AP - 010

STAGE 1 & 2 WORKPLANS

DATE:

JAN. 11, 1999

PHILLIPS PIPE LINE COMPANY

January 11, 1999

Initial Abatement Work Plan
10-27-98 Crude oil Release
Phillips Pipe Line Company

Mr. Bill Olson
New Mexico Oil Conservation Division
2040 S. Pacheco St.
Santa Fe, NM 87505

Dear Mr. Olson:

Phillips Pipe Line Company has enclosed an Initial Abatement Work Plan for the crude oil release that occurred near Hobbs, New Mexico in Lea County on October 27, 1998. The Initial abatement work plan describes activities being performed to reduce the further spread of contaminants and activities that will aid in the development of the Abatement Plan requested by the NMOCD.

A list of activities that have been performed to date follows:

- Excavation to remove heavily contaminated soils
- Testing of soil to show it does not exhibit hazardous characteristics
- Hauling of contaminated soil to Texas for roadspreading (verbal approval from NMOCD)
- Drilling of permanent monitoring well
- Baling of product by hand

The following is a list of activities regarded as initial abatement addressed in this Work Plan:

- Preliminary assessment via Surface Induction Profiling and Vertical Induction Profiling
- Installation of automated baling system

If you need more information regarding this notification, please contact me at 918-661-3557.

Sincerely,

Anthony C. Walker

Anthony "Tony" C. Walker
Phillips Pipe Line Company
Staff Environmental Representative
3 B11 Adams Building

ACW: InitAbatPlan.doc

cc: Mr. Chris Williams
State of New Mexico
Energy Minerals and Natural Resources Dept.
Oil Conservation Division
District 1
P.O. Box 1980
Hobbs, New Mexico 88241-1980

Higgins and Associates, L.L.C.

9940 East Costilla Avenue, Suite B
Englewood, Colorado 80112

303/708-9846
Fax 303/708-9848

January 25, 1999

Mr. Tony Walker
Phillips Pipe Line Company
3B11 Adams Building
Bartlesville, Oklahoma 74004

RE: Initial abatement Work Plan for the Hobbs, New Mexico Gathering Line Release Project

Dear Mr. Walker:

Higgins and Associates, L.L.C. (Higgins and Associates) has prepared the following work plan for conducting initial assessment activities and installation of a product recovery system at the referenced site. The current information concerning the site specific hydrogeology and the nature and extent of the release is limited, therefore a phased approach for activities is being proposed. The work activities which are anticipated to be conducted at the site are dynamic in nature and multiple changes may be required as additional information is obtained. In this respect, the information obtained from the initial phase will determine the approach presented in the Stage I Abatement Plan. Proceeding in this method will help to insure that the project proceeds in an effective and expedient manner.

The initial abatement work plan presented in the following contains a summary of the project background, information concerning the geology/hydrogeology, a discussion of the distribution of the hydrocarbon impacts, details of the initial abatement activities and a schedule for implementation of the activities.

Project Background

Phillips discovered a release of unrefined petroleum products (crude oil) associated with a local well field gathering pipe line located near the Town of Hobbs, New Mexico. Two gathering lines parallel each other at the release site. One line is a six inch diameter line and the second line is an eight inch diameter line. The lines are separated by approximately one foot and are installed three to four feet beneath ground surface. The line leak was noted by the detection of oil impacts on the ground surface in the area of the release. The amount of crude oil released is not known.

Phillips excavated approximately 1,500 cubic yards of petroleum impacted soil from around and below the release location. The limits of the excavation are approximately 30 feet wide by 120 feet long and average approximately 12 feet deep with the deepest extent around 18 feet. Petroleum impacts remained in the floor and side walls of the excavation and therefore the excavation activities were halted until the lateral extent of impacts were defined. The excavated soil has been stockpiled at the site.

Phillips personnel supervised the installation of a 4-inch diameter, 50 foot deep, monitoring well to determine the vertical extent of soil impacts and to determine if the groundwater had been impacted. The well was located approximately 20 feet north of the release location. Visual contamination was observed during drilling activities from a depth of two feet to total depth. Groundwater was encountered at approximately 40 feet. Approximately 13 feet of crude oil was detected on the water table. The geology and hydrogeology will be discussed below. A site sketch is attached which illustrates the location of the monitoring well and the area of excavation. The site sketch is not to scale.

Phillips initiated a product recovery program from monitoring well MW-1 on December 12, 1998. The program consists of periodic bailing of the product from the well utilizing a bailer. As of January 8, 1999 approximately 534 gallons of crude oil have been recovered from the water table.

