



VAFFC / Vancouver Airport
Fuel Facilities Corporation

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Vancouver Airport Fuel Facilities Corporation
Vancouver Airport Fuel Delivery Project – Fuel Receiving Facility
Port Metro Vancouver Permit Consideration Memo
December 2015



Introduction

Vancouver Airport Fuel Facilities Corporation (VAFFC), a consortium owned by most of the major airlines serving Vancouver International Airport (YVR), is building an aviation fuel delivery system to serve YVR.

The new delivery system includes a marine terminal and storage facility on the South Arm of the Fraser River and a 13-kilometre underground pipeline to YVR. The system will meet the future fuel requirements of the airlines and airport for the foreseeable future. The project will be constructed using the latest building, seismic, fire, and environmental codes and industry practices to achieve the highest levels of safety and reliability. With 100% of YVR's fuel requirements delivered through the new system, the project will have a smaller environmental footprint than the existing fuel delivery system.

The project will eliminate the more than 1,000 tanker truck deliveries currently travelling on Delta and Richmond streets and highways each month. Without the project, any growth in fuel demand at YVR will rely on supply from just two refineries and will require additional truck shipments, equivalent to 800 tanker truck deliveries annually for each new daily flight to Asia. With a secure and long-term competitive fuel supply, the project will help ensure that YVR remains a key economic generator and critical part of British Columbia's role as Canada's Pacific Gateway.

In December 2013, following more than a decade of comprehensive planning, research, review and consultation by VAFFC, the project received an Environmental Assessment Certificate from the B.C. government and an Environmental Decision Statement from Port Metro Vancouver (acting on behalf of the federal government), allowing the project to proceed to permitting. Permits are required from authorities and local governments before construction can proceed, including from Port Metro Vancouver for the construction and operation of the Fuel Receiving Facility.

The proposed Fuel Receiving Facility will be located on Port Metro Vancouver land and will receive fuel deliveries from the adjacent Marine Terminal, which will handle three to five vessels a month. Fuel will be stored at the Fuel Receiving Facility and transported to YVR via an underground pipeline. The Fuel Receiving Facility will include six above-ground vertical carbon steel single wall tanks, each approximately 33.5 metres in diameter and 14.6 metres high, with an overall height of 21 metres above sea level. The tanks will provide a combined total capacity of approximately 80 million litres.



Port Metro Vancouver Permit

As part of the Port Metro Vancouver permit process, VAFFC developed a communications and engagement strategy to share information and to provide an opportunity for the public to provide comment on the Fuel Receiving Facility. Two information sessions were held, on August 29 and September 17, respectively.

The following is a summary of input from comment forms and written submissions received during the comment period – August 24 to September 28. The table is broken into the following topic areas:

- Public consultation period
- Environmental effects
- Human health effects
- Facility construction
- Facility operations
- Emergency response
- Hazard and Risk Assessment
- Other (outside the scope of the permit)



Stakeholder Input	VAFFC Consideration of Input
Topic Area: Public Consultation Period	
<ul style="list-style-type: none"> • Requests were made for the August 29th information session to be rescheduled in September or for a second session to be scheduled. • Requests were made for the September 19th public comment deadline be extended. 	<ul style="list-style-type: none"> • A second information session was held on September 17 • A second information session was held on September 17 and the public comment period was extended to September 28.
<ul style="list-style-type: none"> • Appreciation was expressed that VAFFC hosted a second information session. 	<ul style="list-style-type: none"> • Acknowledged
Topic Area: Environmental Effects	
<ul style="list-style-type: none"> • Some concern was expressed about: <ul style="list-style-type: none"> ○ The potential impacts of the fuel receiving facility on the salmon population in the Fraser River. ○ Ability to contain a spill in the river due to river flow. ○ Clean-up costs in the event of a spill. ○ The impact of an earthquake (liquefaction) ○ The risk of an explosion (was ignored). ○ Tank farm looks closer to the river than the EA drawings. • Appreciation was expressed that VAFFC will not remove vegetation in the area located between Waterstone condos and the facility. • Appreciation was expressed that VAFFC is looking at trail amenities. 	<ul style="list-style-type: none"> • Safety and the environment are fundamental priorities for VAFFC. • The fuel receiving facility will be designed, constructed and operated in accordance with all relevant modern codes, standards and best management practices that govern these types of facilities, including seismic design criteria, spill prevention, containment and emergency response measures. • The project was subject to a rigorous provincial/federal environmental assessment, which after five years of review concluded that the Project is not likely to result in significant adverse effects on the environment. The risk of the Fuel Receiving Facility to the salmon population in the Fraser River is extremely low. The tanks, and all facility fuel handling areas, will be located within and surrounded by secondary containment with oil/water separation systems. In the unlikely event of a spill at the facility, this would be isolated and contained, and prevented from reaching the river. • During the Environmental Assessment, Environment Canada lauded elements of VAFFC's response planning as being state-of-the-art for spill modelling and potential incident preparation. • The following spill response equipment will be available at the Marine Terminal: <ul style="list-style-type: none"> ○ Two response boats complete with boom and skimmers during vessel arrival and offloading, two boom reels with over 600 metres of self-inflating boom, fast-current skimmers, one boom reel with over 300 metres of river boom, temporary storage for recovered fuel, sorbents and an array of related parts such as anchors and towing vanes



