

**Natural Resources Conservation
Authority**

**Guidelines for the Decommissioning
of Petroleum Storage Tanks and
Pipelines**

September 2013



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The guidelines will be revised periodically following feedback from stakeholders using it, ensuring its ongoing relevance and reflecting advances in best practice as the result of regulator and industry experience. Comments are invited and should be sent via email to pubed@nepa.gov.jm.

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Definitions

Term	Definition
<i>Closure Plan</i>	Documentation outlining the procedures for decommissioning of a facility and the removal of all the possible contaminants to air, soil and water; equipment decontamination; sampling and laboratory analysis and closure to the satisfaction of the relevant standards and regulations stipulated by the National Environment and Planning Agency.
<i>Contamination</i>	The presence of polluting substances in surface water, groundwater, soil, sediment, or upon the land.
<i>Decommissioning</i>	Permanently taking a tank out of service with the intent to not introduce petroleum to or otherwise use the tank for dispensing or storage of petroleum.
<i>Emergency</i>	An accidental situation involving the release or imminent release of dangerous goods or other substances that would result in serious adverse effects on the health/safety of persons or the environment. An emergency may be the result of man-caused or natural occurrences such as, but not limited to process upsets, uncontrolled reactions, fire, explosions, threats, structural failures, tornadoes, earthquakes, floods and storms. ¹
<i>Free Product</i>	A hazardous substance that is present as a nonaqueous phase liquid (e.g., liquid not dissolved in water). ²
<i>Leak</i>	Any change (loss or gain) in the liquid level in the Petroleum Storage Tank or pipeline that cannot be accounted for or any loss of petroleum products because of a defect in the petroleum storage tank system.
<i>Lower Explosive Limit</i>	The minimum concentration of vapour in air that is capable of being ignited in the presence of an ignition source.
<i>Petroleum Storage Facility</i>	A single property or contiguous or adjacent properties used for a common purpose which are owned or operated by the same person on or in which are located: <ul style="list-style-type: none">o One or more stationary tanks, which may be located aboveground or underground, which are used for the storage (and/or dispensing) of petroleum and petroleum products.
<i>Operator</i>	Any person in control of, or having responsibility for, the daily operation of a Petroleum Storage Tank or Petroleum Storage Facility system.
<i>Owner</i>	A person who, either: <ul style="list-style-type: none">a) Holds a legal, equitable, or possessory interest of any kind in a PST;b) Held at the time of a release, or immediately before a PST was last operated, a legal, equitable or possessory interest of any kind in the PST.
<i>Purging</i>	The process of removing a substance from containment to meet desired environmental conditions.

¹ NEPA Guidelines for the Preparation of an Industry Emergency Response Plan

² <https://www.legis.iowa.gov/DOCS/ACO/IAC/LINC/Chapter.567.135.pdf>

<i>Release</i>	Any spilling, leaking, emitting, discharging, escaping, leaching or disposing from an UST system into groundwater, surface water or subsurface soils
<i>Spill</i>	Any loss of petroleum products from an aboveground or underground storage tank system during product transfer or maintenance.
<i>Totalizer</i>	An accumulator of data.
<i>Ullage</i>	The unfilled space in a container.
<i>Volatiles</i>	Substances capable of readily changing from a solid or liquid form to a vapour; having a high vapour pressure and a low boiling point.
<i>Waste Manifest</i>	A document that tracks hazardous waste from the point of generation to ultimate disposal.

Acronyms

AST	Aboveground Storage Tank
CGI	Combustible Gas Indicator
FID	Flame Ionization Detector
LEL	Lower Explosive Limit
NEPA	National Environment and Planning Agency
NRCA	Natural Resources Conservation Authority
OSH	Occupational Safety and Health
PID	Photoionization Detector
PPB	Pollution Prevention Branch
PPE	Personal Protective Equipment
PSF	Petroleum Storage Facility
PST	Petroleum Storage Tank
PTFE	Poly-tetra-fluoro-ethylene
TCPA	Town and Country Planning Authority
UST	Underground Storage Tank
VOC	Volatile organic compound

1.0 Introduction

1.1 Purpose

To document the Natural Resources Conservation Authority's procedures and requirements for the decommissioning and removal of petroleum storage tanks and pipelines.

1.2 Scope

The guideline document applies to all parties responsible for the operation of petroleum storage facilities and /or responsible for carrying out any environmental investigations as a result of these operations. This includes owners of petroleum storage facilities.

2.0 Submission of a Closure Plan

All petroleum storage facilities are required to have a Closure Plan, approved by the National Environment and Planning Agency (NEPA), prior to the commencement of any closure or decommissioning activity. The Plan should be prepared according to the Natural Resources Conservation Authority (NRCA) Guidelines for the preparation of a Closure Plan for Industrial Type Projects (Appendix I).

Once the Closure Plan is approved, the operator of the facility is required to notify the Agency regarding the commencement of the closure activities using the notification form in Appendix II.

3.0 Notification

3.1 Notification of Tank Removal

The operators or owners of the facility are required to notify NEPA of the commencement of the closure activities at least two weeks prior to the commencement of the closure activities. A *Storage Tank Removal Notification Form* (Appendix II) must be submitted to the Manager, Enforcement Branch of NEPA at the time of the notification. This form can be downloaded for use from the Agency's website at <http://www.nepa.gov.jm>. The Agency should be notified using the *Storage Tank Removal Notification Form* via email to EnforcementManager@nepa.gov.jm, delivered to the Agency's office at 10 Caledonia Avenue, Kingston 5 or submitted by facsimile to 876 754 7595.

If the Form is not received by the stipulated time the tanks may not be removed. The tank removal exercise should not commence until the Notification Form is submitted and date of tank removal is confirmed by the Agency. The Agency will respond in a reasonable time to facilitate the proposed date.

It is a requirement that an Authorized Officer³ from the Agency be present when the tanks are being lifted and during sampling.

The approved documentation received from the Agency must be available on site for inspection upon request.

Where the tank removal is required due to an emergency, the details of the emergency situation should be outlined in writing to the Agency; after receipt of which the Agency will

³ Refer to Section 20 of the Natural Resources Conservation Authority Act, 1991

decide on a course of action which will be outlined to the client. In emergency situations it is understood that the timelines for notification will be less than two weeks.

3.2 Notification of circumstances

In the event of any of the following occurrences the Agency must be duly notified within 7 hours of detection and a written preliminary report should be submitted within 24 hours of detection.

- The discovery of a release of petroleum product at the UST site or observance of petroleum product in the surrounding area (such as the presence of free product or vapours in soils, storm water drains and utility conduits, and nearby surface water);
- Unusual operating conditions observed by owners and operators (such as the erratic behaviour of product dispensing equipment, the sudden loss of product from the UST system, or an unexplained presence of water in the tank);
- Monitoring results from leak detection apparatus (LDA) indicate that a release may have occurred.

4.0 Minimum On-site Safety Requirements

All safety precautions must be observed during the excavation activities to protect human health.

The following sections, including and up to section 10, refer to Underground Storage Tanks.

4.1 Work Programme and Site Safety Plan

A detailed work programme should be prepared which describes the activities to be carried out, who is responsible for them and a clear description of the responsibilities of each party involved. This work programme should include a Site Safety Plan which should be submitted to the Agency with the Storage Tank Notification Form. The site safety plan should include a Job Safety Analysis/Method Statement which details how the following activities (at a minimum) should be carried out:

- excavation
- safe removal
- barricading of site
- safety of neighbouring facility
- hot work
- working at height
- tank purging and inerting
- tank cleaning and disposal of tank sludge etc.
- lifting of tank

The site safety plan should be approved by a qualified professional and the individual's qualification included in the Site Safety Plan.

