



photo courtesy of The Fraser River Port Authority

Port Fire Risk Assessment Study

for the

Vancouver Fraser Port Authority



April 2010



VANCOUVER FRASER PORT AUTHORITY

Port Fire Risk Assessment Study

Submitted to:

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I. BACKGROUND AND DESCRIPTION OF VANCOUVER FRASER PORTS

The Vancouver Fraser Port Authority (VFPA) and the City of Vancouver co-sponsored this fire risk and protection study of the marine and land-side port areas under the jurisdiction of the VFPA and bordering 16 different jurisdictions. VFPA was established on January 1, 2008, when the Fraser River Port Authority, North Fraser Port Authority, and Vancouver Port Authority combined to become the Vancouver Fraser Port Authority (VFPA). The merger signalled a strategic move toward regionalization of the assets and management of the contiguous port and marine operations in the area. VFPA manages the operations and development of the 600 kilometres of shoreline that runs from Point Roberts at the Canada/U.S. border through Burrard Inlet to Port Moody and Indian Arm, and from the mouth of the Fraser River, eastward to Kanaka Creek in Maple Ridge, north along the Pitt River to Pitt Lake. Jurisdiction also covers the north and middle arms of the Fraser River.

Of the local fire departments which border the port areas, the City of Vancouver has the largest financial, operations, and management stake of the members of a Fire Boat Consortium. Vancouver owns and maintains the five fireboats that currently supply all the public fire protection coverage for VFPA. Along with the District of North Vancouver, District of Burnaby, City of North Vancouver, and City of Port Moody, the City of Vancouver participates in the Fire Boat Consortium, which for 18 years has served as the regional marine firefighting service responding waterside and landside to fire and rescue incidents. The Consortium does not, however, cover shipboard firefighting which requires significantly more advanced training, staffing, and equipment.

The contract between the VFPA and the Fire Boat Consortium is due to expire in 2011. Many changes in the types of enterprises leasing the land, the number of leases, and development plans for expansion have occurred in the port areas over the last 18 years. There also are two decades of experience now with the fireboats and knowledge of how well the replacing a single, large fire boat with 5 smaller, faster vessels (responding from multiple jurisdictions under a quasi-governmental organization) has served the expectations and requirements of the VFPA and the signatory jurisdictions. The main reason for initiating the study now is due to three factors: the current Consortium agreement will end in 2011, the fireboats are near the end of their useful life and the port's jurisdictional boundaries have increased dramatically.

Description of the Port

Port Metro Vancouver is Canada's largest port. According to their website, Port Metro Vancouver is the most diversified port in North America. The port represents the fourth largest tonnage port in North America, with 28 deep-sea marine cargo terminals, two international cruise terminals, and three Class 1 railroads. It is also one of the most diversified ports in North America and operates across five business sectors: automobiles, break bulk, bulk, container and cruise. The port handles 95 percent of the



Canadian import and export markets, and facilitates trade with more than 130 world economies with nearly 130 million tons of cargo each year. In Burrard Inlet, the majority of the waterfront industries and terminals are tenants of VFPA, which operates under the Canada Marine Act, and is a Responsible Authority under the Canada Port Authority Environmental Regulations.

Over 3,000 vessels carried 114.6 million tons of cargo in 2008. Sixty (60) percent of that annual cargo represented exports to other countries; 12 percent were imports; and domestic cargo shipped to other parts of Canada accounted for 28 percent of the total. By type of terminal, the cargo was distributed as follows:

- Break bulk cargo – 20.6 million tons
- Containerized cargo – 20.5 million tons (in 2.5 TEUs)
- Automobiles – 460,000 tons
- Cruise ships – 855,000 passengers, which helped to support local businesses in the city and surrounding areas.
- Bulk cargo – 73 million tons

In 2008, the bulk cargo tonnage that passed through this port was as follows:

Table 1: Bulk Cargo Tonnage

Commodity	2008 Tonnage (in millions)
Coal	25.9
Chemicals, Metals, and Minerals	11.7
Fertilizers	11.2
Grain, Specialty Crops, and Feed	11.1
Petroleum Products	7.3
Forest Products	4.4
Machinery, Vehicles, Construction, and Materials	.82
Processed food Products	.75
Total For Bulk Cargo	73

Some of the same cargos that passed through Port Metro Vancouver also were handled in terminals located along the Fraser River. However, unique to the Fraser River are the two automobile terminals. Allenius Wilhelmsen Logistics (WWL) auto terminal handles BMW, Honda, Hyundai, Kia, Mercedes Benz, Mitsubishi, Nissan and Subaru. Fraser Wharves handles GM Daewoo, Lexus, Mazda, Toyota, and Suzuki. Also, much of the Fraser River coastal trade consists of log tows, sand and gravel operations (approximately 22 million tons), fisheries, and cement factories. It is along the River that float home communities are found. There is little coastal cargo in Vancouver. The Fraser River has 3 deep-sea terminals handling approximately 2-2.5 million tons, while BI/Delta Port has over 25 deep-sea terminals handling approximately 70 million tons of cargo. Future growth along the Fraser River is likely to alter the profile of cargo and facilities to some degree.

The port is a significant contributor to the region's economy, and there is competition between the Port Metro Vancouver and ports along the west coast of the United States. If a major incident like a terminal or ship fire were to block a major channel, the incident could have a substantial impact on the local, regional (and possibly national) economy. Almost 44,000 jobs and \$37.2M in wages annually are distributed among the regions' 16 communities (Appendix A). For the economic health of the local, provisional, and federal governments, it is essential to ensure protection and marine safety, including water rescue. A Port Fire Hazard Analysis from 1990 noted that nearly 63 percent of all waterfront sites at that time required a water-side firefighting capability to ensure adequate fire protection. That percentage did not include the fire protection requirements that existed from ships at anchor.

Port Users and Lease Holders

There are dozens of lease holders operating and managing the array of terminals and port uses. Following is a description of the key industries, types of commodities, and capacities which make up the Vancouver and Fraser River Port areas.

Oil, Petroleum, Petro-Chemicals

- **Kinder-Morgan's** terminal located at the Vancouver Wharves has four fuel tanks available: two 100,000 barrel unit (bbl) tanks and two 25,000 bbl tanks. The company's Marine Terminal is designated for crude oil exports and jet fuel imports and storage. The main dock can accommodate vessels up to 250 meters long with maximum of 100 thousand deadweight tonnage (DWT)¹ (over 700,000 barrels or 111,291,106 litres). The storage tanks for jet fuel have capacity for 45 cubic meters, and the terminal is connected to off-site storage with capacity for about 120 thousand cubic meters of crude oil. The terminal has capacity to load 2.6 thousand cubic meters per hour (2,600,000 Litres) and to unload 1.6 thousand cubic meters per hour. (Also listed under Bulk)
- **Kinder Morgan Westridge** is a petroleum terminal located in Burnaby. The terminal imports and stores aviation turbine fuel for delivery to Vancouver International Airport via Kinder Morgan's jet fuel pipeline. It handles crude petroleum, petroleum products, and jet fuel.
- The **Stanovan Terminal** at Burnaby in Port Metro Vancouver's Burrard Inlet is a 52-thousand barrel refinery producing gasoline, diesel, jet fuel, and asphalt.
- **PetroCanada** one of Canada's biggest integrated oil and gas companies, operates its facility in Burnaby in Port Metro Vancouver's Burrard Inlet.



¹ DWT – A ship's carrying capacity, including the weight of crew, passengers, fuel, ballast water, drinking water, and provisions.

- **Imperial Oil IOCO** handles fuel oils and marine gas oil at two berths for barges and coastal tankers up to 15 thousand DWT and up to 135 meters long with maximum draft of 8.8 meters.
- **Shellburn** is a petroleum distribution terminal operated by Shell Canada Ltd. and is located in Burnaby.

Chemicals/Minerals

- **Dow Chemical's** 3-hectare terminal handles caustic soda solution, ethylene dichloride, and ethylene glycol. The facility can store 36 thousand tons of caustic soda and 26 thousand tons of ethylene dichloride.
- **CANEXUS Chemicals** The facility produces chlorine, sodium hydroxide, and hydrochloric acid.
- **Kinder Morgan at Vancouver Wharves** handles over 3 million tons of bulk cargo annually including sulphur, mineral concentrates, wood pellets, and specialty agricultural products (also listed under Oil)
- **Pacific Coast Terminals** loads over 3.5 million tons of sulfur and 750 thousand tons of ethylene glycol every year. The terminal has the capacity to store 220 thousand tons of sulfur, 55 thousand tons of ethylene glycol, and an additional 11.2 thousand tons in currently unused tanks. Pacific Coast Terminals has infrastructure to store an additional 15 thousand tons.
- **Univar Canada Terminal** is located on the north shore of Burrard Inlet and is operated by Univar Canada, the leading chemical distributor in Canada. It was formerly operated as Dow Chemical Terminal and handles caustic soda solution and ethylene glycol.

Coal

- **Neptune Bulk Terminals** is the biggest multi-product bulk terminal in North America. Berth 1 has storage capacity for 600 thousand tons of coal.
- **Westshore Terminals** at Port Metro Vancouver is the leading coal export facility in Canada and the biggest dry bulk terminal on the western coast of the Americas. The 40-hectare Westshore Terminals handle coal and coke. Berth 1 can accommodate vessels up to 260 thousand DWT.

Grains

- **Agricore United** is a farmer-directed agri-business and one of the biggest grain-handling and –marketing businesses in Canada. Agricore United markets grain and

grain products grain and grain products both internationally and domestically. The facility has capacity to store over 102 thousand tons of cargo, and it is served by two intercontinental railways.

- **Alliance Grain Terminal** located on the south shore of Burrard Inlet, is a leading Canadian farmer-directed agri-business and one of Canada's largest grain handling businesses. It handles grain and grain products. Operator: AGT
- The **Cargill terminal**, located on the north shore of Burrard Inlet, is a grain terminal operated by Cargill Limited, one of Canada's largest agricultural merchandisers and processors. It handles wheat, durum, canola, barley and grain by-products.
- **James Richardson International (JRI)** terminal exports an average three million metric tons of grain every year. Its berth has capacity to store 108 thousand tons of grain.
- **Neptune Bulk Terminals** is the biggest multi-product bulk terminal in North America.
- **Richardson International** located on the north shore of Burrard Inlet, is a major exporter of canola and cereal grains to trading economies along the Pacific Rim. It handles wheat, canola, barley, rye, flax, grain, and feed products.
- **Saskatchewan Wheat Pool** operates the Cascadia Terminal under the name Viterra. Pacific Elevators is also owned and operated by Viterra. Each facility handles wheat, canola, durum, barley, and grain by-products at two berths. Each berth is 230 meters long with alongside depth of 15.5 meters, and the facility has capacity to store 240 thousand tons of grain.
- **Cascadia Terminal** handles wheat, canola, barley, durum, rye, oats, and by-products. The facility has capacity to store 282 thousand metric tons of cargo.
- **Pacific Elevators** is also owned and operated by Viterra. Handling canola, peas, flax, agri-forage, and by-products, the Pacific Elevators facilities contain three berths. The Pacific Elevators facility includes storage capacity for 199 thousand metric tons of cargo, and it is served by rail.