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- Before a vessel is offloaded, the boom and skimmers will be positioned around the vessel to contain a spill in the unlikely event of an accidental release of product onto water, and to recover the product as quickly as possible (see the figure below)
- The two response boats would be on standby to deploy boom in the open river if required
- The sorbents would be used to absorb any spilled fuel
- Spill prevention measures for the Fuel Receiving Facility will include:
 - System pressure testing
 - Shut-off devices and emergency shutdown valves
 - Leak detection systems will be located at the bottom of tanks
 - Tanks will be located within an impermeably lined secondary containment area surrounded by a raised retention dike, designed to hold the capacity of one tank plus 10% of the aggregate volume of all remaining tanks
 - Process equipment will be located on concrete pads, with all drainage connected to an oil/water separator system to prevent runoff entering the storm-water system without first being processed through the oil water separator
 - Onsite spill response equipment, including portable spill response kits, spill response trailer, vacuum truck and a waste fuel storage tank
 - Operations vehicles will also contain spill response clean-up supplies
- In the unlikely event of a spill, the cost of a clean-up would be covered by VAFFC, which will have industry-standard insurance. This is a requirement of the lease with Port Metro Vancouver and is also one of the conditions of the Environmental Assessment Certificate.
- The facility will be constructed to modern storage tank and seismic design requirements.
- An independent, third-party hazard and risk assessment (“Vancouver Airport Fuel Delivery Project, Risk and Hazard Analysis for Fuel Receiving Facility” Report, dated August 17, 2015) concluded that a fire occurring in the process area or a tank fire are the potential scenarios for which the response measures should be designed. Statistically, neither have a probability of occurring over the life of the project. The assessment also calculated that the safe perimeter in the unlikely event of a tank fire is 69 metres, while the response planning safe perimeter is 130 metres from the centre of all the tanks, well short of any residential or heavily



	<p>occupied properties. The Marine Terminal and Fuel Receiving Facility will be manned 24 hours a day, providing immediate response to fires or other emergency situations.</p> <ul style="list-style-type: none"> • Commercial aviation fuel is a kerosene-based liquid. The type of fuel used by airlines at YVR and by almost all the world’s commercial airlines is called Jet-A, which is similar to diesel fuel in its composition. It is relatively safe to handle at room temperature and is considered flammable but not explosive. The difference between flammable and combustible liquids is explained in Section 3.2.1 of the Vancouver Airport Fuel Delivery Project, Risk and Hazard Analysis for Fuel Receiving Facility” Report. • The risk of explosion was considered and is addressed in Sections 1, 4.2, 4.3.1, 4.4, 4.5.1, 4.5.4, 4.5.5, 4.6 of the (Vancouver Airport Fuel Delivery Project, Risk and Hazard Analysis for Fuel Receiving Facility” Report. • The facility will be located on PMV lands, which has been the plan since the beginning of the Environmental Assessment. It is not closer to the river. The tanks may appear to be closer now than in the conceptual drawings, however the design has taken the river and dyke into consideration. • The project will not affect vegetation between the facility and Waterstone • VAFFC will work with the City of Richmond on trail amenities in the vicinity of the Fuel Receiving Facility/Marine Terminal as part of the Development Permit application for the marine terminal site.
<p>Topic Area: Human Health Effects</p>	
<ul style="list-style-type: none"> • Some questions were asked about vapour transmissions: <ul style="list-style-type: none"> ○ What studies have been done on the human health effects of jet fuel transfer emissions? ○ What is the area that will be affected by these transmissions considering the prevailing winds in the area of the facility? • Some concern was expressed about the project’s potential impact on air quality with respect to human health. 	<ul style="list-style-type: none"> • The application for the environmental assessment certificate and federal decision statement contains several studies on the potential effects of fuel handling and transfer emissions, as follows. <ul style="list-style-type: none"> ○ Both Chapter 8 of the EAC Application and “Supplement 2 To The Agency and First Nations Issues Tracking Table – Memorandum on Human Health Effects”, assess the potential effects of facility emissions on Human Health. Air quality health effects during operations are not expected to be significant. This conclusion is based on the small increases in exposures, all of which are well below health-based Agency for Toxic Substances and Disease Registry recommendations, and Ontario standards. ○ Section 5.4 of the EAC Application includes conservative modelling conducted for fugitive fuel vapour emissions during facility operations. This modelling assessed the tanks without any vapour reduction mitigation measures. The tanks will, in fact, incorporate vapour reduction mitigation measures and the tank shells will be painted an appropriate colour to further reduce vapour emissions due to heat.