The following sections offer specific guidance based on the requirements of the Agency however, the onus lies with the operator/contractor to be aware of all OSH requirements and to take the appropriate actions for any given situation.

4.1.1 Removal of product from tanks and pipelines

All product should be removed from the tanks and pipelines prior to any excavation activities. All pipelines associated with the USTs to be removed, as well as, any other line⁴ located in the excavated area must be disconnected prior to the commencement of the removal process.

4.1.2 Excavation

The following precautions should be taken when excavating the tank pit:

- Owners of neighbouring structures should be advised prior to excavation about the planned activity and whether it may impact the structure.
- Remove existing tank as specified.
- Perform removal in a manner which will minimize dust, noise, and other nuisance from construction operations.
- Perform excavation activities in a manner that will minimize danger to personnel, public, existing structures, utilities, roadways, or facilities not to be demolished.

Some or all of the following precautions may also be required when removing underground tanks, the actual needs will to be determined for each individual site:

- erect barriers around the work site;
- slope or shore sides of excavation if deemed necessary;
- safety signs should be erected throughout the site
- avoid undermining public roadways or neighbouring foundations, etc.;

Excavations near footings or foundations

Excavations shall not remove lateral support from neighbouring footing or foundation without first protecting the footing or foundation against settlement or lateral movement.

Footing setback from open excavation

Foundation footings on or adjacent to cut slope surfaces shall remain founded in firm material with adequate setback to prevent loss of vertical and lateral soil support.

That is,

- Depth of footing and setback from slope (exposed surface) shall not be compromised by reduced vertical and lateral earth support
- Excavation works shall not expose foundation footing to undue settlement

Surcharge

Neighbouring footings or foundations which can be affected by any excavation shall remain stable throughout the process that is adequately or otherwise protected against settlement and shall be protected against later movement.

Slope Stability

If an excavation is more than 1.524 m (5 feet) in depth, there must be a protective system in place while workers are in the excavation. Protective system may be shoring, sheeting, sloping or any other acceptable system.

⁴ Including but not limited to electrical conduits.

Excavation activities should be monitored during the progress of work to make sure that the hazards associated with excavations are eliminated before workers are allowed to enter. The person monitoring the activities should:

- understand soil classifications and soil behaviour
- know the different types and proper use of excavation safety equipment (e.g. protective systems)
- have the ability to recognize unsafe conditions, the authority to stop the work when unsafe conditions exist, the knowledge of how to correct the unsafe conditions, and ensures that it is undertaken

4.1.3 Lifting of Tanks

Tanks should be lifted using a suitable mechanism which will not compromise safety. There shall be no person in the tank pit during the operation of heavy equipment.

4.1.4 Site Security

The site must be completely fenced/hoarded to prevent unauthorized access to the property. Additionally, the area, once excavated, must be completely cordoned off. Appropriate safety/warning signs should be erected advising of the potential dangers of entering the site and that access is restricted. All signs should be in a legible font and colour and should be written in English. Signs conforming to international standards such as ISO 7010: 2011 Graphical symbols - - Safety Colours and Safety Signs - - Registered Safety Signs and ANSI Z535.2 – 2011 Environmental and Facility Safety Signs may be used. Examples of signs that may be applicable are shown below:



Figure 1: No thoroughfare sign with supplementary sign



Figure 2: General Warning Sign



Figure 3a:
Deep excavation warning signs



Figure 3b:

4.1.5 Tank Purging, Inerting and Cleaning

All tanks and pipelines should be rid of petroleum product prior to disposal. Tanks should be purged or inerted prior to removal from the excavation.

Purging

Flammable vapours must be purged from the tank to minimize the risk of an explosion. An appropriately calibrated Combustible Gas Indicator (CGI) must be used to measure the concentration of flammable vapours. The concentration of vapours must be less than 10% of the Lower Explosive Limit (LEL) before the tank is lifted from the excavation.

Inerting

Tanks should be inerted using an approved standard method which will result in the displacement of the oxygen from the tanks. The oxygen level should be less than 7% before the tank is lifted from the excavation. Inerting is not required if tanks are purged to meet the standard above i.e. the concentration of vapours is less than 10% of the LEL.

Where tanks cannot be purged or inerted due to their physical condition, alternative mechanisms must be employed to remove the tank safely from the excavated area.

Waste Manifest

A Waste Manifest should be prepared by the owner/operator to track the movement of the waste generated during the cleaning exercise to the point of disposal. The manifest must be included in the UST Closure Assessment Report (Appendix III). A template for the Waste manifest has been included as Appendix IX.

4.1.6 Disposal of Removed Tanks

Information on the disposal of the tanks and pipelines should be provided by the owner, operator or contractor as part of the approved Closure Plan.

Where tanks will not be destroyed, prior to the removal of the tanks to the disposal area a label conforming to Figure 4 must be appropriately affixed.

<p>Tank Contained (<i>Leaded Gasoline, Diesel etc</i>)</p> <p>Tank not suitable for storage of food or liquids intended for human or animal consumption</p> <p>Date of Removal: <i>Day/Month/Year</i></p>
--

Figure 4

The label should be clearly printed or painted in letters and figures not less than one inch high. Where tanks are destined for destruction, the requirement for the sign will be waived.

5.0 Abandonment of a UST system in situ

Consideration will be given for the abandonment of a UST system (tanks, pipelines, etc.) in situ if it is determined that removal could significantly damage a building, its foundation or adjacent structures of similar function. In such cases supporting documentation, should be submitted to justify or substantiate the request for abandonment in situ for review and approval. Additionally a work plan should also be submitted detailing the method to be used to determine the presence and extent of contamination. The work plan must include a site plan with proposed sampling locations. Where abandonment in situ is approved, this should be carried out in accordance with the stipulations in Appendix IV.

6.0 Sampling Requirements

Sampling activities must be conducted by trained/certified environmental professionals familiar with the relevant sampling techniques for these purposes.

All samples collected must be labelled. The label must clearly indicate the type of sample, the location and the depth at which the sample was taken. Composite samples must not be submitted for analysis. On submission of the **Post Closure Assessment Report the location of all soil samples collected must be shown on a map (drawn to scale and representative of the current layout of the facility).**

Samples must be collected from any area where contamination is observed.

Additional samples of soil and/or groundwater may be requested by the Agency during the tank removal activities. The owner/operator may be required to perform a comprehensive site assessment based on the results of the initial soil sampling exercise.

Documentation of field sampling should be done in a bound log book. Chain of custody documents shall be filled out and remain with the samples until chain of custody is relinquished. All shipping documents, such as air bills, bills of lading, etc, shall be retained by the project leader and placed in the project files.

6.1 Soil sampling pre-excavation

Backfill material and soils in areas of the associated piping must be collected for analysis.

At least one discrete soil sample for every 3.048 m (10 feet) of piping trench must be submitted for laboratory analysis. Samples must be collected at all fittings, especially joints, or wherever there is heightened potential for a release, and at all locations where staining is present or where contamination is suspected.

Samples must also be collected beneath dispensers, directly below the piping that enters the sump and beneath any defective area of the sump. One grab sample taken 1.524 m (5 feet) below each dispenser associated with the tank(s) to be removed is required unless the dispenser is located in the tank field. If the containment sump is positioned directly above the tank, thereby preventing collection of samples under the sump, then samples must be collected along the perimeter of the sump within 0.3048 meters (one foot) of the sump.