Sugar

- **Lantic Inc. Rogers Sugar's** Vancouver refinery can produce up to 240,000 tons of sugar per year from imported raw cane sugar. The total annual production is dependent on market requirements and on the production from the Taber beet sugar factory. The products include granulated sugar of various grist sizes, sugar cubes, icing sugar, liquid sugars, and soft sugars. Molasses is produced as a by-product.

Break Bulk Terminals

- **Centerm**, located on the south shore of Burrard Inlet handles both break bulk cargoes and containers. The container yard has capacity to store 12 thousand TEUs. (Also listed under Containers.)
- **Kinder Morgan Vancouver Wharves** is located on the north shore of Burrard Inlet, Kinder Morgan Vancouver Wharves offers services for bulk and break bulk shippers moving products to and from all regions of Western Canada and the Pacific Northwest. It handles break bulk pulp, bulk mineral concentrates liquids, sulphur/fertilizers, specialty agri-products and other dry bulk commodities. (Also listed under bulk.)



- **Lynnterm East Gate and West Gate** Located on the north shore of Burrard Inlet, the Lynnterm facility is the consolidation centre for forest products, steel and break bulk in the Pacific Northwest. It handles wood pulp and paper, lumber, panel products, logs, steel products, project cargo, and machinery. Operator: Western Stevedoring Company Ltd.
- Fraser Surrey Docks

Intermodal Cargo

- **Centerm**, located on the south shore of Burrard Inlet handles both break bulk cargoes and containers. The container yard has capacity to store 12 thousand TEUs.
- **Vanterm** is a 31-hectare modern, fully-equipped twin-berth container terminal. The container yard can accommodate seven thousand full TEUs.



- Fraser Surrey Docks
- DeltaPort

Cruise Terminals

In 2008, from May to September, more than 850,000 revenue passengers on some 254 sailings, passed through the port's two cruise terminals.

- **Ballantyne** is one of two Vancouver cruise terminals and is located east of the city centre, adjacent to the Centerm container terminal.
- **Canada Place** is one of two Vancouver cruise terminals and is located in the Vancouver city centre.

Fisheries and Fishing Boat Fleeting Areas

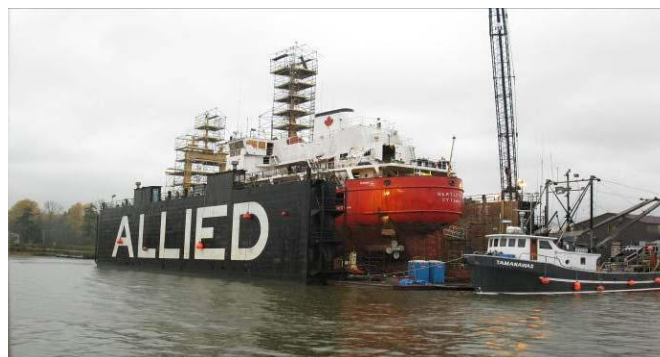
Commercial fishing enterprises and docks include:

- Albion Fisheries Ltd. Sales
- Oceanic Fisheries Inc.
- Sea World Fisheries Ltd.
- Hi-To Fisheries Ltd.
- Ocean Fisheries Ltd.



Ship Repair Facilities

Several marine repair facilities are located throughout the port. Some are designed for small pleasure boat repair and some can handle much larger vessels.



Ferries and Excursion Boats

There are numerous excursion boat companies operating in the port. Some are just for sightseeing while others may include dining and dancing.



Ferry terminals such as the Horseshoe Bay Terminal and the SeaBus connecting downtown Vancouver with the North Shore, provide a valuable service. Several new ferry routes are planned which will increase the number of ferries as well as the numbers of passengers which need protection.

Marinas

The many marinas located in Vancouver and the Fraser River contain docking, fuelling, and in some cases sales and repair of all types and sizes of pleasure craft. The Richmond and Delta area, as well as Howe Sound, contain seven marinas; there are nine marinas in False Creek; four marinas and a cruise terminal in Burrard Inlet West, and three marinas in Burrard Inlet East/Indian Arm. There are two launching ramps, one at Gates Park and the other at Rocky Point.

Miscellaneous

West Coast Reduction is located on the south shore of Burrard Inlet and is a leader in the rendering industry, operating technologically advanced rendering plants of fat and oil products. It handles inedible tallow, feather meal, poultry meal, blood meal, fish meals, and fish oil.

II. PORT AREA FIRE HAZARDS AND RISKS

Fire risks and hazards exist throughout Port Metro Vancouver. The nature and level of risk align directly with the type of cargo in any given location, the built-in fire prevention and safety measures in place, the operator's safety record in general, the condition of the infrastructure involved, and the proximity, response time, and capacity of fire suppression resources. Most of the baseline data for these areas was not available, though we requested the information. To complete the profile of risks will require that Port Metro Vancouver and the array of port operators collect information on the built-in prevention measures, the condition of infrastructure, and the safety records at each port site; and response data from the relevant fire departments to every port area service call. As noted, this information could not be obtained during our study. One of the first steps in ascertaining what additional resources are needed for port fire protection is to identify the fire hazards that exist at present.

Types of Hazards

The fire hazards present in the port range from those which represent a potentially high impact threat (e.g., those related to oil and petroleum products and other hazardous materials) at the high end to lesser threats of more limited impact, such as float homes. Each type of fire hazard is discussed in this next section.

Oil and petroleum products generally present the greatest potential risk within any port to life, property and the environment. Precautions are taken and safeguards are in place, but the possibility of human error, natural disaster, or terrorist act must be considered. Oil facilities within the Port Metro Vancouver have tank capacities in excess of 300,000 barrels. A relatively small oil tanker can carry 1-million barrels of oil. With so many oil facilities directly within the harbour, and adjacent to urbanized areas in the City of Vancouver, the City of Burnaby, and the City of Port Moody, there is the potential for a large scale incident either with one or two of the large oil tankers or within one of the facilities or both. Such an incident could threaten the adjacent land areas. Though all ports are regulated and must comply with fire codes and other statutory requirements, there usually are some facilities that do not entirely comply with regulations, and human error is always possible. The existence of regulations does not obviate the possibility of disaster. The area of greatest risk is the eastern portion of Burrard Inlet where the Chevron, Kindermorgan Westridge and Shell Canada facilities are located, as well as the Port Moody Arm directly east where IOCO and PetroCanada have operations.

Vessel collisions have been the cause of many devastating, costly, and time consuming oil-fed marine fires in the past. The port has established numerous requirements and procedures to help prevent vessel collisions, including: Clear passage for tanker vessels (not other vessels transit at the same time)

- Tug escorts to arrest the vessel from loss of power/steerage
- Redundant shipboard systems
- Two pilots for deep draft tanker vessels
- Independent piloting units etc

However, even with the above safety procedures and those listed in the VFPA Harbour Operations Manual plus the requirement for doubled hulled tankers with gas inserting systems, accidents are still possible. Several collisions which have occurred at other ports make the case for how essential adequate response capabilities are to cover potential collisions and resultant fires from vessels carrying hazardous materials. The two cases profiled below provide an idea of how serious the threat can be. In the first accident involving the collision of 2 tankers, there was a licensed pilot aboard each vessel, one of the vessels was under tug escort, and the collision occurred in excellent visibility in a well-regulated part of the Port of New York/New Jersey.

The mechanical failure of a \$1.00 Allen screw, which was an integral part of the steering system, caused the 1973 collision and fire of the ESSO Brussels and the CV Sea Witch in New York harbour with 16 dead and the total loss of both ships. New York harbour was closed to shipping during the fire.

Collision and Fire of the ESSO Brussels and the CV Sea Witch



“Both ships were now locked together from the force of their collision and were being dragged down the Narrows by the engines of the Sea Witch, still locked in full reverse and unable to be controlled. Flames from the burning oil radiated 200 feet out from both ships as they moved down the channel and rose so high that they scorched the bottom of the Verrazano-Narrows Bridge, 228 feet above the water’s surface, as the ships passed beneath. Fortunately, the anchor chains on the Esso Brussels had parted at this point and both ships passed under the bridge quickly, preventing the steel from suffering heat damage. Propelled by the Sea Witch and the outbound tide, the ships proceeded into outer New York Harbour and ran aground in Gravesend Bay, burning furiously.” USCG accident report

On June 16, 1966, there was a collision and fire between the 546-foot British tanker MV Alva Cape and the 604-foot American tanker SS Texaco Massachusetts. On a clear day in New York harbour an out-bound empty gasoline tanker collided with a fully-loaded in-bound naphtha tanker. Thirty three (33) lives were lost, both ships were total losses and the New Jersey Port was closed for 24 hours. Five fireboats from the Fire Department of New York were used to bring the blaze under control.

Collision and Fire of the MV Alva Cape and the SS Texaco Massachusetts



Errors in judgment by the navigators aboard two tanker ships carrying volatile cargos resulted in a collision, explosion and fire that consumed both tankers, two attending tugs and left 37 sailors dead and more than 20 injured in New York harbour on June 16, 1966. The fiery accident remains counted even today as among the deadliest shipwrecks in the history of New York Harbour. The tankers, the British MV Alva Cape was entering the harbour with a cargo of naphtha and was struck amidships on the starboard side by the outgoing American tanker Texaco Massachusetts. The raging explosion and fire that resulted from the crash destroyed not only the tankers but the tugs Latin America and Esso Vermont. The U.S. Navy, Coast Guard and New York City fire boats worked together to battle the flames and rescue as many sailors as possible from the burning vessels in a place with the ominous name of Kill Van Kull Channel. Great and Lost Ships of the World by James Donahue

Combustible Dusts

Dust explosions are a risk in ports. Such incidents have caused the destruction of facilities and major loss of life and have impacted local and regional economies in the past.

Dusts are generated from the normal handling of many products which enter and leave Port Metro Vancouver. Dust explosions are possible in any process where combustible dusts are present including sugar, grains, flour, coal, and so forth. Numerous incidents of devastating explosions in grain storage facilities have kept the danger of grain dust in the forefront of port risk



assessments. Fire safety regulations and inspections attempt to keep these incidents to a minimum, however, they still occur.

Some of the potentially dangerous dusts often are not recognized as being safety risks. An example of this was the 2008 explosion and fire caused by sugar dust at the Port Wentworth, Georgia (United States) which killed 13 people and injured 42. Investigators revealed that the basement beneath the storage silos was the likely area of origin in that incident. The refinery occupied 160 acres, was old and outdated. Buildings were 6-8 stories high with only narrow space between them. The fire and explosion devastated the sugar refinery. Firefighters and emergency medical services from more than a dozen jurisdictions responded. The United States Coast Guard closed off the river in the area, and a firefighting tug boat was used to douse the resulting fire from the river while a helicopter was used to search the river for anyone who may have been thrown into it by the blast. Refinery workers were brought in to assist with search and rescue operations as emergency services personnel were unfamiliar with the plant's layout.

