

Radiation Safety Plan

2016 ANR Pipeline Company 188 Pig Signal Removal Project

Prepared:	Glenn R. Marshall	<small>Digitally signed by Glenn R. Marshall DN: cn=Glenn R. Marshall, o=ou, email=gmarshall@philotechnics.com, c=US Date: 2016.04.11 15:11:06 -0400</small>	4/11/16
	Glenn Marshall, CHP RSO, Philotechnics	Date	
Technical Review:	Justin Button	<small>Digitally signed by Justin Button DN: cn=Justin Button, o=Philotechnics, ou, email=jbutton@philotechnics.com, c=US Date: 2016.04.11 15:25:55 -0400</small>	4/11/16
	Justin Button Project Manager, Philotechnics	Date	
Technical Review:	Salvatore Delisi	<small>Digitally signed by Salvatore Delisi DN: cn=Salvatore Delisi, o=ou, email=salvatore_delisi@transcanada.com, c=US Date: 2016.04.11 17:15:20 -0400</small>	4/11/16
	Salvatore Delisi RSO, Project Manager, ANR Pipeline	Date	

PUBLIC

- ☒ Immediate Release
☒ Normal Release

NON-PUBLIC

- ☐ A.3 Sensitive-Security Related
☐ A.7 Sensitive Internal
☐ Other

Rev

gpc 4/2/16

Radiation Safety Plan

2016 ANR Pipeline Company 188 Pig Signal Removal Project

FIRST PRIORITY

Safety is the first priority on this project.

Nothing in this document should be interpreted as limiting actions that may be necessary to protect life, health, or safety of personnel.

All field personnel on the project have the responsibility and authority to suspend work in the event an unsafe condition exists or is imminent.

Background

ANR Pipeline Company is in possession of two (2) industrial gauges containing sealed radioactive sources. The gauges are externally mounted on separate gas pipelines at the bottom of the Gulf of Mexico, approximately seventy miles off the coast of Louisiana in Eugene Island Block 188. The pipelines are in approximately seventy-five (75) feet of water, buried to a minimum of four (4) feet of natural earth cover (mud). The gauge devices were installed as part of a control system used to detect the passage of internal pipeline cleaning tools. The system, except for the gauge devices, has since been taken out of service. Philotechnics LTD. (Philotechnics) has been contracted by ANR Pipeline Company to develop and implement a plan for the safe removal, transportation, and disposal of the devices.

The devices are Industrial Nucleonics Corp. Model SH-302. Each device contained, initially, 200 mCi of Cs-137; the current activity of each is 72 mCi. The devices were modified for underwater use. The modification consisted of removing the shutter handle and hermitically closing the unit by weldment where the handle passes through the housing. The source is permanently in the open (exposed) position.

The gauges were used for a short time after they were installed but did not perform as designed and have been in place, but idle ever since.

Sealed source leak tests have not been performed since just before the gauges were placed into service. The integrity of the source capsules is unknown; however, a protective coating along with a cathodic

protection system was part of the original design. It is unlikely, but possible, they could be leaking. A leak test will be performed as soon as practicable after recovery of each source.

Work Environment and Radiological Conditions

The gauges are externally mounted on two pipeline segments, several miles apart. They are located approximately 70 miles off the Louisiana coast and are approximately 75 feet beneath the surface and are covered with mud. The sand/silt and other material covering the sources will have to be removed in order to gain access. It is assumed the source depth, cold environment, mud, pipeline coating and cathodic protection have protected the gauges from corrosion.

The primary hazards to personnel during the removal process are the hazards inherent to deep diving: air supply, pressure and decompression, aquatic life, etc. Radiation exposure, while important, is secondary to those.

Certified divers will be used to locate, excavate and retrieve the gauges. Philotechnics will have an authorized user on the surface in direct communication with the diver(s).

The shutter on each device has been welded in the open (exposed) position. Because of the shielding provided by water, a high radiation area does not exist in the vicinity of each gauge. Dose rates, once the silt/mud has been removed, are expected to be:

- 3 R/hour on contact with face
- 55 mR/hour at 30 cm (12 in) from face
- 7 mR/hour on other side of 24" pipe (4 mR/hour on other side of 30" pipe)
- 0.2 mR/hour at 1 meter (3.3 ft)

Once out of the water, unshielded in air, dose rates will increase and are expected to be:

- 3 R/hour on Contact with face
- 150 mR/hour at 30 cm (12 in) from face
- 20 mR/hour at 1 meter (3.3 ft)

For shipping, Transport Index (dose rate in mR/hour at 1 meter from package) must not exceed 1.0.

