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CITY OF NEW WESTMINSTER

Site Specific Health and Safety Plan

610 Front Street

09216

14 February 2010

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SYNOPSIS

This document constitutes a Site-specific Health and Safety Plan for Investigations scheduled for 2010 at 610 Front Street in New Westminister, BC.

PROJECT 09216 - SITE SPECIFIC HEALTH AND SAFETY PLAN

FILE LOC.: BURNABY

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1. INTRODUCTION

1.1 Overview

This document constitutes the site-specific health and safety plan associated with completion of field investigations at 610 Front Street in New Westminster, BC (the "Site") for the Site owner, the City of New Westminster (the City).

The rationale for compiling a Site-specific health and safety plan includes high risks associated with:

- Hazards associated with Site security (Section 4);
- Chemical hazards potentially present in soil, groundwater, sediment and vapour that will be exposed during intrusive investigation activities (Section 5);
- Biological hazards potentially present on the Site (Section 6);
- Hazards associated with working in and around the water (Section 7);
- Hazards associated with working around moving trains (Section 8);
- Hazards associated with ground disturbance including potential for contacting utilities and other infrastructure and/or disrupting their stability during the installation of monitoring wells and/or vapour probes in utility corridors or adjacent to right of ways (ROW) (Section 9); and
- Weather related risks (Section 10).

The Site-specific health and safety plan contained herein includes detailed identification and discussion of these potential hazards, identification of risk management measures and, where applicable, identification of detailed procedures and project requirements to minimize risks associated with each high risk activity. This site-specific health and safety plan requires acknowledgement by all personnel working on the Site and includes details of the Site-specific Emergency Response Plan (ERP; Appendix 1).

Note that this health and safety plan does not replace task specific procedures and safety plans, but is simply meant to identify hazards, outline risk mitigation and emergency response measures for high risk activities on the Site.



2. PROJECT TEAM

2.1 WorleyParsons

WorleyParsons is responsible for the protection of WorleyParsons employees, contractors, the public and the environment from potential incidents or accidents. As stated in Section 1, the objective for this project is to have no accidents or personal injuries. WorleyParsons will identify safety hazards and communicate all identified hazards and appropriate safety precautions to on-Site workers. All workers have responsibility for project safety.

Specifically, the WorleyParsons Project Manager, discipline leads and associated designates will:

- review this manual, and distribute field copies to the field crew;
- provide resources for personal protective equipment (PPE) for WorleyParsons personnel;
- communicate daily (or on an as-needed basis) with field crews;
- review and investigate all incident and accident reports; and,
- provide safety support as required.

The WorleyParsons HSE Advisor will:

- ensure that all project personnel have copies of or access to this plan;
- ensure that project personnel are aware of company safety policies, and applicable government acts and regulations governing the scope of work;
- ensure that hazards associated with all tasks are identified, discussed, and appropriate hazard controls are prescribed and implemented;
- act as a resource for HSE information;
- assist in incident and accident investigations (including root cause analysis) if required;
- ensure that all injuries that may become lost-time accidents or fatality claims are reported to WorkSafeBC; and,
- ensure that a project file is maintained for safety documentation.

WorleyParsons Site Supervisors will:

- ensure that company safety policies, and government acts and regulations are followed by all on-site employees, and contractors;
- ensure that hazards associated with all tasks are identified, discussed with field crews, and minimized using appropriate controls;
- conduct and document daily safety meetings for the project duration;

- conduct regular safety inspections, and correct unsafe conditions and acts promptly;
- ensure that workers are wearing the appropriate personal protective equipment;
- take the appropriate disciplinary action when personnel do not comply with safety regulations and/or policies;
- review and investigate all incident and accident reports;
- report all accidents, incidents and near-misses to the WorleyParsons Project Manager, discipline leads and associated designates, as soon as possible;
- maintain adequate first aid supplies (including survival equipment and communication tools) on-site; and,
- keep a copy of this plan on-Site.

Field Personnel will:

- report to the Site each day, physically and mentally competent to perform their specified work;
- comply with the requirements of this plan;
- ensure that hazards associated with all tasks are identified and discussed;
- follow all prescribed hazard controls;
- report all accidents, incidents and near-misses, as soon as possible;
- communicate all allergies and medical conditions that may affect work to the WorleyParsons Site Supervisor prior to project commencement;
- participate in daily safety meetings for the project duration;
- report all accidents, incidents and near-misses to the Site Supervisor as soon as possible; and,
- refuse unsafe work.

2.2 Contractors

All contractors are required to:

- report to the Site each day, physically and mentally competent to perform their specified work;
- comply with the requirements of this plan;
- follow all WorleyParsons safety policies;
- report any incidents, accidents or near misses to the WorleyParsons Site Supervisor as soon as possible; and,
- wear personal protective equipment appropriate to their activities.



On-site contractors must submit the following safety documentation prior to commencement of the project:

- proof of valid coverage by WorkSafe BC for account in good standing;
- valid liability insurance coverage; and,
- licenses and certificates appropriate for their contracted work.

2.3 Visitors

It is not anticipated that visitors will be present at the Site under investigation; however, if an interest is expressed by non-project personnel to visit the Site, the visitor must be authorized by the City of New Westminster and a WorleyParsons representative prior to visiting the Site. As the work is to be conducted in a high traffic area and on a high profile Site, there may be an interest in the activities by the general public. Additionally, representatives of the City of New Westminster may be interested in visiting the Site. Visitors are expected to supply and wear basic personal protective equipment specified in this health and safety plan unless WorleyParsons has agreed to provide it for them. Visitors must remain with a designated representative during their visit. The WorleyParsons Site Supervisor will conduct a Field Safety Meeting with any visitor who wishes to enter the work area.

3. SAFETY MANAGEMENT

3.1 Safety Meetings

Documented safety meetings will be held to discuss specific hazards anticipated or encountered previously, and appropriate hazard-control measures. A sample of the Field Safety Meeting Form is included in Appendix 2. Four types of safety meetings will be conducted for this project:

Site Orientation:

- review Site-specific safety considerations for WorleyParsons personnel, contractors and visitors.
- conducted by the Site Supervisor.

Pre-Job Meetings will:

- review the work and safety programs;
- review this manual and the industry risk assessment; and,
- provide a detailed project orientation for all WorleyParsons workers.

Daily Field Safety Meetings will:

- provide a detailed explanation of proposed activities for the day;
- review the daily operations plan with crew and possible health, safety and environmental (HSE) issues; and,
- address personnel questions related to operations and HSE issues.

Task-specific Safety Meetings will:

- review potentially hazardous tasks immediately prior to commencement (Personal Risk Assessment);
- reinforce proper PPE required for specific task; and,
- address previously unidentified or inadequately controlled site hazards.

3.2 Documentation Overview

All WorleyParsons employees, contractors and visitors shall adhere to the following documentation standards. These documents will be maintained on Site by the WorleyParsons Site Supervisor.

- Training certificates of project personnel;
- WorleyParsons Hazardous Task Analysis Form (Appendix 2);
- Emergency Response Plan (Appendix 1);



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- Daily Field Safety Meeting Form (Appendix 2);
 - All utility owner plans;
 - Ground Disturbance 3rd Party Review form;
 - Ground Disturbance Permit and Final Plot Plan;
 - BC One Call documentation;
 - Incident Report form (Appendix 1);
 - Site Inspection form (Appendix 1);
 - Personal Risk Assessment (PRA) form;
 - Job Observation form;
 - WorkSafe BC Occupational Health and Safety Act and Regulation; and
 - Site-specific health and safety manual.

3.2.1 Site Safety Inspection & Job Observation Cards

On a regular basis, WorleyParsons employees are expected to identify HSE opportunities and reflect them on Job Observation cards. In addition, a WorleyParsons HSE Advisor or Project Manager may conduct a Site Safety Inspection of a crew or individual during the course of their work. Each WorleyParsons employee who conducts work on the Site is expected to submit a minimum of one Job Observation card to the Site Supervisor.

3.3 Personal Protective Equipment Requirements

Minimum personal protective equipment will consist of:

- CSA-approved standard steel-toed safety boots and/or chemical resistant steel-toed rubber boots;
- CSA-approved safety glasses with side shields;
- leather and/or nitrile gloves (for sampling only);
- high visibility vest or coveralls;
- CSA-approved standard Class E hardhat; and
- hearing protection.

In addition, the following PPE will be available on Site for use, if required:

- half-mask respirators equipped with particulate (P100, HEPA) and organic vapour (OV) filter cartridges;

- air monitoring equipment, such as 4-gas meter, 4-gas monitor and/or photoionization detector (PID) as appropriate;
- personal floatation device, to be worn during all work on the wharf, on water crafts or within 5 m of the water; and
- throw-bag for recovery of personnel should they fall into the water.

WorleyParsons employees and all subcontractors will also be equipped with a WorkSafe BC Level 1 first aid kit, multi-class fire extinguisher, and eye wash.

3.4 First Aid

Activities on the Site meet WorkSafe BC's definition of high risk activities. Travel time to the nearest hospital is less than 20 minutes. Hence, the first aid requirements for the Site are as follows:

- 1 worker: personal first aid kit, no certifications required;
- 2 – 15 workers: Level 1 first aid kit, Level 1 certified first aid attendant;
- 16 – 30 workers: Level 2 first aid kit, dressing station, Level 2 certified first aid attendant;
- 30 – 300 workers: Level 2 first aid kit, first aid room, Level 2 certified first aid attendant;
- 301 workers: Level 2 first aid kit, first aid room, two Level 2 certified first aid attendants.

For field days with less than 16 employees on the Site, the first aid attendant is the WorleyParsons Site Supervisor or assigned alternate as identified during the Daily Field Safety Meeting. For field days with 16 or more employees on the Site, the first aid attendant is the designated Level 2 Attendant present at the dressing station identified in the Daily Field Safety Meeting.

All injuries and work related illnesses will be reported to the WorleyParsons Site Supervisors immediately and assessed or treated as required by a first aider at Site. Further assessment at the local medical facility must be done when the cause or effects of the injury or illness are questionable or obviously beyond a first aider's ability to treat or assess.

WorkSafe BC employer and employee injury reports will be completed by the worker and employer at the Site or local medical facility as appropriate and sent to WorkSafe BC within 24 hours of work related injury or illness. A copy of the WorkSafe BC report must be provided to the WorleyParsons Safety Representative for the project records.

The WorleyParsons Project Manager, discipline leads and associated designates and the WorleyParsons Site Supervisor are responsible for ensuring all near-misses and incidents are properly reported, analyzed and followed up on.



3.5 Disciplinary Action

The WorleyParsons representative on the work Site has responsibility for ensuring safe work practices and for disciplining personnel who do not comply with company safety policies and/or applicable government acts and regulations. Disciplinary actions will be used to prevent safety violations from recurring. The WorleyParsons Site Supervisor may initiate disciplinary actions including a verbal warning, written warning, or worker discharge as specified in the WorleyParsons safety manual (2010).

3.6 Drugs and Alcohol

There is a zero tolerance for drug and alcohol violations on this project; impaired performance will not be permitted. Any violation of this policy will result in immediate dismissal from the project. Workers who are taking prescription drugs that may impair their judgment, reaction time or physical skills should notify the WorleyParsons Site Supervisor. Failure to do so could result in disciplinary action.

3.7 Workplace Violence

Workplace violence (including implied or actual physical violence) will not be tolerated; offenders will be subject to disciplinary action or dismissal from the Site.

3.8 Inspections

The objective of safety inspections is to ensure that project health and safety policies, procedures and expectations are appropriately implemented. The inspection program for this project may consist of informal daily inspections, Job Observations and Site Safety Inspections.

Daily Inspections

The WorleyParsons Site Supervisor will conduct daily inspections of equipment, work site conditions, employee actions and job procedures to identify and correct potential hazards. All findings will be discussed immediately with site workers, and reviewed at the safety meeting conducted the following day.

Job Observations

- Field personnel will complete at least one Job Observations card for this project.

Each Site Supervisor will ensure that sufficient Job Observations are conducted at their sites during the project, and ensure that copies of cards are filed with the Project Manager, discipline leads and/or designates. Job Observation Cards will also be forwarded to the WorleyParsons HSE Department.

Site Safety Inspections

Site Safety Inspections should be conducted by someone other than regular field personnel. This may include the Project Manager, discipline lead, delegates or the HSE advisor. The Site Safety Inspection should include identification of actual or potential safe and unsafe behaviour. Unsafe behaviours should be corrected immediately. Copies of Site Safety inspection reports should be saved to the project HSE file,

provided to the Site Supervisor for review and corrective action, if required, Project Manager, discipline lead and associated designates and forwarded to the HSE department.