6.2 Field Screening during Excavation

Readings from field monitoring equipment are to be used for screening; however, these will not be accepted by the Agency as a sufficient evaluation of the contamination levels. A Photoionization Detector (PID) or Flame Ionization Detector (FID) should be used for field screening. A combustible gas monitor is not acceptable for use in field screening.

All soil samples collected for field screening must be labelled so as to designate: type of sample, location of sample, and depth of sample (see below). All soil sample locations must be shown on a map of the excavation and a properly calibrated field instrument is to be used in the screening of excavated soils.

During excavation the following procedure must be followed:

- Collect and field-screen soil samples frequently enough to verify the need for soil removal (at least one soil vapour analysis for each 7.65 cubic metres (10 cubic yards) of soil removed).
- Label soil samples with the prefix "R", for "removed" along with the sample depth and carefully note the sample locations on a scaled map.
- The field technician should carefully document successive soil vapour readings vertically below the source of release, indicating the location and depth of each sample on a map of the excavation. *Example:* R-1 (2 m), R-1 (4 m), R-1 (6 m), R-2 (4 m), etc. Note: R-1 samples are from the same location but successively deeper.
- After excavation is completed, screen soil samples from the bottom and sidewalls of the excavation, along removed pipe runs, and beneath removed dispensers. Collect and label sidewall and bottom samples for field screening as discussed in the next section.

The specifications of the field monitoring equipment should be included in the Post Closure Assessment Report.

6.3 Soil Sampling Post-excavation

General Requirements

The goal of sampling a tank excavation at closure is to represent the contamination which may exist in a manner that is as accurate as possible while at the same time minimizing the number of samples that are necessary to achieve the stated purpose. Although the sampling locations described in this document are the minimum necessary, they are not intended to substitute for the conditions which may exist at a particular location. Therefore, a certain amount of professional judgement is necessary in order to evaluate and properly assess the site conditions at a tank closure.

When conducting sampling at a tank removal, all backfill materials must be removed from the excavation prior to sampling. Whether sampling the sidewalls or the floor of an excavation, all samples must be collected from a depth of at least 30 cm (one foot) into the native soil. When abandoning tanks in situ, the soil borings must be conducted in the native soil immediately surrounding the tank bed excavation.

For the purposes of this document, the sampling exercise should result in a detailed characterization of the site. For this reason, composite sampling is not the recommended sampling procedure and therefore should not be used during the site assessment at this stage.

Literature⁵ has shown that composite sampling should not be used in the following circumstances and further should not be considered unless there is a high degree of certainty in the site history and a low likelihood of the existence of contamination:

- To determine the extent of contamination – for example, in detailed environmental site assessments
- For assessment of occupational health and safety risks in relation to site remediation activities
- For validation purposed following remediation
- For semivolatile compounds such as polycyclic aromatic hydrocarbons and petroleum hydrocarbons
- For soils with a high clay content, due to difficulties in the mixing of discrete samples
- For leachate analysis
- If site includes fill of uncertain quality, or is likely to be variable in character

If groundwater is encountered during excavation activities, refer to Section 6.4.

Removal of One Tank within an Excavation

A minimum of five samples are required to determine whether the area is contaminated. Four samples must be taken from the side walls and one from the floor of the excavation. If contamination is visible, samples should be taken from the contaminated areas. If no contamination is apparent, additionally, samples must be collected from the area of the sidewall in close proximity to the fill point and from the centre of the remaining sidewalls.

Additional samples may need to be taken as directed by the Authorized Officer of the Agency on site. One sample must be collected from each of the sidewalls and the floor of the excavation.

Removal of Two or More Tanks within a Common Excavation

At a minimum samples should be taken from the sidewalls and floor of the excavation as shown in Figure 5. If contamination is visible, samples should be taken from the contaminated areas. If no contamination is apparent, additionally, samples must be collected from the area of the sidewall in close proximity to the fill point and from the centre of the remaining sidewalls.

Additional samples may need to be taken as directed by the Authorized Officer of the Agency on site. One sample must be collected from each of the sidewalls and the floor of the excavation.

Where there is exceedance in the concentration of any parameter in the NRCA Interim Standards for Petroleum in Groundwater and Soil (Appendix V), remedial action will be required.

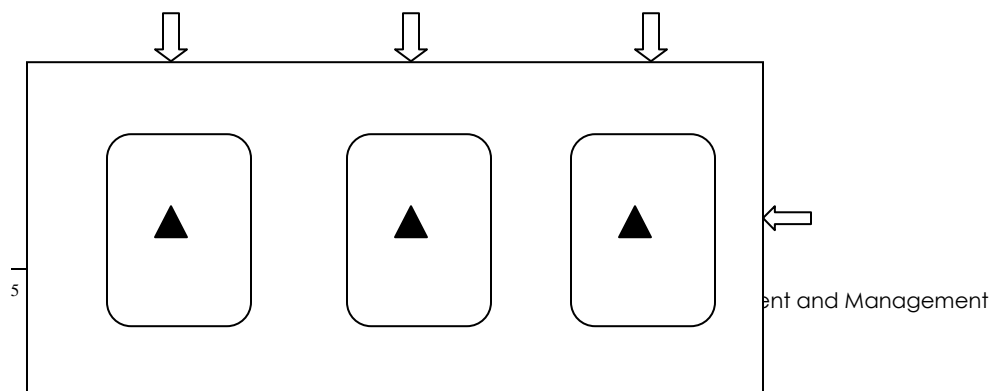




Figure 5. Location for taking samples in the removal of two or more tanks within a common excavation. (Arrows denote sidewall sample locations and triangles denote locations below the tank in the floor of the excavation)

6.4 Groundwater Sampling

The procedures outlined in this section should be used by field personnel when collecting and handling groundwater samples in the field. Where any of these procedures are inappropriate, inadequate or impractical and another procedure is used to obtain a groundwater sample, this procedure should be documented in the field logbook, along with a description of the circumstances necessitating its use.

The Agency in consultation with the proponent will determine whether groundwater samples are required based on current site conditions including but not limited to the geological characteristics of the site. Where groundwater samples are required they must be obtained and submitted for laboratory analysis to a lab with the requisite capabilities to conduct the required tests. Where there are exceedances in the concentration of any parameter in the NRCA Interim Standards for Petroleum in Groundwater and Soil (Appendix V), remedial action will be required.

In areas where groundwater is encountered in the excavation from which the USTs have been removed, soil samples must be collected in the sidewalls of the excavation immediately above the water table. Groundwater samples must be collected from boreholes at a minimum interval of 3.048 m (10 linear feet) around the perimeter of the excavation with a minimum of one sample per sidewall. Water samples obtained from the open excavation are not acceptable.

A groundwater monitoring well must also be installed as close as possible to and within 1.524 m (5 feet) of the former location of UST(s) in a down gradient direction (with respect of direction of groundwater flow). Where this is not possible because of site constraints, this should be documented in the field log book and the location of the groundwater well shown on the map submitted.

6.4.1 Procedural Precautions

The main aim of groundwater sampling is to obtain a representative sample of the groundwater body. Analysis may be compromised mainly by (1) taking an unrepresentative sample or (2) by incorrect handling of the sample. There are many ways of introducing contaminants into a sample and these must be avoided by following strict sampling procedures performed by trained personnel or in consultation with such personnel. Filtration of groundwater which is typically performed in the field may result in contamination. A quality control/quality assurance programme should be developed for the sampling exercise. See section 7.0.

When collecting groundwater samples the following precautions should be borne in mind:

- Proper safety precautions should be observed.

