perform containment and recovery of drilling fluids utilizing Containment and Recovery Equipment listed in Appendix B.

5.4. Frac-out Prevention

The first and most effective step in limiting the potential environmental impacts of HDD frac-outs is to prevent frac-outs from occurring in the first place. This can be accomplished in the conservative design of the HDD profile, as well as by observing preventative procedures during the actual HDD crossing.

5.4.1. Design

Precautionary measures incorporated into the design of the proposed HDDs to minimize the possibility of frac-outs, include:

a) Geotechnical Investigations

The soils strata targeted for the majority of the length of each borehole will be selected based on physical properties most conducive to producing a successful boring. These strata and their properties will be identified in pre-construction geotechnical investigations conducted along the length of each proposed HDD installation.

b) Depth of Cover

The proposed depth of cover will be maintained at a minimum of 20 feet (and in most cases, significantly more) below waterbodies and marsh, except in the initial and final 100 feet (+/-) where the borings enter and exit the ground. Since the possibility of a frac-out may increase as depth of cover decreases, the initial and terminal 100-foot sections of each HDD will be located in either upland areas or in open water, and have been purposely kept out of marsh areas, where possible.

5.4.2. Construction

The HDD Contractor will employ reasonable measures during drilling activities to prevent or minimize the occurrence of frac-outs, including as a minimum:

a) On-site Mud Engineer

A full-time, qualified, mud engineer will be on site. The On-site Mud Engineer will continuously monitor the drilling fluid circulation and returns, and ensure that the fluids handling equipment is operating within expected and optimum parameters (i.e. pressures, flow rates, etc.) for the soils conditions observed.

The On-site Mud Engineer will continuously monitor returned cuttings for soils type, and will modify the drilling fluid properties (i.e. viscosity, density, etc.) with the appropriate additives, as he deems necessary to account for changes in soil conditions.

b) Controlled Drill Head Advance

Where possible at the beginning of a drill, the drill head will be initially advanced with minimum drilling fluid pressure to minimize frac-outs in the relatively shallow depths.

The HDD Operator will advance the drill head at a pace that permits soils cuttings sufficient time to be flushed from the borehole by the drilling fluids. This prevents plugging and thereby maintains down-hole pressures at an acceptable level. The maximum rate of advance will be set, and periodically adjusted, by the HDD Operator, based on consultation with the On-site Mud Engineer, and as subsurface conditions change. If plugging occurs (i.e. return flow is diminished relative to fluid pumping rate), the rate of advance will be reduced, stopped, or reversed, as appropriate, until the plug has been cleared.

c) Minimum Pump Pressure

Drilling fluid pump pressure will be maintained at no more than the minimum necessary to maintain good circulation and to keep the borehole clear of cuttings. In the event a reduction in circulation is observed, at the discretion of the On-site Mud Engineer, adjustments to drilling fluid properties (i.e., density, viscosity, etc.), rate of drill head advance, and reaming diameter will be considered before pump pressure is increased.

5.5. Monitoring for Frac-outs

The HDD Operator will ensure that HDD operations are monitored for the occurrence of frac-outs using each of the following methods, where appropriate:

5.5.1. Pump Pressure

The drilling fluid pump discharge pressure shall be continuously monitored by the On-site Mud Engineer and recorded on a field data log prior to each joint connection. Significant changes or fluctuations in pressure may indicate the possibility of a frac-out, requiring immediate response.

5.5.2. Circulation Rate

The On-site Mud Engineer shall continuously monitor the flow rate of drilling fluid circulation and the volume of returns and record the data prior to each joint connection or following a change in return rate. Differences between the pumping rate and the rate of returns may indicate a frac-out.

5.5.3. Ground Surface Inspection

The HDD Operator shall assign one person to visually inspect the ground surface in uplands and marsh along the progress of the HDD for indications of escaping drilling fluids. Where possible, without trespassing outside the approved workspace or entering marsh (i.e., from a boat adjacent to the marsh), the inspection will cover a corridor approximately 500 feet wide, centered on the drill. Inspections shall be made relative to the rate of advance of the drill head, but an inspection pass shall be made at least once every hour while pumping drilling fluids. Any indications of a frac-out shall be reported immediately to the HDD Operator. If operating parameters (i.e., fluctuations in fluid pressure or returns) indicate the possibility of a frac-out, the surface inspection shall become continuous (daylight only) until the location of the suspected frac-out is found, the drill is completed, or measures to remedy the frac-out using additives or other operational adjustments have been successful. Daylight continuous monitoring will supplement the monitoring of operating parameters. Reasonable efforts will be made to locate the point of frac-out, if possible, in order to assess environmental damage, if any.

Inspections on uplands may be made on foot or from an appropriate vehicle. Inspections in marsh may be made on foot or from a boat in adjacent waters, depending on the potential for negative impacts to marsh by the inspection activities. Site-specific marsh inspection methods shall be reviewed and approved by the On-site KMLP Environmental Monitor, following consultation with the regulatory agency representative, if present.

5.5.4. Surface Water Inspection

The HDD Operator shall assign an individual to visually inspect the waterbodies under which the HDD is crossing for turbidity plumes that might indicate a frac-out is occurring. Inspection passes shall be made at least once every hour while pumping. Any indication of a frac-out shall be reported immediately to the HDD Operator. If operating parameters indicate the possibility of a frac-out under water, the water inspection shall become continuous (daylight only) until the location of the suspected frac-out is found, the drill is completed, or measures to remedy the frac-out using additives or other operations adjustments have been successful. Inspections shall be made by boat, or from an elevated position on land with an unobstructed line-of-sight to the water body (binoculars are recommended). Inspection boats shall be positioned and operated so as not to interfere with the ability to observe a plume or create a prop-induced plume (i.e. down-current from the drill centerline).