3.9 Incidents

WorleyParsons requires that all unplanned events, including near misses, accidents, incidents and contact with underground debris, be reported to the WorleyParsons Site Supervisor immediately and an Incident Report must be completed (see Appendix 2) as soon as possible. Injured personnel must fill out appropriate WorkSafe BC forms. To minimize loss, unplanned events will be recorded and corrective action taken to prevent recurrence.

If an incident occurs at the Site, the WorleyParsons Site Supervisor shall:

- Initial response – provision of first aid, scene control and notification to the Project Manager, discipline leads and/or associated designates and a WorleyParsons HSE Advisor of the event immediately;
- Secondary response – determine the type of incident, who was involved, the severity of the incident, provide notifications to others using the Incident Management System;
- Secure the Scene – protect evidence from being altered or removed;
- Analyze the data;
- Develop corrective action plans;
- Complete the incident investigation report using the Incident Management System (<http://w3/safety/reports/ims/index.shtml>). Ensure that a copy of the report is forwarded to the Project Manager, discipline leads and/or associated designates and HSE Advisor within 24 hours and available for inspection by regulatory agencies, as required; and
- Track the corrective action plans to completion.

The WorleyParsons Site Supervisors will be responsible WorleyParsons Project Managers, discipline leads and/or associated designates in a timely manner (i.e. within one hour of occurrence for all serious accidents or incidents) and assisting in the investigation of unplanned events. WorleyParsons Project Managers, discipline leads and/or associated designates will be responsible for notification of City of New Westminister Project Manager and appropriate designates in a timely manner (i.e., within one hour of occurrence for all serious accidents or incidents). Investigators will review the cause(s) of the unplanned event and make appropriate recommendations.

3.10 Workplace Hazardous Materials Information System

All project personnel will have current Workplace Hazardous Materials Information System (WHMIS) training and the project will comply with WHMIS regulatory requirements.



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All controlled and hazardous products on Site will have a Material Safety Data Sheet (MSDS) that will be available on-site for reference. MSDS sheets specific to the project are included in Appendix 3 for reference.

4. SITE SECURITY

4.1 Hazard Identification

The Site is located in a high traffic area and evidence on the Site suggests that members of the public routinely access the Site, despite it being fenced with a locked gate. Public access to the Site during work is not permitted unless authorized by WorleyParsons and the City of New Westminster, as described in Section 2.3. Unauthorized access to the Site may be unavoidable after work hours. Unauthorized access could result in the individual accessing the Site being exposed to chemical hazards, new biological hazards and injury.

4.2 Risk Mitigation

While work is being completed on the Site, access should be restricted by keeping the gate closed and dummy locked to deter the public from accessing the Site. If a member of the public requests access to the Site during work, the Site Supervisor should direct inquiries to the City of New Westminster for further management of the request. Any attempts at unauthorized access to the Site by the general public during work hours should be reported to the WorleyParsons Project Manager, discipline leads and/or designates as appropriate.

Measures should be taken to limit unauthorized access to the Site after work hours. This includes ensuring appropriate Site cleanliness and security at the end of each work day. Holes in the existing fence should be patched to further restrict Site access. Evidence of unauthorized access to the Site and vandalism (e.g., new holes in fencing) should be reported to the WorleyParsons Project Manager, discipline leads and/or designates as appropriate. If unauthorized access to the Site after work hours proves to be problematic, night security may be required.

The Site should be secured at the end of each work day to limit access by the general public. The Site should be left in safe conditions and free of hazards such that if unauthorized access occurs, risk of chemical exposure and injury is low. This should include (but is not limited to) the following activities:

- Signage should be placed on the Site indicating that the Site is an active Site and that unauthorized access is prohibited;
- Signage should include emergency contact information for the City of New Westminster and WorleyParsons in the event that unauthorized access results in an incident;
- Open excavations, including utility daylighting, test pits and boreholes should be covered, secured and marked with delineators/pylons and caution tape;
- Drums and/or bags of soil, water and/or sediments that are remaining on the Site should be secured and sealed to prevent accidental contact by members of the general public and/or accidental release;



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- All equipment, materials, supplies and refuse must be removed from the Site at the end of each day;
 - Sanitation facilities (i.e., Porta Potty) should be locked and secured to discourage access by members of the general public;
 - Holes in Site fencing should be patched prior to leaving the Site; and
 - The gate should be closed and locked at the end of each work day.

The Site Supervisor should be the last individual to leave the Site and must sign to Site close out on the Field Safety Meeting Form.

5. CHEMICAL HAZARDS

5.1 Hazard Identification

Chemical hazards are commonly encountered as part of contaminated sites investigations. These include (but are not limited to) contamination in soil, groundwater, sediment and/or soil vapour of varying chemical composition and concentration. Typically these risks are easily mitigated through use of appropriate personal protective equipment (PPE) including nitrile gloves, safety glasses, respiratory protection and long sleeve clothing. However, through the execution of this project, chemical hazards pose a concern to employee health and safety, to the health and safety of the public and to the environment as a result of:

- Previously measured concentrations of chlorinated solvents that suggest free product may be present;
- Workers from disciplines other than environment (i.e., marine structural engineers, geotechnical drillers) that may not be experienced with contaminated sites as a component of their job;
- Presence of infrastructure beneath the Site, such as tanks, that may be leaking, with unconfirmed contents;
- Potential for release of contaminated soils, water or sediments as a result of unauthorized access to the Site (see Section 4);
- Potential for environmental release into a sensitive and valuable ecosystem (the Fraser River Estuary) as a result of:
 - equipment spills or leaks on the Site; and/or
 - unauthorized release of drummed and/or bagged soils, water and/or sediments as a result of vandalism (see Section 4).

5.2 Risk Mitigation

To address these issues, the following risk management measures are proposed:

- Access to the work area by non-environment personnel should be restricted through appropriate delineators, signage and caution tape.
- Use of appropriate PPE (including nitrile gloves, safety glasses and personal 4-gas monitor) in accordance with WorleyParsons standard safety procedures is required. Personnel on the Site should wear long sleeved clothing. While performing activities where work (e.g. leather) gloves are required, work gloves should be underlain by nitrile gloves at all times.
- Air monitoring within the work area is required at all times. This includes personal 4-gas monitors for WorleyParsons staff and ambient air measurements near and immediately downwind of the point of intrusive investigations using a photoionization detector (PID) and organic vapour analyzer (OVA), at minimum. In the event that hydrocarbon measurements indicate an explosive or potentially



explosive atmosphere (i.e. greater than 10% lower explosive limit [LEL]), all equipment must be shut down and work will cease. The area will be cleared until readings return to safe levels. Similar protocols will be followed for accumulation of carbon monoxide or depletion of oxygen in the work environment. No smoking is permitted on the Site.

- All heavy equipment, including excavators and drill rigs, should be equipped with an emergency shut off.
- While drilling, WorleyParsons employees should stand as far back from the point of installation as is feasible to prevent dermal contact with contaminated media in the event that groundwater is encountered during installation. If dermal contact does occur, areas of contact should be flushed with clean running water for a minimum of 10 minutes. It may be necessary to contact the poison control centre (604-682-5050 or 604-682-2344) and/or seek medical treatment from a qualified potential if the degree of contact is severe and includes ingestion or eye contact.
- A spill kit appropriate to the type and potential quantity of spillage will be present and readily available in the work area. The WorleyParsons Project Manager, discipline leads and/or designates should be notified in the event that a spill occurs. Appropriate materials should be contained within the kit to clean up potential hydrocarbon spills.
 - For soils and/or sediments that are spilled, cuttings should be contained and transferred using appropriate PPE to the disposal drums and/or bags present on the Site during the drilling program. If the spill occurs adjacent to the shoreline, the cuttings should be bermed to prevent sedimentation into the Fraser River.
 - For water that is encountered, materials should be used to berm stormwater drains and shoreline areas and adsorbent materials should be used to clean up water.
 - For leaks or spill from equipment, adsorbent materials should be used to clean up fluids. If the spill occurs adjacent to the shoreline, the cuttings should be bermed to prevent leakage into the Fraser River.
- In the event that a release occurs into the Fraser River, the Site Supervisor must immediately notify the Ministry of Environment (MOE) emergency response line at 1-800-663-3456. Following emergency notification, the WorleyParsons Project Manager, discipline lead and/or designates should be notified immediately.
- Drill cuttings should immediately be collected into drums or bags and composite samples submitted for analyses. Drums will be sealed at the end of the day to prevent overflow and run-off. Based on the results of soil characterization, disposal should occur at an appropriate licensed facility according to its classification. Appropriate disposal protocols should be followed and appropriate documentation (if necessary; i.e., waste manifest) should be completed.
- Purgewater should be collected into drums or buckets and transferred into drums and sealed at the end of the day to prevent overflow and run-off. Samples should be submitted for analyses and disposal. Based on the results of the water characterization, disposal should occur at an appropriate

licensed facility according to its classification. Appropriate disposal protocols should be followed and appropriate documentation (if necessary; i.e., waste manifest) should be completed.



6. BIOLOGICAL HAZARDS

6.1 Hazard Identification

Materials present on the Site suggest that the Site is currently accessed routinely by unauthorized personnel. Medical waste such as spent needles and condoms has been observed on the Site. Blood-borne illnesses such as HIV and Hepatitis A, B and C are transmitted through contact with bodily fluids. These viruses can survive in ambient air, some maintaining infection potential for 30 days or more after direct contact with fluids of an infected individual. This puts workers at risk for contracting blood borne illness if contact with medical waste or bodily fluids occurs.

6.2 Risk Mitigation

Workers should be conscious of on-Site medical waste and potential hazards associated with sanitation facilities. Generally workers should avoid handling medical waste if possible. If it is necessary to handle medical waste, appropriate PPE is required including nitrile overlain by work (preferably puncture proof material such as Kevlar) gloves. A biohazard disposal container will be provided on-Site for management of medical waste and sharps if necessary. The Porta Potty should be secured at the end of each work day (see Section 4) to restrict access to Site personnel. If it is evident that sanitation is required, a solution of concentrated bleach and/or 70% ethanol may be used to disinfect the area. Alternatively, sanitation can be requested by the Porta Potty provider (Pit Stop Portable Toilet Services; 604-882-8100).

7. WORKING IN AND AROUND THE WATER

7.1 Hazard Identification

The land portion of the Site is bounded to the north by the Fraser River. Additionally, the Site includes a water lot that extends approximately 50 m into the Fraser River at the widest point. The Fraser River in this section is relatively deep (approximately 20 m in the deepest location adjacent to the Site) and fast moving (approximately 5 knots). Additionally, the area in front of the Site is subject to routine boat traffic including barges, log booms, tug boats, fishing boats, recreational boats, marine works companies and other shipping traffic.

There are several potential hazards associated with the proximity of the Site to water including:

- risk of environmental release into the Fraser River;
- risk of personnel falling into the Fraser River;
- risk of wharf collapse;
- risk of collision with shipping traffic during in stream works; and
- risk of entanglement during diving activities.

Any of these events could have significant implications including:

- costs associated with spill clean up or other environmental incidents;
- property loss;
- injury or death to workers;
- impacts to WorleyParsons, City of New Westminister or sub-contractor reputations; and/or
- irreparable environmental damage.

7.2 Risk Mitigation

To overcome the potential risks associated with working adjacent to water, the following risk management measures are required:

- Appropriate spill kits (Section 5) and sedimentation control (Sections 5 and 10) must be maintained on the Site at all times;
- All personnel on the Site are required to wear high visibility clothing at all time to allow for rescue in the event that it is required;
- Personnel working on the wharf or within 5 m of the shoreline must wear a personal floatation device equipped with a whistle;



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- Personnel working on the wharf or within 5 m of the shoreline must have a safety watch equipped with a throw bag for personnel recovery;
 - If an individual falls into the Fraser River, a throw bag should be deployed in an attempt to recover personnel. If unable to recover personnel, the Canadian Coast Guard should be notified immediately (1-800-567-5111) and a rescue requested;
 - Equipment and vehicles should generally not be driven on the wharf. If it is necessary to drive equipment and/or vehicles on the wharf, this must be approved in writing and sealed by a qualified marine structural engineer;
 - If it is necessary to drive on the wharf, all personnel should stand land-side of any equipment such that escape may be possible in the event of wharf collapse;
 - Personnel that are required to be present on the wharf for any reason should watch wharf stability and mark unstable decking with delineators if walking on or adjacent to collapsed parts of the wharf;
 - Tie-backs and deadmen should be marked and generally not exposed, other than for purposes of utility locates, during intrusive investigations to maintain wharf stability. If a strike or damage occurs during environmental investigations, a structural engineer should be notified and an inspection requested prior to commencing work on the wharf;
 - If wharf collapse occurs, the BC MOE Environmental Emergency Program (1-800-663-3456) and Canadian Coastguard (1-800-567-5111) should be notified and informed of the situation immediately;
 - While working in the Fraser River, care should be taken to remain outside of active shipping lanes as much as is reasonably practicable;
 - While working in the Fraser River, appropriate visibility should be maintained to minimize the risk of collisions;
 - Collision avoidance should be implemented if it appears a collision is imminent as a result of loss of control from passing vessels;
 - Boating rules and etiquette should be followed, which includes yielding right of way to larger shipping vessels with restricted manoeuvrability;
 - Work from a boat should be avoided during high risk weather situations such as excessive wind;
 - The boat employed for work in the Fraser River should be of appropriate size and power rating to escape tide and prevent being inadvertently swept out to sea. Appropriate anchor techniques should be used to maintain control at all times;
 - If control of the boat is lost, then the Canadian Coastguard (1-800-567-5111) should be notified and a rescue requested;
 - If a collision occurs, the Canadian Coastguard (1-800-567-5111) should be notified;

- While diving in stream, supplied air is required since the potential exists for entanglement within the wharf structure;
- Standard diving practices should be followed.