Fires and explosions from dust are a potential threat at such terminals as the Cascadia, Alliance Grain, and James Richardson International terminals; as well as at the Rogers Sugar, Centerm, Cargill Vancouver, and Lynnterm terminals. The Ballyntyne cruise terminal presents a particular life exposure risk.

Hazardous Materials

Hazardous materials can be found in almost any facility within the port and aboard any ship visiting the port. Many of the hazardous materials may be of small quantities, but if the material is highly dangerous, even a small amount may be problematic. Several facilities in the port operate with large quantities of hazardous materials which are the mainstay of that facility. Chemical products in the port may be reactive when they come into contact with water, with another chemical also loaded or unloaded at the facility, or simply when in contact with the air.

If there were to be a hazardous materials release at a port facility, or a fire involving hazardous materials, the immediate area and possibly a larger area might have to be evacuated. Chemical facilities, container facilities and petroleum facilities present hazardous materials concerns. There could be spills from offloading/load errors, collisions, or sinking which have the potential for causing a major ecological and financial disaster. Marine life and aquatic birds could be affected. Pristine shorelines could be damaged. Depending on the quantity and impact of the hazardous materials involved in an incident, tourism and port business could be disrupted.

The District of North Vancouver borders large chemical terminals, specifically, Canexus (chlorine, caustic soda, salt, etc.) and Dow Chemical (ethylene glycol, ethylene dichloride, and caustic soda, etc.), while the City of Port Moody is where Pacific Coast Terminals (ethylene glycol and sulphur) is located. Kinder Morgan Vancouver Wharves, located at the southern end of the border between the District of West Vancouver and the District of North Vancouver, operates shipments of sulphur, mineral concentrates, ammonium sulphate, urea, and agri-bulk products, among others.

Extreme care and extensive knowledge of the chemicals involved are essential by facility workers, and especially by the first responders who will be entering the facility under emergency situations. No extinguishment action can be undertaken until the properties and reactivity of the product involved is understood.

Intermodal containers often carry hazardous materials, and procedures for dealing with a hazardous materials incident either aboard a ship or on land must be set up in advance with the first responders as well as the ship and facility employees.

Roll On/Roll Off Car-Carrying Facilities

The Fraser River is home two large “Ro Ro” facilities. Some of these ships are the largest to visit the port and capable of carrying 6,000 cars or more. While still aboard the ship, these cars

represent a fire risk from the fuel which is in each car's fuel tank to enable it to drive on and off the ship. The cars' combustible interior, tires, and hydraulic systems also present the same risk as a car fire on the street, only in this case the fire can be multiplied by 6,000 and the cars are concentrated in a confined area. The inside of the car-carrying vessels are cavernous, undivided decks sometimes 600 feet long. The decks are all hydraulically operated so they can raise and lower depending on the size of the vehicle carried on that deck. The cargo areas are protected by low pressure CO2 systems which can flood the car decks with the extinguishing agent. The CO2 may not completely extinguish the fire and land-based firefighters may have to stretch long distances in order to perform overhaul and final extinguishment.



Forest Product Facilities

Many forest product facilities on the Fraser River appear to be in substantial disrepair, and some, with their wood construction coupled with the wood products they handle, would pose an extremely difficult fire to handle. Vital to the area's economy, this active business will run around the clock when the demand is high. With the economic downturn however, production is slow and in some cases halted. Fires during a down economy are not uncommon.



Machinery in these facilities may also pose a problem for firefighters. Hydraulic machinery and large cutting and stripping machinery can pose a danger to anyone operating in these facilities. The pulp that is collected during the processing is also a very marketable commodity. It is used to create fuel pellets which can then be burned in stoves and fireplaces. While in storage and transit this wood pulp is susceptible to spontaneous combustion.

This self-heating can build up enough heat to start a barge load of this product to start smouldering. While not a major fire, this could be an arduous and time-consuming operation to extinguish the burning pulp as it is slowly unloaded.

Smaller Boat Fires and Emergencies

Some of the smaller vessels operating within the harbour present a unique hazard of their own. Excursion boats and ferries, in addition to posing the usual fire risk of a vessel's engine room, have a more important and immediate concern. The number of people onboard these vessels present a life hazard that would have to be addressed immediately in the event of a fire or emergency. BC Ferries experienced a fire in October, 2009, which resulted in the cancelling of eight sailings that day along a busy route.



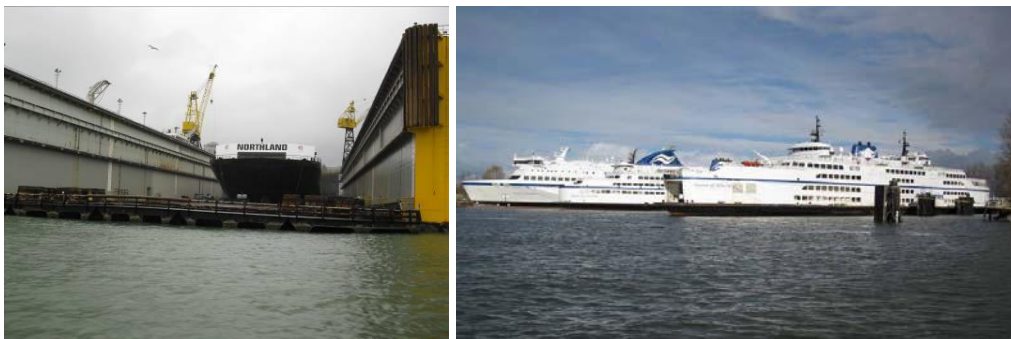
Shipboard Fires

Whether at anchor or docked, large ships represent a fire hazard. First is the hazard to the vessel itself, the crew, and the cargo. Cruise ships have the added risk of a large number of passengers. There is a direct life hazard if there is a fire or explosion on the ship, and this may also directly impact the safety of firefighters who respond, and, if the ship is docked, to civilians in the immediate port vicinity. Smoke and hazardous materials involved in the fire could impact a large area and require evacuation of residents and businesses. The very young, elderly, and chronically ill would be at greatest risk from the impact of smoke and toxic gases.

If a large ship were to sink and obstruct a major channel, the disruption to marine commerce in this very busy port would have local, regional, and possibly national economic ramifications. This is another reason why shipboard firefighting training is so crucial. Lack of knowledge of vessel stability and the hazards of the “Free Surface Effect” that might be caused by water from firefighting operations could cause a vessel to catastrophically capsize at a dock or in a major channel.

Ship Repair Facilities

There are numerous facilities throughout the port that handle ships and boats of all sizes. When a vessel is undergoing repairs in these facilities, the ship’s systems are usually disabled or there is no power being supplied by the vessel itself. If a fire occurs under these conditions, most fire water mains aboard the vessel will be dry and incapable of supplying water. Also, in some cases, fixed extinguishing systems that would normally protect below deck areas will not be functioning.



Although the large BC Ferries do not pick up or discharge passengers in the port, the lay-up yard for these large vessels is located in the Fraser River. These large vessels may be undergoing repairs or simply in storage. Fires are still possible and this possibility should be addressed and pre-fire plans made up to handle any eventuality.

Marinas

The port's numerous marinas provide enjoyment for many. The boats range from small runabouts to large ocean-going yachts. The value of the boats can range in the millions. Fighting a fire in a marina environment can be a very challenging operation, even for a well-trained fire Department. With boat fuel tanks sometimes holding in excess of 100 gallons of unleaded gasoline and hundreds of boats tied up with little space in between vessels, there is an exposure hazard which may cause the fire to extend rapidly. This is especially true of covered marinas where boats are stored under roofs which will act to hold the heat and flame above all the boats and serve as an overhead conduit for the fire.



Fires in these marinas can and do occur. The recent marina fire and explosion at Palms Harbourside Marina in Nanaimo's harbour illustrates the fire risks present at marinas. That fire caused nearly \$1 million in damages. Three boats were destroyed by the blaze and sank in their slips. Local firefighters fought to control the fire on the docks, and some of the firefighters worked on burning boats that had been cut loose from the docks to prevent further extension to the docks and marina. The photo below shows fire crews extinguishing a blaze at Coal Harbour Marina.



By Gerry Bellett, Vancouver Sun, October 13, 2009

Floating Homes

The Fraser River is home to numerous communities of floating homes. Some of these on-water structures are beautifully maintained and are an asset to the community, adding beauty to the river bank. Others, however, are in substandard condition. Regardless of their condition, these structures represent a fire hazard not easily reached by land-based firefighters. A fireboat may represent the first water or the only water on a fire in one of these homes.



III. MARINE FIRE PROTECTION RESOURCES

Nearly all of the fire suppression resources which have been organized to support port fire protection are attached to local fire departments supported by the jurisdictions bordering the extensive jurisdiction of the Vancouver Fraser Port Authority (VFPA). All the fire departments can respond from the land to suppress fires within the built environment along the water. Through the Fire Boat Consortium, as discussed earlier, five of the departments contribute personnel and training time to support operation of the fleet of five fireboats. These departments are from North Vancouver District, Burnaby, North Vancouver City, Port Moody, and the City of Vancouver.

When the Consortium was established members assessed the need for port fire suppression resources on the premise that fire suppression requirements along the marine environment would be predominantly those associated with structural fires, an occasional wharf fire, pleasure craft fires, and fires in working vessels such as tugs and fishing boats. The mission did not include shipboard firefighting.

To meet this need, the Consortium members, with the port authority, financed the purchase of five small, fast-response fireboats, and set about training firefighters to operate the boats. Representatives of the Consortium explained during a meeting with TriData that local governments did not believe that shipboard firefighting, which has a much higher threshold for training, and equipment, should be the responsibility of their fire departments anymore than law enforcement aboard a ship would factor into the basic services of their police departments. At that meeting, local officials indicated that that viewpoint remains today: shipboard firefighting is the responsibility of the vessel owners and operators who are required to have on-board firefighting capabilities and trained crews. VFPA officials also agree that shipboard firefighting should be primarily the responsibility of vessel owners and operators. We concur.

