



Failure Investigation Report

January 10, 2010 Third Party Damage
to Terasen Gas Line at Bay Street
and Pleasant Street, Victoria, B.C.

September 1, 2011

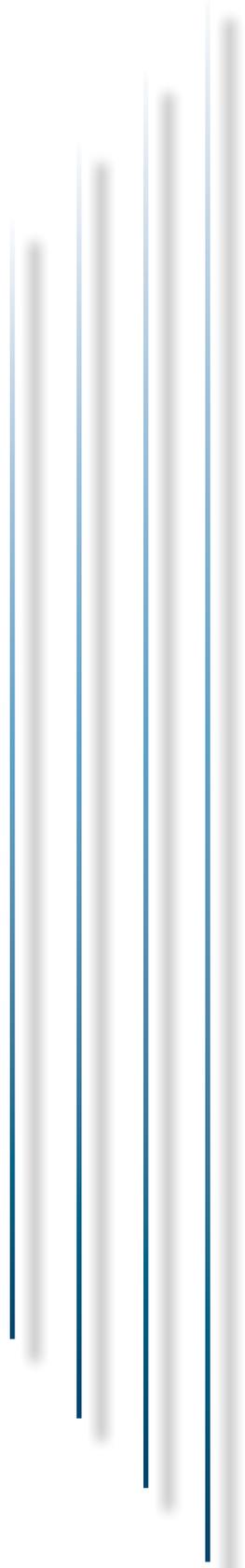


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Incident Summary

In 2009, AECOM Canada (the Consultant) commenced a project to remove and replace waterlines for the Greater Victoria Capital Regional District (the Municipality). G&E Equipment Rentals (the Contractor) was contracted by the Consultant to carry out the excavation for the waterline removal and replacement. The replacement was to take place from Dominion Road along Craigflower Road, Raynor Avenue, Tye Road, Bay Street, Pleasant Street, Bridge Street, and David Street; and along David Street between Pleasant Street and Gorge Road. Figure 1 shows the water main plan.

