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Rupert's Pollution Incident

To: Trevor Graham – Director ENRD

From: Ben Sansom – Head of EMD

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Cc: Mike Durnford (EMD), Isabel Peters (EMD)

Site Investigation

1 Background

EMD were requested by Trevor Graham (Director, ENRD) to attend a pollution incident on the evening of 20th August 2014 in Rupert's valley. Ben Sansom (Head of EMD) and Mike Durnford (Manager, Environmental Risk Management) attended the incident and provided contaminated land advice to Saint Helena Government (SHG), Solomons, Basil Read, Police and Fire service. The pollution incident was thought to be caused by a suspected leak in an underground fuel distribution pipeline beneath the road in Rupert's Valley.

Solomons manage the islands operational bulk fuel installation (and associated infrastructure) under contract with SHG. A potential leak in the fuel distribution pipeline was identified by Solomons during a company investigation of a potential fuel loss.

In the area of concern, the fuel distribution pipeline (comprising two separate pipes for distributing diesel and unleaded petrol) runs within a larger second pipe which acts as a sleeve (reinforcing and protecting the pipeline as it crosses beneath the road). Olfactory evidence in the area of concern indicated that the leak was associated with the unleaded fuel pipeline.

2 Pollution Source, Receptor and Pathway

The section of pipeline was isolated and made safe by Solomons. Prior to any major intrusive investigation, soil vapours observed at the location of the suspected leak indicated that the leak was likely to be associated with the unleaded petrol fuel pipeline (the **source** of the contamination).

The environmental **receptors** were identified as site workers and the general public, the soil beneath the pipeline and down hydraulic gradient of the suspected leak (approximately 10m down gradient to the coast), groundwater and the marine environment of Rupert's Bay.

The **pathway** for the contamination was thought to be via the inside of the pipeline sleeve to the termination of the pipeline sleeve.

3 Site Investigation

3.1 20th August 2014

At the time of EMD attending the incident at 16:30 on 20th August 2014, Solomon's contractor had already excavated an area of pipeline where the principal concentration of hydrocarbon vapours had been reported. The exposed pipeline, sleeve and excavation are presented in Plate 1.

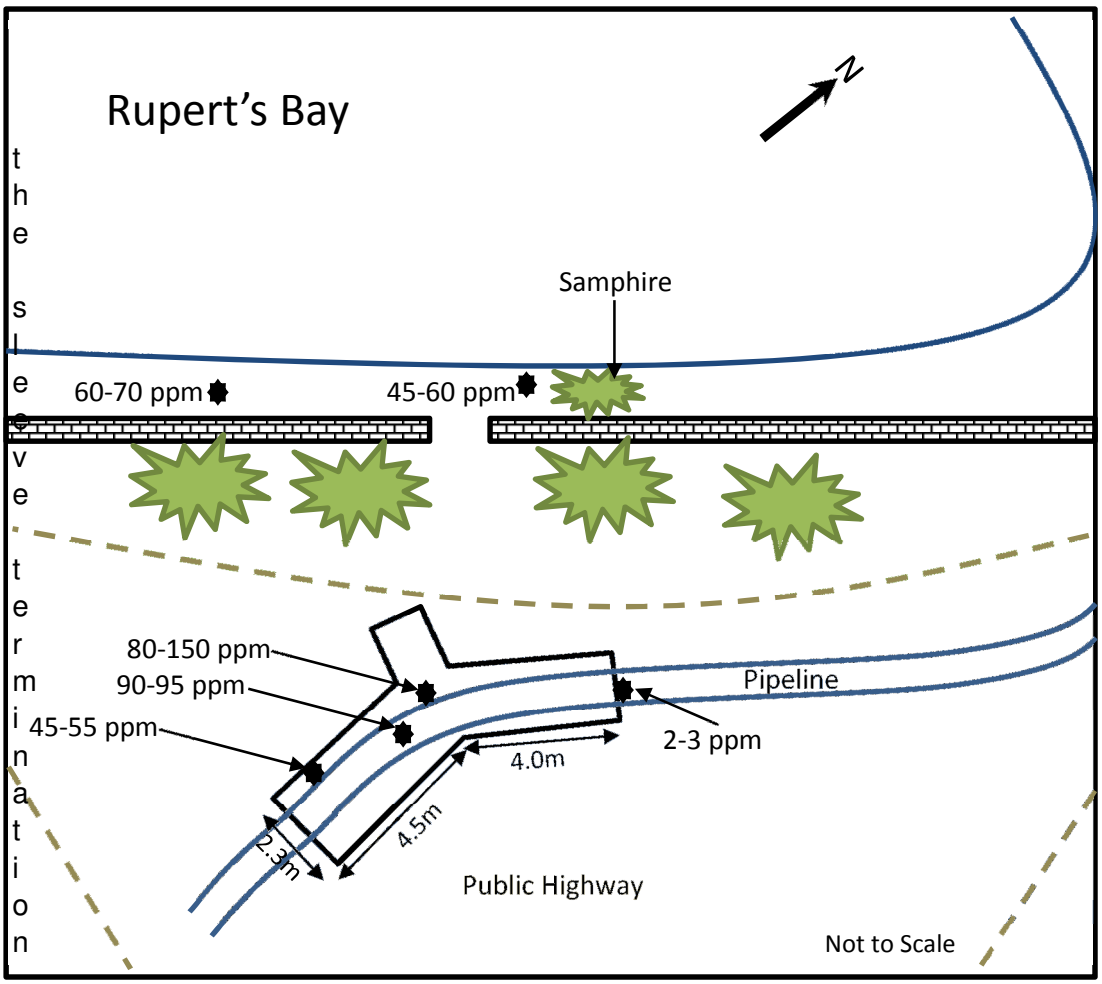
Plate 1: Exposed pipe, sleeve and excavation