8. MOVING TRAINS

8.1 Hazard Identification

Access to the Site is restricted by active rail lines operated by CN Rail, CP Rail and Southern Rail. The rail lines are subject to heavy traffic with trains running at frequencies of two trains per hour or more. The Site does not include rail line right of ways. Further west, a train coupling yard is present. This may result in trains stopping along the access route of the tracks.

There are several potential hazards associated with working on a Site restricted by active rail lines including:

- Risk of personnel being struck by trains while crossing the tracks;
- Risk of blocked exit routes from the Site as a result of train stoppage in the event of an injury;
- Risk of heavy equipment, such as drill rigs, becoming high centred on the track;
- Risk of contact with underground signal control; and
- Risk of destabilization of the rail way tracks during intrusive investigations.

8.2 Risk Mitigation

To overcome potential risks associated with working on a Site adjacent to active rail lines, the following measures should be implemented:

- All personnel must wear high visibility clothing while crossing the train tracks;
- Sufficient set back from the tracks should be maintained when parking or standing near them in preparation to cross to provide adequate clearance for the train to cross;
- Since crossing may be via an uncontrolled crossing, personnel should look both directions prior to crossing the tracks;
- Numbers for CN Rail (1-800-465-9239), CP Rail (1-800-716-9132) and Southern Rail (604-527-6347) must be available on Site at all times such that they can be notified and requested to move or stop train traffic to allow exit from the Site in the event of an emergency;
- CN Rail, CP Rail and Southern Rail should be notified as far in advance as possible if low riding vehicles will be crossing the tracks such that in the event that equipment becomes high centered, it can be mitigated and risk of collision is reduced;
- A request should be made with each rail operator to confirm location of underground signals and, if necessary, mark locations of underground signals;
- Generally, it is anticipated that risk of destabilizing rail tracks during intrusive investigations is low. Higher risk may be associated with soil excavation. While working adjacent to the tracks, care and

attention should be paid to ensure indications of track movement is recorded and reported to the appropriate railway immediately.



9. GROUND DISTURBANCE

9.1 Hazard Identification

Ground disturbance is a routine part of investigations and WorleyParsons has established protocols in place to ensure that ground disturbance is completed in a safe and diligent manner. These protocols should be implemented on this Site including request for location through BC One Call, two independent line locates, hand exposure of all underground infrastructure using a hydrovac and development of a final plot plan outlining locations of utilities, underground infrastructure and overhead lines.

However, additional hazards that may not be captured by standard ground disturbance procedures may be associated with ground disturbance activities on the Site. This is owing to potentially unknown or unlocated infrastructure, unknown extent and placement of tie-backs, deadmen and anchor integral to structural integrity of the wharf and proximity to existing rail tracks. This increases risks associated with ground disturbance activities and potential damage that may occur to infrastructure on the Site. The risks that exist include:

- striking a utility line or other underground infrastructure, including tanks, deadmen, tie backs and/or anchors, during installations; and/or
- disruption of utility and/or rail track stability during installations; and/or
- chemical release.

Any of these events could have significant implications including:

- costs associated with repair and/or spill clean up;
- fire and/or explosion due to line impact;
- injury or death to workers;
- impacts to WorleyParsons, City of New Westminster or sub-contractor reputations; and/or
- irreparable environmental damage.

9.2 Risk Mitigation

To overcome the potential risks associated with ground disturbance on the Site, the following risk management measures are required:

- As per standard protocols, BC OneCall must be contacted, along with all utility owners whose information is not available on BC OneCall (i.e. Shaw Cable);
- As per standard protocols, two independent line locates must be completed by a qualified professional and should be advised of the nature of the project, including that groundwater monitoring wells and/or soil vapour probes are to be installed in utility corridors;

- As per standard protocols, line locates should be completed within a 5 metre radius of all test pit, groundwater monitoring well and soil vapour probe locations, unless it is unsafe to do so (i.e. on railway tracks, wharf structure);
- As per standard protocols, all underground utilities and overhead hazards should be located through a review of documentation combined with field locates. Lines must be marked with paint on the Site and should be clearly identified on the plot plan;
- Lines that could not be located should be noted on the plot plan as such and still considered when conducting intrusive investigations;
- Discussions daily at the field safety meeting about the limitations of the line locates are required with clear documentation of these discussions and sign off by all workers on Site;
- WorleyParsons 3rd Party Review and Ground Disturbance Permit forms must be reviewed and signed by all appropriate parties, including the client, prior to drilling;
- All personnel on Site should hold valid Ground Disturbance Level II training and should be able to produce appropriate documentation to confirm this prior to commencing installations;
- Each utility on the Site should be daylighted for the duration of intrusive investigations using a hydrovac;
- Safe distance must be maintained from overhead lines during intrusive investigations;
- Utilities that are exposed should be properly braced during investigations to limit potential collapse or damage to utilities if exposing beneath the utilities;
- Utilities that are exposed should be properly marked during investigations to limit the potential for contact;
- Photodocumentation of all backfilling activities is required for exposed utilities. Utility owners should be contacted to determine if during backfilling activities they would like to be present. Backfilling materials used should be consistent with materials removed during drilling.

Air monitoring within the work area is required at all times. This includes personal 4-gas monitors for WorleyParsons staff and ambient air measurements near and immediately downwind of the point of intrusive investigations using a photoionization detector (PID) and organic vapour analyzer (OVA), at minimum. In the event that hydrocarbon measurements indicate an explosive or potentially explosive atmosphere (i.e. greater than 10% lower explosive limit [LEL]), all equipment must be shut down and work will cease. The area will be cleared until readings return to safe levels. Similar protocols will be followed for accumulation of carbon monoxide or depletion of oxygen in the work environment. No smoking is permitted on the Site.



10. WEATHER RELATED RISKS

10.1 Hazard Identification

Heavy rainfall may occur during the drilling program based on the current weather forecast. Heavy rainfall may impart additional risks to workers by:

- reducing visibility;
- increasing risk of hypothermia and fatigue;
- creating slip, trip and fall hazards associated with wet and slippery working conditions;
- increasing risk of sedimentation into the Fraser River; and
- decreasing stability of the land base beneath the Site.

10.2 Risk Mitigation

To mitigate weather related hazards associated with the program:

- high visibility striping, at minimum, is recommended. Delineators, caution tape and signage are also recommended;
- scheduled breaks should be taken to allow staff to warm up and dry out, as necessary;
- appropriate clothing should be worn which includes rain gear and appropriate footwear that has good grip and is water resistant or water proof. Clothing should be layered to maximize warmth. Dry clothing should be available to staff on Site to allow them to change if necessary;
- appropriate room should be provided in the work area that allows for staff to move without tripping over clutter. Footing should be watched at all times. Care should be taken when driving or moving equipment to account for stability;
- berms should be placed when working in proximity to the shoreline to minimize potential erosion and sedimentation into the Fraser River;
- open excavations, boreholes or utility exposure should be covered to limit potential for sedimentation; and
- movement of equipment around the Site should be preceded by verification of ground stability.

11. CLOSURE

The site-specific health and safety plan presented herein must be reviewed in the field safety meeting during site kick off. Any new workers that arrive on site must be provided with the health and safety plan for orientation. All hazards must be thoroughly reviewed and appropriate safe work procedures implemented. All personnel on the Site must acknowledge review of the Health and Safety Plan. Any questions or concerns with health and safety on the Site during the program should be directed to:

The Program Site Supervisor: Neil Simpson; 604-219-8144 or alternate.

A WorleyParsons Health and Safety Advisor

Michael Cowdell: 604-562-4684

Annie Larochelle; 403-815-1512

Rob Rosete: 403-809-6218

The Environmental Project Manager or Designate

Kelly Forseth (PM): 604-312-3484

Tiona Todoruk: 604-785-4086

HSE Plan Prepared by:

Tiona Todoruk (February 14, 2010)

Reviewed by:

Kelly Forseth, PEng (February 14, 2010)

Appendix 1 MSDS Sheets

Material Safety Data Sheet

Nitric acid, 20-70%

ACC# 16550

Section 1 - Chemical Product and Company Identification

MSDS Name: Nitric acid, 20-70%

Catalog Numbers: AC124660000, AC124660010, AC124660011, AC124660025, AC124660026, AC124665000, AC124665001, AC133620000, AC133620010, AC133620011, AC133620025, AC133620026, AC424000000, AC424000025, AC424000026, AC424000250, AC424005000, AC424005001, AC613205000, A198C-212, A198C4X-212, A200-212, A200-500, A200-500LC, A200-612GAL, A200212LC, A200C-212, A200C212EA, A200C212LC, A200C4X-212, A200C4X212L, A200S-212, A200S-500, A200S212LC, A200SI-212, A206C-212, A206C4X-212, A467-1, A467-2, A467-250, A467-500, A483-212, A509-212, A509-212LC, A509-500, A509SK-212, A509SK-212LC, MCC-030822, NC9596579, S719721, S71972SC

Synonyms: Azotic acid; Engraver's acid; Aqua fortis.

Company Identification:

Fisher Scientific
1 Reagent Lane
Fair Lawn, NJ 07410

For information, call: 201-796-7100

Emergency Number: 201-796-7100

For CHEMTREC assistance, call: 800-424-9300

For International CHEMTREC assistance, call: 703-527-3887

Section 2 - Composition, Information on Ingredients

CAS#	Chemical Name	Percent	EINECS/ELINCS
7732-18-5	Water	30-80	231-791-2
7697-37-2	Nitric acid	20-70	231-714-2

Section 3 - Hazards Identification

EMERGENCY OVERVIEW

Appearance: clear to yellow liquid.

Danger! May be fatal if inhaled. Causes severe eye and skin burns. Causes severe respiratory and digestive tract burns. Strong oxidizer. Contact with other material may cause a fire. Acute pulmonary edema or chronic obstructive lung disease may occur from inhalation of the vapors of nitric acid. Corrosive to metal.

Target Organs: Lungs, eyes, skin, mucous membranes.

Potential Health Effects

Eye: Causes severe eye burns. Direct contact with liquid may cause blindness or permanent eye damage.

Skin: Causes skin burns. May cause deep, penetrating ulcers of the skin. Concentrated nitric acid dyes human skin yellow on contact.

Ingestion: May cause severe and permanent damage to the digestive tract. Causes gastrointestinal tract burns. May cause perforation of the digestive tract. May cause systemic effects.

Inhalation: Effects may be delayed. Causes chemical burns to the respiratory tract. Inhalation may be fatal as a result of spasm, inflammation, edema of the larynx and bronchi, chemical pneumonitis and pulmonary edema. Aspiration may lead to pulmonary edema. May cause systemic effects. May cause acute pulmonary edema, asphyxia, chemical pneumonitis, and upper airway obstruction caused by edema. Depending on the conditions, the vapor or fumes of nitric acid may actually be a mixture of nitric acid and various oxides of nitrogen. The composition may vary with temperature, humidity, and contact with other organic materials.

Chronic: Exposure to high concentrations of nitric acid vapor may cause pneumonitis and pulmonary edema

which may be fatal. Symptoms may or may not be delayed. Continued exposure to the vapor & mist of nitric acid may result in a chronic bronchitis, & more severe exposure results in a chemical pneumonitis. The vapor & mists of nitric acid may erode the teeth, particularly affecting the canines & incisors.

Section 4 - First Aid Measures

Eyes: Get medical aid immediately. Do NOT allow victim to rub eyes or keep eyes closed. Extensive irrigation with water is required (at least 30 minutes).

Skin: Get medical aid immediately. Immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse. Destroy contaminated shoes.

Ingestion: Do not induce vomiting. If victim is conscious and alert, give 2-4 cupfuls of milk or water. Never give anything by mouth to an unconscious person. Get medical aid immediately.