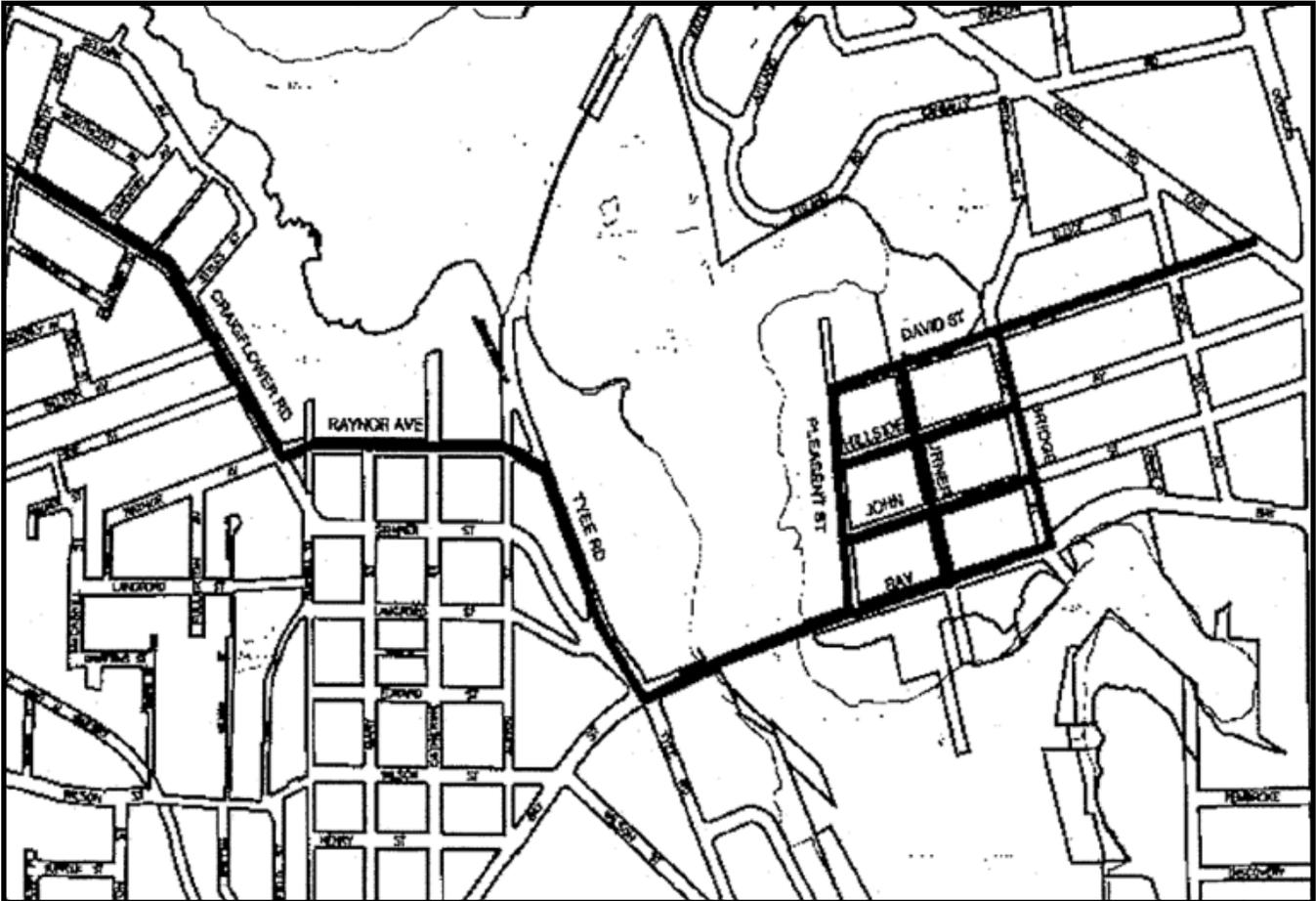


Figure 1 – Proposed waterline removal and replacement project

Prior to the incident on January 10, 2010, communications took place between Terasen Gas (Terasen), the Consultant, the Contractor, and the Municipality relating to the planned waterline removal and replacement. Terasen responded (through fax) to the Consultant on May 4, 2009 and to the Contractor on October 26, 2009, outlining the requirements on the stamped drawings for working adjacent to Intermediate Pressure (IP) pipelines¹ that included the intersection of Bay Street and Pleasant Street.

¹ IP pipelines are defined as pipelines with a working pressure between 701 kPa and 3,100 kPa.

On November 3, 2009, the Contractor requested a Pipeline Crossing permit from Terasen. The permits were issued to the Contractor on November 3, 2009 for the intersections of Bay Street and Tyee Road, David Street and Bridge Street, and David Street and Rock Bay Avenue. No permit was issued for the intersection of Bay Street and Pleasant Street. Inspections for the excavation of the intersections of David Street and Rock Bay Avenue and David Street and Bridge Street were performed by Terasen on November 18, 2009 and December 9, 2009, respectively.

On the evening of January 10, 2010, at approximately 10:20 pm, a 168.3 mm nominal pipe size (NPS) x 4.8 mm wall thickness (WT) Grade 245.1, Category 1, Intermediate Pressure 1,900 kPa (275 psi) natural gas pipeline, owned by Terasen was struck and punctured by the Contractor while working at the intersection of Bay Street and Pleasant Street in Victoria, B.C. Figure 2 provides a spatial view of the incident location and surrounding roads and Figure 3 shows the damaged pipe.



Figure 2 – Incident Location

At 10:46 pm, approximately 26 minutes after the strike, the Victoria Fire Department evacuated the area from Pleasant Street to Bridge Street and from Bay Street to David Street. At this time, Terasen personnel arrived on site and at 10:53 pm, it was confirmed that the line hit was a 168.3 mm IP line on the north side of the intersection. At 11:52 pm, Terasen determined that valve control of the escaping gas was not practical as the only valve closure that could isolate the pipeline break would also disrupt gas supply to most of Victoria. Instead, Terasen decided to install a flow control fitting upstream of the pipeline break which would effectively isolate gas flow to the leak.