5.5.5. Special Safety Considerations

Monitoring in water or marsh at night or in fog will require special safety precautions and equipment considerations, including Coast Guard-approved navigation lights on all vessels, two men in each boat, continuous communication with the onshore crew or the drill barge, and portable lights of sufficient power to effectively monitor the area. No continuous nighttime monitoring will be allowed. Monitoring in water or marsh will be discontinued whenever conditions render the activity unsafe. At such time, the HDD Operator will determine, subject to KMLP approval, if drilling can safely continue while monitoring for frac-outs based solely on pump pressure and drilling fluids returns.

5.5.6. Notifications

Upon first indication of a frac-out, the HDD Operator shall notify the On-site KMLP Environmental Monitor. Upon confirmation of a frac-out, the On-site KMLP Environmental Monitor will notify the appropriate regulatory agencies, and the HDD Operator shall notify the affected landowner(s).

5.6. Initial Response to a Frac-out

The HDD Contractor’s initial response to a potential frac-out shall be in accordance with the flow diagram provided in Figure 1, and as described in further detail below.

- Upon first indication of a potential frac-out, the HDD Operator shall reduce drilling fluid circulating pressure, continue rotation of the drill string, and continue to advance the drill head in an attempt to stop or substantially reduce the frac-out rate.

- If the frac-out is initially or subsequently confirmed by an observed release of fluids to the surface or an observed turbidity plume in water, the HDD Operator will attempt to advance the drill head past the known point of the frac-out.

- Concurrently, the On-site Mud Engineer may inject pre-approved additives, in concentrations recommended by the manufacturer and as calculated by the On-site Mud Engineer, into the drilling fluid mixture in an additional attempt to control the release.

- If the release of drilling fluids continues unabated at a rate that threatens to expand to more than 0.1 acres of marsh habitat, or at a rate otherwise deemed excessive by the On-site KMLP Environmental Monitor (in consultation with the regulatory agency representative, if present), or completion of the drill is in jeopardy due to failure to remove cuttings from the borehole, advancement of the drill will be temporarily suspended.

- The Drill Operator may continue to rotate the drill string in the borehole and circulate fluids at a pressure that does not result in continued fluid release at the frac-out point, in order to keep the borehole open.

- If the frac-out is to marsh, the HDD Operator shall request that the On-site KMLP Environmental Monitor proceed to the analysis for containment and recovery described in Section 5.7.2 below, before continuing with the drill.

- If the frac-out is to uplands, the HDD Operator may continue advancing the drill, provided the released fluids are contained and removed (as described in Section 5.7.3 below), and after confirmation that cuttings are being returned at a sufficient rate to ensure successful completion of the borehole. The On-site Mud Engineer shall make adjustments to the drilling fluid properties to plug the frac-out or reduce the volume of fluids being released.