Basil Read environment staff used a Photo Ionisation Detector (PID) to monitor concentrations of Volatile Organic Carbon (VOC) in ambient air in the vicinity of the investigation area and from soil within the excavation.

For the purposes of assessing the risks of the VOC to human health and the environment, an occupational exposure health limit of 50 parts per million (ppm) VOC was used as an appropriate threshold value. This limit is used by Basil Read for assessing the risks of hydrocarbon pollution incidents associated with the Saint Helena airport construction project. Concentrations of VOC less than 50ppm are deemed to be acceptable for protecting human health and the environment.

Figure 1 provides a summary of VOC readings taken by Basil Read on 21st August 2014 at 07:30.

Figure 1: VOC Concentrations at Pollution Incident



Concentrations of VOC were seen to exceed the identified threshold within the excavation ("Y" shape) and in ambient air sampled adjacent to Rupert's Bay on the

opposite side of the old sea wall. Plate 2 shows an area of samphire behind the old sea wall, where VOC readings exceeded the identified threshold.

Plate 2: Samphire and area of contaminated soil behind old sea wall

In order to ensure that the risk of polluting Rupert's Bay was reduced as quickly as possible, it was decided that the excavation would be enlarged in order to remove as much of the contaminated soil as possible. Approximately 49m^3 of contaminated soil was removed around and down gradient of the pipe sleeve termination to a depth no greater than that of the exposed pipeline (approximately 1.2m below ground level) during the evening of the 21st August 2014. No contaminated soil beneath the pipeline was removed for safety reasons. No groundwater was encountered in the excavation beneath the pipeline

The soil was moved by lorry to Horse Point landfill and was temporarily stored in a stockpile on a large area of concrete hard standing in the new public recycling area (Plate 3). Public Health were alerted to the emergency stockpiling of contaminated soil at the public waste reception area.

3.2 21st August 2014

The following day all parties re-convened at the site to discuss a way forward for identifying the location of the leak, repairing the pipeline and completing the removal of contaminated soil for bioremediation at Horse Point Landfill.