Participating fire departments in the Consortium along with the VFPA contributed initial funds to purchase five fireboats and begin operations. The initial funding level for Consortium members and VFPA to purchase five fireboats in 1991 were:

Table 2: Initial Funding Levels by Jurisdiction

Jurisdiction	Amount	Percentage
North Vancouver District	\$174K	5.8%
Burnaby	\$240K	8.0%
North Vancouver City	\$159K	5.3%
Port Moody	\$69K	2.3%
City of Vancouver	\$858K	28.6%
Port Authority	\$1.5M	50.0%
Total	\$3.0M	100.0%

Following its initial fund contribution, each jurisdiction was then required to contribute an annual amount to maintain the five fireboats and provide training for personnel in the various departments, per the contract. However, VFPA, which contributed \$1.5M (50 percent) of the initial cost in 1991, is not required to contribute to the cost of maintaining the fireboats or related costs such as training, administration, or other expenditures. This arrangement has resulted in a burden on the fire departments, because maintenance costs have been higher than were originally factored into the Consortium agreement. That agreement included several key elements:²

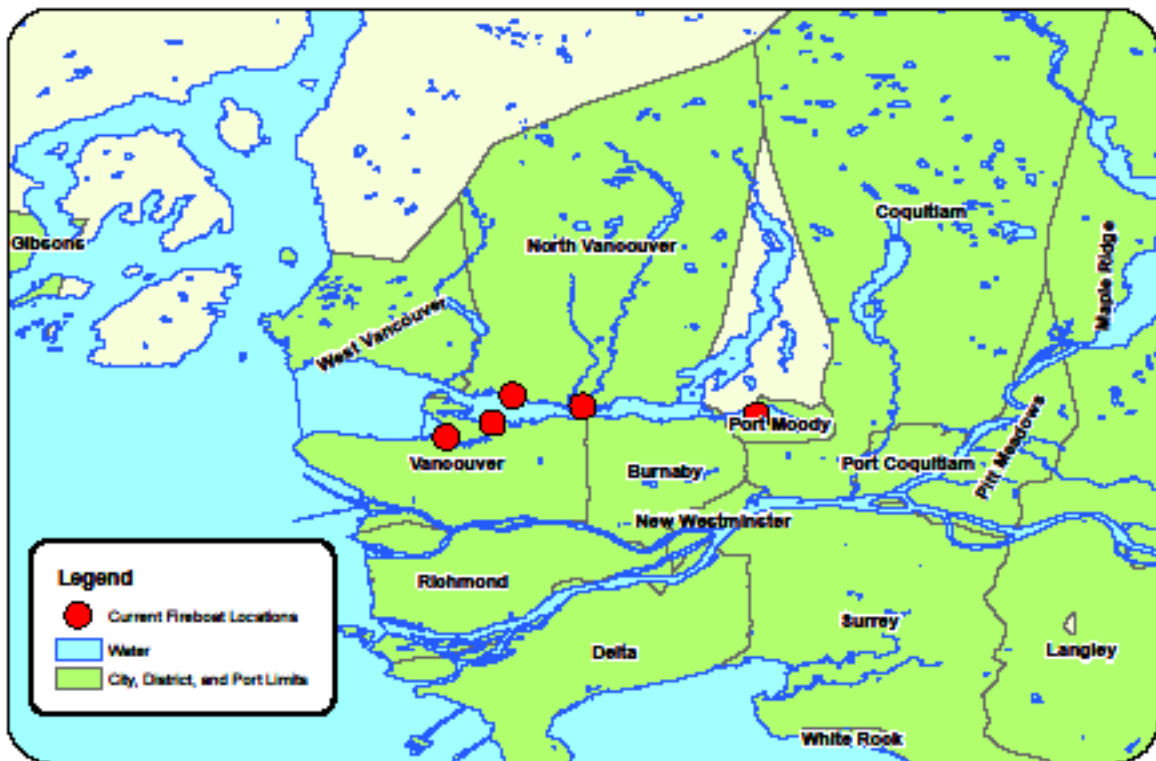
- The agreement was valid for 20 years.
- Five small fireboats would be purchased.
- The City of Vancouver was designated as the lead for the fireboats, which would then be operated by them as well as other signatory departments in the port.
- The City of Vancouver would handle most of the required maintenance.
- The City of Vancouver would not acquire any additional, new fireboats or resources unless agreed to by the Consortium.
- Municipalities in possession of and responsible for the operation of a fireboat were to pay for minor repairs on their boat.
- A reserve fund of five percent of the total capital cost was added in 1993
- A “Management Committee” of one representative from each jurisdiction was established.
- A “Fire Protection Operations Committee” was created, consisting of a fire chief or deputy fire chief from each jurisdiction and a representative of the Harbour Master (Port).

² Operating and Management Agreement; Marine Firefighting Services in the Port of Vancouver, August 27, 1991.

- Bi-annual meetings were to be held in April and October.

Two fireboats (1 and 5) are located in the City of Vancouver, one at the Main Street dock and one in False Creek. The remaining three fireboats are located in and operated by, the communities of Port Moody and Burnaby (who share one boat), the City of North Vancouver, and the District of North Vancouver. The following map shows the location of the current fireboats.

Current Fireboat Locations



Paramount to the development of the fireboats was that they would be primarily for fire suppression, not water-related rescue. While some of the Consortium departments do provide some aspects of water rescue, overall it is not considered a primary responsibility for the fire departments. In one department, the responders that we spoke with stated that they may not even be called to respond in the event of a seaplane accident or other such accident in the port. The incident, they stated, would probably be handled by the police department, coast guard or other agency. We maintain that rescue is an integral part of all fire protection operations and that all the fire departments associated with any future Consortium or regional response plan should be equipped and trained in water rescue (including a dive team) as well as fire suppression.

The life expectancy of the current boats used by the Consortium is only 20 years. The fact is, the boats are at the end of their useful lifespan and they need to be replaced in the next few years. Realistically, several of the boats in slightly better condition than the others could probably have their life extended for three to five more years with good maintenance and more major repairs to the hulls, cooling systems, fire pumps, engines and propulsion system. Fortunately, major incidents within the port’s area of operation over the last two decades, have been few. As far as we could tell, there have been no major shipboard fires in recent years and other calls for the current fireboats have not been high. A number of recent incidents have occurred that were handled by the local departments without major assistance from port authorities (Appendices B–E).

An immediate need is to determine how many of the smaller fire/ rescue boats will be deployed in the region and then develop a schedule to purchase new boats. There is no reliable data to analyze the situation, however, and remedying this almost total lack of consistent and complete data needs to become a major priority as soon as possible. Since 2005, records show that 87 incidents occurred within the environs of the Port of Vancouver, which does not include the Fraser River that is now part of the port. Records provided by the fire departments are incomplete and there are no standards for incident reporting. Fireboat 4, operated by North Vancouver District, had the most responses (36). Table 3 shows the calls responded to by Consortium members from 2005 through mid-December 2009.

Table 3: Fireboat Responses, 2005–2009

Unit	2005	2006	2007	2008	2009³	Total	Average
Fireboat 1 – City of Vancouver (Main Street Dock)	Not Reported	Not Reported	5	10	2	17	3.4
Fireboat 2 – City of North Vancouver	Not Reported	1	2	3	Not Reported	6	2.4
Fireboat 3 – City of Burnaby shared with City of Port Moody	3 Not Reported	2 Not Reported	2 0	2 4	6 2	15 6	3 2.4
Fireboat 4 – North Vancouver District	11	8	3	7	9	36	7.2
Fireboat 5 – City of Vancouver (False Creek)	Not Reported	Not Reported	1	2	4	7	2.8
Total	14	11	13	28	23	87	17.4
Average	2.8	2.2	2.6	5.6	4.6	-	-

Note: Burnaby and Port Moody share Fireboat 3 and rotate the responsibility of staffing the unit.

³ Data for 2009 is up to December 7, 2009.

Data on the types of calls handled or losses was either nonexistent or so inconsistent that we were unable to provide any analysis.

Private Fire Protection Resources in the Ports

Tugboat – Currently there are no dedicated marine foam delivery systems within the port. There is a tug boat owned by Smit which has firefighting foam capabilities and is designed for shipboard firefighting. This tug has two firefighting monitors which can be used to deliver either water or foam. (See photo below). The boat's foam system is comprised of electrically driven foam pumps with a capacity of 18 m³/hr at 17 bar. The foam tank can hold 12.9 m³ of foam concentrate.



Even if new fireboats with foam delivery systems for shipboard firefighting become available in the port this local resource should be explored. Familiarization visits and operational drills should be scheduled with Smit. The management of Smit seemed very cooperative and willing to work with the port and with all of the port's municipal fire departments. This is the only type of equipment that will work on a large scale oil fire, especially if the fire is aboard one of the many bulk liquid tankers which use the port.

Water supply is another concern in fighting marine fires. The same Smit tug just mentioned while discussing firefighting foam can be used to help solve this problem. The large fire monitors are capable of throwing a stream of 600 m³/hr for one monitor and 300 m³/hr from the other. In addition there is a hose manifold with four 2 ½" connections where firefighters can attach their fire hoses so that the boat can supply its large volume of water to the land or to firefighters on the deck of a ship.

This boat would not always be available, so it should not be relied on as a primary or exclusive resource. However, its powerful firefighting capabilities should be used whenever

possible. Port firefighters should make arrangements to familiarize themselves with this boat and realistic drills should incorporate this vessel in any marine fire scenario.

The VFPA should also look into the possibility of contracting with any other large scale firefighting tug boat which may become available, especially in the Fraser River area. With the expected expansion of that river's facilities new recourses such as this may become available.

Ferries and Barges

Another resource in the port that may be able to supply back-up to an initial fireboat response is at Seaspan ferry facility. The ferry is designed to transport trucks and intermodal containers. The port and local municipalities should research the possibility of having one or more fire apparatus respond to a ship fire on this ferry. They could then use their pumping capability and as well as elevated nozzles on ladders and platforms to operate on the ship fire.



The VFPA should also look into the possibility of using a barge to operate in the same manner as the ferry mentioned above. In this case landing and loading areas would have to be found that would allow fire apparatus to be driven aboard at all tide levels. Indeed, there is a precedent for this option. At one time the City of Vancouver berthed two barges in the vicinity of Number 10 Fire Hall on the Burrard Inlet. Each barge was equipped with two 90 horsepower engines which could pump approximately 500 gallons per minute. In many cases there may already be facilities with ramps (see photo) which may be suitable for the loading and unloading of fire apparatus onto a barge. Fire departments along with the Port Authority should canvass the port community to find such existing facilities to save the expense of building a dedicated ramp.

Caution: In both cases, no apparatus should ever be brought aboard a ferry or barge until a complete engineering feasibility study is undertaken to determine if the ferry or barge can handle the load and maintain stability while firefighting operations are being conducted.

IV. PROBLEMS WITH THE FIREBOATS AND GAPS IN PORT FIRE RESPONSE CAPABILITIES

Much has changed over the past 18 years since the Consortium was established, including the merger of the Fraser River Port Authority, North Fraser Port Authority and the Port of Vancouver into what is now a much larger port facility of VFPA. Although the current cooperation of the five departments is a good start, in its present form it is not likely to meet the needs of the expanded port, in particular Fraser River, which is expected to see considerable expansion in the future. A replacement of the 100 year-old railroad bridge which hinders large tankers from accessing the upper portions of the Fraser River is planned, precisely with expanded commercial river traffic in mind. As this part of the port grows, adding facilities and terminals, so too will the requirements for fire protection expand.

There are also issues with funding because the City of Vancouver is supporting the Consortium by providing services not covered by the Consortium's annual budget appropriation. Training of personnel is also a problem as is the location of current resources. Areas of concern that should be addressed when a new 'agreement' is considered are:

1. Small fireboats already deployed in VFPA are poorly distributed with regard to the expanded port area that now includes the Fraser River.
2. Coordination among the five departments of the Consortium could be better; the absence of a designated individual to coordinate port fire protection is an obvious gap.
3. Funding is insufficient and the reserve fund for fireboat replacement is being depleted. The contingency reserve fund was also to be used for "major repairs and expenses or equipment replacement (see section 11 that then indicates "for the purposes stated in clause 13.") Some members of the Consortium have stated at annual meetings that this fund was not intended for Fireboat replacement and, if they stay to the end of the agreement, any funds that remained in the reserve are to be returned to each department clause 40.
4. A lack of understanding exists between the Consortium members and VFPA officials on how a major shipboard fire is to be handled.
5. Currently, there are no shipboard firefighting response capabilities in the port. Protocols for managing and suppressing ship fires are very limited and incomplete.