Inhalation: Get medical aid immediately. Remove from exposure and move to fresh air immediately. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Do NOT use mouth-to-mouth resuscitation. If breathing has ceased apply artificial respiration using oxygen and a suitable mechanical device such as a bag and a mask.

Notes to Physician: Treat symptomatically and supportively.

Section 5 - Fire Fighting Measures

General Information: As in any fire, wear a self-contained breathing apparatus in pressure-demand, MSHA/NIOSH (approved or equivalent), and full protective gear. Strong oxidizer. Contact with other material may cause fire. During a fire, irritating and highly toxic gases may be generated by thermal decomposition or combustion. Use water spray to keep fire-exposed containers cool. May react with metal surfaces to form flammable and explosive hydrogen gas. Approach fire from upwind to avoid hazardous vapors and toxic decomposition products.

Extinguishing Media: Use extinguishing media most appropriate for the surrounding fire.

Flash Point: Not applicable.

Autoignition Temperature: Not available.

Explosion Limits, Lower: Not available.

Upper: Not available.

NFPA Rating: (estimated) Health: 4; Flammability: 0; Instability: 0; Special Hazard: OX

Section 6 - Accidental Release Measures

General Information: Use proper personal protective equipment as indicated in Section 8.

Spills/Leaks: Avoid runoff into storm sewers and ditches which lead to waterways. Clean up spills immediately, observing precautions in the Protective Equipment section. Absorb spill using an absorbent, non-combustible material such as earth, sand, or vermiculite. Do not use combustible materials such as sawdust. Provide ventilation. Evacuate unnecessary personnel. Approach spill from upwind. Use water spray to cool and disperse vapors and protect personnel.

Section 7 - Handling and Storage

Handling: Wash thoroughly after handling. Remove contaminated clothing and wash before reuse. Do not breathe dust, mist, or vapor. Do not get in eyes, on skin, or on clothing. Keep container tightly closed. Avoid contact with clothing and other combustible materials. Discard contaminated shoes. Do not use with metal spatula or other metal items. Use only with adequate ventilation or respiratory protection.

Storage: Do not store near combustible materials. Do not store in direct sunlight. Keep container closed when not in use. Store in a cool, dry, well-ventilated area away from incompatible substances. Keep away from metals. Store away from alkalis. Separate from organic materials. Inspect periodically for damage or evidence of leaks

of corrosion.

Section 8 - Exposure Controls, Personal Protection

Engineering Controls: Facilities storing or utilizing this material should be equipped with an eyewash facility and a safety shower. Use adequate general or local exhaust ventilation to keep airborne concentrations below the permissible exposure limits. Use a corrosion-resistant ventilation system.

Exposure Limits

Chemical Name	ACGIH	NIOSH	OSHA - Final PELs
Water	none listed	none listed	none listed
Nitric acid	2 ppm TWA; 4 ppm STEL	2 ppm TWA; 5 mg/m ³ TWA 25 ppm IDLH	2 ppm TWA; 5 mg/m ³ TWA

OSHA Vacated PELs: Water: No OSHA Vacated PELs are listed for this chemical. Nitric acid: 2 ppm TWA; 5 mg/m³ TWA

Personal Protective Equipment

Eyes: Wear chemical splash goggles and face shield.

Skin: Wear butyl rubber gloves, apron, and/or clothing.

Clothing: Wear appropriate clothing to prevent skin exposure.

Respirators: Follow the OSHA respirator regulations found in 29 CFR 1910.134 or European Standard EN 149. Use a NIOSH/MSHA or European Standard EN 149 approved respirator if exposure limits are exceeded or if irritation or other symptoms are experienced.

Section 9 - Physical and Chemical Properties

Physical State: Liquid

Appearance: clear to yellow

Odor: strong odor - acid odor - suffocating odor

pH: 1.0 (0.1M soln)

Vapor Pressure: 51 mm Hg @ 25 deg C

Vapor Density: 2.17 (air=1)

Evaporation Rate: Not available.

Viscosity: 0.761 cps @ 25 deg C

Boiling Point: 86 deg C

Freezing/Melting Point: -42 deg C

Decomposition Temperature: Not available.

Solubility: Soluble in water.

Specific Gravity/Density: 1.4

Molecular Formula: HNO₃

Molecular Weight: 63.01

Section 10 - Stability and Reactivity

Chemical Stability: Stable. Decomposes when in contact with air, light, or organic matter. The yellow color is due to release of nitrogen dioxide on exposure to light.

Conditions to Avoid: High temperatures, light, confined spaces.

Incompatibilities with Other Materials: Metals, reducing agents, strong bases, acetic acid, alcohols, acetone, aniline, hydrogen sulfide, metal powders, carbides, aldehydes, organic solvents, combustible materials, chromic acid, flammable liquids, cyanides, sulfides, Incompatible with many substances.

Hazardous Decomposition Products: Nitrogen oxides.

Hazardous Polymerization: Has not been reported.

Section 11 - Toxicological Information

RTECS#:

CAS# 7732-18-5: ZC0110000

CAS# 7697-37-2: QU5775000; QU5900000

LD50/LC50:

CAS# 7732-18-5:

Oral, rat: LD50 = >90 mL/kg;

CAS# 7697-37-2:

Inhalation, rat: LC50 = 260 mg/m³/30M;Inhalation, rat: LC50 = 130 mg/m³/4H;Inhalation, rat: LC50 = 67 ppm(NO₂)/4H;**Carcinogenicity:**

CAS# 7732-18-5: Not listed by ACGIH, IARC, NTP, or CA Prop 65.

CAS# 7697-37-2: Not listed by ACGIH, IARC, NTP, or CA Prop 65.

Epidemiology: No information found**Teratogenicity:** No information found**Reproductive Effects:** No information found**Mutagenicity:** No information found**Neurotoxicity:** No information found**Other Studies:**

Section 12 - Ecological Information

Ecotoxicity: No data available. No information available.**Environmental:** Terrestrial: During transport through the soil, nitric acid will dissolve some of the soil material, in particular, the carbonate based materials. The acid will be neutralized to some degree with adsorption of the proton also occurring on clay materials. However, significant amounts of acid are expected to remain for transport down toward the ground water table. Upon reaching the ground water table, the acid will continue to move, now in the direction of the ground water flow.**Physical:** No information available.**Other:** No information available.

Section 13 - Disposal Considerations

Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. US EPA guidelines for the classification determination are listed in 40 CFR Parts 261.3. Additionally, waste generators must consult state and local hazardous waste regulations to ensure complete and accurate classification.

RCRA P-Series: None listed.**RCRA U-Series:** None listed.

Section 14 - Transport Information

	US DOT	Canada TDG
Shipping Name:	NITRIC ACID	NITRIC ACID
Hazard Class:	8	8
UN Number:	UN2031	UN2031

Packing Group:

II

II

Section 15 - Regulatory Information**US FEDERAL****TSCA**

CAS# 7732-18-5 is listed on the TSCA inventory.

CAS# 7697-37-2 is listed on the TSCA inventory.

Health & Safety Reporting List

None of the chemicals are on the Health & Safety Reporting List.

Chemical Test Rules

None of the chemicals in this product are under a Chemical Test Rule.

Section 12b

None of the chemicals are listed under TSCA Section 12b.

TSCA Significant New Use Rule

None of the chemicals in this material have a SNUR under TSCA.

CERCLA Hazardous Substances and corresponding RQs

CAS# 7697-37-2: 1000 lb final RQ; 454 kg final RQ

SARA Section 302 Extremely Hazardous Substances

CAS# 7697-37-2: 1000 lb TPQ

SARA Codes

CAS # 7697-37-2: immediate, delayed, fire.

Section 313

This material contains Nitric acid (CAS# 7697-37-2, 20-70%), which is subject to the reporting requirements of Section 313 of SARA Title III and 40 CFR Part 373.

Clean Air Act:

This material does not contain any hazardous air pollutants.

This material does not contain any Class 1 Ozone depletors.

This material does not contain any Class 2 Ozone depletors.

Clean Water Act:

CAS# 7697-37-2 is listed as a Hazardous Substance under the CWA.

None of the chemicals in this product are listed as Priority Pollutants under the CWA.

None of the chemicals in this product are listed as Toxic Pollutants under the CWA.

OSHA:

CAS# 7697-37-2 is considered highly hazardous by OSHA.

STATE

CAS# 7732-18-5 is not present on state lists from CA, PA, MN, MA, FL, or NJ.

CAS# 7697-37-2 can be found on the following state right to know lists: California, New Jersey, Pennsylvania, Minnesota, Massachusetts.

California Prop 65

California No Significant Risk Level: None of the chemicals in this product are listed.

European/International Regulations**European Labeling in Accordance with EC Directives****Hazard Symbols:**

C

Risk Phrases:

R 35 Causes severe burns.

Safety Phrases:

~~S 23 Do not inhale gas/fumes/vapour/spray.~~

S 26 In case of contact with eyes, rinse immediately with plenty of water and seek medical advice.

S 36 Wear suitable protective clothing.

S 45 In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible).

WGK (Water Danger/Protection)

- CAS# 7732-18-5: No information available.
- CAS# 7697-37-2: 1

Canada - DSL/NDSL

- CAS# 7732-18-5 is listed on Canada's DSL List.
- CAS# 7697-37-2 is listed on Canada's DSL List.

Canada - WHMIS

This product has a WHMIS classification of E, C, D1A.

This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations and the MSDS contains all of the information required by those regulations.

Canadian Ingredient Disclosure List

CAS# 7697-37-2 is listed on the Canadian Ingredient Disclosure List.

Section 16 - Additional Information
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MSDS Creation Date: 9/30/1998

Revision #16 Date: 2/11/2008

The information above is believed to be accurate and represents the best information currently available to us. However, we make no warranty of merchantability or any other warranty, express or implied, with respect to such information, and we assume no liability resulting from its use. Users should make their own investigations to determine the suitability of the information for their particular purposes. In no event shall Fisher be liable for any claims, losses, or damages of any third party or for lost profits or any special, indirect, incidental, consequential or exemplary damages, howsoever arising, even if Fisher has been advised of the possibility of such damages.

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AUG-7-2007 02:25P FROM:

AUG 07 2007

Cargille Lab-Pro Corporation
4 E. Frederick Place
Cedar Knolls NJ 07927
873-267-8888 Fax 873-267-7998

MATERIAL SAFETY DATA SHEET - SB 807
SODIUM BISULFATE TABLETS

Product Name: Tablet, Sodium Bisulfate, Reagent, Monohydrate, 200mg,

Chemical Family: Sodium Bisulfate in a tablet carrier.

Intended Conditions of Use: The Sodium Bisulfate tablet is designed for use in analytical procedures requiring a controlled amount of Bisulfate.

Component Data:

Ingredient	CAS#	
Sodium Bisulfate Monohydrate	10034-88-5	99%
Inert Ingredient		1%

Precautions for Safe Handling and Storage

Danger: Corrosive. Keep out of reach of children. Do not take internally. Avoid eye contact. In case of eye contact, flush with copious amounts of water for 15 minutes. Seek immediate medical assistance. In case of ingestion, do not induce vomiting. Give 2-4 cups of milk or water. Get medical aid immediately. Harmful if absorbed through the skin. Wash skin with copious amounts of water for 15 minutes.

Avoid prolonged or repeated exposure and wash thoroughly after handling. Wear suitable protective clothing, Gloves, and eye/face protection. Can cause digestive and respiratory tract burns.

Storage Conditions:

Keep tightly sealed. Store in a cool, dry, well-ventilated area.

Physical Data:

Appearance:	Tablets, white, approximately 1/4" od.
Odor:	Oderless
Solubility:	67g/100ml
Melting Pt:	137 deg. F.
Boiling point:	n.a.
Vapor pressure:	n.a.

Personal Protective Equipment

For Routine Use of Product: wear rubber gloves and safety glasses to avoid skin and eye contact.

Fire and Explosion Hazard Information:

Flammability Data: Flammable: NO Combustible: NO Pyrophoric: NO

Hazardous Decomposition Products: Sulfur Oxides.

Incompatibilities: Strong bases, oxidizing agents, alcohols and aqueous solution of hypochlorites. May decompose on exposure to moist air or water.

Waste Disposal:

The user of this material has the responsibility to dispose of unused materials, residues and containers in compliance with all relevant local, state and federal laws and regulations regarding treatment, storage and disposal for non-hazardous wastes.