Due to the impending Bank Holiday weekend, need to distribute fuel to all of the islands petrol filling stations and deadline for offloading the NP Glory 4, it was agreed that the temporary excavation would be backfilled with inert material and a barrier put in place so that Basil Read vehicles could offload the NP Glory 4 by the end of the

Bank Holiday weekend and stockpile construction materials at the wharf construction site. This would avoid delays to airport construction and enable the continuation of works at the wharf construction site whilst the pollution incident site was closed off to allow Solomon's contractor to re-open the excavation, excavate more of the impacted soil surrounding the leak and repair the pipeline. This would also give the contractor time to order materials needed to repair the pipeline and have them delivered by the RMS Saint Helena in time to make the repair.

The site assessment on the 21st August evaluated the potential for the coastal water of Rupert's Bay to be impacted by the leak; however there was no observed oily sheen on the water or on the sand and rocks above the high tide mark. Volatile organic hydrocarbons were detected on the seaward side of the old sea wall which separates the bay and shoreline from Rupert's valley. The volatile organic hydrocarbons were confirmed as beneath a large patch of samphire between the wall and the coast, adjacent to the archway in the wall. The data suggests that the leaked fuel has migrated down gradient of the pipe sleeve termination and into soil on the seaward side of the wall (see Plate 2).

Plate 3: Temporary Stockpile at Horse Point Landfill

Plate 4: Temporary Backfill of Excavation and Barrier

3.3 26th August to 5th September 2014

The intrusive investigation was re-started on 26th August. Solomon's contractor excavated the inert backfill and continued to excavate contaminated soil surrounding the pipeline and beneath the pipeline. PID readings of soil samples within the excavation were taken on the 26th August and the excavation enlarged whilst the contaminated soil was chased out and the pipeline exposed to identify the location of the leak. All soil with VOC readings that exceeded the identified threshold were excavated and removed to the landfill for remediation.

On 27th August, an inspection of the area of samphire adjacent to Rupert's Bay confirmed that VOC concentrations had declined to 0.3ppm. The reading confirmed that the source of contamination was being managed by removal of the "hot spot" and the risks of any further contamination to the environment was significantly reduced. Once again adjacent to this location, there was no observed oily sheen on the water or on the sand and rocks above the high tide mark.

Unfortunately the Basil Read PID malfunctioned on 27th August and could not be used to assist in the excavation of contaminated soil. The remainder of the excavation was informed by visual and olfactory evidence of hydrocarbon contamination in the soil surrounding the pipeline.

Plate 5 shows the final excavation area around the pipeline and the location of the leak. The maximum excavation depth was 2.5m below ground level.

A “saddle” supporting the fuel pipeline within the sleeve had broken and created a small fracture in the pipeline at the up gradient (south-east) end of the sleeve. Fuel was thought to have leaked through the fracture whilst being pumped under pressure (up to 7 bar) from the fuel supply ship to storage tanks in Rupert’s Bay. The investigation confirmed that unleaded petrol leaked from the pipe into the pipeline sleeve, which migrated down gradient inside the pipe sleeve before draining into the soil to the down gradient termination of the pipeline sleeve.

Note: hydrocarbon vapour was detected within residual soil beneath the repaired pipeline and in the side walls of the excavation. The excavation reached a maximum depth of ~2.0m around the excavated pipeline.