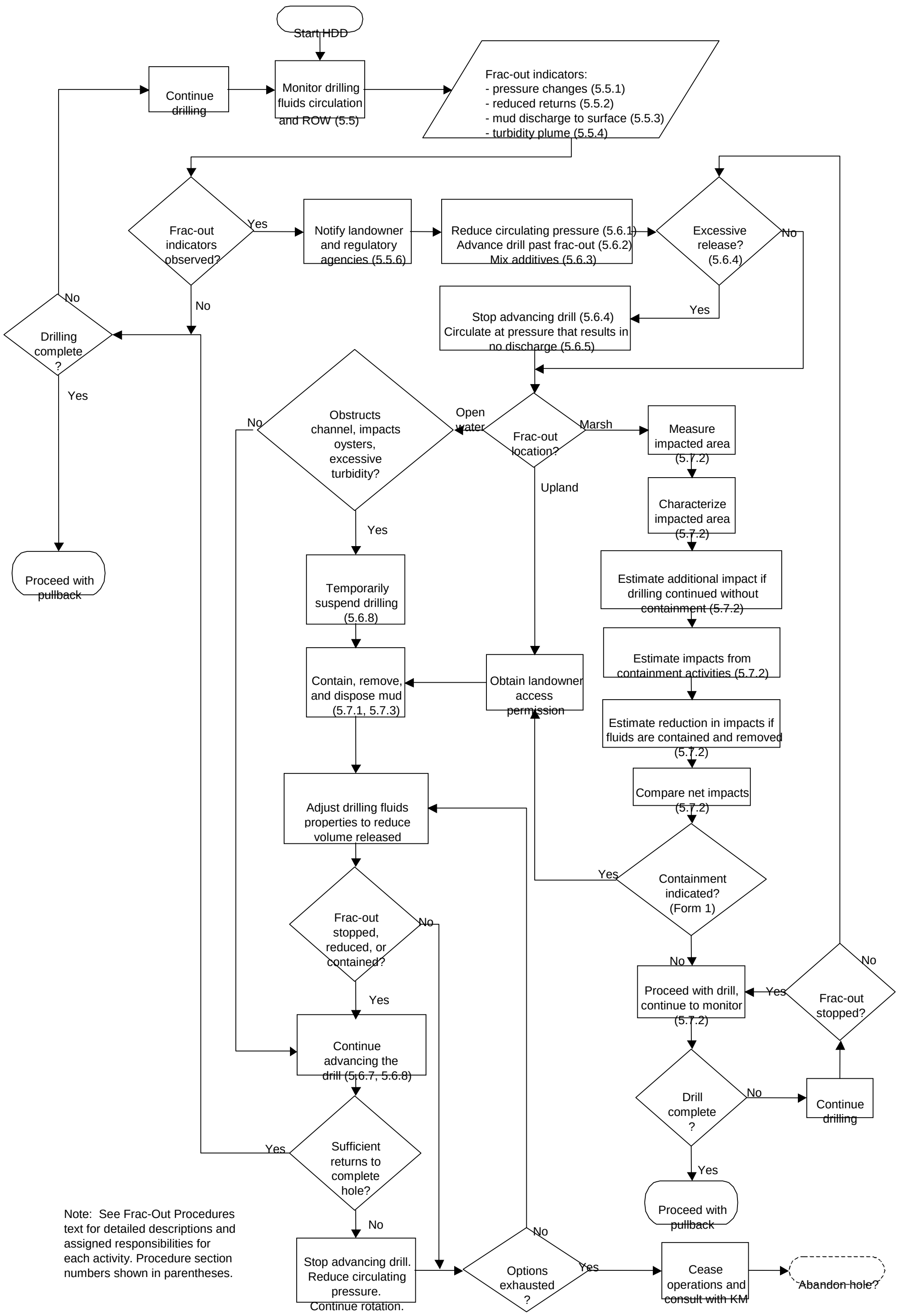

Figure 1. HDD Frac-out Flow Chart

- The HDD Operator may also continue to advance the drill if the release is to open water, the release does not obstruct a navigation channel, directly impact oyster resources, or accumulate in marsh and the cuttings are being returned at a sufficient rate to ensure successful completion of the borehole. The On-site Mud Engineer shall make adjustments to the drilling fluid properties to plug the frac-out or reduce the volume of fluids being released. If, however, the On-site KMLP Environmental Monitor (in consultation with the regulatory agency representative, if present) deems the resulting turbidity plume to be excessive, the HDD Operator shall temporarily suspend drilling until necessary corrective measures are successfully implemented.

- The On-site Mud Engineer shall record all parameters being tracked at the time of frac-out, including fluid circulating pressure, fluid mixture composition, fluid viscosity, location and depth of the drill head, location of the frac-out, rate of drill advance, and time of day. The HDD Operator shall keep a running log of all activities associated with the attempts to control the frac-out.

5.7. Containment and Removal

Containment and removal of drilling fluid releases to the surface from a frac-out shall be performed where practical and where there will be a net benefit in the reduction of total environmental impacts.

5.7.1. To Surface Waters

Containment and removal of drilling fluids released to surface waters as a result of a frac-out is generally impractical and ineffective because of dilution in the water column, and dispersion due to tides and currents. If, however, the On-site KMLP Environmental Monitor (in consultation with the regulatory agency representative, if present) considers the resulting plume excessive, or the plume may directly and negatively impact oyster resources or adjacent marsh, the HDD Operator shall implement the following containment measures.

- Depending upon the depth of water and surface conditions, floating silt booms, anchored in place, shall be placed over the location of the frac-out. The purpose of the containment is to confine the suspended solids until some observable degree of settlement can occur. Removal of the diluted drilling fluids is not anticipated, unless dictated by unusual circumstances, and subject to KMLP approval.

- The containment shall remain in place until the frac-out stops, and settlement renders the turbidity inside the containment similar to the adjacent waters based on visual inspection (Secchi disk), or the threat to the sensitive resource has passed (e.g. reversal of tidal currents).

- Any containment structure placed in open water shall be clearly marked as an obstruction in accordance with Coast Guard regulations, with special consideration given to the type of marine traffic observed in the area.

5.7.2. In Marsh

Containment and removal of released drilling fluids from a frac-out to marsh shall be performed when there is a net benefit in the reduction of impacts, as determined by the following actions.

- Upon confirmation of a frac-out in marsh, the HDD Operator shall assist the On-site KMLP Environmental Monitor in measuring the area directly affected by the released drilling fluids. The area affected may be estimated from a distance, if access to the affected area for measurement would result in additional unacceptable negative impacts.

- The On-site KMLP Environmental Monitor (a qualified wetlands biologist) will characterize the type of impact (e.g., temporary, permanent, vegetation only, change in surface hydrology) caused by the released fluids. The On-site KMLP Environmental Monitor will seek concurrence from the regulatory agency representative, if present.

- The HDD Operator and the On-site KMLP Environmental Monitor shall jointly estimate the additional area, if any, likely to be affected if the drilling were to proceed and the drilling fluids were not contained and removed.

- In consultation with the HDD Operator, the On-site KMLP Environmental Monitor will estimate and characterize the additional impacts to marsh likely to occur as a result of accessing the affected area for containment and removal of the drilling fluids.

- The On-site KMLP Environmental Monitor will estimate any reduction in impacts that might be achieved if the released fluids were removed.

- The total actual impacts, plus the estimated impacts from continuation of an uncontained release, shall be compared to the total actual impacts, plus the estimated impacts from accessing the area for containment and removal, less the estimated reduction in impacts as a result of recovery of the fluids. (Use Form 1 for guidance.) When making this comparison, some consideration and judgment should be given to the types of impacts, and value of the resources affected, if dissimilar. The action resulting in the least total impacts will generally be selected, unless there are mitigating circumstances, or as otherwise instructed by the regulatory agency representative, if present.