Hp19lectp\mads\NaBis

Material Safety Data Sheet

Sulfuric acid 90-98%

ACC# 22350

Section 1 - Chemical Product and Company Identification

MSDS Name: Sulfuric acid 90-98%

Catalog Numbers: AC124640000, AC124640010, AC124640011, AC124640025, AC124640026, AC124645000, AC124645001, AC133610000, AC133610011, AC133610025, AC133610026, AC133610051, AC302070000, AC302070010, AC302070011, AC302070025, AC302070026, AC388270000, AC424520000, AC424520026, AC424525001, 13361-0010, 42452-0025, 42452-5000, A298-212, A298N119, A300-212, A300-225LB, A300-500, A300-500LC, A300-612GAL, A300-700LB, A300C-212, A300C-212002, A300C-212003, A300C-212LC, A300C212004, A300C212005, A300C212006, A300C212007, A300C212008, A300C212009, A300C212010, A300J-500, A300P-500, A300S-212, A300S-212LC, A300S-500, A300SI-212, A468-1, A468-2, A468-250, A468-500, A484-212, A510-212, A510-500, A510SK-212, NC9008405, NC9825433, S71211SC, S71211SCMF, S79200, SA174-212, SA174-4, SA176-4, SA196-500

Synonyms: Hydrogen sulfate; Oil of vitriol; Vitriol brown oil; Mattling acid; Battery acid; Sulphuric acid; Electrolyte acid; Dihydrogen sulfate; Spirit of sulfur; Chamber acid.

Company Identification:

Fisher Scientific
1 Reagent Lane
Fair Lawn, NJ 07410

For information, call: 201-796-7100

Emergency Number: 201-796-7100

For CHEMTREC assistance, call: 800-424-9300

For International CHEMTREC assistance, call: 703-527-3887

Section 2 - Composition, Information on Ingredients

CAS#	Chemical Name	Percent	EINECS/ELINCS
7664-93-9	Sulfuric acid	90-98	231-639-5

Section 3 - Hazards Identification

EMERGENCY OVERVIEW

Appearance: clear colorless to yellow liquid.

Danger! Causes eye and skin burns. Causes digestive and respiratory tract burns. May be fatal if mist inhaled. Strong inorganic acid mists containing sulfuric acid may cause cancer. Concentrated sulfuric acid reacts violently with water and many other substances under certain conditions. May cause lung damage. Hygroscopic (absorbs moisture from the air). Corrosive to metal.

Target Organs: Lungs, teeth, eyes, skin.**Potential Health Effects**

Eye: Causes severe eye burns. May cause irreversible eye injury. May cause blindness. May cause permanent corneal opacification. The severity of injury depends on the concentration of the solution and the duration of exposure.

Skin: Causes skin burns. The severity of injury depends on the concentration of the solution and the duration of exposure.

Ingestion: May cause severe and permanent damage to the digestive tract. Causes gastrointestinal tract burns.

Inhalation: May cause irritation of the respiratory tract with burning pain in the nose and throat, coughing, wheezing, shortness of breath and pulmonary edema. Causes chemical burns to the respiratory tract. Inhalation may be fatal as a result of spasm, inflammation, edema of the larynx and bronchi, chemical pneumonitis and

pulmonary edema. Because its vapor pressure is negligible, it exists in the air only as a mist or spray. Exposure may impair lung function and cause mucostasis (reduced mucous clearance).

Chronic: Prolonged or repeated skin contact may cause dermatitis. Prolonged or repeated inhalation may cause nosebleeds, nasal congestion, erosion of the teeth, perforation of the nasal septum, chest pain and bronchitis. Prolonged or repeated eye contact may cause conjunctivitis. Effects may be delayed. Workers chronically exposed to sulfuric acid mists may show various lesions of the skin, tracheobronchitis, stomatitis, conjunctivitis, or gastritis. Occupational exposure to strong inorganic acid mists containing sulfuric acid is carcinogenic to humans.

Section 4 - First Aid Measures

Eyes: In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Get medical aid immediately.

Skin: In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Get medical aid immediately. Wash clothing before reuse.

Ingestion: If swallowed, do NOT induce vomiting. Get medical aid immediately. If victim is fully conscious, give a cupful of water. Never give anything by mouth to an unconscious person.

Inhalation: POISON material. If inhaled, get medical aid immediately. Remove victim to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen.

Notes to Physician: Monitor arterial blood gases, chest x-ray, and pulmonary function tests if respiratory tract irritation or respiratory depression is evident. Treat dermal irritation or burns with standard topical therapy. Effects may be delayed. Do NOT use sodium bicarbonate in an attempt to neutralize the acid.

Section 5 - Fire Fighting Measures

General Information: As in any fire, wear a self-contained breathing apparatus in pressure-demand, MSHA/NIOSH (approved or equivalent), and full protective gear. Use water spray to keep fire-exposed containers cool. Substance is noncombustible. Contact with water can cause violent liberation of heat and splattering of the material. Contact with metals may evolve flammable hydrogen gas. Runoff from fire control or dilution water may cause pollution. Approach fire from upwind to avoid hazardous vapors and toxic decomposition products. Strong dehydrating agent, which may cause ignition of finely divided materials on contact. Oxides of sulfur may be produced in fire.

Extinguishing Media: Use extinguishing media most appropriate for the surrounding fire. Do NOT get water inside containers. If water is used, care should be taken, since it can generate heat and cause splattering if applied directly to sulfuric acid.

Flash Point: Not applicable.

Autoignition Temperature: Not available.

Explosion Limits, Lower: Not available.

Upper: Not available.

NFPA Rating: (estimated) Health: 3; Flammability: 0; Instability: 2; Special Hazard: -W-

Section 6 - Accidental Release Measures

General Information: Use proper personal protective equipment as indicated in Section 8.

Spills/Leaks: Avoid runoff into storm sewers and ditches which lead to waterways. Clean up spills immediately, observing precautions in the Protective Equipment section. Carefully scoop up and place into appropriate disposal container. Provide ventilation. Do not get water inside containers. Cover with dry earth, dry sand, or other non-combustible material followed with plastic sheet to minimize spreading and contact with water.

Section 7 - Handling and Storage

Handling: Wash thoroughly after handling. Remove contaminated clothing and wash before reuse. Do not allow

water to get into the container because of violent reaction. Do not get in eyes, on skin, or on clothing. Keep container tightly closed. Discard contaminated shoes. Use only with adequate ventilation. Do not breathe spray or mist. Do not use with metal spatula or other metal items. Inform laundry personnel of contaminant's hazards.
Storage: Do not store near combustible materials. Keep container closed when not in use. Store in a cool, dry, well-ventilated area away from incompatible substances. Do not store near alkaline substances. Store protected from moisture. Ideally, sulfuric acid should be stored in isolation from all other chemicals in an approved acid or corrosives safety cabinet.

Section 8 - Exposure Controls, Personal Protection

Engineering Controls: Facilities storing or utilizing this material should be equipped with an eyewash facility and a safety shower. Use adequate general or local exhaust ventilation to keep airborne concentrations below the permissible exposure limits. Use a corrosion-resistant ventilation system.

Exposure Limits

Chemical Name	ACGIH	NIOSH	OSHA - Final PELs
Sulfuric acid	0.2 mg/m ³ TWA (thoracic fraction)	1 mg/m ³ TWA 15 mg/m ³ IDLH	1 mg/m ³ TWA

OSHA Vacated PELs: Sulfuric acid: 1 mg/m³ TWA

Personal Protective Equipment

Eyes: Wear chemical splash goggles and face shield.

Skin: Wear neoprene gloves, apron, and/or clothing. Viton gloves are recommended.

Clothing: Wear appropriate protective clothing to prevent skin exposure.

Respirators: Follow the OSHA respirator regulations found in 29 CFR 1910.134 or European Standard EN 149. Use a NIOSH/MSHA or European Standard EN 149 approved respirator if exposure limits are exceeded or if irritation or other symptoms are experienced.

Section 9 - Physical and Chemical Properties

Physical State: Liquid

Appearance: oily - clear colorless to yellow

Odor: odorless

pH: 0.3 (1N solution)

Vapor Pressure: < 0.001 mm Hg @ 20 deg C

Vapor Density: 3.38 (air=1)

Evaporation Rate: Slower than ether.

Viscosity: 21 mPas @ 25 C

Boiling Point: 290 - 338 deg C

Freezing/Melting Point: 10 deg C

Decomposition Temperature: 340 deg C

Solubility: Soluble with much heat

Specific Gravity/Density: 1.84

Molecular Formula: H₂SO₄

Molecular Weight: 98.07

Section 10 - Stability and Reactivity

Chemical Stability: Sulfuric acid reacts vigorously, violently or explosively with many organic and inorganic chemicals and with water.

Conditions to Avoid: Excess heat, exposure to moist air or water, Note: Use great caution in mixing with water due to heat evolution that causes explosive spattering. Always add the acid to water, never the reverse..

Incompatibilities with Other Materials: Metals, oxidizing agents, reducing agents, bases, acrylonitrile, chlorates, finely powdered metals, nitrates, perchlorates, permanganates, epichlorohydrin, aniline, carbides,

fulminates, picrates, organic materials, flammable liquids.
Hazardous Decomposition Products: Oxides of sulfur.
Hazardous Polymerization: Has not been reported.

Section 11 - Toxicological Information

RTECS#:**CAS#** 7664-93-9; WS5600000**LD50/LC50:**

CAS# 7664-93-9:

Draize test, rabbit, eye: 250 ug Severe;
Inhalation, mouse: LC50 = 320 mg/m³/2H;
Inhalation, mouse: LC50 = 320 mg/m³;
Inhalation, rat: LC50 = 510 mg/m³/2H;
Inhalation, rat: LC50 = 510 mg/m³;
Oral, rat: LD50 = 2140 mg/kg;

Carcinogenicity:

CAS# 7664-93-9:

- **ACGIH:** A2 - Suspected Human Carcinogen (contained in strong inorganic acid mists)
- **California:** carcinogen, initial date 3/14/03 (listed as Strong inorganic acid mists containing sulfuric acid).
- **NTP:** Known carcinogen (listed as Strong inorganic acid mists containing s).
- **IARC:** Group 1 carcinogen

Epidemiology: Workers exposed to industrial sulfuric acid mist showed a statistical increase in laryngeal cancer. This suggests a possible relationship between carcinogenesis and inhalation of sulfuric acid mist.

Teratogenicity: Sulfuric acid was not teratogenic in mice and rabbits, but was slightly embryotoxic in rabbits (a minor, rare skeletal variation). The animals were exposed to 5 and 20 mg/m³ for 7 hr/day throughout pregnancy. Slight maternal toxicity was present at the highest dose in both species.

Reproductive Effects: No information found

Mutagenicity: There are no mutagenicity studies specifically of sulfuric acid. However, there are established effects of reduced pH in mutagenicity testing, as would be caused by sulfuric acid. These effects are an artifact of low pH and are not necessarily due to biological effects of sulfuric acid itself.

Neurotoxicity: No information found

Other Studies:

Section 12 - Ecological Information

Ecotoxicity: Fish: Bluegill/Sunfish: 49 mg/L; 48Hr; TLm (tap water @ 20C)
Fish: Bluegill/Sunfish: 24.5 ppm; 48Hr; TLm (fresh water)

Section 13 - Disposal Considerations

Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. US EPA guidelines for the classification determination are listed in 40 CFR Parts 261.3. Additionally, waste generator must consult state and local hazardous waste regulations to ensure complete and accurate classification.

RCRA P-Series: None listed.

RCRA U-Series: None listed.

Section 14 - Transport Information

	US DOT	Canada TDG
Shipping Name:	SULFURIC ACID	SULFURIC ACID
Hazard Class:	8	8
UN Number:	UN1830	UN1830
Packing Group:	II	II

Section 15 - Regulatory Information

US FEDERAL

TSCA

CAS# 7664-93-9 is listed on the TSCA inventory.

Health & Safety Reporting List

None of the chemicals are on the Health & Safety Reporting List.

Chemical Test Rules

None of the chemicals in this product are under a Chemical Test Rule.

Section 12b

None of the chemicals are listed under TSCA Section 12b.

TSCA Significant New Use Rule

None of the chemicals in this material have a SNUR under TSCA.

CERCLA Hazardous Substances and corresponding RQs

CAS# 7664-93-9: 1000 lb final RQ; 454 kg final RQ

SARA Section 302 Extremely Hazardous Substances

CAS# 7664-93-9: 1000 lb TPQ

SARA Codes

CAS # 7664-93-9: immediate, delayed, reactive.

Section 313

This material contains Sulfuric acid (CAS# 7664-93-9, 90-98%), which is subject to the reporting requirements of Section 313 of SARA Title III and 40 CFR Part 373.

Clean Air Act:

This material does not contain any hazardous air pollutants.

This material does not contain any Class 1 Ozone depletors.

This material does not contain any Class 2 Ozone depletors.

Clean Water Act:

CAS# 7664-93-9 is listed as a Hazardous Substance under the CWA.

None of the chemicals in this product are listed as Priority Pollutants under the CWA.

None of the chemicals in this product are listed as Toxic Pollutants under the CWA.