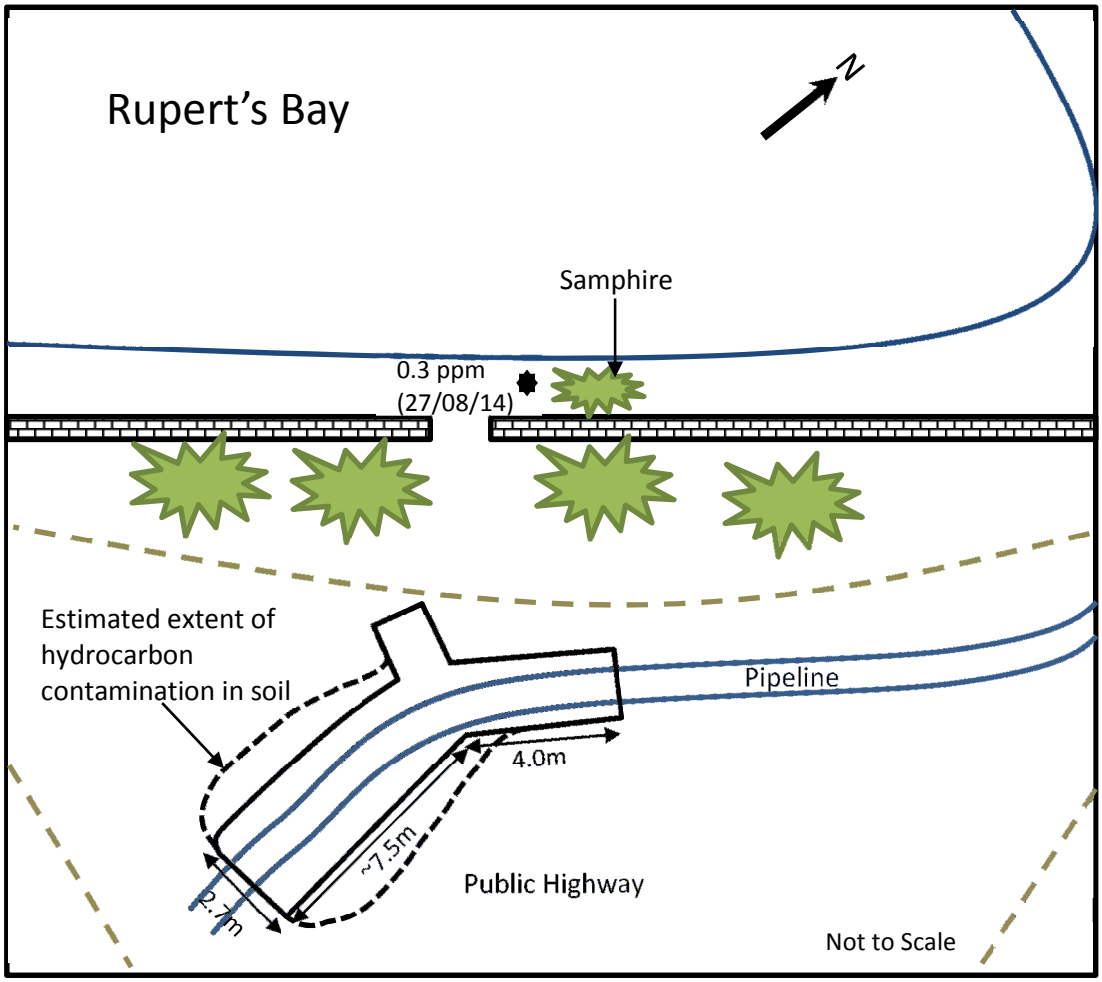
Plate 5: Location of Leak in Unleaded Petrol Pipeline

On the 5th September, ENRD and the Fire Service visited the site and agreed that further excavation was not necessary and the site could be closed down. The decision was based on the following evidence:

1. The damaged section of pipeline had been isolated and all unleaded petrol and diesel had been drained from the section of pipeline being investigated. This significantly reduced the risk of additional soil contamination whilst the investigation took place and was a mandatory requirement to ensure that the site was made as safe as possible for the general public and site workers;
2. The "hot spot" of contamination had been removed on the night of the 20th August. This significantly reduced the risk of contamination migrating down gradient of the pollution incident towards Rupert's Bay;
3. All shallow depth contaminated soil had been removed around the section of pipeline being investigated, and deeper contaminated soil surrounding the pipeline and beneath the pipeline (to a depth of 0.5m beneath the pipeline);
4. PID readings in the area of samphire adjacent to Rupert's Bay indicated that concentrations of VOC were significantly declining over time. By the 27th August VOC concentrations were well below the threshold identified to protect human health and the environment. Removal of the "hot spot" and evidence of declining VOC concentrations indicated that the residual contamination in soil was degrading through natural processes and did not pose a risk to the marine environment in Rupert's Bay;
5. The location of the leak had been identified and repaired. The length of diesel pipeline adjacent to the leak also had joints and saddles replaced to ensure that the diesel pipeline was safe for future operation;
6. Residual VOC concentrations within the vicinity of the excavation were not detectable at ground level by the 5th September;
7. The excavation would be backfilled with inert fill material and the road surface made good. The backfill would provide a minimum of 1m cover, providing a physical barrier between site workers and the general public from the residual contamination beneath the pipeline and within the sidewalls of the excavation at depth;
8. Future planned development at Rupert's would include the construction of a new road above the current ground level. This would significantly reduce the risks of any residual contamination coming into contact with construction workers or the need for further investigation and remediation of contaminated residual soil.