Figure 3 – Damaged Pipe

On January 11, 2010 at approximately 12:51 am, excavation commenced at 522 David Street where the flow control fitting would be installed. At 1:15 am, Terasen determined the location would not provide adequate space to install the fitting due to the presence of rock near the existing pipe depth. The hole was abandoned and a second hole was excavated. At approximately 3:45 am, welding commenced at the second location and tapping procedures started at approximately 8:00 am. The leak at Bay Street and Pleasant Street was stopped at approximately 10:20 am and at 11:49 am, pipe was being pressure tested for replacement. At 1:30 pm, pipe repairs commenced. On January 12, 2010, at approximately 3:30 am, the repair was completed and gas was reintroduced with the pipeline back to operating pressure at approximately 5:30 am.

This pipeline strike resulted in the release of approximately 142,000 m³ (5 million ft³) of odourized natural gas into the atmosphere over approximately 12 hours. There were no explosions, fires, or injuries resulting from this incident.

Investigation Procedures

All companies engaged in oil and gas activities² in British Columbia are required to report incidents where the safety of persons or the quality of the environment has been placed at risk. The British Columbia Oil and Gas Commission (Commission) receives and reviews these reports and provides regulatory

² Oil and Gas Activities are defined in the Oil and Gas Activities Act and the Oil and Gas Activities General Regulation. The construction or operation of a natural gas pipeline, except for “piping used to transmit natural gas at less than 700 kPa to consumers by a gas utility as defined in the Gas Utility Act” is defined as an Oil and Gas Activity.

oversight of the follow up response and mitigation by the company.

Certain incidents may prompt a more detailed investigation by the Commission. As a general rule, the Commission may launch an Engineering/Technical Investigation into an incident when the incident:

- Results in significant impacts to the public or other stakeholders.
- May stem from a systemic issue within the company's management systems.
- May identify deficiencies in current practices and procedures within industry.
- May identify opportunities for improvement of processes and procedures within the Commission or within industry.
- Result or may have resulted in serious injury or death.
- Attracts significant public attention.

The Commission's goals in conducting an Engineering/Technical Investigation are to identify the incident cause and contributing factors. The results of these investigations will be summarized in a publicly accessible report available from the Commission website. By sharing the results and findings of these investigations, the Commission attempts to reduce the likelihood of similar events occurring.

Enforcement actions may arise during the course of an investigation but they are not the primary purpose.

Relevant Information

Incident Chronology

The following observations and statements have been made following a review of the incident logs and the responses to the information requests made by the Commission. The events took place between January 10, 2010 and January 12, 2010. The timing of events and the emergency response to the incident are provided in Table 1.

Table 1 - Incident Time Log (continued on next page)

Time	Detail
Jan 10 Approx. 10:20 PM	Contractor strikes and punctures a 168 mm steel IP natural gas pipeline near the intersection of Pleasant and Bay Street. The Victoria Fire Department (VFD) is notified.
10:22 PM	Terasen receives a call from the VFD advising Terasen of blowing gas at the intersection of Bay Street and Pleasant Street.

Time	Detail
Approx. 10:46 PM	Terasen Employee arrives on site approximately 26 minutes after the initial call is received.
Approx. 10:46 PM	VFD evacuates approximately a two block radius that includes Pleasant, John, David, Hillside, and Turner Street to Bridge Street. Barricades are set up in the area of Bay Street and Pleasant Street where the pipeline had been struck, isolating a radius of approximately 300 m.
Approx. 10:50 PM	Terasen employee(s) start checking for gas migration into the surrounding buildings and infrastructure using personal gas monitors to ensure safety of the surrounding area (as per Terasen's Distribution Emergency Plan). Terasen employee(s) determine that gas is not migrating into adjacent buildings and infrastructure (e.g. the sewers) and that the area is safe.
10:53 PM	Terasen confirms that the leaking pipeline is a 168 mm Intermediate Pressure natural gas pipeline of steel construction.
11:30 PM	Terasen's Emergency & Operations Representative contacts 10 customers that had reported odours arising from the leak and informs them of the situation.
11:52 PM	Terasen determines that it is not feasible to close the isolation valve (#52975), located at the South West corner of Harriet Road and Cadillac Avenue as this would cause more than 30,000 outages throughout Victoria and it would take several days to restore gas service. Terasen decides to use a 168 mm flow control fitting to control the flow of gas.
Jan 11	
12:29 AM	A Terasen crew mobilizes to begin excavating at the site.
12:49 AM	VFD requests Coast Guard shut down the Gorge waterway in the area until further notice. Air traffic control is contacted to reroute float planes.
12:51 AM	Terasen reports that they are commencing excavating in front of 522 David Street where the flow control fitting will be installed.
12:56 AM	The British Columbia Safety Authority is notified by Terasen's Emergency Support Manager.
1:02 AM	The Oil & Gas Commission is notified by Terasen's Emergency Support Manager.