- If the decision is to forgo containment and proceed with the drill, the On-site KMLP Environmental Monitor will continue to observe the location of the frac-out. If the impacts continue to increase, the On-site KMLP Environmental Monitor will periodically repeat the comparison described above, until such time as containment and removal are justified, or the drill is complete.

- In the event of excessive and uncontrolled discharges of drilling fluids to marsh, KMLP and the HDD Operator shall determine a course of action. The frac-out shall be successfully plugged through adjustments in mud mixture or drilling techniques, or the released fluids shall be contained and recovered from the marsh with minimal and acceptable levels of impact. [NOTE: No containment or recovery activities will be allowed in the marsh without agency approval.] If this cannot be achieved, the borehole shall be abandoned.

- Prior to commencement of any HDD, the HDD Operator shall ensure that appropriate equipment is available at each HDD location to contain and recover drilling fluid flow from frac-outs into marsh. (See checklist in Appendix B.)

- If it is determined (as described above) that the released drilling fluid is to be contained and recovered, the HDD Operator shall direct the placement of the equipment at the obvious point or points of frac-out and transfer the contained fluids to a hopper barge or frac tank for reuse or disposal.

Form 1. Marsh Frac-out Impacts Comparison

Drilling Fluids Containment vs. No Containment (to be completed by On-site KMLP Environmental Monitor)

HDD No.:		**Date:**				
Frac-out Location:	**X=**		**Y=**		**Distance from Entry Point (ft) =**	

Description	**Impact Characterization**			
	Area (Acres)	**Vegetation**	**Surface Hydrology**	**Comments**
No Containment or Recovery Option:				
Actual marsh area impacted by drilling fluids		☐ Temp ☐ Perm ☐ None	☐ Temp ☐ Perm ☐ None	
Plus estimated additional area impacted if drill proceeds (consider all reduction measures, such as drill head advancing past frac-out, frac-out control additives, reduced pump pressure, etc.)		☐ Temp ☐ Perm ☐ None	☐ Temp ☐ Perm ☐ None	
Subtotal No Containment or Recovery				
Containment and Recovery Option:				
Actual marsh area impacted by drilling fluids		☐ Temp ☐ Perm ☐ None	☐ Temp ☐ Perm ☐ None	
Plus estimated impacts from accessing area for containment and recovery		☐ Temp ☐ Perm ☐ None	☐ Temp ☐ Perm ☐ None	
Less estimated reduction in impacts by removing drilling fluids		☐ Temp ☐ Perm ☐ None	☐ Temp ☐ Perm ☐ None	
Subtotal Containment and Recovery				
Option Selected: ☐ Least total acreage impacted ☐ Other, explain:				

Construction (To Be Determined): ____________________ KMLP: ______________________ Agency: ______________________________________

- All access to the marsh shall be done in such a manner as to cause the least impacts to the marsh vegetation and surface hydrology, and only with agency approval. Because of site-specific variables, such as distance from open water, surface hydrologic conditions, and vegetation cover, the selection of the most appropriate access method (e.g., using shallow draft boats, airboats, or on foot) must be made on a case-by-case basis, subject to approval by the On-site KMLP Environmental Monitor. The least number of personnel and equipment necessary to accomplish the task safely and in a timely manner shall be deployed into the marsh as described above.

- Following containment and removal, the HDD Operator shall continue to monitor this location for additional releases, and the remainder of the drill for new frac-outs, as the drill progresses.

- Whether or not containment and recovery is performed, all impacts to marsh from frac-outs will be measured, assessed, and recorded by the On-site KMLP Environmental Monitor, with assistance from the HDD Operator, for determination of any mitigation or restoration measures that may be necessary, as described below.

- Upon completion of the boring, the HDD Operator shall ensure that all containment and recovery equipment, tools, supplies, materials, wastes, and debris are removed from the marsh.

5.7.3. On Uplands

- The HDD Operator shall utilize as necessary, the appropriate combination of sand bags, hay bales, silt fence, pumps, hoses, and frac tanks that will most effectively contain and remove drilling fluids from upland areas (see checklist in Appendix B). The HDD Superintendent shall make the determination of the equipment and materials to be used, with approval of the On-site KMLP Environmental Monitor.

- The HDD Operator shall instruct the recovery crew to pump the contained and recovered fluids to frac tanks on site for reuse, if the On-site Mud Engineer determines the fluids are reusable. Otherwise, the fluids will be transported off site for disposal. (See HDD procedures for instructions on proper transportation and disposal of drilling fluids.)

- KMLP will obtain landowner permission prior to accessing any upland sites for fluids containment and removal operations, except in an emergency where inaction would pose an imminent threat to human health, sensitive environment, or property.

5.8. Impacts Assessment

Whether or not the drilling fluids have been successfully contained and removed, the On-site KMLP Environmental Monitor will fully characterize the environmental impacts from any release of drilling fluids following completion of the HDD, including the areal extent of the plume, the area affected by any recovery efforts, the type of marsh and vegetation impacted, changes to marsh elevation and hydrology, and whether the impacts are permanent or temporary. The On-site KMLP Environmental Monitor will seek concurrence of his assessment with the regulatory agency representative, if present.

The HDD Operator will provide an assistant and a boat (if necessary) to assist the On-site KMLP Environmental Monitor in completing this assessment.

A report of the assessment will be provided to the regulatory agency representative for determination of any further action.