Geology and Hydrogeology

The regional geology surrounding the site is understood to be eolian alluvium (unconsolidated) overlaying the Ogalalla Formation. The Ogalalla is also known as the High Plains aquifer which extends north to south from South Dakota to New Mexico and Texas. The Ogalalla was formed during the formation of the Rocky Mountains (Larimide orogeny - late Cretaceous to end of Paleocene). The Ogalalla Formation primarily consists of outwash alluvium deposited by the streams draining the newly formed Rocky Mountains. Caliche deposits are encountered in those areas considered under semiarid to arid conditions. The caliche was (and continues to be) formed as a result of the vertical movement of water through the unconsolidated alluvium from rainfall recharge (downward) and evaporation (upward). The calcium carbonate and or calcium sulfate forms out of solution and creates a cementation effect. The origin of the calcarious material is either eolian (wind blown dust) or eroded limestone within the alluvium of the Ogalalla.

The hydrogeology of the Ogalalla aquifer can vary tremendously on a relatively small scale due to the wide grain-size distribution of the alluvial sediments. The Ogalalla aquifer can be "designated" unconfined, semi-confined, or confined depending on the regional conditions. From data provided, the Ogalalla near Hobbs is unconfined to semi-confined. The regional water table slopes from west to east. The saturated thickness of the Ogalalla ranges from 0 feet to the west to upwards of 1,000 feet to the east. In the area of Hobbs, New Mexico, the saturated thickness may be 10 to 150 feet. Depth to groundwater is shallower to the west and gradually gets deeper to the east. As a regional average, the groundwater flow rate is approximately 1 ft/day. Hydraulic conductivity varies from 25 to 300 ft/day and averages 60 ft/day. Aquifer recharge is primarily rainfall; aquifer discharge is a combination of streams or springs and evapotranspiration. Water table fluctuations can be as much as 10 to 50 feet during the year depending on precipitation and irrigation usage. The Ogalalla is a principal source of water for domestic and irrigation use for the High Plains.

Based on the information obtained from the drilling of monitoring well MW-1, the site specific geology consists primarily of caliche mixed with sands and some gravel. The upper 23 feet of the hole was drilled with a hollow stem auger. A layer of limestone was encountered at a depth of 23 to 25 feet below ground surface (bgs) which required changing the drilling method to air rotary. The limestone was described as very hard and dry while the caliche above the limestone was described as moist with a sheen on the outside of the split spoon. Based on this description, the limestone may be acting as an aquitard resulting in crude oil accumulating on top of this stratigraphic unit. However, the lateral extent of the limestone is not known and may be discontinuous. Below the limestone layer the lithology is logged as caliche becoming "mostly sand with depth". This description indicates that the level of cementation of the caliche is decreasing with depth.

Groundwater was encountered in the monitoring well at approximately 40 feet. Thirteen feet of crude oil was detected on the water table. The depth to water following a bail down test was 36.97 feet with the top of the free phase hydrocarbons at 27.16 feet. Due to the presence of the crude oil, the actual depth to water is unknown but is anticipated to be between 30 and 35 feet. The actual site groundwater flow direction, gradient, and other specific hydrogeologic conditions (conductivity, permeability, velocity, and saturated thickness) are unknown at this time.

Hydrocarbon Distribution

The primary phases of petroleum impacts which are associated with this site are adsorbed phase hydrocarbons, liquid phase hydrocarbons and possibly dissolved phase hydrocarbons. The lateral extent of petroleum impacts to the soil and groundwater are not known.

It is understood that petroleum impacts were apparent throughout the limits of the excavation from near surface to the total depth. Also the drilling activities detected impacts to the soil from a depth of two feet to the total depth of 50 feet. This information indicates that shallow impacts to soil may be extensive. The lateral extent of the petroleum may have been the result of the crude oil migrating along the pipe line or may be representative of the subsurface geology. The subsurface soils at the site consists primarily of caliche cemented sediments. The crude oil may have spread out laterally along zones of increase permeability (preferential pathways). This method of fluid transport may have resulted in fingers of crude oil in the subsurface. Additional assessment activities will help to determine if this has occurred.

Project Approach

Site activities are planned to proceed in a stepped approach with the results of each phase being used to design the scope of work for the subsequent phase. The major phases of work are outlined as follows:

Initial Abatement: These activities will consist of free phase hydrocarbon abatement and preliminary

assessment.

Stage I: Delineation of hydrocarbon impact to soil and groundwater through the drilling of soil borings and installation of monitoring wells.

Stage II: Remedial approach selection, testing, design, and implementation.

The scope of work for the abatement phase is presented in the following section.