6. Data collection as it relates to fire and rescue incidents among the various fire departments and VFPA is poor; the problem, if it continues, will make future need assessments a continued problem.
7. The current cost-sharing formula used by the Consortium is outdated. There is also a need for VFPA to assume more of the cost burden for future fire protection in the port environment, particularly for shipboard firefighting. A discussion of suggested cost-sharing partners follows.
8. Owner-operated resources, such as a large fireboat, are available for shipboard firefighting. Planning among local fire departments, VFPA, and owners who operate the tugboat with fire suppression capabilities and other resources would be valuable to conduct.

With the current agreement set to expire in 2011, VFPA and the many fire departments within the region recognize that now is the time to improve fire protection and water-rescue capabilities. Due to the potential for economic loss in the entire region from a major port-related incident, Provincial officials should also be included in the discussions and any final decision.

Problem 1: Budget and Cost-Sharing for Current Fire Boat Operations

Initial funding for the Fireboat Consortium was \$3M, of which the port provided \$1.5M. Originally, population estimates and data from the Class Four Major Industrial Property Assessment were the basis for apportionment of costs among the participating parties. Costs covered the expense of purchasing and maintaining five identical fire/rescue vessels. Under the agreement, the cost was to cover the salary for one individual from VFRS to manage the program and oversee the maintenance of the five boats. The fund also included monies for training, insurance, and fuel. Also included in the fund was a reserve account to pay for the eventual replacement of the fireboats. The reserve account was to be increased by five percent each year.

Since the initial contribution by the port for 50 percent (\$1.5M) of the \$3.0M Consortium budget, the port has not paid anything towards fire protection, even though it has a number of large terminals and assets that are protected by Consortium fire department members. The situation regarding the City of Vancouver's services to port properties, for example, is described by Karen Levitt in an excerpt from a City Council report on the issue:

As a host municipality to the Vancouver Port Authority and the North Fraser Port Authority, the City of Vancouver provides a full range of municipal services to port properties and related port industries. As with services provided in the rest of the City, our ability to fund these services depends primarily on the property tax system. Where port properties are privately owned, owners are liable for full property taxes. The City also receives full taxes on properties that are owned by port authorities but leased to private concerns on a long term basis. The balance of port property owned and occupied by federally chartered port authorities is exempt from property taxation, however the City does receive payments in lieu of taxes (PILTs) from these port authorities for these properties.

To offset the initial funding provided by the port, the agreement stipulated that the percentage increase of each Consortium member would double after the initial year. For example, the initial funding level for North Vancouver District was 5.8 percent (\$174,000). Thereafter, North Vancouver District's portion was doubled to 11.6 percent. The funding portion for the other four Consortium members also increased. The funding formula agreed to in 1991 is shown in Table 4.

Table 4: Cost-Sharing Formula/ Marine Facilities Agreement⁴

Agency	Initial Percentage	Out-Year Percentage
North Vancouver District	5.8	11.6
Burnaby	8.0	16.0
North Vancouver City	5.3	10.6
Port Moody	2.3	4.6
City of Vancouver	28.6	57.2
Port Corporation	50.0	0.0
Total	100	100

From its initial funding level of \$3.0 million that included the purchase of five small fire/rescue boats, the Consortium's budget has remained low. In 2009, the budget for marine fire protection was about \$539,000, a comparably small amount for the protection provided. Table 5 shows the budget line items for the past four years and that which is projected for 2010.

Table 5: Fire Boat Consortium Budget Items, 2006–2010

Program	2006	2007	2008	2009	2010	Average
Salaries	\$40,000	\$40,000	\$40,000	\$40,000	\$40,000	\$40,000
Insurance	\$87,000	\$80,600	\$70,400	\$32,800	\$35,600	\$61,280
Maintenance	\$105,500	\$117,100	\$131,400	\$171,400	\$151,100	\$135,300
Fuel Cost	\$35,900	\$40,800	\$41,600	\$43,700	\$34,300	\$39,260
Rental/ Water -lot lease	\$27,300	\$28,100	\$28,500	\$29,500	\$31,200	\$28,900
Travel and Training	\$38,000	\$33,000	\$33,700	\$34,400	\$51,100	\$38,040

⁴ Ibid.

Program	2006	2007	2008	2009	2010	Average
Contingency Reserve	\$143,200	\$150,400	\$157,900	\$165,800	\$174,100	\$158,280
Overhead	\$21,000	\$21,000	\$21,000	\$21,000	\$21,000	\$21,000
Total	\$497,900	\$511,000	\$524,500	\$538,600	\$538,400	\$522,060

Table 6 shows the budgeted contribution of each community participating in the current fireboat Consortium from 2006 through 2010.

Table 6: Annual Budget Contribution of Consortium Members, 2006-2010

Community	Share	2006	2007	2008	2009	2010
City of Vancouver	.572	\$284,700	\$292,200	\$300,100	\$308,000	\$308,000
City of North Vancouver	.106	\$52,800	\$54,200	\$55,600	\$57,100	\$57,100
City of Burnaby	.160	\$79,700	\$81,800	\$83,900	\$86,100	\$86,100
District of North Vancouver	.116	\$57,800	\$59,300	\$60,800	\$62,500	\$62,500
City of Port Moody	.046	\$22,900	\$23,500	\$24,100	\$24,800	\$24,800
Total	1.00	\$497,900	\$511,000	\$524,500	\$538,500	\$538,500

At an average annual cost of \$522,000 over the past five years, the cost per boat for the Consortium is only \$104,000 annually, a relatively small sum. Overall, the Fire Boat Consortium is operating on a shoestring budget, and it is doing everything possible to keep the costs low. The problem is that maintenance costs for the boats is in excess of the amount budgeted for maintenance, and funding for the extra repairs are affecting the contingency reserve account.

Contingency Reserve – Since its inception, the Consortium has budgeted funds for the eventual replacement of the five existing boats and for major repairs and equipment. By agreement, the contingency reserve is to increase by five percent each year. The problem is, annual maintenance costs are somewhat depleting the reserve account such that there will not be enough funds to replace the current vessels. As it stands the contingency reserve account has dwindled substantially over the past few years with the fund balance projected for 2009 at \$920,000. This is after a drawdown of an additional \$200,000 for maintenance above that which was already budgeted.

To understand the gravity of the situation regarding the current fireboats and the extent of maintenance costs, consider that on average \$155,000 was added to the reserve fund each year from 2001 through 2009, for a total of \$1.35M. Added to the 2001 balance of \$930,000, the fund

should have about \$2.3M. However the account balance currently stands at \$1.02M, not nearly enough to replace five boats.

VFPA Spending for Port Security Versus Fire Protection – VFPA is concerned about security, and, along with the federal government, VFPA is committing resources to this end. The following information is reported on VFPA’s website:

- Since 2003 Port Metro Vancouver has invested more than \$16 million to support security initiatives. Over the same time period each terminal operator has invested up to \$2 million for security improvements, depending on the nature of their business.⁵
- As part of the Canadian Government’s \$115 million commitment to assist Canada’s ports and marine facilities to modernize and strengthen their security systems to meet the requirements of the Marine Transportation Security Regulations, in November 2006 the federal government allotted \$42 million from the Marine Security Contribution Program (MSCP) to provide surveillance equipment, dockside and perimeter security, communications equipment for command and control, and training across the Canadian Port system.⁶

While almost \$175M was reportedly spent on *security* since 2003, with the exception of the initial \$1.5M for the initial fireboat procurements in 1991, the VFPA has not spent any of its budget on port *fire* protection. It should be noted, though, that the costs of compliance and enforcement of port security laws and regulations directly affect security budgets.

Problem 2: Water Supply Inventory

Based on our experience and knowledge of fire operations in marine environments, we know that water supply at marine incidents, whether on board a ship or at a waterfront facility, is often a major problem for firefighters. VFPA has standards of compliance for all its facilities and facilities it approves for development. On-going review that these standards are still met and remain adequate after development is finished, is important to ensure adequate and available water supply, especially in terms of large incidents requiring sustained fire suppression operations. Extremely long hose stretches from municipal fire hydrants located outside a facility can greatly delay the extinguishment of the fire. Even when commercial yard hydrant systems exist they are often either destroyed by an initial explosion, useless due to lack of maintenance, or located too close to the fire for use. In cases like these a large capacity fireboat or other vessel

⁵ <http://portmetrovancover.com/users/securityandemergency.aspx>

⁶ Ibid.

with sufficient capacity fire pumps can be invaluable. Their high capacity fire monitors can throw water onto the fire from great distances or be used as a water source to supply water to the land-based firefighters or firefighters aboard a ship.

Problem 3: Insufficient Resources and Capabilities for Fighting Shipboard Fires

It is the belief of some in the marine community that a fire aboard a ship can be handled completely by the crew of that vessel. Most of the time these ships are sailing in the open ocean and are not near any land-based help. In some cases this is true but in some others the results have been less than adequate and the life boats have had to be used. Some members of ship crews have received marine firefighting training and have fought fires aboard their own vessels in the past. Crew size on most ocean-going ships has been reduced to half the number it had been at the time of the start of the Consortium 20-years ago.

The use of fixed extinguishing systems aboard these vessels is also viewed as a reason that the crews can handle any fire. In many cases the extinguishing systems are discharged into areas which have not been properly sealed and the extinguishing agent is released to the atmosphere. Also, fires in cargo areas either do not have fixed extinguishing systems or the extinguishing agent is unable to completely extinguish a fire. (Citations from technical literature which describe this problem are provided in Appendix F). In many cases such as these the vessel on fire is brought into a port either under its own power or it is towed in by tugs. Land-based firefighters then are asked to board and extinguish the fire.

The consensus among the fire department chiefs with whom we spoke was that *none of them would place any of their firefighters aboard a burning vessel as long as the only pieces of equipment are the small fire boats were available*. Moreover, few firefighters are trained in shipboard firefighting making that scene an inordinately dangerous one for fire personnel. In other words, there currently is no onboard shipboard firefighting response capabilities in the port.

Larger fireboats can provide a firefighting platform that is able to support a shipboard firefighting operation for many hours and days if necessary. Room would be available for the firefighters who must be brought to a ship on fire at anchor in the harbour. A large fire boat can carry enough hose, foam, and specialized shipboard firefighting tools to enable a realistic attack on the fire. Its larger pumping capacity and larger foam/water monitors can deliver fire streams from a distance for a large scale fire or water in sufficient quantities to supply an onboard fire attack.

If a large fireboat is designed with a platform or nozzle capable of being elevated it can direct large calibre water/foam streams down onto the deck of a burning vessel. This would be advantageous on any type of vessel fire. As a last resort, there are commercial marine firefighting companies located throughout the world who can respond to ship and oil tank fires under contract with a municipality. SMIT Marine is one such company. While their current presence in the port is not a firefighting response presence, contact with the local SMIT tug boat company could answer many questions in this regard to their company's other services.