OSHA:

None of the chemicals in this product are considered highly hazardous by OSHA.

STATE

CAS# 7664-93-9 can be found on the following state right to know lists: California, New Jersey, Pennsylvania, Minnesota, Massachusetts.

California Prop 65

The following statement(s) is(are) made in order to comply with the California Safe Drinking Water Act:

WARNING: This product contains Sulfuric acid, listed as 'Strong inorganic acid mists contain', a chemical known to the state of California to cause cancer.

California No Significant Risk Level: None of the chemicals in this product are listed.

European/International Regulations

European Labeling in Accordance with EC Directives

Hazard Symbols:

C

Risk Phrases:

R 35 Causes severe burns.

Safety Phrases:

- S 26 In case of contact with eyes, rinse immediately with plenty of water and seek medical advice.
- S 30 Never add water to this product.
- S 45 In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible).

WGK (Water Danger/Protection)

CAS# 7664-93-9: 2

Canada - DSL/NDSL

CAS# 7664-93-9 is listed on Canada's DSL List.

Canada - WHMIS

This product has a WHMIS classification of D2A, D1A, E. This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations and the MSDS contains all of the information required by those regulations.

Canadian Ingredient Disclosure List

CAS# 7664-93-9 is listed on the Canadian Ingredient Disclosure List.

Section 16 - Additional Information
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MSDS Creation Date: 4/22/1999

Revision #15 Date: 2/13/2008

The information above is believed to be accurate and represents the best information currently available to us. However, we make no warranty of merchantability or any other warranty, express or implied, with respect to such information, and we assume no liability resulting from its use. Users should make their own investigations to determine the suitability of the information for their particular purposes. In no event shall Fisher be liable for any claims, losses, or damages of any third party or for lost profits or any special, indirect, incidental, consequential or exemplary damages, howsoever arising, even if Fisher has been advised of the possibility of such damages.

ISO9001:2000 Certified



Material Safety Data Sheet

Sodium hydroxide solutions, 1-50%

Section 1 - Chemical Product and Company Identification

MSDS Name:

Sodium hydroxide solutions, 1-50%

Catalog Numbers:

LC23950, LC24000, LC24040, LC24060, LC24070, LC24075, LC24078, LC24085, LC24090,
 LC24095, LC24100, LC24110, LC24115, LC24120, LC24140, LC24150, LC24200, LC24220,
 LC24230, LC24250, LC24270, LC24275, LC24280, LC24300, LC24305, LC24307, LC24310,
 LC24320, LC24330, LC24350, LC24380, LC24400, LC24420, LC24430, LC24450, LC24455,
 LC24460, LC24500, LC24523, LC24525

Synonyms:

Caustic Soda, Soda Lye, Sodium Hydrate

Company Identification:

LabChem, Inc.
 200 William Pitt Way
 Pittsburgh, PA 15238

Company Phone Number:

(412) 826-5230

Emergency Phone Number:

(800) 424-9300

CHEMTREC Phone Number:

(800) 424-9300

Section 2 - Composition, Information on Ingredients

CAS#	Chemical Name	Percent
7732-18-5	Water	balance
1310-73-2	Sodium hydroxide	0.04-50

Section 3 - Hazards Identification

Emergency Overview

Appearance: Clear

Caution! Corrosive. Causes skin burns. Causes eye burns. Causes digestive tract burns.
 Causes respiratory tract burns.

Target Organs: None.**Potential Health Effects****Eye:**

Causes severe eye burns.

Skin:

Causes skin burns. May cause deep, penetrating ulcers of the skin.

Ingestion:

Causes gastrointestinal tract burns. Causes severe pain, nausea, vomiting, diarrhea, and shock.



Material Safety Data Sheet

Sodium hydroxide solutions, 1-50%

Inhalation:

Irritation may lead to chemical pneumonitis and pulmonary edema. Causes severe irritation of upper respiratory tract with coughing, burns, breathing difficulty, and possible coma.

Chronic:

Prolonged or repeated skin contact may cause dermatitis.

Section 4 - First Aid Measures

Eyes:

Immediately flush eyes with plenty of water for at least 15 minutes, occasionally lifting the upper and lower lids until chemical is gone. Get medical aid at once.

Skin:

Get medical aid at once. Immediately flush skin with plenty of soap and water for at least 15 minutes while removing contaminated clothing and shoes. Remove contaminated clothing to reduce further exposure.

Ingestion:

Do NOT induce vomiting. Give conscious victim 2-4 cupfuls of milk or water. Never give anything by mouth to an unconscious person. Get medical aid at once.

Inhalation:

Move victim to fresh air immediately. Give artificial respiration if necessary. If breathing is difficult, give oxygen. Get medical aid.

Notes to Physician:

Treat symptomatically and supportively.

Section 5 - Fire Fighting Measures

General Information:

Wear appropriate protective clothing to prevent contact with skin and eyes. Wear a self-contained breathing apparatus (SCBA) to prevent contact with thermal decomposition products. Use water with caution and in flooding amounts.

Extinguishing Media:

For small fires, use dry chemical, carbon dioxide, water spray or alcohol-resistant foam.

Autoignition Temperature:

Not applicable.

Flash Point:

Not applicable.

NFPA Rating:

CAS# 7732-18-5: Not published.

CAS# 1310-73-2: Not published.

Explosion Limits:

Lower: No information Upper: No information

Section 6 - Accidental Release Measures

General Information:

Use proper personal protective equipment as indicated in Section 8.



Material Safety Data Sheet

Sodium hydroxide solutions, 1-50 %

Spills/Leaks:

Absorb spills with absorbent (vermiculite, sand, fuller's earth) and place in plastic bags for later disposal.

Section 7 - Handling and Storage

Handling:

Wash thoroughly after handling. Use with adequate ventilation. Do not get in eyes, on skin, or on clothing. Do not ingest or inhale.

Storage:

Store in a cool, dry, well-ventilated area away from incompatible substances. Keep away from strong acids. Keep away from metals. Keep away from flammable liquids. Keep away from organic halogens.

Section 8 - Exposure Controls, Personal Protection

Engineering Controls:

Use adequate general or local exhaust ventilation to keep airborne concentrations below the permissible exposure limits.

Exposure Limits:

Chemical Name	ACGIH	NIOSH	OSHA
Water	None of the components are on this list.	None of the components are on this list.	None of the components are on this list.
Sodium hydroxide	None of the components are on this list.	None of the components are on this list.	2 mg/m ³ TWA;

OSHA Vacated PELs:

Personal Protective Equipment

Eyes:

Wear appropriate protective eyeglasses or chemical safety goggles as described by OSHA's eye and face protection regulations in 29 CFR 1910.133.

Skin:

Wear appropriate gloves to prevent skin exposure.

Clothing:

Wear appropriate protective clothing to prevent skin exposure.

Respirators:

Follow the OSHA respirator regulations found in 29CFR 1910.134. Always use a NIOSH-approved respirator when necessary.

Section 9 - Physical and Chemical Properties

Physical State: Liquid
 Color: Clear
 Odor: Not available.
 pH: Alkaline
 Vapor Pressure: 14 mm Hg
 Vapor Density: No information found.



Material Safety Data Sheet

Sodium hydroxide solutions, 1-50%

Evaporation Rate:	No information found.
Viscosity:	>1 (ether=1)
Boiling Point:	212°F (100.00°C)
Freezing/Melting Point:	32°F (0.00°C)
Decomposition Temperature:	No information found.
Solubility in water:	No information found.
Specific Gravity/Density:	1.0
Molecular Formula:	NaOH
Molecular Weight:	40

Section 10 - Stability and Reactivity

Chemical Stability:

Stable.

Conditions to Avoid:

Incompatible materials, acids.

Incompatibilities with Other Materials:

Reacts with mineral acids to form corresponding salts; reacts with weak acids gases like hydrogen sulfide, sulfur dioxide, and carbon dioxide; ignites when in contact with cinnamaldehyde or zinc; and reacts explosively with a mixture of chloroform and methane. Corrosive to metals such as aluminum, tin, and zinc as well as to alloys such as steel, and may cause formation of flammable hydrogen gas.

Hazardous Decomposition Products:

Toxic fumes of sodium oxide, sodium peroxide fumes.

Hazardous Polymerization:

Has not been reported.

Section 11 - Toxicological Information

RTECS:

CAS# 7732-18-5: ZC0110000.

CAS# 1310-73-2: WB4900000.

LD50/LC50:

CAS# 7732-18-5:

Oral, rat: LD50 = >90 mL/kg.

CAS# 1310-73-2:

No information found.

Carcinogenicity:

CAS# 7732-18-5: Not listed as a carcinogen by ACGIH, IARC, NIOSH, NTP, OSHA, or CA Prop 65.

CAS# 1310-73-2: Not listed as a carcinogen by ACGIH, IARC, NIOSH, NTP, OSHA, or CA Prop 65.

Epidemiology:

No information reported.

Teratogenicity:

No information reported.

Reproductive:

No information reported.

Mutagenicity:

Mutation data reported.



Material Safety Data Sheet Sodium hydroxide solutions, 1-50%

Neurotoxicity:

No information reported.

Section 12 - Ecological Information

No information found.

Section 13 - Disposal Considerations

Dispose of in accordance with Federal, State, and local regulations.

Section 14 - Transport Information

US DOT

	< 0.5%	Between 0.5% and 2.0%	> 2.0%
Shipping Name:	Not regulated.	Sodium hydroxide solution	Sodium hydroxide solution
Hazard Class:		8	8
UN Number:		UN1824	UN1824
Packing Group:		PG III	PG II

Section 15 - Regulatory Information

US Federal

TSCA:

CAS# 7732-18-5 is listed on the TSCA Inventory.

CAS# 1310-73-2 is listed on the TSCA Inventory.

SARA Reportable Quantities (RQ):

CAS# 1310-73-2: final RQ = 1000 pounds (454 kg)

CERCLA/SARA Section 313:

None of the components are on this list.

OSHA - Highly Hazardous:

None of the components are on this list.

US State

State Right to Know:

Sodium hydroxide can be found on the following state Right-to-Know lists: California, New Jersey, Florida, Pennsylvania, Minnesota, Massachusetts.

California Regulations:

European/International Regulations

Canadian DSL/NDSL:

CAS# 7732-18-5 is listed on Canada's DSL List.

CAS# 1310-73-2 is listed on Canada's DSL List.

Canada Ingredient Disclosure List:

CAS# 7732-18-5 is not listed on Canada's Ingredient Disclosure List.



Material Safety Data Sheet Sodium hydroxide solutions, 1-50 %

CAS# 1310-73-2 is listed on Canada's Ingredient Disclosure List.

Section 16 - Other Information

MSDS Creation Date: July 6, 1998
Revision Date: October 23, 2007

Information in this MSDS is from available published sources and is believed to be accurate. No warranty, express or implied, is made and LabChem Inc. assumes no liability resulting from the use of this MSDS. The user must determine suitability of this information for his application.

Praxair Material Safety Data Sheet

1. Chemical Product and Company Identification

Product Name: Helium, compressed (MSDS No. P-4602-G)	Trade Names: Helium, LaserStar™ Helium, Medipure® Helium, UltraLift® Helium
Chemical Name: Helium	Synonyms: Helium-4, refrigerant gas R-704
Chemical Family: Rare gas	Product Grades: Industrial; Ultralift; 6.0 research/chromatographic; 5.5 ECD, trace analytical; 5.0 UHP; 4.7, 5.0, 5.5 LaserStar; 4.6 zero, oxygen-free; 5.0 methanizer FID gas; 4.5; 5.0, 5.5, 6.0 semiconductor process gas
Telephone:	Emergencies: 1-800-645-4633* CHEMTREC: 1-800-424-9300* Routine: 1-800-PRAXAIR
	Company Name: Praxair, Inc. 39 Old Ridgebury Road Danbury, CT 06810-5113

**Call emergency numbers 24 hours a day only for spills, leaks, fire, exposure, or accidents involving this product. For routine information, contact your supplier, Praxair sales representative, or call 1-800-PRAXAIR (1-800-772-9247).*

2. Hazards Identification

EMERGENCY OVERVIEW

CAUTION! High-pressure gas.

Can cause rapid suffocation.

May cause dizziness and drowsiness.

Self-contained breathing apparatus may be required by rescue workers.

Under ambient conditions, this is a colorless, odorless, tasteless gas.

OSHA REGULATORY STATUS: This material is considered hazardous by the OSHA Hazard Communications Standard (29 CFR 1910.1200).

POTENTIAL HEALTH EFFECTS:

Effects of a Single (Acute) Overexposure

Inhalation. Asphyxiant. Effects are due to lack of oxygen. Moderate concentrations may cause headache, drowsiness, dizziness, excitation, excess salivation, vomiting, and unconsciousness. Lack of oxygen can kill.