Abatement Work Plan

The goal of the abatement work plan activities is to initiate abatement measures for the free phase crude oil and to obtain preliminary information concerning the lateral extent of crude oil present on the water table. The tasks in this phase will include the following:

- Identify water wells within 1 mile radius of the release site as outlined in Rule 19.E.3(I).
- Installation of an interim free product recovery system for recovery of crude oil in the vicinity of the release location.
- Conduct a geophysical survey to determine preliminary information concerning the lateral and vertical extent of petroleum impacts.
- Preparation of a Stage I abatement plan for installing monitoring wells or other means to confirm the results of the geophysical survey and to define and monitor the lateral extent of the crude oil impacts.

The work plan is discussed in additional detail in the following.

Water Well Survey

The State Engineers office will be contacted to obtain a list of registered water wells within a one mile radius of the release. The locations of these wells will be plotted on a topographic map.

Product Recovery

Several options for the removal of the LPH from the water table were evaluated. Site specific conditions which were taken into consideration were:

- The depth to the product layer is thirty to forty feet.
- The LPH consists of crude oil with a viscosity of API 35.
- Electrical power is not available at the site.

- The site is remote and therefore equipment must require minimal maintenance.
- Recovery equipment must adjust automatically to fluctuations in the water table.
- The product appears to be an emulsification of crude oil and water.

The following is a brief evaluation of some of the systems which were considered.

Pneumatic Total Fluids Pumps

Vendor: Clean Environment Equipment (CEE)
Pump Model: AP-4 and AP-2

Feasibility: The Clean Environment AP-4 top loading pump would not be able to handle the viscosity of the crude oil. The Clean Environment AP-2 could possibly handle the crude oil, but would require frequent cleaning and adjustment for fluctuating water table conditions. The AP-2 is a total fluids pump and will pump water with the crude oil. This pump is not highly recommended for this application by the manufacturer.

Vendor: Clean Environment Equipment
Pump Model: Specific Gravity Oil Skimmer

Feasibility: The Clean Environment Specific Gravity Pump could not handle the viscosity or the emulsification of the crude oil. The crude oil tends to clog the inlet of the skimmer and the skimmer tube in a short period of time. This pump is not recommended for this application.

Remote Electric Pump (Solar Powered)

Vendor: Clean Earth Technology, Inc.
Model: Spillbuster Magnum System - 1.9

Feasibility: The Clean Earth Technology indicated that their pump could not handle crude oil. A crude oil model is under development however, it will not be available for at least one year.

12V Efficient Belt Skimmer

Vendor: Abernaki Corporation
Model: PetroXtractor

Feasibility: The Abernaki PetroXtractor has been specifically designed to handle recovery of oil such as crude oil from 2, 4, or 6 inch diameter wells. The system can recover the oil from depths up to 100 feet. The PetroXtractor makes use of the differences in specific gravity and surface tension between oil and water. These physical characteristics allow the unit's continuous belt, which extends from the top of the well into the oil/water interface, to attract floating oil in the well. The oil adheres to the belt and then travels trough tandem wiper blades located at the well head scraping the oil off both sides of the belt and into a discharge hose (see attached CAD drawing). The system is reported by the manufacturer to require minimal maintenance.

Of the models of pumps evaluated, the PetroXtractor is the most practical approach for removal of the free phase crude oil on an interim basis. The system is simple in design and operation and requires minimal maintenance.

The second portion of the evaluation process for the product recovery system was evaluating options for providing electrical power to the product recovery system. The options included gasoline and diesel fueled generators, propane or natural gas fueled generators, and solar power. Due to the continuous operation requirement for the generators, regardless of the fuel type, the maintenance required in order to keep for the generators in operation was extensive. The PetroXtractor system can be designed to operate from a 12 volt power supply which allows the incorporation of solar power. The solar power converter is understood to require minimal maintenance. Though not inexpensive, this option appears to be the most cost effective option for providing long term electrical service at this time.

The interim product recovery system consists of the following:

- Installation of a PetroXtractor in monitoring well MW-1. This system can remove up to six gallons of oil per hour (based on oil with a viscosity of 30 weight motor oil).

- Installation of a 500 gallon product storage tank. The tank will be equipped with a tank full probe connected to a power interrupter system to de-energize the PetroXtractor systems in the event of a tank full condition.

The above system should work effectively in the remote setting of the site and with the physical properties of the crude oil.

Preliminary Assessment

The assessment portion of the abatement activities involves activities to determine the lateral extent of free phase crude oil on the water table. Due to the uncertainty of the amount of crude oil released and the

lateral extent of free phase crude oil on the water table, geophysical methods are proposed for obtaining preliminary information on the lateral extent of the free phase plume. Geophysical surveys are designed to provide information on the lateral extent of the petroleum impacts without having to install a large number of monitoring wells.