Time	Detail
1:04 AM	WorkSafeBC is notified by Terasen's Emergency Support Manager.
1:15 AM	<p>Terasen's Crew Leader advises that they had to abandon the first excavation hole because bedrock below the pipe does not allow adequate space for installing the flow control fitting.</p> <p>Terasen commences a second excavation. During the second excavation, Terasen determines that the depth of excavation is more than four feet and will require shoring or sloping to meet WorkSafeBC requirements. Terasen calls out their geotechnical engineer to certify the second hole is safe to enter without shoring.</p>
1:42 AM	Terasen leaves a voicemail with BC Transit informing them of the situation and the likelihood of a bridge closure continuing into the morning commute.
Approx. 1:50 AM	An email is sent to the BC Utilities Commission (BCUC) from Terasen's Emergency Support Manager advising BCUC of the incident and the current situation.
Approx. 2:07 AM	Terasen finds a telecommunications duct in the second excavation hole which will interfere with the installation of the flow control fitting. Terasen calls Telus and is notified that dispatch will send someone out.
2:49 AM	<p>Still no responders from Telus arrived.</p> <p>One of the Terasen employee's on site remembers installing the telecommunications duct as a possible link between stations.</p> <p>The duct is removed. The duct is filled with water, causing additional delays while the water is pumped out.</p>
Approx. 3:45 AM	Welding commences. Heat loss associated with high flow rates through the pipeline makes the welding difficult.
Between 3:48 AM & 5:53 AM	Terasen's Emergency Support Manager advises the Department of National Defence in Esquimalt (large downstream gas user) to reduce gas usage to maintain gas pressure in the pipeline system. Attempts are made to contact other large load customers who could reduce gas usage to assist in assuring there is enough gas feed once the 168 mm IP pipeline is shut off.
4:23 AM	BC Transit calls Terasen. BC Transit is advised that the bridge is closed and Terasen will advise BC Transit when the bridge is reopened.

Time	Detail
4:25 AM	Terasen's Community Relations Manager notifies radio stations advising them of the incident.
Between 8:00 AM & 9:25 AM	Terasen commences with the tapping procedure. During the hot tapping operation, a Terasen employee reports that the bottom coupon was lost in the pipe and squeezing procedures may be required on 168 mm IP pipeline.
Between 9:00 AM & 9:25 AM	Terasen's Emergency Support Manager updates both the Commission and Ministry of Environment.
9:40 AM	Terasen reports that the coupon was retrieved and stopper was put down to shut off the gas.
10:20 AM	Terasen reports that the gas leak is stopped. Terasen continues to check for any signs of significant pressure drop and determines there will be no gas outages. Shortly after 10:20 am, persons are allowed to return to their business. Access to the repair site continues to be limited until the repair work is completed.
11:49 AM	Terasen reports that they have found a length of 168 mm replacement pipe and it is being pressure tested.
1:30 PM	Excavation of the line is nearly complete. The pipe will be cut and repairs will commence.
Jan 12	
Approx 3:30 AM	The permanent repair is completed and gas is reintroduced to the pipeline.
Approx 5:30 AM	The pipeline is back to normal operating pressure.

Information Requests

On January 19, 2010 and August 20, 2010, formal requests for information (Information Requests or IR's) were issued to Terasen to obtain evidence required to determine cause and contributing factors for the incident.