Roles and Responsibilities, Regulatory Compliance

ANR Pipeline Company is the current licensed possessor of the gauges. ANR Pipeline Company will maintain possession of the gauges until such time they have been prepared, packaged, marked and labeled in accordance with U.S. Department of Transportation regulations; the Shipper (Philotechnics) has signed appropriate shipping paper; and the gauges have been accepted by the carrier for transport.

Chet Morrison Engineering (Morrison) is the prime contractor to ANR Pipeline Company. Philotechnics will be subcontracted to Morrison. The diving company and any other related services associated with the work will also be subcontracted to Morrison. The boat expected to be used for this work is Chet Morrison's "Joanne", a 240-foot commercial diving/salvage boat. All activities will be performed from the Joanne or similar dive support vessel.

The Chet Morrison Project Manager is in charge of all activities related to the safe retrieval of the sources, including dive safety. The Dive Boat Captain has full authority regarding safe boat operation.

All personnel assigned to field work on this project have full authority and responsibility to stop or suspend work in the event any unsafe condition exists or is imminent.

All radiological controls intended to protect personnel, members of the public, and the environment from hazards associated with radiation exposure shall be prescribed and enforced by Philotechnics. This responsibility will not be delegated. All personnel on the project shall obey instructions from Philotechnics' health physics representatives in all matters of radiological safety.

Philotechnics will obtain reciprocal recognition from the Nuclear Regulatory Commission to perform the work in offshore areas under exclusive federal jurisdiction. If necessary, Philotechnics will also obtain agreement state reciprocal recognition with the state of Louisiana.

All work shall be performed in strict compliance with federal and state regulations and licenses. Best industry practices, where applicable, should be used to ensure hazards are eliminated or mitigated to the extent practicable.

ANR Pipeline Company is responsible for ensuring compliance with environmental protection regulations including any required actions associated with a leaking source, should this condition occur.

Prerequisites

TRAINING

Philotechnics personnel will require PEC Safe Gulf, water survival with HUET and personnel transfer training. These training requirements were completed on February 23, 2016 at the Safe Zone facility in Houma, Louisiana.

Divers, Dive Supervisor, and other personnel on the boat who may have occasion to handle or be in close proximity to gauges will receive Philotechnics' Radiological Worker Training. Such training shall include, as a minimum, a live PowerPoint presentation, use of instruments, and specific discussion of nuclear gauges followed by exam. Individuals having current radiological worker training from another organization are not exempt from Philotechnics' training. All other personnel on the boat shall receive Philotechnics' awareness level radiation safety brief.

Philotechnics health physics personnel (HP) and the Dive Supervisor will jointly conduct a pre-job brief each day of diving operations. Brief will be attended by divers, boat captain, crane operator, dive support personnel, and project manager.

PERSONNEL MONITORING

Philotechnics personnel, divers, dive supervisor, and deck personnel will be monitored using NVLAP-accredited dosimetry (TLDs). The diver will also have an electronic dosimeter and finger rings in addition to whole body TLD. Philotechnics personnel will wear electronic dosimeter and finger rings in addition to whole body TLD.

The only possible internal source of radiation dose would be from a severely leaking source. Because the diver will be breathing surface air supplied through a diving helmet, inhalation and ingestion are not viable dose pathways beneath the surface of the water. Additionally, the diver will be wearing a wet suit, gloves, and steel-toed boots which will protect against skin contamination. For these reasons, divers and support personnel will not require internal dose monitoring. Even if a source is leaking, it will still be wet when brought to the surface and will be monitored for contamination prior to bringing it on board. Philotechnics employees already participate in Philotechnics' internal dosimetry program.