6. Definition of HDD Failure and Abandonment Criteria

In the event the mitigation methods identified in Sections 4 and 5 are implemented with unsatisfactory results, KMLP will employ the following criteria to determine if the HDD method has failed and should be abandoned. If it is determined that HDD has failed, the alternative crossing method (or methods) identified in Table 1 will be utilized to complete the installation of the pipe.

6.1. Criteria for Pilot Hole Failure

Generally, breakdown of the HDD equipment is not considered to be acceptable criteria for an HDD failure. If surface HDD equipment, such as the HDD rig, breaks, it is the responsibility of the HDD Contractor to repair the equipment within 7 days. If the HDD Contractor can not repair the equipment within that time period, a second HDD Contractor may be identified and the HDD crossing will be re-started.

If, according to the HDD Operator, subsurface conditions are such that additional attempts at completing the HDD crossing would likely result in continued equipment failure, and, in the HDD Operator's option, the HDD method will not be successful, KMLP and the agency will discuss the possibility of abandoning the HDD method.

If drilling equipment breaks in the boring and cannot be retrieved, the HDD Operator will attempt to drill around the downhole equipment. If the HDD Operator cannot advance the pilot hole, the HDD equipment will be moved to the second, immediately adjacent, HDD location, if available (see Table 1), and the HDD Operator will attempt to re-drill the pilot hole. If a second HDD location is not available, the HDD as designed will have failed, and KMLP will advance to the alternative crossing method (see Table 1).

If, after adjusting the drilling fluids, the initial pilot hole collapses on the downhole equipment or there is a frac-out that meets conditions of failure identified in Section 5, the HDD Operator and the On-site KMLP Environmental Monitor will determine if the pilot hole can be redesigned to utilize a different subsurface strata and attempt a second installation of the pilot hole at the original HDD location.

If the pilot hole can be redesigned but not installed at the original HDD location or if the pilot hole can not be redesigned, the HDD equipment will be moved to the second adjacent location, if available (see Table 1), and a pilot hole installation attempt will be completed at the second, adjacent HDD location. If the attempt fails at the second HDD location, KMLP may consider the HDD as designed a failure. If a second adjacent HDD location is not available, the HDD as designed may be considered a failure.

Failure of the pilot hole installation due to deviation from the designed pathway is not anticipated. If the pilot hole deviates from the designed pathway, the HDD operator will back out of the borehole, grout the incorrect pathway and re-drill the pilot hole, correcting for the pathway deviation as needed.

Once HDD has been determined to have failed, the HDD Contractor will demobilize its equipment from the site after approval from KMLP and the crossing will be completed using the alternative method.

6.2. Criteria for Reaming and Swabbing Failure

If, following the collapse of the opened borehole or due to stresses on the equipment, the reamer equipment fails and part or the entire reamer is lost downhole, the HDD Contractor will be allowed 7 working days to attempt to retrieve the equipment from the hole and then return to the HDD crossing installation. If the HDD Contractor cannot retrieve the lost equipment, this is an unsuccessful attempt at opening the completed pilot hole due to equipment failure. If possible, a new pilot hole will be redesigned and installed at the first HDD location or if available, installed at the second adjacent HDD location. If neither of these two options can be implemented, HDD may be considered a failure due to equipment failure.

If the borehole collapses during the reaming process and the reaming equipment is retrieved, the pilot hole will be re-drilled at the original location and the pilot hole opening re-attempted. If, there is a second unsuccessful attempt at opening the pilot hole, the HDD Operator and the On-site KMLP Environmental Monitor will determine if the pilot hole can be redesigned and installed at the original location. If not, the HDD equipment will be moved to the second adjacent HDD location, if available (see Table 1), and the HDD Operator will attempt pilot hole installation and conditioning. If there are two unsuccessful attempts at opening the pilot hole at the second HDD location, HDD may be considered a failure. If there is not a second adjacent HDD location, the HDD as designed may be considered a failure.

Once HDD has been determined to have failed, the HDD Contractor will demobilize its equipment from the site after approval from KMLP and the crossing will be completed using the alternative method.

6.3. Criteria for Pullback Failure

If during the pull back process the pipe becomes stuck in the borehole, the HDD Operator will attempt to remove the pipe. If the pipe can be removed, the hole will be reconditioned and a second attempt to pullback the pipe will be completed. If during the second attempt to pullback the pipe, the pipe again becomes stuck, the HDD Operator will attempt to remove the pipe. If the pipe can be removed, the HDD Operator and the On-site KMLP Environmental Monitor will determine if a third attempt at the original location is warranted or if a new pilot hole should be drilled and opened at the second adjacent HDD location, if available (see Table 1). If a third attempt to pull the pipe at the original location fails, the HDD equipment will be moved to the second adjacent HDD location, if available (see Table 1) and a new pilot hole will be installed and opened. If a second HDD location is not available, HDD may be considered a failure.

If the crossing is moved to the second HDD location, three attempts to pullback the pipe, in which the pipe becomes stuck but can be retrieved, will be completed before HDD may be considered a failure.

If during the pullback process the pipe becomes stuck and cannot be retrieved from the borehole, the pipe will be abandoned in place. If a second HDD location is available, a new pilot hole will be installed and conditioned. A maximum of three attempts at the second location to pullback the pipe will be completed before HDD may be considered a failure. If a second location is not available, then HDD may be considered a failure.

Once HDD has been determined to have failed, the HDD Contractor will demobilize its equipment from the site after approval from KMLP and the crossing will be completed using the alternative method.