Analysis

Locate Requirements

At the time of the incident, pipelines regulated by the Commission were governed by the Pipeline Regulation under the Pipeline Act³. Section 12(1) of the Pipeline Regulation, required all pipelines with a maximum operating pressure greater than 700 kPa (101.5 psi) to be operated and maintained in accordance with CSA Z662 – Oil and Gas Pipeline Systems (Z662). The IP pipeline was designed, constructed and operated in accordance with Clause 12 of Z662 for gas distribution systems.

Clause 12.10.15 of Z662 requires operating companies to communicate safe work practices to those who propose ground disturbances:

12.10.15 Ground disturbances - Operating companies shall communicate company specific safe work practices to those who propose ground disturbances.

Note: It is intended that the requirements of Clause 12.10.15 supersede the requirements of Clause 10.3.11.

The stated intention of the note to Clause 12.10.15 is that Clause 12.10.15 supersedes the requirements of Clause 10.3.11. This note is significant as the requirements for locations and marking of pipelines are found in Clause 10.3.11. The more general requirements as set out by Clause 12.10.15 do not necessarily require that pipelines be physically located when there is a possibility of damage from proximate activities.

Z662 itself is somewhat ambiguous on the interpretation of notes to clauses:

Notes accompanying clauses do not include requirements or alternative requirements; the purpose of a note accompanying a clause is to separate from the text explanatory or informative material.

Regardless of the interpretation on the applicability of the note attached to Clause 12.10.15, pipeline location information provided by Terasen outlined safe work practices in accordance with Z662, including the following instructions:

- That Terasen should be contacted to conduct a physical locate prior to excavating within 10 m of an IP pipeline, and that a permit is required when crossing or working within two m of an IP pipeline.

Terasen's policy when crossing or working within two m of an IP pipeline is to have a Terasen inspector on site to witness the excavation.

Terasen was aware of the nature of the work and in fact conducted two locates for the Contractor to accommodate the work on November 18, 2009 and December 9, 2009. Despite being aware of the work and the requirements imposed by Terasen when working within two metres of the pipe, communications were not sufficient to protect the pipeline from damage.

³ Since the time of the incident, the Pipeline Act and the Pipeline Regulation have been replaced by the Oil and Gas Activities Act and the Pipeline and Liquefied Natural Gas Facility Regulation.

Section 20.79 of the Occupational Health and Safety Regulation (OHSR) contains the following requirements for excavating in the vicinity of underground utilities:

20.79 Underground utility services

- (1) Before excavating or drilling with powered tools and equipment, the location of all underground utility services in the area must be accurately determined, and any danger to workers from those utility services must be controlled.
- (2) Excavation or drilling work in proximity to an underground utility service must be undertaken in conformity with the requirements of the owner of that utility service.
- (3) Pointed tools must not be used to probe for underground petroleum and electrical utility services.
- (4) Powered equipment used for excavating must be operated so as to avoid damage to underground utility services, or danger to workers.

The Contractor clearly did not comply with the above requirements as they did not accurately determine the location of the IP pipeline and they did not obtain a permit for working within two metres of the IP pipeline in accordance with Terasen's requirements.

Regulatory references included in Terasen's pipeline locate information were not consistent with the regulatory framework in place at the time of the locate request. Locate drawings indicated that the Pipeline Act requires a permit when working within two metres of or crossing an IP pipeline. The requirement for a permit is a requirement of Terasen, the owner and therefore is a requirement of section 20.79 of the Occupational Health and Safety Regulation (OHSR) under WorkSafeBC, not the Pipeline Act. The Commission has no evidence to suggest that this inconsistency was a contributing factor to the incident.

The Commission notes subsequent to the incident, the Contractor acknowledged and demonstrated familiarity with the requirements of the Gas Safety Regulation (GSR) of the Safety Standards Act. This Regulation does not apply to the subject pipeline. The GSR applies to gas distribution pipelines that operate at pressures less than 700 kPa. Section 39 of the GSR requires the excavating company to request information from the operating company prior to excavation. If the excavating company cannot locate the pipeline positions based on that information they must verify the information with the company prior to excavation. The GSR does not specifically require attendance at the site of the excavation by the company or its representatives or the physical marking of the location of the pipeline by the company.