- Special care must be taken not to contaminate samples. This includes storing samples in a location that precludes conditions which could alter the properties of the sample. Samples should be custody sealed during long-term storage or shipment.
- Samples should be taken from the anticipated least contaminated location, to the most contaminated location. It is acknowledged that the least contaminated location is not always easily identifiable; therefore, proper decontamination of sampling equipment and the use of clean sample containers is of paramount importance.
- Collected samples must remain in custody of the sampler or sample custodian until the samples are relinquished to another party.
- Documentation of field sampling is to be done in a bound logbook.
- Chain of custody documents should be filled out and remain with the samples until custody is relinquished.
- All shipping documents such as air bills, bills of lading, etc. should be retained by the project leader and placed in the project files.

6.4.2 Purging

Prior to groundwater sampling, wells should be adequately purged. This may be carried out using different instruments. Traditionally, a minimum of three well volumes were required to be purged; however, by monitoring pH, conductivity, dissolved oxygen, temperature and turbidity during purging it can be determined when the static water has been purged. If after three well volumes the chemical parameters have not stabilized, additional well volumes should be removed. If the parameters have not stabilized after five volumes, the project leader should determine whether or not a sample should be collected or purging continued. A field log record should be kept of the actual volume of water purged from the well along with the criteria used for determining when an adequate purge volume has been achieved. In addition the physical conditions of the sample (colour, odour) should be recorded in the log book.

6.4.3 Temporary monitoring wells

The procedures used to purge temporary groundwater monitoring wells differ from permanent wells because temporary wells are installed for acquiring samples immediately. Efforts to remove several volumes of water to replace stagnant water may not necessarily apply, however, it is important to note that the longer a temporary well is in place and not sampled the more stagnant the water column becomes and the more appropriate it becomes to apply to the extent possible, standard permanent monitoring well purging criteria to it to re-achieve aquifer conditions.

6.4.4 Sampling

Sampling should follow the necessary approved protocols based on the parameter that is being sampled for and the analytical method that will be used. Of special note are the sampling protocols that must be followed for VOC samples. The analytical method and method numbers (where applicable) should be included in the Closure Report.

6.4.4.1 Sample Handling and Preservation Requirements

- Groundwater samples will typically be collected from the discharge line of the pump or from a bailer, either from the pour stream of an up-turned bailer or from the stream from a bottom-emptying device. Efforts should be made to reduce the flow from either the pump discharge line or the bailer during sample collection to minimize sample agitation.
- During sample collection, the pump discharge line or the bailer should not come into contact with the sample container.
- The sample should be placed into appropriate, labelled containers. Samples collected for VOC, acidity and alkalinity analysis must not have any headspace. All other sample containers must be filled with an allowance for ullage.

7.0 Quality Assurance/Quality Control Procedures

All samples must be collected in pre-preserved packaged glass sample bottles or vials for the collection and analyses of samples for petroleum products. Where these are not available clean sealed glass containers can be used. Where clean sealed glass containers are being used wide mouth glass bottles that have been rinsed with water and then rinsed with solvent should be used. The bottle must be capped with a PTFE lined cap and aluminium foil may be used before capping. Please note that the cap must be cleaned using the same procedure as the bottle. Alternatively, instead of rinsing with solvent, the bottles can be baked at 200 – 250 °C for one hour and the caps at 100 – 200 °C. Amber coloured bottles should be used in preference to clear bottles to prevent breakdown of samples by sunlight.

BTEX samples can be collected in pre-preserved glass vials bought directly from the supplier. Soil samples can be collected in clear glass jars. The glass jars are to be prepared in the same manner as the wide mouth glass bottles above.

The laboratory carrying out the analyses must receive the samples in accordance with its established quality control procedures. Storage procedures must be documented on the chain of custody form.

Samples should be appropriately preserved labelled, logged and placed in a cooler to be maintained at 4°C. Samples must be shipped well before the holding time is over and ideally should be shipped within 24 hours of sample collection. All samples requiring preservation must be preserved as soon as practically possible, ideally immediately at the time of sample collection. Where special handling requirements are required these should be determined prior to conducting fieldwork.

All data must be documented in the field log book.

All instruments should be operated in accordance with the manufacturer's instructions.

Field duplicates and equipment or field blanks should be collected along with the samples at a frequency of one for every ten samples.

7.1 Equipment Considerations (Groundwater)

- All equipment must be decontaminated prior to use and between wells.
- Samples should be collected into the sample container from the sampling device. Intermediate containers should not be used.
- In order to avoid contaminating the sample or loss of analytes from the sample, the sampling equipment should be handled as little as possible.
 - The equipment exposed to the sample should be minimized.

- The aeration of samples collected for VOC should be minimized.
- Sampling pump flow rates should be reduced to < 100 ml/minute when collecting VOC.
- Wherever possible dedicated equipment should be used as it reduces the chance of cross contamination.
- Ensure pumps are clean or dedicated prior to installation.
- Clean or make sure any permanently mounted tubing is clean before installation.
- Change or clean tubing when the pump is withdrawn for servicing.
- Collect equipment blanks on dedicated pumping systems when the tubing is cleaned or replaced.
- Clean or ensure dedicated bailers are clean before placing them into the well.
- Collect an equipment blank on dedicated bailers before introducing them into the water column.

7.2 Special Precautions for Trace Contaminant Groundwater Sampling

- A clean pair of new, non-powdered, disposable nitrile gloves should be worn each time a different location is sampled and the gloves should be donned immediately prior to sampling. The gloves should not come in contact with the media being sampled and should be changed any time during sample collection when their cleanliness is compromised.
- Sample containers for samples suspected of containing high concentrations of contaminants shall be stored separately.
- Sample collection activities shall proceed progressively from the least suspected contaminated area to the most suspected contaminated area as sampling devices are to be re-used. Samples of waste or highly contaminated media must not be placed in the same ice chest as environmental (i.e. containing low contaminant levels) or background samples.
- If possible, one member of the field sampling team should take all the notes and photographs, fill out tags, etc. while the other members collect the samples.
- Care should be taken to minimize contamination of sampling equipment by accidental contact with the ground surface. This may be achieved by placing clean plastic sheeting on the ground at each sample location.
- Samplers must use new, verified certified-clean disposable or non-disposable equipment that have been cleaned according to the procedures for the collection of samples for trace metals or organic compound analyses.

8.0 Management of Excavated Soil

Contaminated soils stored on-site must be placed on an impermeable liner and covered with plastic. The material used must have been so designed to prevent any leachate from migrating from the soil pile. It should also be stored in a manner that will prevent storm water run-on to the storage area.

Contaminated soils destined for destruction need not be sampled. However if the soil is destined for reuse or disposal at a solid waste disposal site it must be sampled and analyzed for the parameters in the NRCA Interim Standard for Petroleum In Soil and Groundwater (Appendix V). Typically, 3 discrete or appropriately composited samples will be required per each 38.228 m³ (50 yd³) stockpiled. Contaminated soils removed during the excavation activities must be transferred to an approved treatment/disposal facility within the time period approved by the Agency.

Arrangements should be made so that the tank and any contaminated soil can be disposed of without delay.

Excavated soil must not be used as backfill unless approved by the Agency.

Written confirmation must be submitted from the disposal or recycling facilities indicating their willingness to accept all wastes, including: the tank, associated piping, remaining product or sludge, and other excavated materials to be removed as part of these activities. This must also be included in the relevant section of the Closure Plan submitted prior to the commencement of the removal activities.

The Agency will consider both ex situ and in situ treatment of contaminated soil; however, these activities will require an environmental permit from the NRCA.