7. KMLP/Agency Communication

The On-site KMLP Environmental Monitor will prepare documentation in the form of daily progress reports, as-built information, and a description of the events leading up to the HDD failure. This documentation will be presented to the appropriate agencies notifying them of the HDD failure and KMLP's schedule for implementing the approved alternative crossing method. Pre-approval of the alternative crossing method will allow KMLP to proceed in a timely manner to begin implementation of the alternative method without additional agency approval or acknowledgement of the receipt of the failure documentation.

Appendix A – MSDS Sheets for Drill Additives

MATERIAL SAFETY DATA SHEET

Trade Name: RINGFREE **MSDS NO.** 12003

Revision Date: 10/09/2001

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Trade Name:	**RINGFREE**		
Synonyms:	None	**HMIS Rating**	
Chemical Family:	Not Determined	**Health:**	1
Product Use:	Oil well drilling fluid additive.	**Flammability:**	1
UN/NA PIN No:	Not Regulated	**Reactivity:**	0
WHMIS Class:	Non-Controlled	**PPE:**	J

Emergency Telephone (24 hr.): 281-561-1600

Supplied by a Business Unit of:
M-I L.L.C.
5950 North Course Drive
Houston, TX 77072
Phone: (281) 561-1509
Fax: (281) 561-7240

Contact Person:	Sam Hoskin - Manager, Occupational Health
Revision Date:	10/09/2001
Revision Number:	1
MSDS Status:	Approved

2. COMPOSITION/INFORMATION ON INGREDIENTS

Ingredient/CAS	**Wt. %**
Acrylic Polymer NONE	60-100

Ingredient Comments: No comments.

3. HAZARDS IDENTIFICATION

Emergency Overview: CAUTION! MAY CAUSE EYE, SKIN, AND RESIRATORY TRACT IRRITATION. Avoid contact with eyes, skin and clothing. Avoid breathing airborne product. Keep container closed. Use with adequate ventilation. Wash thoroughly after handling.
This product is a/an Colorless to light yellow liquid

Potential Health Effects:
Acute Effects

Eye Contact:	May irritate eyes.
Inhalation:	May be irritating to the respiratory tract if inhaled.
Ingestion:	May cause gastric distress, nausea and vomiting if ingested.
Skin Contact:	May be irritating to the skin.

Chronic Effects

Sensitization: Not determined.

Carcinogenicity:

Principle Routes of Exposure: Inhalation. Dermal - skin. Eyes.

Target Organ Effects: Respiratory System. Lungs. Skin. Eyes.
Signs and Symptoms: None known from occupational exposure.
Medical Conditions Aggravated By Exposure:
None known from occupational exposure.

Environmental Effects and Hazards:
Environmental effects have not been determined.

4. FIRST AID MEASURES

Eye Contact:	In case of contact, or suspected contact, immediately flush eyes with plenty of water for at least 15 minutes and get medical attention immediately after flushing.
Ingestion:	If swallowed, call a physician immediately. Only induce vomiting at the instruction of a physician. Never give anything by mouth to an unconscious person.
Inhalation:	Remove person to fresh air. If not breathing, give artificial respiration. If breathing is difficult, get immediate medical attention.
Skin Contact:	Wash skin thoroughly with soap and water. Remove contaminated clothing. Get medical attention if any discomfort continues.
General Notes:	Persons seeking medical attention should carry a copy of this MSDS with them.
Notes To Physician:	None known.

5. FIRE FIGHTING MEASURES

Flammable Properties

Flash Point: °F	N/A	°C	N/A
Flash Point Method:	Not Determined		
Flammable Limits in Air - Lower (%):	Not Determined		
Flammable Limits in Air - Upper (%):	Not Determined		
Autoignition Temperature: °F	Not Determined	°C	Not Determined

Flammability Class: Not determined.
Other Flammable Properties: Not determined.
Extinguishing Media: Carbon dioxide Dry chemical Foam Water mist
Protection Of Fire-Fighters:

Special Fire-Fighting Procedures: Wear approved positive-pressure self-contained breathing apparatus and protective clothing.
Hazardous Combustion Products: Carbon monoxide. Carbon dioxide.

6. ACCIDENTAL RELEASE MEASURES

Personal Precautions: Use personal protective equipment identified in Section 8.

Spill Procedures: Absorb in vermiculite, dry sand or earth and place into containers. Rinse area with water. Dike far ahead of larger spills for later disposal.

Environmental Precautions: Do not allow to enter sewer or surface and subsurface waters.

7. HANDLING AND STORAGE

Handling: Use in a well ventilated area to prevent irritation by vapors. Wear full protective clothing for prolonged exposure and/or high concentrations. Eye wash and emergency shower must be available at the work place. Wash hands often and change clothing when needed.

Storage: Store at room temperature in dry, well ventilated area. Keep in original container.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Exposure Limits

Ingredient/CAS	Wt. %	ACGIH TLV TWA	ACGIH TLV STEL	ACGIH TLV Ceiling:	ACGIH Skin	OSHA PEL TWA	OSHA PELs Ceiling:	OSHA PELs Skin	Notes
Acrylic Polymer NONE	60-100	Not Listed	Not Listed	Not Listed	Not Listed	Not Listed	Not Listed	Not Listed	(1)

Notes: (1) Control as Particulates Not Otherwise Regulated (PNOR); PEL: 5 mg/m3 resp; TLV: 3 mg/3m resp;

Engineering Controls: Local exhaust ventilation as necessary to maintain exposures to within applicable limits.