Skin Contact. No harm expected.

Swallowing. This product is a gas at normal temperature and pressure.

Eye Contact. No harm expected.

Effects of Repeated (Chronic) Overexposure. No harm expected.

Other Effects of Overexposure. Helium is an asphyxiant. Lack of oxygen can kill.

Medical Conditions Aggravated by Overexposure. The toxicology and the physical and chemical properties of helium suggest that overexposure is unlikely to aggravate existing medical conditions.

CARCINOGENICITY: Helium is not listed by NTP, OSHA, or IARC.

POTENTIAL ENVIRONMENTAL EFFECTS: None known. For further information, see section 12, Ecological Information.

3. Composition/Information on Ingredients

This section covers materials of manufacture only. See sections 8, 10, 11, and 16 for information on by-products generated during use in welding and cutting.

See section 16 for important information about mixtures.

COMPONENT	CAS NUMBER	CONCENTRATION
Helium	7440-59-7	>99%*

*The symbol > means "greater than."

4. First Aid Measures

INHALATION: Immediately remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, qualified personnel may give oxygen. Call a physician.

SKIN CONTACT: An unlikely route of exposure. This product is a gas at normal temperature and pressure.

SWALLOWING: An unlikely route of exposure. This product is a gas at normal temperature and pressure.

EYE CONTACT: An unlikely route of exposure. This product is a gas at normal temperature and pressure.

NOTES TO PHYSICIAN: *There is no specific antidote. This product is inert. Treatment of overexposure should be directed at the control of symptoms and the clinical condition of the patient.*

5. Fire Fighting Measures

FLAMMABLE PROPERTIES: Nonflammable.

SUITABLE EXTINGUISHING MEDIA: Helium cannot catch fire. Use media appropriate for surrounding fire.

PRODUCTS OF COMBUSTION: Not applicable.

PROTECTION OF FIREFIGHTERS: CAUTION! High-pressure gas. Evacuate all personnel from danger area. Immediately deluge cylinders with water from maximum distance until cool; then move them away from fire area if without risk. Self-contained breathing apparatus may be required by rescue workers. On-site fire brigades must comply with OSHA 29 CFR 1910.156.

Specific Physical and Chemical Hazards. Heat of fire can build pressure in cylinder and cause it to rupture. No part of cylinder should be subjected to a temperature higher than 125°F (52°C). Helium cylinders are equipped with a pressure relief device. (Exceptions may exist where authorized by DOT.)

Protective Equipment and Precautions for Firefighters. Firefighters should wear self-contained breathing apparatus and full fire-fighting turnout gear.

6. Accidental Release Measures

STEPS TO BE TAKEN IF MATERIAL IS RELEASED OR SPILLED:

CAUTION! High-pressure gas.

Personal Precautions. Helium is an asphyxiant. Lack of oxygen can kill. Evacuate all personnel from danger area. Use self-contained breathing apparatus where needed. Shut off leak if without risk. Ventilate area of leak or move cylinder to a well-ventilated area. Test for sufficient oxygen, especially in confined spaces, before allowing reentry.

Environmental Precautions. Prevent waste from contaminating the surrounding environment. Keep personnel away. Discard any product, residue, disposable container, or liner in an environmentally acceptable manner, in full compliance with federal, state, and local regulations. If necessary, call your local supplier for assistance.

7. Handling and Storage

PRECAUTIONS TO BE TAKEN IN HANDLING: *Protect cylinders from damage.* Use a suitable hand truck to move cylinders; do not drag, roll, slide, or drop. ***Never attempt to lift a cylinder by its cap;*** the cap is intended solely to protect the valve. Never insert an object (e.g., wrench, screwdriver, pry bar) into cap openings; doing so may damage the valve and cause a leak. Use an adjustable strap wrench to remove over-tight or rusted caps. ***Open valve slowly.*** If valve is hard to open, discontinue use and contact your supplier. Close valve after each use; keep closed even when empty. ***Never apply flame or localized heat directly to any part of the cylinder.*** High temperatures may damage the cylinder and could cause the pressure relief device to fail prematurely, venting the cylinder contents. For other precautions in using helium, see section 16.

PRECAUTIONS TO BE TAKEN IN STORAGE: *Store and use with adequate ventilation.* Store only where temperature will not exceed 125°F (52°C). ***Firmly secure cylinders upright to keep them from falling or being knocked over.*** Screw valve protection cap firmly in place by hand. ***Store full and empty cylinders separately.*** Use a first-in, first-out inventory system to prevent storing full cylinders for long periods.

RECOMMENDED PUBLICATIONS: For further information on storage, handling, and use, see Praxair publication P-14-153, *Guidelines for Handling Gas Cylinders and Containers*. Obtain from your local supplier.

8. Exposure Controls/Personal Protection

See section 16 for important information on by-products generated during use in welding and cutting.

COMPONENT	OSHA PEL	ACGIH TLV-TWA (2007)
Helium	Not Established.	Simple asphyxiant

IDLH = Not available.

ENGINEERING CONTROLS:

Local Exhaust. Use a local exhaust system, if necessary, to prevent oxygen deficiency, and in welding, to keep hazardous fumes and gases in the worker's breathing zone below all applicable exposure limits.

Mechanical (General). General exhaust ventilation may be acceptable if it can maintain an adequate supply of air and keep hazardous fumes and gases in the worker's breathing zone below all applicable exposure limits.

Special. None

Other. None

PERSONAL PROTECTIVE EQUIPMENT:

Skin Protection. Wear work gloves when handling cylinders; welding gloves for welding. Metatarsal shoes for cylinder handling. Select in accordance with OSHA 29 CFR 1910.132 and 1910.133. For welding, see section 16. Regardless of protective equipment, never touch live electrical parts.

Eye/Face Protection. Per input or existing MSDS.

Respiratory Protection. Use air-purifying or air-supplied respirators where local or general exhaust ventilation is inadequate to keep worker exposure below all applicable exposure limits for fumes, gases, and other by-products of welding with helium. See section 16 for details. Air-supplied respirators must be used in confined spaces. Respiratory protection must conform to OSHA rules as specified in 29 CFR 1910.134.

9. Physical and Chemical Properties
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APPEARANCE:	Colorless gas	
ODOR:	None	
ODOR THRESHOLD:	Not applicable.	
PHYSICAL STATE:	Gas at normal temperature and pressure	
pH:	Not applicable.	
MELTING POINT:	-456.5°F (-271.39°C)	
BOILING POINT at 1 atm:	-452.07°F (-268.93°C)	
FLASH POINT (test method):	Not applicable.	
EVAPORATION RATE (Butyl Acetate = 1):	Not applicable.	
FLAMMABILITY:	Nonflammable	
FLAMMABLE LIMITS IN AIR, % by volume:	LOWER: Not applicable.	UPPER: Not applicable.
VAPOR PRESSURE at 68°F (20°C):	Not applicable.	
VAPOR DENSITY at 70°F (21.1°C) and 1 atm:	0.0104 lb/ft ³ (0.166 kg/m ³)	
LIQUID DENSITY at boiling point and 1 atm:	7.802 lb/ft ³ (124.98 kg/m ³)	
SPECIFIC GRAVITY (Air = 1) at 70°F (21.1°C) and 1 atm:	0.138	
SOLUBILITY IN WATER 32°F (0°C) and 1 atm:	0.0094	
PARTITION COEFFICIENT: n-octanol/water:	Not available.	

AUTOIGNITION TEMPERATURE:	Not applicable.
DECOMPOSITION TEMPERATURE:	None
PERCENT VOLATILES BY VOLUME:	100
MOLECULAR WEIGHT:	4.003
MOLECULAR FORMULA:	He

10. Stability and Reactivity

CHEMICAL STABILITY: Unstable Stable

CONDITIONS TO AVOID: None known.

INCOMPATIBLE MATERIALS: None known. Helium is chemically inert.

HAZARDOUS DECOMPOSITION PRODUCTS: None known.

POSSIBILITY OF HAZARDOUS REACTIONS: May Occur Will Not Occur

11. Toxicological Information

ACUTE DOSE EFFECTS: Helium is a simple asphyxiant.

STUDY RESULTS: None known.

12. Ecological Information

ECOTOXICITY: No known effects.

OTHER ADVERSE EFFECTS: Helium does not contain any Class I or Class II ozone-depleting chemicals.

13. Disposal Considerations

WASTE DISPOSAL METHOD: Do not attempt to dispose of residual or unused quantities. Return cylinder to supplier.

14. Transport Information

DOT/IMO SHIPPING NAME: Helium, compressed

HAZARD CLASS:	PACKING GROUP/Zone:	IDENTIFICATION NUMBER:	PRODUCT RQ:
2.2	NA*	UN1046	None

SHIPPING LABEL(s): NONFLAMMABLE GAS

PLACARD (when required): NONFLAMMABLE GAS

*NA-Not applicable.

SPECIAL SHIPPING INFORMATION: Cylinders should be transported in a secure position, in a well-ventilated vehicle. Cylinders transported in an enclosed, nonventilated compartment of a vehicle can present serious safety hazards.

Shipment of compressed gas cylinders that have been filled without the owner's consent is a violation of federal law [49 CFR 173.301(b)].

MARINE POLLUTANTS: Helium is not listed as a marine pollutant by DOT.

15. Regulatory Information

The following selected regulatory requirements may apply to this product. Not all such requirements are identified. Users of this product are solely responsible for compliance with all applicable federal, state, and local regulations.

U.S. FEDERAL REGULATIONS:

EPA (ENVIRONMENTAL PROTECTION AGENCY)

CERCLA: COMPREHENSIVE ENVIRONMENTAL RESPONSE, COMPENSATION, AND LIABILITY ACT OF 1980 (40 CFR Parts 117 and 302):

Reportable Quantity (RQ): None

SARA: SUPERFUND AMENDMENT AND REAUTHORIZATION ACT:

SECTIONS 302/304: Require emergency planning based on Threshold Planning Quantity (TPQ) and release reporting based on Reportable Quantities (RQ) of Extremely Hazardous Substances (EHS) (40 CFR Part 355):

TPQ: None

EHS RQ (40 CFR 355): None

SECTIONS 311/312: Require submission of MSDSs and reporting of chemical inventories with identification of EPA hazard categories. The hazard categories for this product are as follows:

IMMEDIATE: No

PRESSURE: Yes

DELAYED: No

REACTIVITY: No

FIRE: No

SECTION 313: Requires submission of annual reports of release of toxic chemicals that appear in 40 CFR Part 372.

Helium is not subject to reporting under Section 313.

40 CFR 68: RISK MANAGEMENT PROGRAM FOR CHEMICAL ACCIDENTAL RELEASE PREVENTION: Requires development and implementation of risk management programs at facilities that manufacture, use, store, or otherwise handle regulated substances in quantities that exceed specified thresholds.

Helium is not listed as a regulated substance.

TSCA: TOXIC SUBSTANCES CONTROL ACT: Helium is listed on the TSCA inventory.

OSHA: OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION:

29 CFR 1910.119: PROCESS SAFETY MANAGEMENT OF HIGHLY HAZARDOUS CHEMICALS: Requires facilities to develop a process safety management program based on Threshold Quantities (TQ) of highly hazardous chemicals.

Helium is not listed in Appendix A as a highly hazardous chemical.

STATE REGULATIONS:

CALIFORNIA: Helium is not listed by California under the SAFE DRINKING WATER AND TOXIC ENFORCEMENT ACT OF 1986 (Proposition 65).

PENNSYLVANIA: Helium is subject to the PENNSYLVANIA WORKER AND COMMUNITY RIGHT-TO-KNOW ACT (35 P.S. Sections 7301-7320).

16. Other Information

Be sure to read and understand all labels and instructions supplied with all containers of this product.

OTHER HAZARDOUS CONDITIONS OF HANDLING, STORAGE, AND USE: *High-pressure gas.* Use piping and equipment adequately designed to withstand pressures to be encountered. Use a backflow prevention device in any piping. **Never work on a pressurized system.** If there is a leak, close the cylinder valve. Blow the system down in an environmentally safe manner in compliance with all federal, state, and local laws; then repair the leak. **Never place a compressed gas cylinder where it may become part of an electrical circuit.**

SPECIAL PRECAUTIONS: *Use in welding and cutting.* Read and understand the manufacturer's instructions and the precautionary label on the product. See American Standard Z49.1, *Safety in Welding, Cutting, and Allied Processes*, published by the American Welding Society, www.aws.org—order from Global Engineering Documents, 15 Inverness Way East, Englewood, CO 80112-5776 and OSHA Publication 2206 (29CFR 1910), US Government Printing Office, Washington, DC 20402, for more information.