Ground Truth Technology, Inc.(GTT) was selected for this project based on the technology which they have developed and their ability to mobilize quickly to the site. GTT utilizes various geophysical tools which have been developed specifically for mapping petroleum impacts in the subsurface. GTT was provided the available site specific information in order to evaluate the applicability of their technologies to the site. Based on this review, GTT recommended two geophysical methods for mapping the crude oil impacts. The first method would involve Surface Induction Profiling (SIP) to provide preliminary information on the lateral extent of crude oil impacts. This method can map large areas rapidly (up to 3 acres per day). The second geophysical method is Vertical Induction Profiling and would be able to map the vertical extent of petroleum impacts. The VIP tool would be used in conjunction with the SIP results to prepare a 2 ½ D evaluation of the petroleum impacts. The scope of work for evaluating the lateral extent of the plume is presented in the following:

- Conduct a geophysical survey using Surface Induction Profiling ("SIP") and Vertical Induction Profiling ("VIP"). The SIP process will provide general information concerning the lateral extent of the petroleum impacts. The VIP survey will provide specific information concerning the lateral and vertical extent of the petroleum impacts.

  The SIP survey consist of an induction coil and a receiver both of which are placed on the surface. A grid will be developed and surveyed on a 100 X 100 foot spacing and the SIP soundings will be collected over a 25 foot by 25 foot grid spacing within the surveyed grid. The SIP data will be contoured and evaluated on site and recommendations for the VIP survey will be made based on the SIP results. The SIP and VIP survey is anticipated to be accomplished over a three day period with the second day being used primarily for interpolation of the SIP results.

  The VIP survey will be conducted by utilizing the induction coil at various surface stations with the receiver being placed in the existing monitoring well. The induction coil stations will be based on the results of the SIP survey. Soundings will be collected at each station and the receiver will be drawn up the well bore at a predetermined rate of assent with readings being collected along the well bore. This information is used to evaluate the vertical distribution of the petroleum impacts.

  The VIP survey can cover an area of approximately 250 feet from the existing monitoring well. Therefore if the survey area extends beyond this point, additional wells will be required.

Stage I Abatement Plan

Following completion of the above activities a Stage I Abatement Plan will be developed. The abatement plan will include the following:

- Summary of the results of the abatement activities.
- Number and location of soil borings and monitoring wells to define the lateral and vertical extent of impacts.
- A sampling and monitoring plan.
- A quality assurance plan.
- A schedule for the proposed activities.