9.0 Remediation

All backfill material and soil remaining in the environment around the tank excavation must be remediated to be in compliance with the Interim Standards for Petroleum in Soil and Groundwater.

Please note that if land farming is the preferred remedial option chosen for contaminated soil, an Environmental Permit(s) for the storage, treatment or transportation of hazardous waste must be received prior to the commencement of any such storage, treatment or transportation. If storage and treatment are taking place in different locations, more than one permit will be required as permits are site specific.

10.0 Future Development of the Site

Prior to the use of the site for any activity other than petroleum storage, checks should be made with the NEPA/NRCA/TCPA regarding the suitability of the site for the proposed activity before the new development is undertaken.

11.0 Reporting Requirements

Within six weeks (unless otherwise stipulated by the Agency) after the UST(s) removal/soil sampling, the owner/operator must submit a Post Closure Assessment Report to the PPB of the Agency.

The report shall include, but not be limited to, the following information:

- The number of tanks removed and the contents thereof
- Screening method utilized
- Depth of final excavation
- Amount of impacted soil
- Number of samples collected and location from which they were collected. A site plan must be included highlighting the location at which each sample was obtained, the depth at which the sample was collected for analysis and the results of the samples collected. The site plan must be to drawn to scale and the locations of the USTs, piping locations, and buildings and/or streets must be depicted (see Appendix III for an example).

- Copies of the laboratory reports, and chain-of custody forms (from sample collection to analysis)
- Documentation on disposal of wastes
- Soil sampling data presented in a table format (see Appendix III for an example)
- Information concerning the removal, storage and/or disposal of tanks, piping and other ancillary underground equipment
- Information concerning the removal, remediation and/or disposal of petroleum, petroleum waste, petroleum contaminated soil and/or ground water.

The report should be presented in the format outlined in Appendix III. This document can be downloaded from the Agency's website at <http://www.nepa.gov.jm>.

12.0 Aboveground Storage Tanks

The Agency may determine that soil/groundwater sampling is required for the decommissioning of aboveground storage tanks. Where ASTs have secondary containment with no evidence of release or compromise to the containment area, soil/groundwater sampling may not be required. Where aboveground petroleum storage tanks are associated with underground piping, all the general requirements for underground tank removals must be adhered to.

Where there is evidence of contamination outside the bunded area or there is no bund, soil sampling will be required to be undertaken as per the approved sampling plan.

Tank removal will not be deemed complete until a Post Closure Assessment Report has been submitted to the Enforcement Branch/Pollution Prevention Branch, NEPA and accepted by the Agency as complete.

13.0 Decommissioning Pipelines on the Sea Floor

All pipelines should be cleaned prior to decommissioning. When cleaning, pipelines should be pigged and purged to flush residual fluids using the most appropriate methods and suitable chemical additives to ensure effective cleaning. Pipelines must be flushed from the seaward end to the shore into a holding tank in order to facilitate decanting. The historical information of the pipeline must be considered and submitted when preparing specific cleaning procedures.

13.1 Removal of Pipelines

Removal of any pipeline sections or associated structures should be supported by the proposed mitigation measures to minimize potential impacts on the environment at each phase of the removal process from removal, transportation to shore, onshore handling and through to final disposal.

13.2 Decommissioning of Pipelines In situ

A Beach Licence from the NRCA will be required for proposed abandonment in situ.

Appendix I: NRCA Guidelines for the Preparation of a Closure Plan for Industrial Type Projects

*Natural Resources Conservation Authority
Guidelines for the preparation of a Closure Plan for Industrial Type*

Projects

Introduction

These guidelines have been prepared in order to assist the Permitted/owner/operator in developing Closure Plans for his facility. This guideline describes a Closure Plan as *the procedures for decommissioning of a facility and the removal of all the possible contaminants to air soil and water; equipment decontamination; sampling and laboratory analysis and closure to the satisfaction of the relevant standards and regulations stipulated by the National Environment and Planning Agency.*

A. General

- The activities to be undertaken in the Plan should be clearly listed, with target dates for completion.
- Waste produced due to closure activities must be both classified and quantified and the method of treatment and/or disposal stated.
- The Plan should include soil (and groundwater, if accessible) testing for the presence of contamination. The test methods used for analysis of the soil and groundwater samples should be indicated.

B. Background Information

This should include:

1. The nature of the probable/possible contamination including list of chemicals used on site
2. Any published or otherwise known information in order to establish whether adjacent property owners are or have been potential sources of contamination
3. Present zoning of the site and details of the zone categories of properties surrounding the site
4. Contour or topographic maps
5. Likely future use of the site
6. Risk Assessment
7. The results of any previous investigations of the site or surrounding land
8. Locations of surface water bodies, particularly where these may be adversely affected by contaminated groundwater or surface drainage from the site
9. Hydrogeological information which should include:
 - The extent and use of aquifers in the area
 - Estimated depth to groundwater
 - Probable direction of groundwater flow and gradient
 - Soils and soil properties (soil type, porosity and hydraulic conductivity)

- o Location of any springs
- o Sources of local municipal water supply and the location of registered private or industrial wells or bores

10. Solid waste disposal

11. Security of facility/area scheduled for closure. This should include the postage of relevant signs.

Note: The Authority may require remediation for sites found with significant levels of contamination. In such cases a Remediation Plan shall be submitted for review and approval.

Post Closure Monitoring must be conducted for an agreed period for any contamination that may be present on site. The parameters to be monitored, the frequency of monitoring, the test methods used for the analyses and the end points to be achieved must be clearly stated.

Appendix II: Storage Tank Notification Form

Storage Tank Notification Form	
I. Ownership of Tank(s)	II. Location of Tank(s)

Owner Name (corporation, Individual, Public Agency, or Other Entity)	If known, give geographic location of tanks by degrees, minutes and seconds For example Lat Latitude 42,36,12 N Long. 85, 24, 17 W Longitude				
Address	Address				
Telephone #	Telephone #				
Tank Identification Number	Tank No. 1	Tank No.2	Tank No. 3	Tank No. 4	Tank No. 5
UST (underground) or AST (aboveground) Tank					
Single wall (SW) or Double wall (DW) tank					
Capacity					
Date use discontinued					
Type of fuel Stored					
Construction material of the tank					
Construction material of the pipeline(s) associated with the tank					
Date of last structural integrity test					
If the tank has been previously repaired, please indicate date and give reason for repairs					
Will this tank system be replaced? If yes, describe					

If the tank has been previously repaired, please indicate date and give reason for repairs					
Have closure plans been approved the National Environment and Planning Agency (NEPA)?					
Scheduled commencement date (attach detailed schedule of activities as outline in the approved Closure Plan)					
Has any environmental assessment been conducted at the removal location?					
Name of Environmental Consultant to be present during removal (include also qualification and competencies) _____ _____ _____					
Volume of Sludge _____ m ³ Volume of Product _____ m ³ Volume of water _____ m ³					
Planned disposal mechanism of tanks, sludge and water _____ _____ _____					
Form completed by _____ (Name) _____ (Position) _____ (Signature) _____ (Date)					

Appendix III: Post Closure Assessment Report Template

Post Closure Assessment Report Template



National Environment and Planning Agency
Pollution Prevention Branch
10 Caledonia Avenue
Kingston 5

Petroleum Storage Tank, Pipeline and Dispenser Closure Report

PERMIT NUMBER (if applicable)	
--------------------------------------	--

Site Name:	
Site Address:	
Contact Person:	Phone:

OWNER IDENTIFICATION		
Name:	Company:	Phone:
Address:	E-mail:	

I certify that I have reviewed this document, appendices and attachments for submittal to the National Environment and Planning Agency. To the best of my knowledge, the information provided is true, accurate and complete.	
Signature - OWNER/CONTRACTOR	Date

CURRENT SITE CONDITIONS						
Description of the removed UST System and Tank Pit or AST (This section may be photocopied if more than 6 tanks were removed)						
TANK NUMBER	1	2	3	4	5	6
Date Tank Removed						
Date Piping Removed						
Tank Size (litres)						
Tank Age (approximately)						
Tank Contents						
Tank Construction Material						
Leak Detection Method Used During Active Life of Tank						
Number of Remaining Tanks:						
Will new USTs be installed at site? <input type="checkbox"/> Yes <input type="checkbox"/> No						
If No, and no tanks remain, what is planned future use of site?						