Arcs and sparks can ignite combustible materials. Prevent fires. Refer to NFPA 51B, *Standard for Fire Prevention in Welding, Cutting, and Other Hotwork.* **Do not strike an arc on the cylinder.** The defect produced by an arc burn could lead to cylinder rupture.

Use in Underwater Breathing. Suitability of this product for use in underwater breathing must be determined by or under supervision of someone experienced in the use of underwater breathing gas mixtures. This person must be familiar with *how* the product is used; the frequency, duration, and effects of use; the hazards and side effects of use, and the precautions to take to avoid or control them.

Mixtures. When you mix two or more gases or liquefied gases, you can create additional, unexpected hazards. Obtain and evaluate the safety information for each component before you produce the mixture. Consult an industrial hygienist or other trained person when you evaluate the end product. Remember, gases and liquids have properties that can cause serious injury or death.

HAZARD RATING SYSTEMS:

NFPA RATINGS:

HEALTH = 0
 FLAMMABILITY = 0
 INSTABILITY = 0
 SPECIAL = SA (CGA recommends this to designate Simple Asphyxiant.)

HMIS RATINGS:

HEALTH = 0
 FLAMMABILITY = 0
 PHYSICAL HAZARD = 3

STANDARD VALVE CONNECTIONS FOR U.S. AND CANADA:

THREADED:

0-3000 psig CGA-580
 3001-5500 psig CGA-680
 5001-7500 psig CGA-677

PIN-INDEXED YOKE:

CGA-930 (medical use)

ULTRA-HIGH-INTEGRITY CONNECTION:

CGA-718

Use the proper CGA connections. **DO NOT USE ADAPTERS.** Additional limited-standard connections may apply. See CGA pamphlet V-1 listed below.

Ask your supplier about free Praxair safety literature as referred to in this MSDS and on the label for this product. Further information can be found in the following materials published by the Compressed Gas Association, Inc. (CGA), 4221 Walney Road, 5th Floor, Chantilly, VA 20151-2923, Telephone (703) 788-2700, <http://www.cganet.com/Publication.asp>.

- AV-1 *Safe Handling and Storage of Compressed Gases*
- G-9.1 *Commodity Specification for Helium*
- P-1 *Safe Handling of Compressed Gases in Containers*
- P-2 *Characteristics and Safe Handling of Medical Gases*
- P-9 *Inert Gases—Argon, Nitrogen, and Helium*
- SB-2 *Oxygen-Deficient Atmospheres*
- SB-8 *Use of Oxy-Fuel Gas Welding and Cutting Apparatus*
- V-1 *Compressed Gas Cylinder Valve Inlet and Outlet Connections*
- V-7.1 *Standard Method Of Determining Cylinder Valve Outlet Connections For Medical Gases*
- *Handbook of Compressed Gases, Fourth Edition*

Praxair asks users of this product to study this MSDS and become aware of product hazards and safety information. To promote safe use of this product, a user should (1) notify employees, agents, and contractors of the information in this MSDS and of any other known product hazards and safety information, (2) furnish this information to each purchaser of the product, and (3) ask each purchaser to notify its employees and customers of the product hazards and safety information.

The opinions expressed herein are those of qualified experts within Praxair, Inc. We believe that the information contained herein is current as of the date of this Material Safety Data Sheet. Since the use of this information and the conditions of use of the product are not within the control of Praxair, Inc., it is the user's obligation to determine the conditions of safe use of the product.

Praxair MSDSs are furnished on sale or delivery by Praxair or the independent distributors and suppliers who package and sell our products. To obtain current MSDSs for these products, contact your Praxair sales representative or local distributor or supplier, or download from www.praxair.com. If you have questions regarding Praxair MSDSs, would like the form number and date of the latest MSDS, or would like the names of the Praxair suppliers in your area, phone or write the Praxair Call Center (**Phone:** 1-800-PRAXAIR; **Address:** Praxair Call Center, Praxair, Inc., PO Box 44, Tonawanda, NY 14151-0044).

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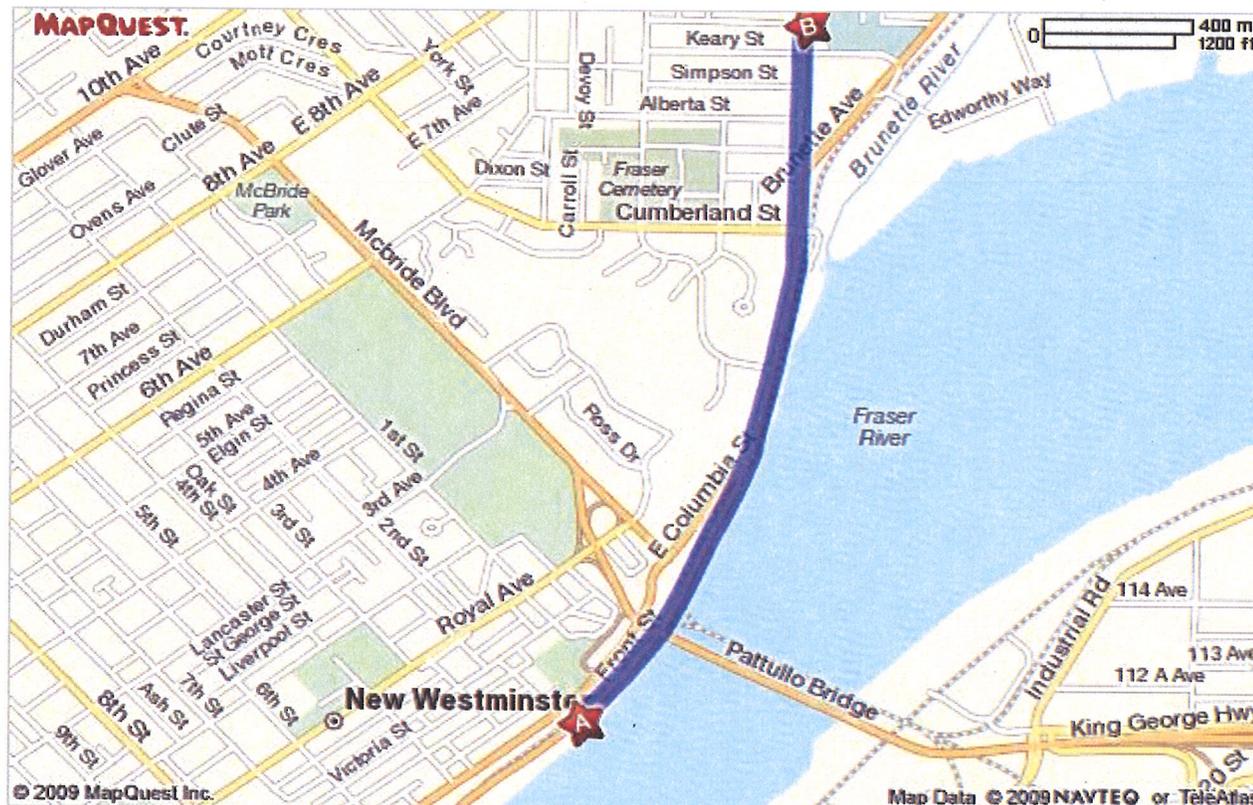
MAPQUEST.

Notes

Trip to Royal Columbian Hospital

330 Columbia St E, New Westminster,
BC V3L 3W7 - (604) 520-4253
1.47 miles - about 5 minutes

Route Map [Hide](#)



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Project No 09216 999 Client City of New Westminster Area and Site Location (LSD) 610 Front Street
 GPS Coordinates mN mE Sour Site Prime Contractor WorleyParsons
 Scope of work: Utility locate, environmental drilling, hydrovac, well installation, development, and sampling *TEST PITTING*
 Site Access Road, controlled and uncontrolled rail crossings Field Start Date 15/Feb/10 Project Duration (Field) 1 year

HAZARD IDENTIFICATION / CONTROLS		RISK RANKING
Chemical Hazards		
<input checked="" type="checkbox"/>	Possible Contaminants Hydrocarbons	Low
<input checked="" type="checkbox"/>	Controlled Products Silica sand, bentonite	
<input checked="" type="checkbox"/>	Hazard Controls Do not contact groundwater of soils. Wear appropriate PPE.	Low
<input checked="" type="checkbox"/>	Flammable/Explosive Materials No source of ignition within 10m of borehole or pier.	Low
<input checked="" type="checkbox"/>	Hazardous Waste Disposal Soils to be drummed, hydrovaccated, or stockpiled in designated location.	Low
<input checked="" type="checkbox"/>	Sanitation Washrooms and water at the New Westminster Quay.	Low
<input checked="" type="checkbox"/>	Overhead Power Lines or Hazards To be marked on final plot plan, and discussed at tailgate meeting.	Low
<input checked="" type="checkbox"/>	Underground Pipelines or Utilities Utility locate and BC 1Call required. Mark all lines. Complete Plot Plan.	Med
Heavy Equipment		
<input checked="" type="checkbox"/>	Equipment on site Hydrovac, drill rig, excavator, dump truck, support vehicles	Low
<input checked="" type="checkbox"/>	Hazard Controls Wear appropriate PPE. Make eye contact with drillers and vehicle operators prior to approach. Ensure approach paths for trucks are delineated.	Low
<input checked="" type="checkbox"/>	Open Excavation Cover all exposed boreholes, Delineate excavation boundaries.	Low
<input checked="" type="checkbox"/>	Animal Hazards Be aware of insect allergies.	Low
<input checked="" type="checkbox"/>	Extreme Weather Conditions Monitor weather daily. Keep warm. Take breaks as required.	Low
<input checked="" type="checkbox"/>	Road Conditions Monitor weather. Extra caution during heavy rain. Watch for snow.	Low
<input checked="" type="checkbox"/>	High Traffic Areas Cross only at designated rail crossings. City of NW to provide gate at 6 th Street. Watch for train traffic.	Low
<input checked="" type="checkbox"/>	Materials Handling Do not lift objects over 50lb alone. Be aware of positioning of back/knees.	Low
<input checked="" type="checkbox"/>	Rigging or Towing Perform JSA	Low
<input checked="" type="checkbox"/>	Unstable Slopes/Site Features Trip hazards present. Pier is unstable; avoid driving or walking on pier without inspection. Stay at least 1 metre from edge of excavations.	Low
<input checked="" type="checkbox"/>	Short Service Worker Mentor accordingly. Communicate at Field Safety Meeting.	Low
<input checked="" type="checkbox"/>	Confined Space(s) No confined space entry. Plan for safe egress from excavations.	
<input checked="" type="checkbox"/>	Railroad Tracks Must not conduct work within 9 m of tracks without CN rep. on site.	Low
<input checked="" type="checkbox"/>	Other cell phone Do not use while driving, including hands free.	Med

REQUIRED PPE

Hard Hat Fall Protection Steel Toe Boots Respiratory Protection (specify type): 1/2 mask as requ. Safety Glasses
 Gloves nitrile/leather Hearing Protection Visibility Vest or Striping Fire Resistant Coveralls Other:
 Other: *LOCATION DEVICE? THROW BAG (RESUME LINE) FOR WORK WITHIN 30M OF WATER EDGE*

SITE INSPECTIONS

Number of site inspections planned 1 *PERSONAL* Should the HSE department be involved in the site inspection?
 Dedicated HSE Support required? Number of Hours

SUBCONTRACTOR(S)	ADDITIONAL Monitoring and Safety Equipment	ADDITIONAL SAFETY TRAINING
Subcontractor to be used? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	<input checked="" type="checkbox"/> Personal 4-Gas <input checked="" type="checkbox"/> MSDSs	<input type="checkbox"/> Wildlife Awareness <input checked="" type="checkbox"/> Fit Test <input type="checkbox"/> Confined Space <input type="checkbox"/> ATV
Subcontractor Companies (Subcontractors require approval)	<input type="checkbox"/> Wildlife Deterrent <input type="checkbox"/> Satellite Phone	<input type="checkbox"/> Client Orientation <input checked="" type="checkbox"/> TDG
OneCall, others TBD	<input type="checkbox"/> Other <i>FLOWMETER</i>	<input checked="" type="checkbox"/> Other GD II

PERMITS DOCUMENTS

Ground Disturban Other
 ERP Prepared ERP Must be attached to HTA

VERIFICATION

I have reviewed the WorleyParsons Safety Manual, client requirements and legislation and will adopt controls as specified therein.
 I have reviewed procedures for this project with an HSE advisor A project-specific health and safety manual has been/will be developed.

Project Manager Kelly Forseth	(print)	<i>Kelly Forseth</i>	(sign)	Date: Feb 9, 2010
Site Supervisor Neil Simpson	(print)	<i>Neil Simpson</i>	(sign)	Date: Feb 10, 2010
Site Supervisor	(print)		(sign)	Date:
HSE Advisor Michael Cowdell	(print)	<i>Michael Cowdell</i>	(sign)	Date: 10/02/2010