Contamination monitoring will be performed as soon as practicable after either the diver or source emerges from the water; each source will be monitored for gross contamination by large area wipe before being brought on board. Upon exiting the water, the diver has approximately three to five minutes in which to enter the decompression chamber. He/she will remove wet suit and breathing apparatus and place it in a designated (cordoned off) lay-down area. Philotechnics health physics personnel will survey the diver's equipment for beta-gamma contamination. Upon exit from decompression chamber, the diver will receive a whole-body contamination frisk.

TLDs used by affected personnel will be sent to a NVLAP accredited facility for processing. Results will be provided to the individuals using NRC Form 5 or equivalent. If requested in writing by the individual, dosimetry results will also be provided to ANR Pipeline and Chet Morrison.

JOB SITE MONITORING

Radiation Monitoring

Option 1: Diver will have a radiation detector that is attached to a general purpose meter on the surface. Basic plan is to use a 1" x 1" scintillation detector coupled to a Ludlum Measurements Model 14C or 2221 on the surface. Probe and cable will be sealed in a hose to keep dry. HP technician on the boat will instruct diver where to position the probe and will monitor (and document) dose rates throughout the work.

Option 2 (PREFERRED): Diver will have a portable dose rate instrument vacuum-sealed in plastic to prevent water in-leakage. The instrument must have a bright, high-contrast digital display. HP Technician on the boat will instruct diver where to take readings and will document the readings. Diver must be able to read the display and communicate clearly.

Each diver will wear a head-mounted video camera. CCTV will be on dive boat, and will be monitored by HP and Dive Supervisor.

Each diver will be equipped with voice communication. They will communicate directly with the Dive Supervisor on the surface.

Contamination Monitoring

Contamination "job-coverage" surveys are not possible under water.

When the gauge is first exposed, the diver will collect a soil sample as near as possible to the gauge. This sample will be field checked by HP on the boat using a pancake probe. Any reading distinguishable from background is evidence of potential source leakage. This is a qualitative measurement only. Soil samples will be sent to an independent laboratory for gamma spectroscopy analysis (Cs-137 only) after conclusion of the job.

Each gauge will be surveyed for removable contamination as soon as practical after removal from the water.

Only beta contamination surveys are required. Contamination surveys will be performed in accordance with Philotechnics procedure HPO-105, Contamination Surveys.

Diver equipment will be surveyed ("frisked") for total contamination at the end of each dive. All diving equipment used on the sea floor will be surveyed for unrestricted release by Philotechnics HP technician prior to demobilization from the job. Any diving equipment that does not pass unrestricted release will be placed in a container and shipped for disposal once the dive boat returns back to shore.

The immediate work area of the deck on the dive boat, especially the travel path from dive ladder to decompression chamber will be surveyed after each gauge removal.

Contamination limits at the end of the project are:

TOTAL (fixed + removable) contamination, 5000 dpm/100 cm²

REMOVABLE contamination, 1000 dpm/100 cm²

Environmental Monitoring

The diver will collect a soil sample of the ocean floor during soil removal, as soon as each source housing becomes visible. At least one additional sample will be collected underneath the mounting bracket after each gauge is removed.

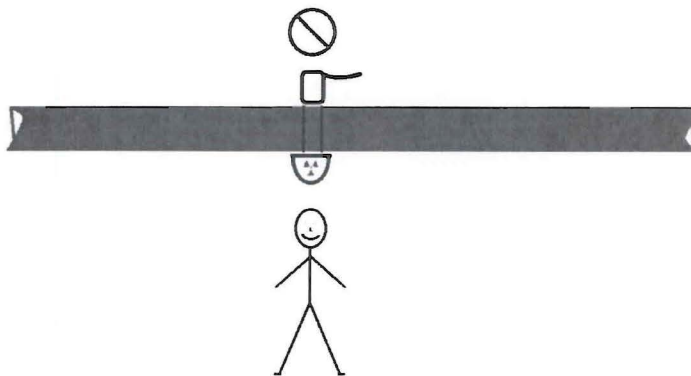
Sealed source leak tests will be performed as soon as practicable after the sources are brought to the surface.

If the leak test indicates greater than 0.005 uCi of removable radioactivity, the source will be declared to be leaking. The source and its housing will be wrapped as appropriate and placed into the shipping container as soon as practicable. Contamination surveys of the dive boat and equipment will be conducted, and decontamination performed as necessary. As soon as possible, notification will be made to NRC's Toll-Free Safety Hotline: **(800) 695-7403**.