EXCAVATION (TANK PIT) CONDITION						
Surface Staining (Yes/No)						
Excavation Depth						
Excavation Length						
Excavation Width						
Free Product (Yes/No)						
Notable Odours (Yes/No)						

Soil Discoloration (Yes/No)						
Water in Tank Pit (Yes/No)						
Depth to Water						
Sheen on Water (Yes/No)						
Composition of Backfill Material						
Composition of Native Soil						
EXTERIOR TANK CONDITION (describe)						
(X ALL THAT APPLY)						
General Corrosion	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Random Pitting	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Perforations	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Location of perforations on tank	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Stress-Corrosion Cracking	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Possible Leak Locations						
PIPING CONDITION (describe)						
Piping Construction Material						
Possible Leak Locations						
(X ALL THAT APPLY)						
General Corrosion	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Random Pitting	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Perforations	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Location of perforations	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Stress-Corrosion Cracking	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Possible Leak Locations						
TANK CLEANING AND DISPOSAL						
Tank Cleaning Method Used						
Final Disposal of Sludge and Wastewater						
Contractor Responsible for Tank Cleaning/Disposal (Name/Address/Phone)						
Tank Disposal Location						
TANK NUMBER	1	2	3	4	5	6
Quantity of Surplus Product Removed From tanks (litres)						
Final Disposition of Surplus Product						
DISPOSAL / TREATMENT OF BACKFILL						
Volume of soils disposed (m3 or tons)						

Appendix 1. Dimensioned Site Diagram:

- a. Location of all USTs, piping runs and dispenser islands
- b. Sampling locations/identification (include coordinates) that correspond to the laboratory analytical reports
- c. Boring/monitoring well locations
- d. Location of buildings and above ground tanks and piping on the site (include size and contents of ASTs)
- e. Groundwater flow direction (if unknown, estimate and explain how determined)
- f. North arrow
- g. Scale of the diagram in metres (or at least provide distances in metres)
- h. Dimensions of excavation pit area
- i. Location of underground utilities within 30.48 m (100 feet) of the site (e.g., sanitary sewers, public/private wells, power lines, storm sewers, utility trenches, water lines, pipelines, etc.)

Appendix 2. Laboratory Analytical Results

Certified laboratory analytical results for each sample, including completed chain of custody form(s)

Appendix 3. Tanks and Tank Cleaning

- a. Tank cleaning/disposal (e.g., signed statement from the party who performed the cleaning service indicating the UST was cleaned, and a certificate of disposal from the receiving facility)
- b. Documentation of sludge/wastewater disposal (e.g., signed statements, copies of permits)
- c. Photographs of the cleaning of the tanks

Appendix 4. Soil and Water Disposal

- a) Documentation of the proper disposal of contaminated soil (e.g., solid waste disposal facility receipts, weight tickets)
- b) Documentation of the proper disposal of contaminated pit water, including: signed statement of permission

Colour Photographs

- a. Photos before excavation
- b. Ends and sides of all tanks
- c. Cleaned interior of tanks
- d. Tank pit floor and sidewalls
- e. Product line and dispenser trenches
- f. Bedrock if exposed
- g. Sealed USTs/product lines that are closed in place
- h. Photos after completion of closure
- i. Descriptions of photos
- j. Disk of colour photos

Appendix IV: Guidelines for the Abandonment of USTs and Pipelines in Situ

Guidelines for the Abandonment of USTs and Pipelines In Situ

A formal work plan must be submitted to the Agency in the event that the abandonment of the USTs and/or pipelines in situ is being considered. This plan should inter alia, detail the proposed sampling regime to determine the extent of contamination, if any and is subject to the approval of NEPA. Please note that an officer from the Agency must be present onsite to witness the filling of the tank.

USTs

The following procedures should be observed in the event that the tanks are being abandoned in situ.

In preparation for filling with the inert material the vent must be disconnected and all tank openings must be plugged.

All piping associated with the abandoned tank must be removed. However, if it is impossible to remove same, the pipe must be isolated, drained and plugged at both ends⁶.

The tank must be filled with a slurry mixture for e.g. cement. In order to prepare the tank for filling with the slurry, the openings to be used must be able to allow the material to flow to all parts of the tank without leaving any pockets. Openings with fixed internal pipes are unsuitable for this purpose⁷. While filling the tank the slurry should be vibrated during pouring to remove air pockets and ensure complete filling of the tank.

Very old tanks without a manhole access cover require specialist treatment. In these circumstances, for example where there is no tank manlid opening and filling must be carried out through a restricted opening such as the fill pipe⁸ hydrophobic foam may be the most suitable method.

Tanks should be examined for two openings, one at each end of the tank. One opening must be large enough to accept the fill material and the other opening should be used as an observation hole to ensure the tank is filled to capacity. If sufficient openings do not exist, excavate to the top of the tank and make the openings. The tanks should then be filled until the inert material flows out of the observation hole.

Soil Sampling Requirements

Borings should be placed to a depth of 0.3048 m to 0.9144 m (1'-3') below tank bottoms and samples should be collected at the interval of highest contamination indicated by PID readings.

⁶<http://www.falls creek.com.au/Assets/1924/1/AS49762008TheRemovalanddisposalofundergroundpetroleumstoragetanks.pdf>

⁷ If it is necessary to cut special openings in the tank, cold cutting methods must be used.

⁸<http://www.westyorksfire.gov.uk/uploads/assets/media/pdfs/safetyleaflets/7b2893d625dd3048139894c0a9cf3015bb0dc1d.pdf>

Borings should also be drilled every 3.048 m to 6.096 m (10 – 20 feet) along piping runs, at a depth of 0.3048 m to 0.9144 m (1'-3') below trench bottom.

Borings should also be drilled within 0.9144 m (3 feet) of each dispenser (supply side). If dispensers are located within 4.572 m (15 feet) of each other on the same fuel island, one sample should be collected per Fuel Island, on the supply side.

If groundwater is encountered during soil boring activities, groundwater samples must be collected from each boring that contains groundwater and each sample must be analyzed separately. Soil sampling must be conducted from those borings that do not have groundwater. In addition, regardless of whatever soil and/or groundwater sampling that is conducted, one soil sample must be collected from the boring that exhibited the highest level of petroleum contamination during the field screening process.

Pipelines

In these cases, consideration will only be given in the following scenarios:

1.

Test results in keeping with the NRCA Guidelines for Frequency of Structural Integrity Tests are submitted. The pipelines must be pressure tested above operating pressure for at least 30 minutes. For suction lines a minimum of 30 psi should be used. For pressurized lines a minimum of 50 psi should be used, unless operating pressures exceed 50 psi. The line test must be performed in such a manner that no more than 10% loss of pressure occurs over a 30 minute time period.

and

There is no visible product staining around the exposed soil or pavement immediately around or above the product lines.

and

There is no evidence or record of previous pipeline leaks (such as inventory losses); previous repairs to the line(s) or evidence that the lines have been replaced

OR

2.