The differences between the requirements of Z662, Terasen's IP excavation requirements and the GSR are complex and would benefit from closer alignment (see Recommendation 1).

From the GSR:

- 39**
- (1) A person must not excavate or cause any excavating to be done in the vicinity of a gas installation that is or could be in any way damaging or dangerous to a gas installation.
 - (2) A person who intends to excavate must, at least 2 business days before the person intends to excavate, request from the gas company serving that area, or its agent, information on the location of all underground gas installations in the vicinity of the proposed excavation.

(3) A person must not excavate until

(a) the person ascertains that a request has been made under subsection (2) and

(i) the information was provided by the gas company under subsection (5) and that information revealed that there is no gas installation in the vicinity, or

(ii) the information was provided by the gas company under subsection (5) and that information revealed that there is a gas installation in the vicinity and that installation has been indicated in accordance with subsection (5), and

(b) the person ascertains that information provided by the gas company in respect of the lack of indicators under paragraph (a) (i) or the presence of indicators under paragraph (a) (ii) was supplied by the gas company within 10 days before beginning of the excavation.

(4) If the excavator is not satisfied under subsection (3) (b), the person must verify the information with the gas company before excavating.

(5) On receiving a request under subsection (2) a gas company must

(a) provide the information requested within 2 business days, and

(b) in a manner that is clear and easily understood, indicate the location of gas installations owned or operated by it in the area where the excavation is intended to be made by one or more of the following methods as appropriate for conditions at the excavation site:

(i) providing a plan or listing of facility locations by measurement from an ascertainable point on the surface;

(ii) surface staking;

(iii) surface marking.

(6) Prelocated or marked gas installations must be considered to lie within a zone equal to the diameter of the gas installation plus one metre on either side of the location indicated by the gas company under subsection (5).

(7) The indicated location of gas installations must be confirmed by the excavator by means of hand digging and the excavator must expose the gas installations at a sufficient number of locations to determine their exact positions and depths before using mechanized excavation equipment for any purpose other than breaking the surface cover.

(8) For existing gas installations of non-metallic material not provided with tracer wires, the gas company must, on request, indicate the location, including all changes in direction, of the installation by stakes or paint or both, at intervals not exceeding 100 metres, and subsection (7) applies.

- (9) If an excavator finds that the gas installation is not within the limits described by the gas company,
- (a) the excavator must so advise the gas company,
 - (b) the gas company must immediately assist in locating and exposing the installation for the excavator, and
 - (c) mechanized excavation must not be carried on in the vicinity until the installation has been located and exposed.
- (10) As the excavation work progresses, the excavator must
- (a) maintain and keep visible all markings placed by the gas company that identify the location of the gas installation, or
 - (b) if it is impractical to maintain the markings, make other arrangements to ensure that the location of the gas installation is obvious to any observer.

Events Preceding the Incident

The Commission notes that communication took place between Terasen and the Contractor, Terasen and the Municipality, and Terasen and the Consultant as set out in Table 2 below.

Table 2 - Summary of Communications Prior to the Incident

Time	From	To	Detail
Apr 30, 2009	Consultant	BC One Call	Consultant submits request for underground utility locations for the proposed waterline removal and replacement.
May 4, 2009	Terasen	Consultant	Terasen responds to Consultant informing about the Terasen line at locations for waterline removal and replacement.
Oct 23, 2009	Consultant	BC One Call	Consultant submits request for underground utility locations for the proposed waterline removal and replacement.
Oct 26, 2009	Terasen	Contractor	Terasen responds to Contractor about the Terasen line at locations for waterline removal and replacement.
Nov 3, 2009	Contractor	Terasen	Request for Pipeline Crossing Permit at Bay St & Tyee Rd, David St & Bridge St, and David St & Rock Bay Ave.