Figure 2 shows the extent of the excavation. The dashed line indicates the likely extent of the residual contamination in soil beneath the road.

Figure 2: Final Excavation and Estimate of Residual Contamination in Soil



A section of unleaded petrol fuel pipeline was confirmed through site investigation as the **source** of the contamination.

The environmental **receptors** were confirmed through site investigation as site workers and the general public, soil beneath the pipeline and down hydraulic gradient of the suspected leak (approximately 10m down gradient to the coast), groundwater and the marine environment of Rupert's Bay.

The **pathway** for the contamination was confirmed to be via the inside of the pipeline sleeve to the termination of the pipeline sleeve.

4 Site Remediation

On 21st August Public Health were alerted to the emergency stockpiling of contaminated soil at the public waste reception area. On 22nd August, EMD provided instruction to the landfill manager on the method to be employed to *ex situ* bio-remediate the contaminated soil. The method advised was via aeration of the soil by regular turning of the stockpiled soil by mechanical excavator.

This method allowed hydrocarbons to degrade in the excavated soil via naturally occurring organisms and breaking down into less toxic or non-toxic substances. EMD would take regular readings of the volatile hydrocarbon content of the bio-remediated soil using a portable Photo-Ionisation Detector (PID) borrowed from Basil Read. The bio-remediation would continue until PID readings fell below 50 ppm (Occupational Exposure Limit for Toluene – threshold limit value). The treated soil would then be used as backfill to cover the general waste cell at the landfill.

VOC concentrations were measured in the temporary stockpile on 26th August 2014 using the Basil Read PID. Readings ranged between 3.7 ppm and 361 ppm. EMD were unable to take further readings in the stockpile as the PID malfunctioned and was taken off-island for repair.

Additional lorry loads of excavated spoil were added to the stockpile during the investigation. The larger stockpile was regularly turned to ensure that the ex-situ bioremediation process was successful. Plate 5 shows the final extent of the temporary stockpile that was remediated at Horse Point Landfill.

Plate 5: Final temporary stockpile at Horse Point Landfill

On the 14th September 2014, Basil Read took the repaired PID to the landfill and tested a representative number of samples from the stockpile for VOC. Basil Read confirmed that all sample VOC concentrations were recorded as 0ppm. Based on this information, EMD instructed the landfill operator to stop all bioremediation activities move the stockpile from its temporary location and use the soil for landfill cell cover.

5 Future Site Development

Rupert's Valley is currently being re-developed as part of the airport construction project. It is understood that the area of public highway recently excavated to investigate and repair the leaking unleaded fuel pipeline will be re-developed as part of a new road layout. It is understood that the new road will be raised above the current ground level, limiting the need for any intrusive works. This will significantly reduce the risk of construction workers encountering any residual contaminated soil.

An annotated airport project site plan is presented in Figure 3 showing the location of the new sea rescue building and road layout. The figure has been annotated to show the excavated area and estimated area of contaminated soil which was left in-situ. Figure 3 is for illustration only and EMD do not provide any guarantee that the annotation is 100% correct, as a detailed site survey was not completed as part of the remediation and repair works.

Figure 3: New Rupert's Valley Road Layout Near the Old Sea Wall