Removal and Shielding of Source Housing

One diver will complete the task of removing the gauges from pipes. A water lance is the preferred tool for uncovering the gauges. The diver will cut a hole in the sea floor large enough to work in, without risking collapse. Once the gauge is uncovered, radiation dose rates will be measured and documented. These dose rates will also help to confirm which half is the source housing and which half is the detector. The source housing is normally marked as containing radioactive material. The detector (which does not contain a radioactive source) will have a wire attached to it, or will have the remnant of a pigtail/terminator where the wire used to be attached.

The diver, with assistance from the crew on deck, will positively identify the source housing. He will position himself such that he is never in direct line with the beam. While the gauge remains mounted to the pipeline, the only place the diver can be where he is exposed to the beam is on the opposite side of the pipeline directly ahead of the detector. However, the pipeline itself, water and distance between the pipeline and the diver will provide additional protective shielding. Debris that is stuck to the source housing will be removed to the extent practicable.

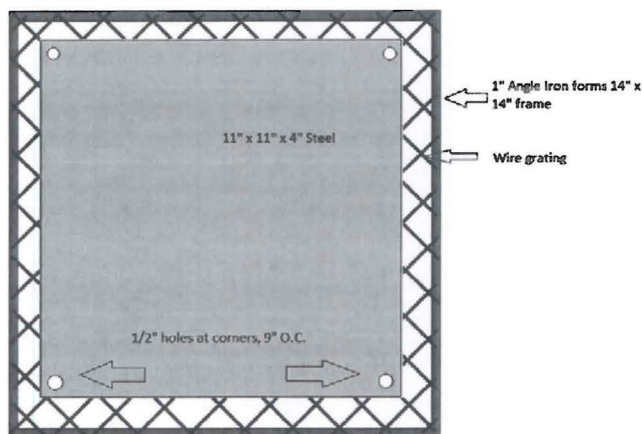


CAUTION: The lifting eye may be corroded and might not be able to support the entire weight of the source housing.

A shielded basket will be placed on the sea floor near the gauge. The lifting eye on the source housing will be visually examined for signs of degradation prior to attachment. Should no deleterious condition be observed, the crane hook will be attached to the lifting eye on the source housing. The crane cable should have minimal slack.

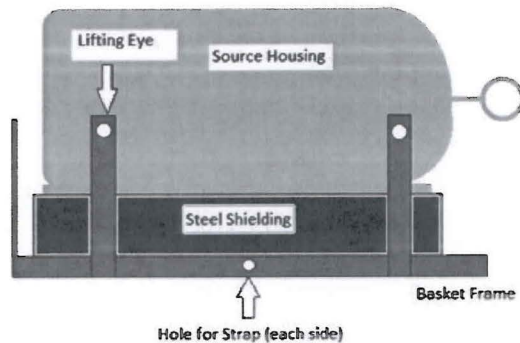
The diver will attempt to loosen the four (4) bolts that hold the source housing to the clamp and bracket. There should be sufficient “play” such that the source housing will break away from the clamp. If the bolts are loose but the source housing does not sufficiently move, a mechanical agitation or prying will be used.

If necessary, and after obtaining concurrence from the surface, the diver will mechanically cut through the bolt or nuts as necessary to remove the gauge. If that does not work, then the diver may apply force to the face flange of the source housing to free it from the clamp/pipeline.



CAUTION: Under no circumstances will the source housing be cut, drilled, or otherwise damaged. If the source housing will not break free from the clamp, this constitutes a STOP WORK condition.

Once the source housing has been verified to be loose from its mounting clamp, position the shielded basket underneath it ensuring the shield block is centered on the bottom of the basket. Remove the bolts. Lower the source housing onto the shielded basket; then lower it so the flange face rests on the shield. Measure dose rate around the basket to verify the source housing is properly positioned. Strap the source housing to the basket.



Hoist the basket containing the source housing to the surface. Suspend the basket above water as necessary to allow excess water to drain from the basket. Before bringing the basket completely on board, reach out with an extendable pole and collect a smear or large area wipe. Check the wipe with a pancake probe to verify no contamination that is distinguishable from background is present.