There is no evidence or record of previous pipeline leaks (such as inventory losses); previous repairs to the line(s) or evidence that the lines have been replaced

and

No inventory losses reported using electronic leak detection systems.

Facilities at which not all tanks are equipped with electronic leak detection systems, the provisions in scenario 1 will have to be adhered to for the tanks without the electronic leak detection systems in place.

In the case of proposed abandonment of pipelines in-situ, soil sampling will be required to assess potential contamination prior to the consideration of such a proposal. If the environment is deemed to be contaminated, based on existing NRCA standards, removal/ remediation will be required.

Appendix V: UST Closure Report – Abandonment In Situ Template

UST Closure Report – Abandonment In Situ Template



National Environment and Planning Agency
 Pollution Prevention Branch
 10 Caledonia Avenue
 Kingston 5

UST Closure Report – Abandonment in Situ

Permit Number (if applicable)	
--------------------------------------	--

Site Name:	
Site Address	
Contact Person:	Phone:

OWNER IDENTIFICATION	
Name:	Company:
Address:	E-mail:
Phone:	

I certify that I have reviewed this document, appendices and attachments for submittal to the National Environment and Planning Agency. To the best of my knowledge, the information provided is true, accurate and complete.	
Signature - OWNER	Date

CURRENT SITE CONDITIONS						
Description of the UST System and Site Conditions (This section may be photocopied if more than 6 tanks were removed)						
TANK NUMBER	1	2	3	4	5	6
Tank Size						
Number of Samples Collected for each tank						
Tank Contents						
Tank Construction Material						
Leak Detection Method Used During Active Life of Tank						
Date Tank Filled in Place						
Inert Material Used to Fill Tank						
Surface Staining? (Yes/No)						
Product Piping Removed?	<input type="checkbox"/> Yes <input type="checkbox"/> No		Length of piping removed (in metres):			

Discussion/Recommendations (based on lab results and visual observations):

SUPPORTING DOCUMENTATION AND INFORMATION (These items must be attached to the Closure Report)

Appendix 1. Dimensioned Site Diagram:

- a. Location of all USTs, piping runs and dispenser islands
- b. Sampling locations/identification that correspond to the laboratory analytical reports
- c. Boring/monitoring well locations
- d. Location of buildings and above ground tanks and piping on the site (include size and contents of ASTs)
- e. Groundwater flow direction (if unknown, estimate and explain how determined)
- f. North arrow
- g. Scale of the diagram in metres (or at least provide distances in metres)
- h. Dimensions of: 1) excavation pit area
- i. Location of underground utilities within 30.48 m (100 feet) of the site (e.g., sanitary sewers, public/private wells, power lines, storm sewers, utility trenches, water lines, pipelines, etc.)

Appendix 2. Laboratory Analytical Results

Certified laboratory analytical results for each sample, including completed chain of custody form(s)

Appendix 3. Other Documentation

- a. Tank cleaning/disposal (e.g., signed statement from the party who performed the cleaning service indicating the UST was cleaned, and a certificate of disposal from the receiving facility)
- b. Evidence solid, inert material used to fill tank in place

Colour Photographs

- a. Photos before excavation
- b. Ends and sides of all tanks
- c. Cleaned interior of tanks
- d. Tank pit floor and sidewalls
- e. Product line and dispenser trenches
- f. Bedrock if exposed
- g. Sealed USTs/product lines that are closed in place
- h. Photos after completion of closure
- i. Descriptions of photos
- j. Disk of colour photos

Appendix VI: NRCA Revised Standards for Petroleum in Groundwater and Soil 2015

CONTAMINANT	GROUND WATER	SOIL	NOTES
TPH	50 mg/l	1000 mg/kg	Unchanged from Interim Standard.
Lead	10 µg/l	70 mg/kg (soils for agriculture)	Values based on guidance given from the Environmental Health Unit (Ministry of Health).
		140 mg/kg (soils for residential/playgrounds)	
MTBE	5000 µg/l	4400 mg/kg (Florida - direct exposure residential)	Newly added contaminant for both groundwater and soil; value taken from Florida's jurisdictional guidelines. Although now phased out from most petroleum products, MTBE contamination from past pollution incidents are still present in the soil, as such testing for the chemical is required.
Total BTEX	91 µg/l	135mg/kg	Newly added values for groundwater; values taken from Florida's jurisdictional guidelines. Soil values unchanged from Interim Standard.
Benzene	1 µg/l	5 mg/kg	
Toluene	40 µg/l	30 mg/kg	
Ethylbenzene	30 µg/l	50 mg/kg	
Total Xylenes	20 µg/l	50 mg/kg	

A summary of the process that led to the preparation of the draft revise standard is provided below.

1) The revision of the Interim Standards for Petroleum in Groundwater and Soil was carried out by the Agency's internal Petroleum Working Group (PWG). The group consisted of members of the various technical branches within the Agency.

2) A jurisdiction review was conducted inclusive of the standards for petroleum in groundwater and soil in nine (9) jurisdictions. A draft document was prepared by the PWG based on this review. The jurisdictions researched included:

- USA: New York, Arizona, Kansas, Wyoming, Mississippi, Florida
- Canada
- The Netherlands
- New Zealand

For each of the above jurisdictions, the contaminants of concern applicable to Jamaica were reviewed and discussed by the members of the PWG.

3) The World Health Organisation's '*Guideline values for chemicals that are of health significance in drinking water*', and Petrojam's product specification for its finished petroleum products and crude oil were also reviewed. The contaminants of concern were determined by the composition of the petroleum used in Jamaica; the contaminants of concern did not include volatile organic compounds.

4) A copy of the first draft of the revised standard was sent to key government agencies for review. These are the Water Resources Authority, the Environment Health Unit (Ministry of Health), and the Rural Physical Planning Division (Ministry of Agriculture). These comments were incorporated into the draft document as necessary.

5) A copy of the second draft of the revised standard was sent to private sector stakeholders. These comments were incorporated into the draft document as necessary.