Problem 4: Sufficient Marine and Shipboard Firefighting Training

While shipboard firefighting tools are important, they are useless unless the firefighters know how to use them and what they are expected to do once they reach a ship fire. One of the key elements of any marine firefighting program must be proper and continuous training. Municipal fire departments have extensive training for all of their members in structural firefighting and specialty areas such as hazardous materials, confined space, etc.

Shipboard firefighting is a unique job. The training for structural firefighting is not adequate to cover the contingencies and tactics for fighting small fires and conducting rescues from small fire boats. In fire departments that must protect facilities and/or waterways where commercial shipping is present, marine-based firefighting skills are essential. Failure to provide such training could place firefighting personnel's safety at risk, and could have serious legal, liability consequences for municipalities who do not provide such training. All members of the Consortium have trained at least some of their firefighters on basic marine and small boat firefighting operations. That training needs to continue and to be expanded to all fire departments bordering the port area.

The National Fire Protection Association's standard 1405 "Marine Firefighting for Land Based Firefighters" is applicable. Chapter 15-1.2 of 1405 deals with volunteer, career, and mutual aid fire departments that have been defendants in law suits involving losses at ship fires, states:

*An understanding of the dangers inherent in marine fire fighting should include an understanding of the consequences of the failure to provide a standard of training, planning, response, and action **equivalent to that which a department provides on the land-based portions** of its response area.*

The U.S. Fire Administration published a report entitled *Fireboats Then and Now*, which notes:

“A central principle in the fire and rescue service has been that firefighters and rescue personnel do as they practice when called to the scene of an emergency. Like land-based firefighting, shipboard and marine fire emergencies require unique skills to be mitigated effectively. These skills must be taught, evaluated, and refreshed regularly to ensure quality performance and firefighter safety. Dependence on traditional land-based firefighting skills which have often been mastered by individuals selected or promoted to serve in marine units **may be inefficient or dangerous** in the non land-based environment.”

Since the expansion of the port in 2008 several municipalities are now considered to be within the Port Authority jurisdiction. The municipalities of Richmond Surrey, Delta, New Westminster and Coquitlam have always had marine facilities and waterways within their jurisdiction, however these areas are also now within the jurisdiction of the VFPA.

In the Vancouver area several of the Fireboat Consortium member departments have provided basic shipboard firefighting training, but only to the officers. This training has, in the past, been spotty at best. Some of the newer Fire Departments have had no training or, in some cases, have not received specific marine firefighting training for over 10 years.

While it would be ideal to have every member of every fire department within the port area trained to the highest level of marine firefighting, this goal might be financially and logistically unrealistic. However, each fire department that operates a fire boat and that might provide mutual aid to shipboard firefighters (whether the ship be at a dock or at anchor) should consider having a special operations Marine Response Group trained to the highest standards and available to respond 24/7 to a ship fire within their own municipal boundaries or through mutual aid agreements with other municipalities. Other members of the department could receive “awareness level” training just to cover the basic information regarding marine and shipboard firefighting. This lower level training could actually be done in-house while members are on duty. Training personnel could receive the training and then train the firefighters or the members of the Marine Response Group could do the awareness training.

The specially trained Marine Response Group could respond as an advance team to a dockside ship fire or on one of the small fast response boats. Their initial duties would be rescue, if needed, and to contain the fire by closing watertight doors and providing boundary cooling. Once a large fireboat arrived there could be an attack on the fire.

Problem 5: Identification of Available De-watering Pumps

De-watering at any shipboard fire is one of the most important steps. Water cannot just be indiscriminately be poured aboard without serious ramifications. The intention is to put out the fire, not sink the vessel. Any shipboard firefighting training program would emphasize the importance of large de-watering pumps being brought aboard to remove firefighting water before it can compromise the vessel's stability.

Many fire departments have pumps used to de-water flooded basements. These pumps can be used, but there generally are not enough pumps available. CCG Environmental Response uses dewatering pumps to keep vessels afloat and prevent oil spills—such was the case of the recent fire in Coal Harbour where after the fire department gave the clear, CCG dewatered the three vessels that were gutted by the fire.

During this study several interviews were conducted with the tug boat companies which provide towing and vessel escort service to all areas of the port. All of these boats carry at least one portable de-watering pump (usually gasoline driven). They are used to de-water barges while under tow. Barges are notorious for leaks and all of the bilge areas are continually monitored and de-watered when necessary.

In addition to the one or two pumps found on each tug, the tug company's home dock may have a supply of back-up pumps. Both SMIT Marine and Seaspan have indicated that they have these pumps and that they might be made available in an emergency. Survey these companies to determine how the pumps might be obtained and have the firefighters familiarize themselves with the pumps safe use.

Problem 6: Assurance of an Adequate Supply of Firefighting Foam for Oil and Other Hazardous Materials Fires

Regardless of whether the port area fire is located on land, on the water, or on board a ship, huge quantities of foam will be required for a Class B liquid fire. The amount required usually exceeds local municipal supplies. Port Metro Vancouver and its municipal fire departments not only need large quantities of foam concentrate, but must also have the capability of applying that foam great distances to reach the fire. Large foam monitors are needed both ashore and on the waterside. Any new fireboats design should take this into consideration and allow for foam monitors and holding tanks.

A survey is needed to locate any other sources of fire fighting foam in large quantities. Oil refineries and oil storage facilities should have foam storage. If this supply could be accessed during a fire in another facility it might provide the backup supply needed. The survey should indicate the location, type, and quantity of foam that is accessible, and the method of transferring that foam from its source to a fireboat or other conveyance. Maritime government agencies may also have large quantities of foam. Canadian Coast Guard and Navy facilities should likewise be canvassed.

V. RECOMMENDATIONS FOR IMPROVING PORT FIRE PROTECTION

There are a number of issues that need to be addressed as VFPA and the communities surrounding the extensive port area examine how best to ensure adequate fire protection coverage of the assets, livelihoods, and public safety that are at stake among the owners and users of port land. Solving these issues and implementing new solutions will require effective cooperation on many fronts. Making these changes will also require adequate funding from a variety of sources including local, provincial, and federal entities. The key will be the fair allocation and distribution of fire risk reduction and fire response duties among all stakeholders: provisional government, local government, VFPA, and port lease holders and users along the entire Port Metro Vancouver area.

There are several approaches to improving port fire protection that should be considered. Our recommendations cover these key areas:

- Regional structure and cost-sharing for port fire protection
- Firefighting equipment
- Marine and shipboard firefighting training

Recommendation 1: Establish a Broader Regional Approach to Marine Fire Protection and Rescue

For the VFPA and the communities which border the harbour and the Fraser River, there is a need for a broader approach to marine firefighting and emergency preparedness. Given the expansive area covered by the amalgamated port and communities which border it, the most efficient and effective way to provide services is to include as many partners as possible. Though such an approach can be difficult to establish on a larger scale, once it is underway, such cooperation often leads to other, related partnerships.

Regional cooperation to improve delivery of emergency services has become the norm, not the exception, as more communities explore options to improve efficiency. In fact, during TriData's recent study of the Vancouver Fire/ Rescue Department (VFRS), we recommended that technical rescue and hazmat response be regionalized. That same approach makes sense for marine firefighting. With 16 communities bordering the operational area which is VFPA, any other approach would be inequitable. A regional effort also makes sense in terms of grant-seeking opportunities, as the provisional and federal governments are more likely to support

funding for port fire protection when the venture—whether physical plant, equipment, or training—is part of a well-planned, regional effort.

Regional port fire protection is already in practice elsewhere. For example, the port of Seattle, Washington and the many communities surrounding it are using a similar approach successfully. Obtaining wider regional cooperation for port fire protection may take some time to accomplish, but it can be done. The existing Fire Boat Consortium represents a good effort, and though not perfect, has proven that multi-governmental partnerships of this type can be successful. During the course of this project we had conversations with the fire chiefs from several of the communities that are not part of the existing Fire Boat Consortium. During these conversations we explained the current agreement, its genesis, and the cost-sharing formula used. We also discussed the possibility of a regional approach that many seem to prefer. Despite some observations about the regions' political situation not being especially conducive to such cooperation, the chiefs agreed that a wider regional base for port fire protection is best and should be explored.

Recommendation 2: Organize the Resources for Port-wide Fire Protection and Response under One Lead Agency/Fire Department

For greatest efficiency and consistency in providing marine fire protection and response, we propose that one agency or jurisdiction be selected as the contracting authority for all regional partners under a new Consortium, possibly the Marine Fire Protection Consortium, or other name as deemed appropriate.

Combine the available and any newly acquired resources and response plans under the aegis of this one entity, preferably a fire department. The lead agency should be chosen by a representative from VFPA and from each of the fire departments which will participate in a new Consortium made up of VFPA, port area fire departments, and the British Columbia provincial government. The new Consortium could be constructed as one, overarching agency or as two parallel agencies: one covering the port fire protection requirements of the harbour and the other covering the port fire protection requirements of the Fraser (and Pitt) Rivers.

Create a position of marine fire/rescue manager within the new Consortium to oversee operations. Have the marine fire manager develop operational plans for marine firefighting, mass casualty incidents, and water rescue. VFPA and the local communities should equally share the cost for the position.

The fire chiefs we met with concurred that VFPA should be a key player in the lead agency discussions and that it was important for the 16 communities to reach consensus on the lead agency chosen, should this approach be accepted. The new Consortium could use the lead agency as their headquarters location. The lead agency could handle the deployment of all fire boats berthed in jurisdictions throughout the port area, including any new ones that would be acquired. Training would be consolidated and shared under the lead agency so that there would be consistency in the skills taught, which is particularly important whenever multiple agencies are likely to be involved in mutual aid for special operations. Response plans, which all Consortium members would contribute to, could be centralized with the lead agency which would be responsible for updating and distributing the plans.

A new, 5-year agreement under which all Consortium members, including VFPA, would share the cost for services under a formula that could be similar to that which is already in place, or that reflects the new, proposed 40/40/20 cost assessment model for the acquisition of new small fire boats and the daily maintenance of all fire boats, old and new.

Recommendation 3: Review Options for Increasing Marine Fire Fighting Equipment and Fire Protection and Implement

There are many ways to organize and deploy fire suppression and rescue resources. The key is to strike a good balance between effectiveness and efficiency. To do this we considered the variety of risks in the region currently, and the plans for the near future. The large VFPA area that must be covered by firefighting and rescue personnel and equipment makes achieving a good response time a challenge. To meet this challenge we recommend the addition of a sixth fire boat and making changes in the areas covered by the six boats.

The section that follows describes the various options and the resources needed as well as some of the pros and cons for each. Certainly, one option is to do nothing. While this option does not seem to be a logical choice for the many reasons, nonetheless, it is noted.