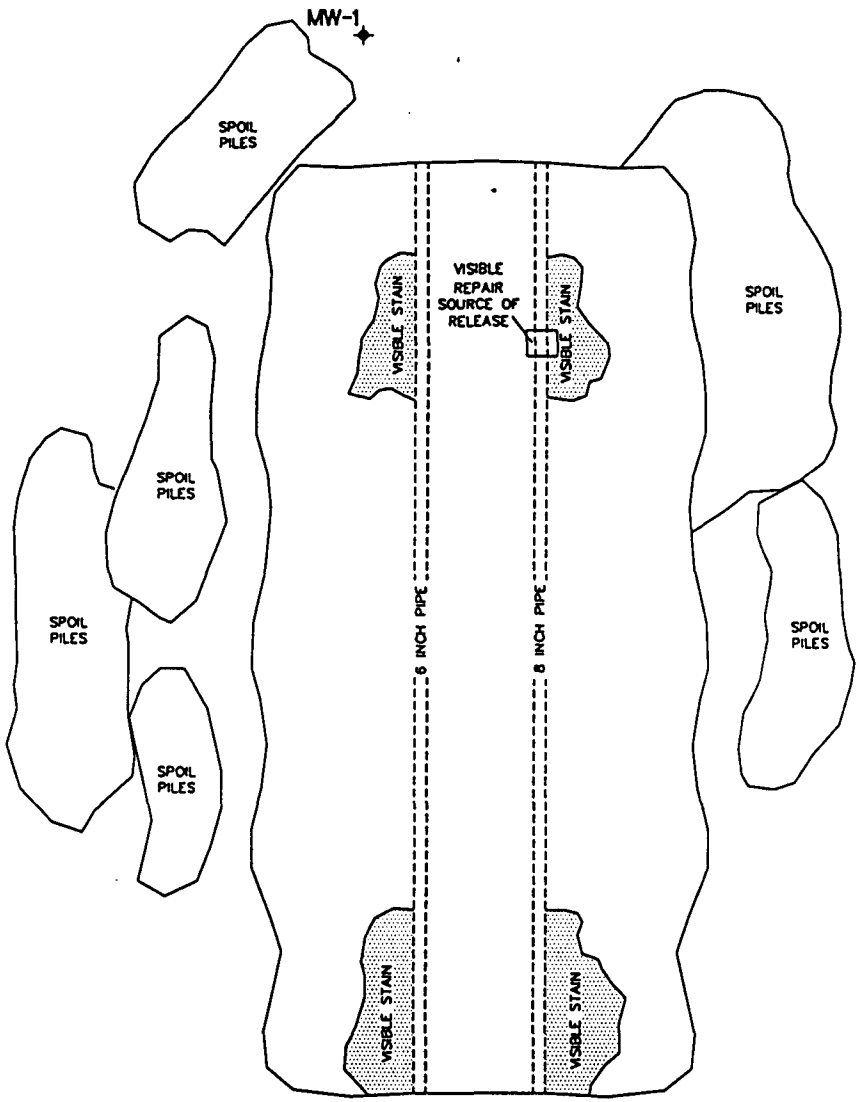
Schedule

The geophysical survey is scheduled to be conducted the week of February 1, 1999. The product recovery system will be installed following receipt and testing of the equipment. The order for this system has been placed and the delivery time is estimated at four to six weeks.

Higgins and Associates appreciates the opportunity to provide Phillips Pipe Line Company with environmental consulting services. Should you have any questions concerning this work plan please contact me at 303/708-9846.

Sincerely,
Higgins and Associates, L.L.C.

Chris Higgins
NMUB Certified Scientist #234
President



N

LEGEND

MW- MONITOR WELL

--------- SUBSURFACE FEATURES

NOT TO SCALE

8-DE-1

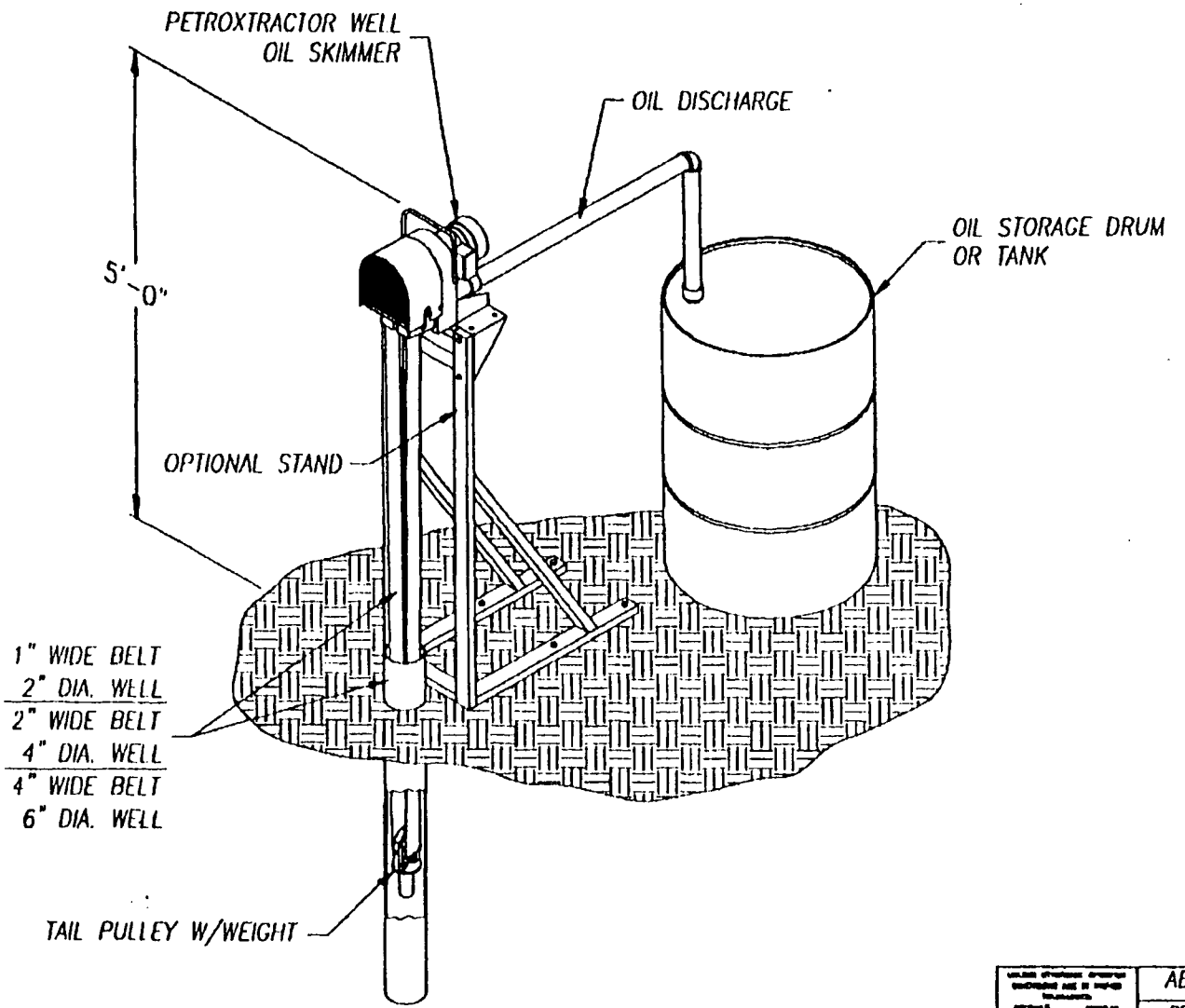
FLUOR DANIEL GTI
1201 BELTLINE ROAD
SUITE 100
COPPELL, TEXAS 75019
(972) 341-8300 (TEL)
(972) 341-8365 (FAX)