Appendix VII: Reconciliation Data Reporting Form

Reconciliation Data Reporting Form

DAILY INVENTORY WORKSHEET

FACILITY NAME: _____

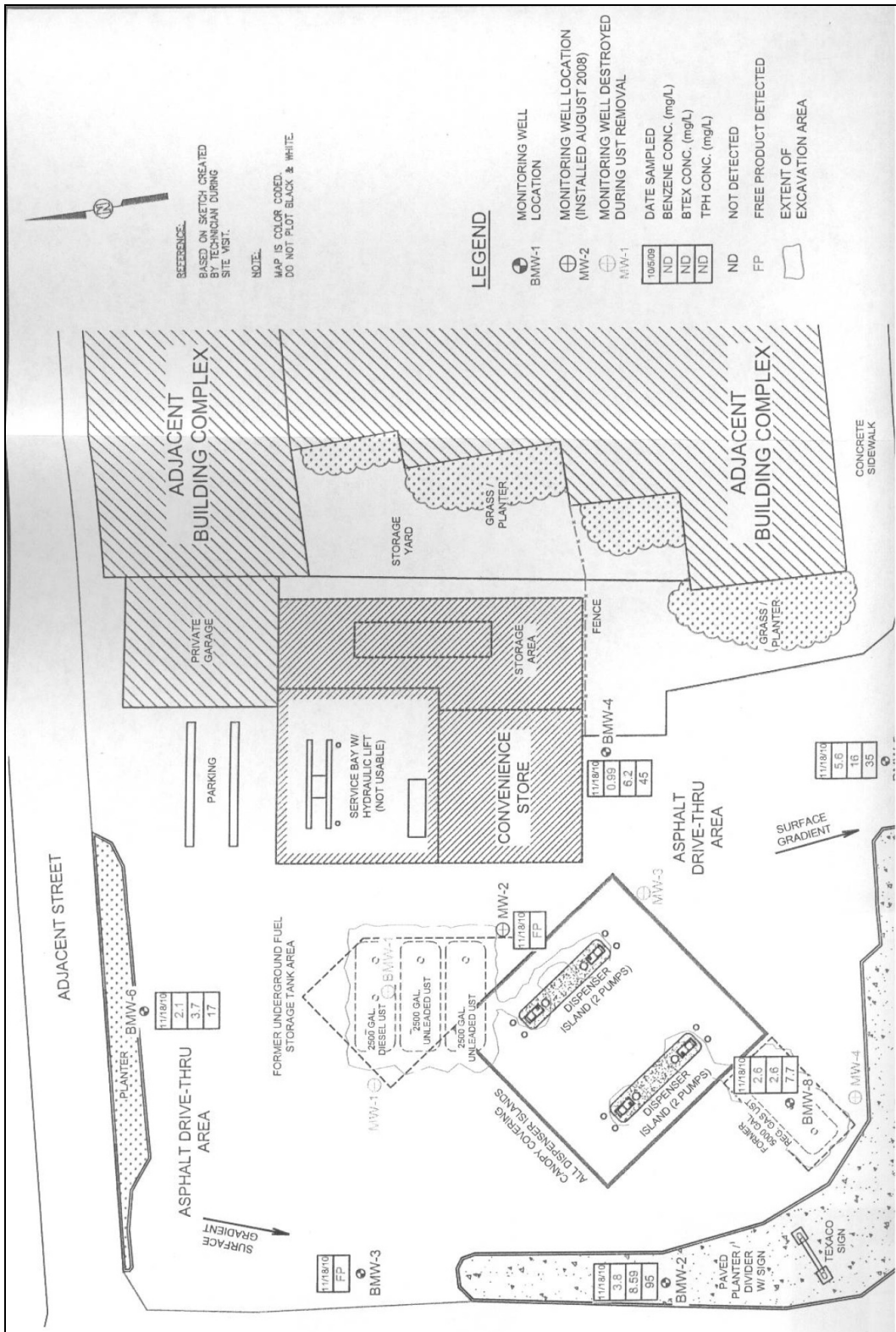
YOUR NAME: _____

DATE: _____

TANK IDENTIFICATION					
Type of Fuel					
Tank Size (litres)					
END STICK CENTIMETRES					
AMOUNT PUMPED					
Totalizer Reading					
Totalizer Reading					
Totalizer Reading					
Totalizer Reading					
Totalizer Reading					
Totalizer Reading					
Totalizer Reading					
Totalizer Reading					
TODAY'S SUM OF TOTALIZERS					
Previous Day's Sum of Totalizers					
AMOUNT PUMPED TODAY					
DELIVERY RECORD					
Centimetres of Fuel Before Delivery					
Litres of Fuel Before Delivery (from tank chart)					

Centimetres of Fuel After Delivery					
Litres of Fuel After Delivery (from tank chart)					
LITRES DELIVERED (STICK)					
GROSS LITRES DELIVERED (RECEIPT)					

Appendix VIII: Sample Map



Appendix IX: Waste Manifest Template for Decommissioning of Petroleum Tanks and Pipelines

Waste manifest				1. Page 1 of	
2. Generator's name and mailing address				NRCA Permit No. (if applicable)	
Telephone	Fax	Email			
3. Transporter 1 Company Name and mailing address				NRCA Permit No. (if applicable)	
Telephone	Fax	Email			
4. Transporter 2 Company name and mailing address				NRCA Permit No. (if applicable)	
Telephone	Fax	Email			
5. Description of the waste	Proper shipping name	Hazard Class	ID #	Packaging Group	Unit wt/vol
a					
b					
c					
d					
6. Additional details for materials listed above					
7. Generator's Declaration: I hereby declare that the contents of this consignment are fully and accurately described above by proper shipping name and are classified, packaged, marked and labeled/placarded and are in all respects in					

proper condition for transport by road according to applicable international and national government regulations.		
Name	Signature	Date (yy/mm/dd)
8. Transporter 1		
Name	Signature	Date (yy/mm/dd)
9. Transporter 2		
Name	Signature	Date (yy/mm/dd)
10. Facility Owner or Operator: Certification of receipt of hazardous materials covered by this manifest (note any discrepancies below).		
Facility Owner or Operator name and mailing address		NRCA Permit No.
Telephone	Fax	Email
Name	Signature	Date (yy/mm/dd)

References and Sources of Additional Information

References

American Petroleum Institute. Closure of Underground Petroleum Storage Tanks API Recommended Practice 1604, Third Edition, March 1996

EPA South Australia. EPA Guidelines Composite Soil Sampling in Site Contamination Assessment and Management March 2005

Florida Department of Environmental Protection DEP-SOP-001/01 FS 2200 Groundwater Sampling <http://www.dep.state.fl.us/water/sas/qa/docs/62-160/fs-2200-groundwater-sampling.pdf>

Guideline for the Dismantling and Removal of Petroleum Storage Tank Systems, Manitoba, February 2007

Iowa Administrative Code Chapter 35 Technical Standards and Corrective Action Requirements for Owners and Operators of Underground Storage Tanks <https://www.legis.iowa.gov/DOCS/ACO/IAC/LINC/Chapter.567.135.pdf> accessed 27 February 2013

Iowa Department of Natural Resources UST Tank Closures <http://www.iowadnr.gov/InsideDNR/RegulatoryLand/UndergroundStorageTanks/USTOwnersOperators/TankClosureInformation.aspx> accessed 5 October 2012

Mississippi Department of Environmental Quality Office of Pollution Control Underground Storage Tank Branch. Guidelines for the Permanent Closure of Petroleum Underground Storage Tank Systems, April 4, 2001

National Environment and Planning Agency. NEPA Guidelines for An Industry Emergency Response Plan, April 2009

New England Interstate Water pollution Control Commission. Tank Closure Without Tears: An Inspector's Safety Guide, May 1998 (reprinted August 1990)

Region 4 U.S. Environmental Protection Agency Science and Ecosystem Support Division Athens, Georgia. SESD Operating Procedure Groundwater Sampling

Standards Australia. Australian Standard® The Removal and Disposal of Underground Petroleum Storage Tanks AS4976-2008

USEPA Region 9 Laboratory Richmond, California Field Sampling Guidance Document #1220 Groundwater Well Sampling http://www.epa.gov/region6/qa/qadevtools/mod5_sops/groundwater/sampling/r9_gw_gui.pdf

West Yorkshire Fire and Rescue Service. Fire Safety – Public Advice Petrol Stations – Methods of Rendering Underground Storage Tanks Safe from Risk of Fire/Explosion, 01/12/2011

Sources of Additional Information (Groundwater)

The following documents may be consulted for additional information on Groundwater Sampling:

USEPA Region 9 Laboratory Richmond, California Field Sampling Guidance Document #1220
Groundwater Well Sampling

http://www.epa.gov/region6/qa/qadevtools/mod5_sops/groundwater/sampling/r9_gw_gui.pdf

Florida Department of Environmental Protection DEP-SOP-001/01 FS 2200 Groundwater Sampling

<http://www.dep.state.fl.us/water/sas/qa/docs/62-160/fs-2200-groundwater-sampling.pdf>