Option 1 (No Change, Minimum Protection) – Continue the same model of using small fire boats. Under Option I, protection would continue to be supplied via five small fire boats by members of a (new) Consortium. The only change would be a new Consortium structure, as described in the previous recommendation. Any communities that elect not to participate in the Consortium would only receive marine fire protection from the Consortium under dire circumstances, and then a high fee would be charged for response. Local fire

departments in the Consortium would have no responsibilities for shipboard firefighting, though they could support any off-ship, land-based operations for fires in ships that are docked.

Pros: Lower cost; Consortium already in place; easy to maintain

Cons: Short-sighted; does not provide adequate resources for the entire VFPA region; solves only a few of the current Fire Boat Consortium issues; would not cover major incidents such as shipboard fires, water rescue, or mass-casualty incidents.

Option 2 (Very Good Protection) – The regional port fire protection would be expanded—either by forming a second Consortium within the Fraser River environment or bringing those governments into one, larger Marine Fire Protection Consortium; and by adding more firefighting-related equipment, including a large fireboat. Under Option 2, the area of automatic protection is expanded to include the communities along the North and South Fraser River, Delta Port, and the areas up to the Pitt River. In this option, a sixth small fire boat is added to the fleet which would be positioned strategically throughout VFPA and a large fireboat positioned in at Canada Place or the Ballantyne pier is procured. In addition, a barge would be obtained for use by local fire departments and stationed on the Fraser River.

This option provides an excellent level of port fire protection and water rescue through the deployment of six small fire/rescue boats (cross-staffed), and one large fireboat (staffed). Fireboats would be staffed 24/7 by two personnel; one pilot and one deckhand (the deckhand is also trained in firefighting and EMS). Firefighters from the five departments operating small fire/rescue boats would be organized as a regional marine response team to provide shipboard firefighting capabilities.

The recommended locations for these assets are:

1. Two fire/ rescue boats in the city of Vancouver (present locations)
2. One fire/rescue boat shared by Burnaby and Port Moody (present location)
3. One fire/ rescue boat in North Vancouver District (present location)
4. One fire rescue boat in Richmond (Fraser Wharf)
5. One fire/rescue boat in Surrey (Fraser-Surrey Docks) or New Westminister (current location of VFPA Port security boat) Surrey (Fraser-Surrey Docks)
6. One large fireboat at Canada Place or Ballantyne pier

Pros: Builds on the already developed Consortium model and provides better potential for more timely delivery of fire boat response to any given scene; expands services to include other major incidents (shipboard firefighting, major explosions with fire extension, large-scale water rescue, and mass casualty); promotes VFPA as a leader in public and port safety per similar protection provided to Long Beach and Los Angeles, CA and Seattle, WA; and provides fire departments with the tools and training needed to successfully manage any port-related incident which might occur.

Con: High **cost:** Option 2 adds the expense of a large fireboat and a sixth small fireboat plus the related training and berths.

Option 3 (Optimum Protection) – Expand port fire protection to include Option 2, plus the addition of a second large fireboat to provide the best shipboard and major incident firefighting capabilities. Under Option 3, a second large fireboat is added. Optional locations for this boat include the South Fraser River (Richmond or Delta); Fraser-Surrey Docks (Surrey); current location of port security boat (New Westminster).

Pros: Highest level of protection.

Cons: Most costly; more difficult to organize and maintain; requires high level of effort, particularly for additional training.

Recommendation 4: Review Cost-Sharing Options Related to Fire Boats

To continue the current model of operation or implement any of the new ones will certainly require additional revenue. First of all, the City of Vancouver is subsidizing some of the costs such as maintenance, which is far exceeding that which is actually budgeted. Likewise, if new equipment, training, and services are added, those will require funding. The Marine Fire Protection Consortium (which includes VFPA) should seek provisional and federal grants since the port is a vital resource, regionally and nationally. In particular, grants to replace the existing boats or to purchase the larger fireboats should be pursued.

With the implementation of any of the aforementioned options, one or more new agreements will be necessary. Such agreements should be for a regional plan such that each of the 16 communities within the port VFPA will share in the cost. There are several important aspects to consider in the basic funding formula for any model chosen. First are the costs for **basic** marine fire/rescue protection—that is, the small fire boats under Options 1 and 2. These should be shared among VFPA and all of the communities within the service area. The break out would be:

- Acquisition of any new replacement and additional small fire boats: VFPA = 50 percent Consortium communities = 50 percent, each jurisdiction assessed per the formula described below.
- The costs for maintaining all the fire boats are covered 100% by VFPA
- The costs for operating the small fire boats are shared among the Consortium communities per the same formula as applied to purchasing new, small fire boats, *whether or not* the community has a fire boat located in their jurisdiction.

Second are the costs associated with Option 3—the addition of larger pieces of firefighting equipment to cover potential fire and explosion risks on board ships that are at anchor or docked. The costs for ensuring shipboard firefighting capabilities should be covered 100% by VFPA, recoverable in large part (some of the properties are owned by VFPA) through fees potentially assessed on the commercial lease holders, ships that access the port, owners, and operators. This can be accomplished in a few ways:

- By contract with privately-owned companies such as SMIT Marine of Canada, which already has one large tug with firefighting capabilities located in the port of Vancouver. In addition to this resource, VFPA could contract for a second tug so equipped.
- By purchasing one or two large fireboats such that one vessel is located in Burrard Inlet and one in the Fraser River.
- By providing a barge equipped specifically for firefighting to be located in the eastern portion of the Fraser River.

Costs would include purchasing any of the identified equipment, staffing, fuel, and maintenance, berthing, and training for fire fighters of the various departments. The larger fireboats would be owned and operated by VFPA under the already existing operations division, which staffs and operates harbour patrol boats.

To provide the necessary funds for any of the options, a number of cost-sharing formulas is possible, but one that seems viable for the Vancouver region is to share the cost for the small fire boats (this does not include shipboard firefighting resource requirements) based on three variables: 1) assessed value of property adjacent to the marine environment; 2) linear kilometres of land; and 3) population. The rationale for such an approach is as follows:

1. Assessed Value – Risk is related to the assessed value of a property as it relates to a potential loss; the loss can be to both the property owner and to the local jurisdiction,

which, if the property were destroyed by fire, stands to lose the taxable value of the property plus the loss of jobs which would impact spending in the area.

2. Linear Kilometres (of Land) – Those communities where the linear measure of land along the waterway is greater may be more susceptible to loss from fires or other emergencies where marine fire protection resources are needed.
3. Population – Population is often used as a variable in cost-sharing formulas for local emergency services. In the case of marine fire protection, communities with a larger population are likely to have more recreational activities and marine traffic along the water, in which case these services should be more readily available.

Under such a plan, every jurisdiction with land adjacent to the Port of Vancouver and the Fraser River would pay an amount that fairly represents the degree of risk and potential loss and the amount of land represented.

The cost-sharing formula would be as follows:

$$\underline{[\% \text{ Total Assessed Value} + \% \text{ Total Population} + \% \text{ Linear Kilometres}]}$$

As to how these factors should be weighted, the port and communities would need to decide. We worked out a sample, using fictitious communities, first using the following percentages and then switching the values of linear kilometres and population. The formula does not take into account risk associated with each port owner or tenant in terms of type of operation, but does incorporate the value of the improved property in terms of dollar loss risk.

- a. 40% - Assessed value of improved property along the water
- b. 20% - Linear kilometres of land along the water
- c. 40% - Total population of the jurisdiction

Table 7: Sample of Weighted Factors Per Fictitious Communities

Community	Assessed Value \$M	Population	Linear Kilometres	Assessed Value x .4	Population x .2	Linear Kilometres x .4
Sullivan	\$135	65,300	7.46	54	13,060	2.984
Lancaster	\$268	210,000	11.9	107.2	42,000	4.76
Mill Port	\$93	78,000	8.92	37.2	15,600	3.568
Center Point	\$345	654,000	245	138	130,800	98
Monroeville	\$65	45,200	4.65	26	9,040	1.86
Total	\$906	1,052,500	277.93	362.4	210,500	111.172

Table 8: Results of Cost-Sharing Formula Per Fictitious Communities

Community	Sullivan	Lancaster	Center Point	Monroeville	Total
Assessed Value	0.149	0.296	0.381	0.072	1.000
Population	0.062	0.200	0.621	0.043	1.000
Linear Kilometers	0.027	0.043	0.882	0.017	1.000
Total	0.238	0.538	1.884	0.131	3.000
Share = n/3	0.079	0.179	0.628	0.044	1.000
Annual Fireboat Budget (Example)	\$538,000	\$42,662	\$96,508	\$337,808	\$23,568

The final numbers were nearly identical in our sample, regardless of whether population or linear kilometres were factored at 40%. That may have been an anomaly, so the formula would need to be worked using the actual numbers that related to the port area. In any case, the issue centers on how important a factor population is when considering port protection requirements. Unlike other emergency service analyses, the number of people in the area may not be as compelling a factor because most of the real estate bordering the water is not residential, but commercial and industrial. A citizen might need to call the fire department for EMS services or a fire in his home, but is quite unlikely to have a port -based need for the fire department to come to his aid. The risks in port areas and the need for marine fire services might need to be calculated more on the basis of assessed value and linear feet than other factors, such as population. The users of the port are the most important factor in assessing fair payments for fire protection.

Summary of Recommendations

1. Establish a Marine Fire Protection Consortium that covers the now expanded VFPA port area and includes 16 communities.
2. Under the new Consortium agreement, establish a five-year contract for all participating cities and VFPA.
3. Create a position of Marine Protection Manager under the new Consortium.
4. Expand the distribution of small fire/rescue boats to include the Fraser/Pitt River environment.
5. Implement a cost-sharing plan for basic marine fire protection to include every community (16) along the navigable waterway; the plan should include three variables: assessed property value for properties along the waterway; population; and linear kilometres along the waterway.
6. Have VFPA assume all costs for any large fireboats acquired and for training for a special marine response group of firefighters in shipboard firefighting.

7. Consider having VFPA secure, outfit, and deploy a barge near the confluence of the North and South Fraser River for use by fire departments to use as an operating platform for land companies.
8. Establish a regional response team for shipboard firefighting and incorporate a call-out procedure for incidents where these personnel are needed (typically to those incidents where larger fireboats are dispatched)
9. Establish a regional incident reporting procedure for all marine fire incidents and emergency responses.
10. Develop a marine radio-interface procedure for all departments in the region using available technology.
11. Increase the small boat fleet to between 6-8 (ideally, six deployed and two in reserve), and replace the existing fireboats over the next five years.
12. Transfer the responsibility for fireboat repairs to VFPA and contract those services to available vendors. Another option was to have Vancouver form a Marine Maintenance Division that would include its Police boats. This would follow one of the recommendations from the Mercury/TriData Operational Report and have Vancouver be the lead agency.
13. Consider implementing a surcharge for carriers to cover VFPA's portion of the cost for the new, regional Consortium, and for expenses for shipboard firefighting and large fireboats.

VI. NEXT STEPS NEEDED

The next five years will be an exciting time as plans for port area expansion are realized, the Fraser River bridge is addressed, and commerce along the waterway grows. Concurrent with this growth will be the need to ensure that VFPA and the port jurisdictions are prepared to respond quickly and well to any port-related fires, thus protecting the safety and livelihoods of the residents, workers, and visitors, and the economic health of the area.