<u>Personal Protection Equipment</u>

Eye/Face Protection: Wear chemical safety goggles where eye exposure is reasonably probable.

Skin Protection: Wear appropriate clothing to prevent repeat or prolonged skin contact.

Respiratory Protection: If exposed to particulates/aerosols:
Use at least a NIOSH-approved N95 half-mask disposable particulate respirator. In work environments containing oil mist/aerosol use at least a NIOSH-approved P95 half-mask disposable or reuseable particulate respirator.
If exposed to organic vapors:
Use a NIOSH/MSHA-approved organic vapor respirator. CCROV: CCR with organic vapor cartridge.

General Hygiene Considerations: Wash promptly with soap and water if skin becomes contaminated. Change work clothing daily if there is any possability of contamination.

9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance:	Not determined.
Color:	Light Yellow
Odor:	Mild
Physical State:	Liquid
pH Value, Conc. Sol.:	Not Determined
pH Value Diluted Sol.:	7.25
Vapor Pressure:	Not Determined
Vapor Density (Air=1):	Not Determined
Boiling Point (°F):	194 - 212
Melting/Freezing Point:	Not determined.
Solubility in Water Description:	Not Determined
Solubility:	Soluble in Water
Density/Specific Gravity:	1.27
Evaporation Rate:	Not Determined
Odor Threshold Lower:	NA
Odor Threshold Upper:	Unknown

10. STABILITY AND REACTIVITY

Chemical Stability:	Stable
Conditions to Avoid:	Heat.
Materials to Avoid:	Strong oxidizing agents.
Hazardous Decomposition Products:	Oxides of carbon
Hazardous Polymerization:	Will not occur

11. TOXICOLOGICAL INFORMATION

Toxicological Data

Ingredient/CAS	Wt. %	Route	Species	Dose	Duration	Effect	Source
Acrylic Polymer NONE	60-100	N/D	N/D				N/D

Toxicological Information: No toxicological data is available for this product.

12. ECOLOGICAL INFORMATION

Ecotoxicological Data

Ingredient/CAS	Wt. %	Species	Concentration	Duration	Source
Acrylic Polymer NONE	60-100	N/D		N/D	N/D

Chemical Fate Data

Biodegration: Not determined.

Bioaccumulation: Not determined
Octanol/Water Partition Coefficient: None Known

Ecological Information: No ecological information is available for this product.

13. DISPOSAL CONSIDERATIONS

Waste Classification: Not determined.

Waste Management: This product does not meet the criteria of a hazardous waste if discarded in its purchased form. Under RCRA, it is the reponsibility of the user to determine at the time of disposal, whether the product meets RCRA criteria for the hazardous waste. This is because product uses, transformations, mixtures, processes, etc., may render the resulting materials hazardous. Empty container retain residues. All labeled precautions must be observed.

Disposal Method: Recover and reclaim or recycle, if practical. Should this product become a waste, dispose of in a permitted industrial landfill. Ensure that the containers are empty by the RCRA criteria prior to disposal in a permitted industrial landfill.

14. TRANSPORT INFORMATION

U.S. DOT

Proper Shipping Name:	Not Regulated
Hazard Class:	None
Subsidiary Harzard:	None
UN/NA Number:	Not Regulated
DOT Packing Group:	None
Packaging Authorizations:	None
Product RQ:	Not determined.
Emergency Response Guide No.:	Not determined.

TDG (Canada):

Proper Shipping Name:	Not Regulated
Hazard Class:	Not regulated.
Subsidiary Hazard:	None
UN/NA PIN No:	Not Regulated
Packing Group:	None

IMDG:

Proper Shipping Name:	Not Regulated
Hazard Class:	Not regulated.
Subsidiary Hazard:	None
UN No.:	Not Regulated
Packing Group:	None
EMS No.:	None
Marine Pollutant:	None

ICAO/IATA:

Proper Shipping Name:	Not Regulated
Hazard Class:	Not regulated.
Subsidiary Hazard:	None
UN No.:	Not Regulated
Packing Group:	None

15. REGULATORY INFORMATION

US Federal Regulations

SARA 311/312:

SARA 311/312 Hazard Catagories: Immediate (acute) health hazard;

Acrylic Polymer 60-100 **NONE**

SARA 313	Not Listed
CERCLA	Not Listed
SARA 302 / TPQs	Not Listed

State Regulations

State Comments: Proposition 65: This product does not contain chemicals considered by the State of California's Safe Drinking Water and Toxic Enforcement Act of 1986 as causing cancer or reproductive toxicity, and for which warnings are now required.

Acrylic Polymer 60-100 **NONE**

California Prop. 65 Cancer list	Not Listed
California Prop. 65 Developmental Toxicity	Not Listed
California Prop. 65 Reproductive Female	Not Listed
California Prop. 65 Reproductive Male	Not Listed

International Inventories

TSCA - Sect. 8(b) Inventory	This product complies with TSCA.
Canada - Domestic Substances Inventory	This product complies with Canadian DSL.
Canada - Non-Domestic Substances Inventory	This product does not comply with Canadian NDSL.

Canadian Regulations

Controlled Products Regulations Statement: This product has been classified in accordance with the hazard criteria of the CPR and the MSDS contains all the information required by the CPR.