OFFICE:	DRAWING DATE:	ACAD FILE:	DISK 1
(TM) 03	14-DEC-98	8242SITE.DWG	

SITE MAP

CLIENT:	PM:
PHILLIPS PIPELINE	MC
LOCATION:	CHECKED:
HOBBS, NM	

DESIGNED:	DETAILED:	PROJECT NO.:	FIGURE:
MC	T. MONTI	108242	2



DO NOT SCALE DRAWING

DRAWN BY Ken Fagan

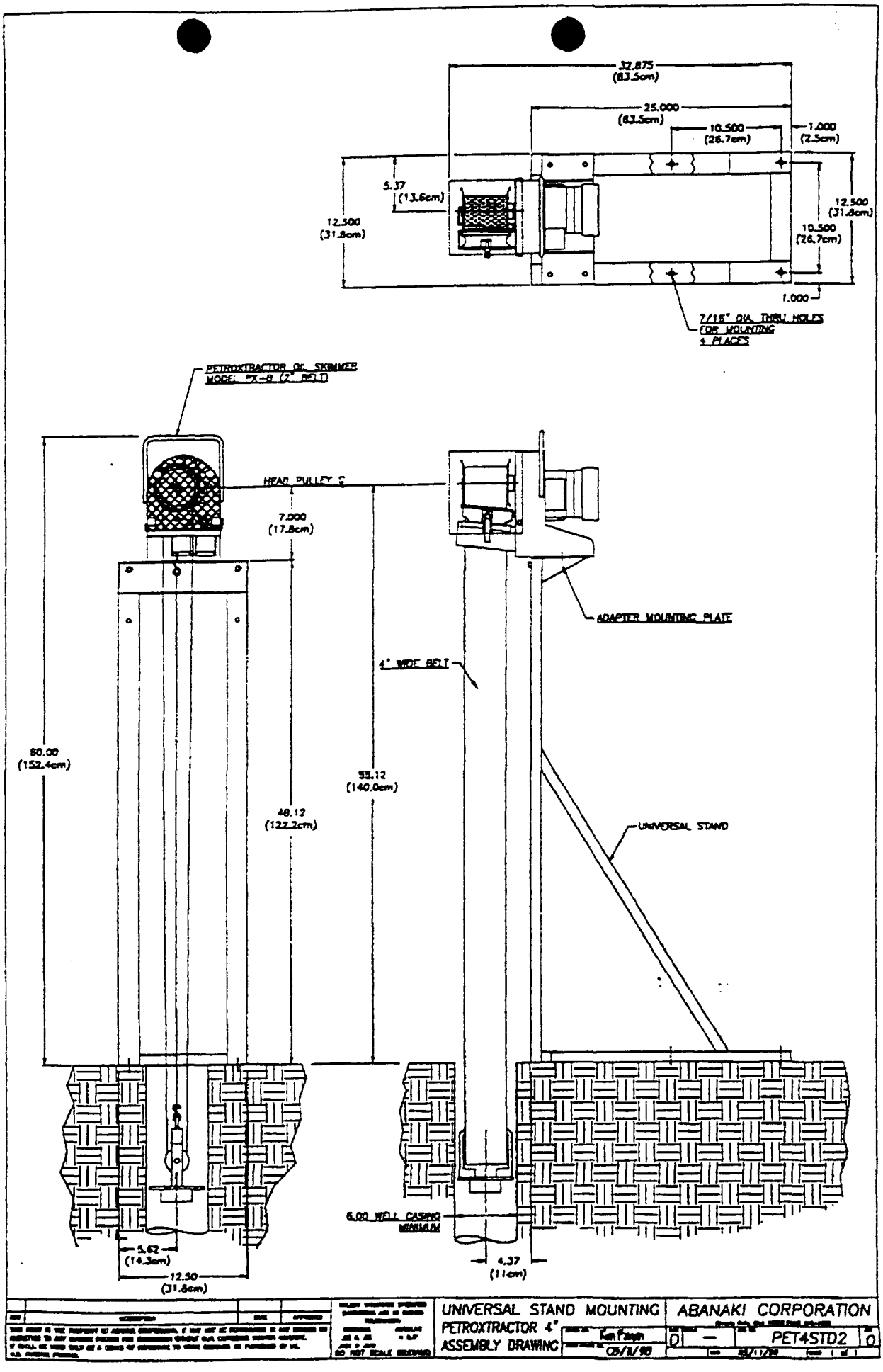
11/12/98

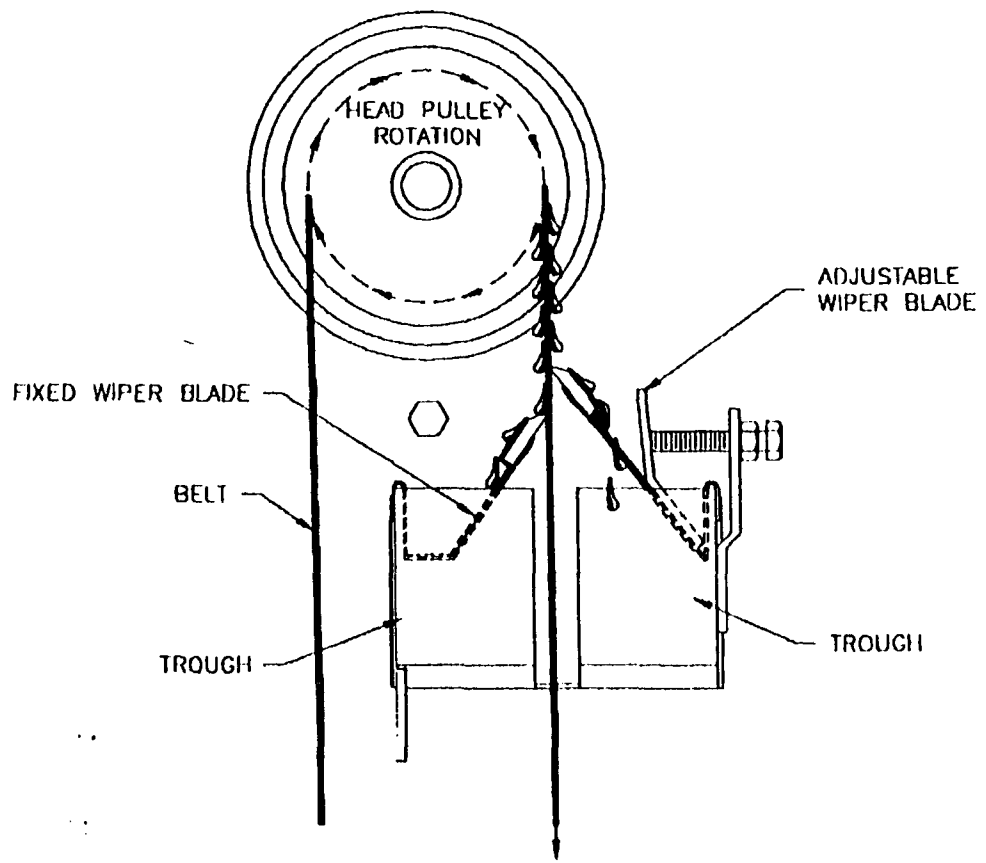
ABANAKI CORPORATION

PETROXTRACTOR OIL SKIMMER
SHOWN WITH OPTIONAL 4' STAND
OVERALL ISOMETRIC

SIZE 0 | DWG — | PT-002 | REV 0

11/12/98


32.875
(83.5cm)
25.000
(63.5cm)
10.500
(26.7cm)
1.000
(2.5cm)
5.37
(13.6cm)
12.500
(31.8cm)
12.500
(31.8cm)
10.500
(26.7cm)
1.000
7/16" DIA. THRU HOLES
FOR MOUNTING
4 PLACES
PETROXTRACTOR OR SKIMMER
MODEL PX-4 (2" BELT)
HEAD PULLEY ℄
7.000
(17.8cm)
ADAPTER MOUNTING PLATE
4" WIDE BELT
60.00
(152.4cm)
48.12
(122.2cm)
53.12
(140.0cm)
UNIVERSAL STAND
6.00 WELL CASING
MINIMUM
5.62
(14.3cm)
12.50
(31.8cm)
4.37
(11cm)
UNIVERSAL STAND MOUNTING
PETROXTRACTOR 4"
ASSEMBLY DRAWING
Ken Fagan
05/11/98
ABANAKI CORPORATION
PET4STD2
D
—
0