We believe there are a few additional projects that VFPA and other stakeholders should consider in the near future—the results of which will facilitate the implementation of the recommendation from this report as well as build a strong new partnership with buy-in from port area jurisdictions. The first step toward that goal would be to conduct a 1- or 2-day work session with stakeholders to discuss options and formulate plans. Select a neutral arbiter to organize and facilitate the conference, take notes, provide feedback, and deliver a summary report to all participants.

Possibly the most important key to obtaining support for and establishing a successful Marine Fire Protection Consortium (or otherwise-named entity) is to develop a truly fair cost-sharing basis for basic marine fire protection. We strongly encourage the initiation of a study of the waterfront land in each jurisdiction that would document the property classification, the tax value of the land, the tax value of the improved property, and the linear kilometres of the area. Securing and analyzing this data will serve as the basis for creating a defensible, equitable formula.

As part of that same study, or as a separate one, the requirements for new fire boats and boat sheds—both small and large—should be studied and should involve all participants who would be helping to pay for the new equipment. The specifications should take into consideration the type of physical plant and improved property in the port area, as well as the risks as noted in this report. Expected response times and the locations of the boats should be calculated as well.

Finally, as discussed with Barbara Yandel, Senior Property Administrator at Port Metro Vancouver, the topic of how to enhance fire prevention should be on the agenda as part of any deliberations on fire risk and response. One idea is to develop a brief guidebook on best practices for fire prevention and include a copy with the lease whenever a lease is renewed or lease is provided to a new tenant.

APPENDIX A: ECONOMIC IMPACT OF PORT AUTHORITY ON THE REGION BY COMMUNITY⁷

Community	Jobs	Wages (\$ millions)
Vancouver	18,300	870
Richmond	5,700	5,000
Surrey	4,000	3,700
Delta	3,500	2,900
North Vancouver (District)	3,500	3,100
New Westminster	3,000	3,000
North Vancouver (City)	2,000	1,900
Port Coquitlam	800	700
Coquitlam	700	700
Burnaby	700	600
Maple Ridge	400	400
Port Moody	300	200
Pitt Meadows	300	300
Langley (Township)	200	200
Langley (City)	200	200
West Vancouver	100	100
Total Metro Vancouver	43,900	37,200

⁷ 2008 Port Metro Vancouver; Economic Impact Study, p. IV.

APPENDIX B: PORT METRO VANCOUVER'S NEXT STOP: UP THE FRASER RIVER⁸

Sun

Fiona Anderson

Friday, November, 20, 2009

The next route for expansion at Port Metro Vancouver is through the Fraser River, the Port's chief operating officer Chris Badger told an audience of mayors and municipal representatives at the Vancouver Board of Trade's Metro forum on Thursday.

"Most people don't realize this, but the Fraser River is as important to the economic well-being of Canada as the St. Lawrence Seaway," Badger said.

In 2008, the St. Lawrence Seaway, which runs from the Atlantic Ocean through the St. Lawrence River to Montreal and into the Great Lakes, moved about 40 million tonnes of cargo. The Fraser River moved 30 million tonnes, Badger said. But the economic benefit of the tonnage moved through the Fraser River was in fact greater than its eastern counterpart, he said.

So the next stage of funding the Port will be looking for will be to upgrade facilities along the Fraser, including replacing the 100-year-old New Westminster railway bridge.

"The bridge is at or near, or some people say beyond, sustainable capacity," Badger said.

The goal is to have ships move goods further inland before transferring their cargo to trucks for the rest of the trip, reducing traffic congestion.

"We believe there is great potential for the Fraser River to become a more usable green highway," Badger said. "Right now, economically it's not there, and it will not replace trucks but we think there is opportunity for the future."

While the opportunities aren't there yet, "they certainly will be in the next 10 to 15 years," he said.

⁸ <http://www.6717000.com/newsArticle-6400.html>

APPENDIX C: COMMERCIAL FISHING BOAT GOES UP IN FLAMES IN CITY'S HARBOUR⁹

The Vancouver Province

February 7, 2008

For two hours last night, Vancouver firefighters fought a two-alarm blaze that involved a 100-foot commercial fishing boat tied up at a Vancouver dock before a tug pulled the vessel out into the harbour, where it was allowed to burn.

"The harbour master's advice to us is to let it go into free burn, which it is," said Capt. Rob Jones-Cook of Vancouver Fire and Rescue Services. "The reason for that is it just creates all sorts of huge environmental problems if we try to fill the boat with water and sink it."

The boat had taken on about 3,785 litres of diesel. An environmental cleanup crew was on standby in case of a leak.

The call came in at 6:30 p.m. to the Ocean Fisheries dock in the 2300-block Commissioner Street. For the next three hours thick smoke poured out of the steel-hulled vessel.

Firefighters from seven fire trucks and two fireboats battled the smoke and flames. Everyone on board got off safely.

"There was an initial report that a child was on board, but that turned out to be untrue," said Jones-Cook.

Three boats were tied together when the fire broke out.

A tug managed to pull them into the harbour, where they were split up. Jones-Cook said saved the other two boats, one a 55-foot vessel and the other a 75-footer. VFRS crews were expected to remain on the scene until 1 a.m., said Jones-Cook.

"They had the flames pretty much beaten down, but it kept on smoking," said Province photographer Nick Procylo, who arrived around 7 p.m.

⁹ <http://www.canada.com/theprovince/news/story.html?id=c6cad163-16d9-4ced-a9ad-d1a2b0d5732c>

APPENDIX D: CARGO SHIP FIRE BREAKS OUT ON BURRARD INLET¹⁰

Vancouver Sun

June 26, 2008

A large fire broke out on a cargo ship moored on the north side of Burrard Inlet on Thursday evening at about 7:15 p.m.

The Coast Guard, North Vancouver fire department and RCMP dealt with the blaze, which appeared to start in the living quarters of the ship, and had it contained by 8:30 p.m.

The ship, called the *Antoine D*, was moored by the Neptune Bulk Terminals in North Vancouver, located west of the Second Narrows bridge.

Police said there were at least a dozen crew members on board.

“There doesn’t appear to be any injuries,” said Cst. Mike McLaughlin of the North Vancouver RCMP. “Anytime you have an interior fire there will be significant smoke damage and water damage.”

McLaughlin said it was a large fire, but the full extent of it will be determined by fire inspectors.

The ship is registered in Nassau, in the Bahamas, said McLaughlin.

¹⁰ http://www.canada.com/story_print.html?id=b7f4fcfb-e3e8-4682-9f9c-a478e1393b4b&sponsor=

APPENDIX E: SHIP-LOAD OF TAMILS TRYING TO ENTER CANADA SEIZED¹¹

Indo Asian News Service

October 19, 2009

Vancouver, Oct 19 (IANS) Canadian authorities have thwarted a major attempt at human smuggling, seizing a ship-load of refugees possibly from Sri Lanka near Vancouver Saturday.

The ship bearing the name of Ocean Lady was carrying 76 males. The passengers were brought to Vancouver Sunday and sent to correctional facilities (jail) for questioning.

The ship was spotted in the sea near the Canadian coast and escorted by the authorities into Victoria which is the capital of British Columbia province.

The Royal Canadian Mounted Police (RCMP) said its officers took control of the ship Friday afternoon.

Though it is an obvious attempt at human smuggling, the RCMP and the Canada Border Services Agency (CBSA) said they were questioning the passengers to ascertain the origin of the ship.

‘The individuals have been transported to ... a corrections facility (jail) in Vancouver, where the CBSA will continue to examine their admissibility to Canada,’ the Canada Border Services Agency (CBSA) said Sunday.

‘We are acting quickly to meet the immediate personal and health needs of these individuals, and we are processing them in an efficient manner and in accordance with Canadian law,’ Rob Johnston of the CBSA said the statement.

Canadian Public Safety Minister Peter Van Loan said in Ottawa that preliminary inquiry hinted that the ship came from Sri Lanka.

David Poopalapillai, the vocal spokesman for the Canadian Tamil Congress, also said the passengers looked like Tamils.

He said the Tamils were being forced to take such risks as they faced a dire situation in Sri Lanka after the recent conflict.

Though a few large-scale attempts at human smuggling have been foiled in recent past, lax Canadian laws make human smuggling – particularly at a small scale – very easy.

Once a person manages to enter this country illegally, it is very difficult to remove him because of cumbersome laws. Currently, there are more than 60,000 refugee seekers in this country.

¹¹ <http://trak.in/news/ship-load-of-tamils-trying-to-enter-canada-seized/15297/>

APPENDIX F: SOURCES REGARDING PERFORMANCE OF FIRE EXTINGUISHING SYSTEMS

Following are three sources which detail research on the performance of fire extinguishing systems:

- 1) The primary reason for the limited effectiveness of the carbon dioxide systems seems to be carbon dioxide leakage due to either: (1) unclosed doors, vents, ducts, etc.; (2) fire/explosion damaged closures (particularly in fires with delayed system actuation); and (3) crew or firefighter early reentry into the machinery space before temperatures have been reduced sufficiently to preclude re-ignition.,

Comparative Analysis of the Reliability of Carbon Dioxide Fire Suppression Systems as Required by 46 CFR, SOLAS 11-2, and NFPA 12, Authors: Robert Zalosh; Douglas Beller; Robert Till; D. W. Alley; Coast Guard Research and Development Center, Groton, Ct.

- 2) A CO₂ extinguisher was used to knock down the fire; however, it re-ignited as the space was not effectively sealed. The spread of the fire into the accommodation could not be controlled because the crew failed to follow boundary cooling techniques and monitor all sides of the provision room. Further, the senior officers had failed to take control of the fire party, to assess the situation and consider using different medium to fight the fire. What can we learn?
- CO₂ can knock down a fire quickly, however its cooling effect is limited. To prevent re-ignition, the space containing the seat of fire should be effectively sealed.

International Maritime Organization (IMO) Lessons Learned from Casualties for Presentation to Seafarers, (as reviewed and approved by the Sub-committee on Flag State Implementation at its twelfth session)

- 3) During the fire fighting procedures, the vessel's crewmembers attempted **to** release CO₂ into the engine room and auxiliary machinery room space by activating controls at one of the system's three master control units and at the instrument panel in the CO₂ room. Investigators believe that prior to or during these activation attempts an electrical fault occurred and damaged the control circuitry of the CO₂ system. Post casualty inspection indicated that despite the crew's efforts at both releasing stations, CO₂ was not released into the engine room and auxiliary machinery room spaces.

Further investigation revealed that components of the control system depend on electrical power to release the extinguishing agent when following the normal release procedures. An

electric solenoid operated-shuttle valve is used in conjunction with an electrical timing circuit. The shuttle valve and timing circuit control the opening of the storage tank main release valve, thereby ensuring that the proper quantity of extinguishing agent is released as determined by the type and size of space served.

No CO2 will be released if electrical power is unavailable to the control circuitry when the system is activated from one of the master control units.

Marine Safety Advisory No. 5-02, Republic of the Marshall Islands Maritime
Administrator