A dedicated area aft of the dive vessel will be cordoned off for inspection activities. Bring the basket on board, as far aft of the dive vessel as practicable. Set the basket on an absorbent material. Ensure the shielding is positioned properly on the face of the source housing, and secure it into position using bolts and/or additional straps as needed. Monitor and document dose rates.

Philotechnics will perform and document a sealed source leak test.

Place the source housing with shield into a drum and secure it in position to prevent shifting. Close drum and secure from access by unauthorized personnel.

Packaging, Stowage, and Transport

The source housing will be packaged in DOT-approved Type A packages such as 55-gallon drums. Adequate shielding and bracing will be used to ensure dose rate on contact (within 1 inch) with the package does not exceed 50 mrem/hour and the Transport Index for either package does not exceed 1.

Removable contamination on package external surfaces will not exceed 1000 dpm/100 cm².

Both packages will be labeled with DOT-approved labels. It is expected both packages will be Radioactive Yellow-II.

Once labeled, the package will be moved to its stowage location as soon as practicable. The stowage area will be in a metal container such as a tool crib which will be secured on the deck of the dive boat. Stowage will not be in any normally occupied compartment. "Compartment" means an area separated by decks and bulkheads or other permanent structures. The drum(s) should be at least 6 feet from any living accommodation or regularly occupied working space.

The stowage container will be locked to prevent unauthorized access. If dose rate at 30 cm from drum exceeds 5 mR/hour, post as a radiation area.

Once the dive/salvage boat arrives on shore (expected to be Louisiana), all containers/waste will be safely removed off of the boat and loaded into a Philotechnics vehicle. The vehicle will be surveyed in accordance with DOT 49 CFR. Waste generator (ANR Pipeline Company) and Shipper (Philotechnics) shall sign the manifest. The gauges, still in their containers, will be transported to the Philotechnics location in Oak Ridge, Tennessee where they will be repackaged and encapsulated as necessary in preparation for final disposal at Waste Control Specialists. Any other waste generated will be transported to Oak Ridge, Tennessee where a disposition site will be determined then later sent for disposal.

ALARA Evaluation

Estimated dose per gauge:

	Task	Time	Avg. mR/hr	Dose, mrem	Notes
DIVER	Locate Gauge	2 Hours	0	0	
	Uncover gauge	8 Hours	0	0	
	Soil samples	5 minutes	0	0	
	Radiation Survey	5 minutes	2	0.2	
	Remove Gauge	2 Hours	2	4	
	Strap gauge to basket	10 minutes	10	2	
	Radiation Survey	5 minutes	10	1	
	2 minutes in line of beam	2 minutes	55	2	Diver Total 9.2 mrem/source
HP	Radiation survey	1 minute	10	0.2	
	Leak test	1 minute	10	0.2	
	Secure shielding	5 minutes	10	1	
	Package gauge	10 minutes	10	2	
	Final surveys	2 minutes	10	0.4	HP Total 3.8 mrem/source
GRAND TOTAL per Source				14 mrem	

Philotechnics Supplies:

- MicroRem meter
- Underwater dose rate meter.
- Removal basket to hoist devices to the surface
- (3) 55-gallon Drums modified with additional shielding
- (4) lead blankets or equivalent
- (2) Shield flanges and something with which to secure them to the source housings

- (2) Ludlum Measurements Model 3 with 44-9 probe
- (1) Ludlum Measurements 14C with 44-38 probe
- Pack of masslins
- Extendable pole with clip
- Bags
- Tape
- RAM Labels
- Box of Tyvek or equivalent
- Box of rubber gloves
- Rubber shoe covers
- (6) 500-ml wide mouth sample bottles
- Boundary rope and signs – Radioactive Material, Radiation Area
- (5) Spare TLDs
- (2) Spare sets Finger Rings
- (3) Electronic dosimeters
- 1 box of smears
- Spare batteries
- Waterproof containers for instruments, etc.
- DOT labels
- Absorbent padding
- Dosimetry Forms
- Survey Forms
- Shipping forms / Manifests

PUBLIC

- ☐ Immediate Release
☒ Normal Release

NON-PUBLIC

- ☐ A.3 Sensitive-Security Related
☐ A.7 Sensitive Internal
☐ Other: _____

Reviewer: gpc Date: 6/2/16