ABANAKI CORPORATION

PETROXTRACTOR/TOTE-IT
WIPER ACTION
OVERALL DRAWING

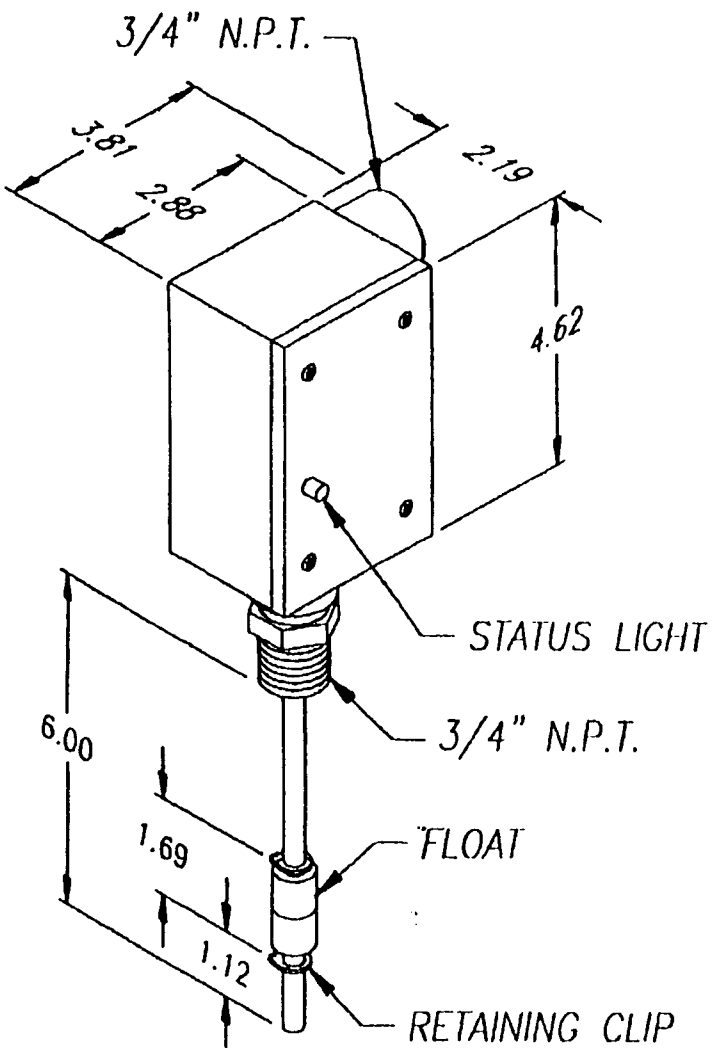
DO NOT SCALE DRAWING

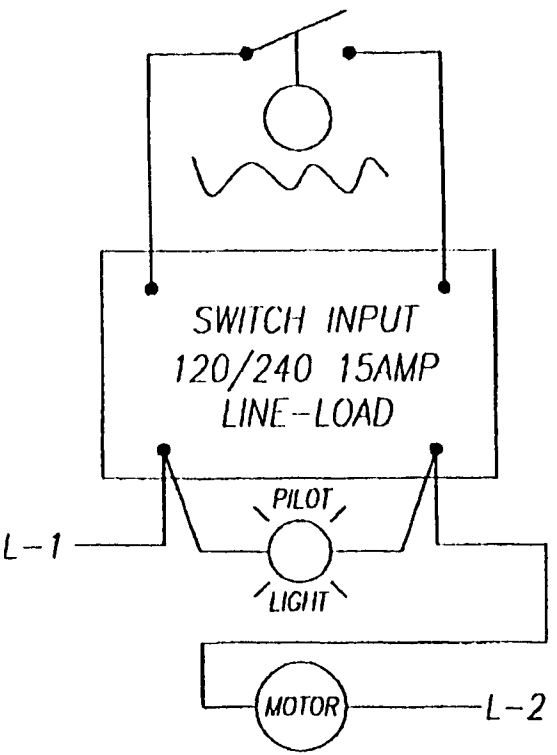
04/22/98

WIPER

0

04/28/98





			ABANAKI CORPORATION
			FLOAT SWITCH OVERALL DRAWING
DO NOT SCALE DRAWING			
Ken Fagan 09/09/98		D –	FLT-SW-5 0