Nov 3, 2009	Terasen	Contractor	Permits issued for Bay St & Tyee Rd, David St & Bridge St, and David St & Rock Bay Ave (permits re-issued on Dec 8, 2009).
Nov 12, 2009	Contractor	Terasen	Contractor requests an inspection for David St & Rock Bay Ave for Nov 16, 2009.
Nov 16, 2009	Terasen	Contractor	Terasen responds to Contractor and schedules an eight hour inspection for David St & Rock Bay Ave for Nov 18, 2009.
Nov 18, 2009	Terasen	Contractor	Inspection is done by Terasen for the intersection of David St & Rock Bay Ave; inspection report is written for the excavation.
Dec 8, 2009	Contractor	Terasen	Contractor requests an inspection for David St & Bridge St for Dec 9, 2009.
Dec 9, 2009	Terasen	Contractor	Inspection is done by Terasen for the intersection of David St & Bridge St; inspection report is written for the excavation.

From the communications record provided by Terasen it is clear that communication was established between all parties prior to the January 10 incident. Despite these communications, the Commission notes that at the time of the incident:

- No locate had been requested or performed.
- The location of the pipeline had not been determined by the Contractor who was relying on drawings.
- Terasen was aware that the work was proceeding and had performed locates for the contractor on November 18, 2009 and December 9, 2009 for the intersections of David Street and Rock Bay Avenue and David Street and Bridge Street, respectively.

Events During the Incident

During the incident, several factors were considered by Terasen in determining what actions to take in response to the pipeline break including:

- The ability to isolate the leaking section through existing valves.
- The ability to maintain service to customers.
- The safety of the ongoing release of gas.
- The possibility of the use of steel squeezers.
- The possibility of the use of bolt on (non-welded) flow control fittings for emergency isolation.

Upon consideration of the aforementioned, Terasen determined that the safest course of action was to monitor the ongoing release of gas from the damaged pipeline while maintaining flow through the damaged pipeline to avoid customer outages downstream of the break. In addition to the monitoring, Terasen worked with the Victoria Fire Department in maintaining site control and ensuring the elimination of possible ignition sources near the releasing gas.

The measurement of gas concentrations in air is a critical element in ensuring the safe venting of gas from a release point. Terasen relied on the use of personal monitors for gas detection during the release but did not record ambient methane concentrations at the perimeter of the isolation area. A record of methane concentrations would have provided confirmation that the isolation zone was adequate.

As no quantitative ambient measurement of gas in air was conducted at the perimeters of the evacuation area, the Commission requested Terasen to provide a gas dispersion model post incident simulating the same conditions and parameters that occurred at the time of the incident. The calculated maximum plume height and distance at the lower flammability limit (LFL) were 5.8 m and 25.9 m, respectively. The dispersion model results concluded that the 300 metre evacuation radius was adequate.

The Commission notes that Terasen did consider the use of steel squeezers to isolate the damaged section of the pipeline as evidenced by the transport of squeeze equipment to the incident site. Terasen has since noted that squeezers were not deployed based on site conditions and a lack of procedures for use of that equipment on the diameter and grade of pipe at the failure location (168.3 mm x 4.8 mm Grade 290).

Engineering Design Considerations

Clause 12.10.2.2 of Z662 requires companies to include provisions for regular surveys for detecting leaks on pipelines. Evidence provided by Terasen indicates that prior to the incident, Terasen Gas pipeline leak surveys were conducted annually for this location. Terasen's leak survey involves the use of a flame ionization detector used to detect leaks along the line as well as visual inspections to determine any hazards.

An isolation valve located at the Terasen regulator station could have been closed to isolate the damaged pipeline and stop the gas flow, however, closing the valve would have resulted in an outage for approximately 30,000 customers requiring several days to restore service. Clause 12.4.13.1 of Z662 requires valves to be installed in order to limit the time required to shut a line down in an emergency and that, in determining the spacing of the valves, consideration be given to the operating pressure and size of the line and local physical conditions such as the number and type of customers that could be affected by a shutdown. There was an isolation valve immediately adjacent to the failure location but the valve could not be safely operated during the incident.

Cause and Contributing Factors

Based on the available information, the Commission has determined the root cause of the piping damage that released natural gas for 12 hours on the evening of January 10, 2010 at Bay Street and Pleasant Street in Victoria, B.C. was third party mechanical damage resulting from the failure to follow required

procedures for excavation near intermediate pressure pipelines. The Contractor did not confirm the location of underground utilities prior to excavating and did not obtain a pipeline permit in accordance with Terasen requirements for crossing or excavating within two m of an IP pipeline.