WHMIS Class: Non-Controlled

16. OTHER INFORMATION

Notes: N/D = Not Determined; N/A = Not Applicable

Information Sources:

OSHA Permissible Exposure Limits, 29 CFR 1910, Subpart Z, Sections 1910.1000, Air Contaminates. ACGIH Threshold Limit Values and Biological Exposure Indices for Chemical Substances and Physical Agents (Latest edition). Sax´s Dangerous Properties of Industrial Materials, 9th ed., Lewis, R.J. Sr., (ed), VNR, New York, New York, (1997). IARC Monographs on the Evaluation of the Carcinogenic Risk of Chemicals to Humans, Silica, Some Silicates, Coal Dust, and para-Aramid Fibrils, Vol. 68, World Health Organization, Lyon, France, 1997. Product information provided by the commercial vendor(s).

Trade Name: RINGFREE **MSDS NO.** 12003

Revision Date: 10/09/2001

The following has been revised since the last issue of this MSDS:
Nothing has been revised.

Disclaimer:
MSDS furnished independent of product sale. While every effort has been made to accurately describe this product, some of the data are obtained from sources beyond our direct supervision. We can not make any assertions as to its reliability or completeness; therefore, user may rely on it only at user's risk. We have made no effort to censor or conceal deleterious aspects of this product. Since we cannot anticipate or control the conditions under which this information and product may be used, we make no guartantee that the precautions we have suggested will be adequate for all individuals and/or situations. It is the obligation of each user of this product to comply with the requirements of all applicable laws regarding use and disposal of this product. Additional information will be furnished upon request to assist the user; however, no warranty, either expressed or implied, nor liability of any nature with respect to this product or to the data herein is made or incurred hereunder.

MATERIAL SAFETY DATA SHEET

Trade Name: PARGEL 220 **MSDS NO.** 12034

Revision Date: 12/17/2001

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Trade Name: **PARGEL 220**

Synonyms: Bentonite
Chemical Family: Naturally occuring mineral
Product Use: Oil well drilling fluid additive.
UN/NA PIN No: Not Regulated
WHMIS Class: D2A

HMIS Rating
Health: *1
Flammability: 1
Reactivity: 0
PPE: J

Emergency Telephone (24 hr.): 281-561-1600

Supplied by a Business Unit of:
M-I L.L.C.
5950 North Course Drive
Houston, TX 77072
Phone: (281) 561-1509
Fax: (281) 561-7240

Contact Person: Sam Hoskin - Manager, Occupational Health
Revision Date: 12/17/2001
Revision Number: 1
MSDS Status: Approved

2. COMPOSITION/INFORMATION ON INGREDIENTS

Ingredient/CAS	Wt. %
Bentonite 1302-78-9	70 - 95
Silica, crystalline, quartz 14808-60-7	2 - 15
Silica, crystalline, Cristobalite 14464-46-1	2 - 12
Silica, crystalline, Tridymite 15468-32-3	1 - 5
Gypsum 13397-24-5	0 - 1

Ingredient Comments: No comments.

3. HAZARDS IDENTIFICATION

Emergency Overview: CAUTION! MAY CAUSE EYE, SKIN, AND RESIRATORY TRACT IRRITATION. Avoid contact with eyes, skin and clothing. Avoid breathing airborne product. Keep container closed. Use with adequate ventilation. Wash thoroughly after handling. This product is a/an tan to gray powder. Slippery when wet. No significant immediate hazards for emergency response personnel are known.

Potential Health Effects:
<u>Acute Effects</u>

Eye Contact: May be irritating to the eyes.
Inhalation: May be irritating to the respiratory tract if inhaled.
Ingestion: May cause gastric distress, nausea and vomiting if ingested.
Skin Contact: May be irritating to the skin.

Chronic Effects

Sensitization: Not determined.

Carcinogenicity:

Cancer Comments: ATTENTION! CANCER HAZARD. CONTAINS CRYSTALLINE SILICA WHICH CAN CAUSE CANCER. Risk of cancer depends on duration and level of exposure. IARC Monographs, Vol. 68, 1997, concludes that there is sufficient evidence that inhaled crystalline silica in the form of quartz or cristobalite from occupational sources causes cancer in humans. IARC Classification Group I.

Silica, crystalline, quartz 2 - 15 **14808-60-7**

IARC: Listed
OSHA: Listed
NTP: Listed

Silica, crystalline, Cristobalite 2 - 12 **14464-46-1**

IARC: Listed
OSHA: Listed
NTP: Listed

Silica, crystalline, Tridymite 1 - 5 **15468-32-3**

IARC: Listed
OSHA: Listed
NTP: Listed
Target Organ Effects: Respiratory System. Lungs. Skin. Eyes.
Signs and Symptoms: Particulates may cause mechanical irritation to the eyes, nose, throat and lungs. Particulate inhalation may lead to pulmonary fibrosis, chronic bronchitis, emphysema and bronchial asthma. Dermatitis and asthma may result from short contact periods.

Medical Conditions Aggravated By Exposure:
Respiratory conditions.

Environmental Effects and Hazards:
Environmental effects have not been determined.

4. FIRST AID MEASURES

Eye Contact: Promptly wash eyes with lots of water while lifting eye lids. Continue to rinse for at least 15 minutes. Get medical attention if any discomfort continues.

Ingestion: Drink a couple of glasses of water or milk. Do not give victim anything to drink if he is unconscious. Get medical attention.

Appendix B – Containment and Recovery Equipment Checklist

Silt fence	500 feet
Hay bales	50 bales
Small pumps	2
Flex-line (2”) pump hose	200 feet
Aluminum boats	2
Shovels	6