Emergency Management

The following observations and statements have been made following a review of the incident logs and the responses to the information requests made by the Commission:

- The VFD was notified at the time of the pipeline strike, at approximately 10:20 pm on January 10, 2010 through a 911 phone call.
- Terasen was notified by the VFD at approximately 10:22 pm.
- Terasen's Customer Service Technician was dispatched from home within two minutes of receiving the call.
- The VFD barricaded a 300 m area from the damage area and implemented and maintained the evacuation of a two block radius starting at 10:46 pm.
- As Terasen's employees arrived on site, they were equipped with personal gas monitors which did not alarm near the perimeter of the barricades.
- At 11:30 pm, Terasen's Emergency & Operations Representative began responding to the 10 customers who had reported natural gas odours, informing them of the situation.
- The VFD requested the Coast Guard shut down the Gorge water way in the area until further notice and air traffic control for the Victoria Inner Harbour was requested to re-route the float planes at 12:49 am on January 11, 2010.
- Terasen's Emergency Support Manager contacted the BC Safety Authority at 12:56 am, the Provincial Emergency Program (PEP) at 12:57 am, the Oil & Gas Commission at 1:02 am, and WorkSafeBC at 1:04 am, to inform them of the incident.
- BC Transit was contacted and a voicemail was left at 1:42 am to inform them of the situation and to request bridge closure; at 4:23 am a call was received from BC Transit and they have been advised that the bridge will close and Terasen will contact when it can be reopened.
- The Terasen Community Relations Manager notified radio stations at 4:25 am to inform them of the situation.
- Gas monitoring checks were completed at the openings of nearby buildings before the evacuation was lifted.

Based on the preceding observations and statements, the Commission has determined Terasen's response to this incident conformed to their Distribution Emergency Plan, last updated April 22, 2008. The first Terasen employee notified was Terasen's Customer Service Technician, which conforms to Terasen's Distribution Emergency Plan. Terasen took the steps necessary to protect responders, the

public and existing infrastructure throughout the incident by:

- Cooperating with the VFD and evacuating and barricading the area as necessary.
- Protecting public property, in particular preventing vehicular traffic from passing the Point Ellice Bridge.
- Controlling the gas with stop-off fittings and equipment.
- Consulting their “decision logic” to determine the course of action to take.

The “decision logic” is included in Terasen’s Standard Field Guidelines for Gas Emergencies, which outlines the steps to take in order to assess and determine the risks associated with venting gas. Terasen used this guideline as the basis for the decisions made during the incident response. This included checking surrounding infrastructure for migrating gas as well as checking for secondary leakage prior to lifting the evacuation, coordinating activities with the VFD, and reporting significant developments to media and regulatory agencies and authorities. Terasen followed the “decision logic” chart by ensuring the site of the incident was safe and the hazards presented by the escaping gas were mitigated through monitoring and evacuation. The subsequent decision to allow continued venting instead of isolation via remote valve closure was made in light of the hazard controls implemented as well as the serious disruptions that would occur with service loss to approximately 30,000 residences and businesses.

Terasen did not record gas monitoring results or meteorological conditions during the incident.

Directions

1. Terasen shall ensure their line locate and safe work practices information clearly reference the appropriate regulatory requirements and that mandatory requirements are clearly identified using appropriate language (i.e. “shall” or “must”).
2. Terasen shall install another isolation valve on the line to provide a more accessible means to isolate the line should another incident occur in the future.
3. Terasen shall develop standards and procedures for perimeter and ambient air monitoring in addition to their current use of personal air monitors to ensure accuracy in the measurement of air quality. Terasen shall also develop standards for recording air quality readings that will also quantitatively measure ambient gas concentrations in the air at the perimeter of the evacuation area and downwind from the incident location.

Recommendations

1. The Commission shall undertake a review of the Oil and Gas Activities Act, the Pipeline and Liquefied Natural Gas Facility Regulation and the Oil and Gas Activities Act General Regulation to ensure the requirements for ground disturbances near pipelines are simple and effective.

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