This section also includes an assessment of the potential effects of these facility emissions on the local and regional air shed.

The dispersion modelling considered meteorological criteria and was conducted in accordance with the “Guidelines for Air Quality Dispersion Modelling in British Columbia” (B.C. Ministry of Environment 2008) using the United States Environmental Protection Agency Industrial Source Complex Short Term “ISCST3” model to predict maximum concentrations. The highest concentrations were predicted in the immediate vicinity of the fuel receiving facility location and in two areas between 0.5 and 1 kilometre north and south of the proposed facility.

Concentrations decreased rapidly with distance from the fuel receiving facility. The probability of an adverse effect due to emissions was considered to be low because the predicted ambient concentrations were much less than ambient air quality criteria. Overall, the residual effects on ambient air quality and GHG emissions due to Project operations was considered to be not significant.

Figure 5.4.10 in the EAC Application shows the isopleths of maximum predicted 1-hour VOC concentrations ($\mu\text{g}/\text{m}^3$) due to fugitive emissions from the fuel receiving facility, based on the worst-case scenario of medium-grey coloured storage tanks with no vapour reduction measures. All estimated concentrations of specific VOCs for this worst-case tank scenario were several orders of magnitude less than the relevant Alberta and Ontario objectives (BC has no objectives). As noted earlier, the tanks will incorporate vapour reduction measures in the design, so the actual VOCs for the facility are predicted to be even less.

- When compared to the existing fuel delivery system, VOC emissions associated with the storage and movement of aviation fuel to YVR will be reduced as a result of the Project (refer to page 5.4-33 of the EAC Application). In brief, the delivery, storage, and transfer of fuel through the new facilities (upgrade marine terminal, new receiving facility and 15 km transfer pipeline) will be more efficient than the current delivery system (Westridge marine terminal and related receiving facility, 40 km pipeline, and daily tanker



	<p>truck deliveries). The substantially greater efficiency will result in less emissions associated with the delivery and storage of the aviation fuel. The elimination of tanker truck deliveries will provide the greatest improvement to air emission associated with aviation fuel delivery to YVR.</p>
<ul style="list-style-type: none"> Some concern was expressed that the tank farm is a threat to personal safety and the business and residential buildings in the vicinity. 	<ul style="list-style-type: none"> An independent, third-party hazard and risk assessment concluded that a fire occurring in the process area or a tank fire are the potential scenarios for which the response measures should be designed. Statistically, neither have a probability of occurring over the life of the project. The assessment also calculated that the safe perimeter in the unlikely event of a tank fire is 69 metres, while the response planning safe perimeter is 130 metres from the centre of all the tanks, well short of any residential or heavily occupied properties. The Marine Terminal and Fuel Receiving Facility will be manned 24 hours a day, providing immediate response to fires or other emergency situations. Commercial aviation fuel is a kerosene-based liquid. The type of fuel used by airlines at YVR and by almost all the world’s commercial airlines is called Jet-A, which is similar to diesel fuel in its composition. It is relatively safe to handle at room temperature and is considered flammable but not explosive. The difference between flammable and combustible liquids is explained in Section 3.2.1 of the “Vancouver Airport Fuel Delivery Project, Risk and Hazard Analysis for Fuel Receiving Facility” Report. The risk of explosion was considered and is addressed in Sections 1, 4.2, 4.3.1, 4.4, 4.5.1, 4.5.4, 4.5.5, 4.6 of the “Vancouver Airport Fuel Delivery Project, Risk and Hazard Analysis for Fuel Receiving Facility” Report.
<p>Topic: Facility Construction</p>	
<ul style="list-style-type: none"> Some concern was expressed about traffic congestion on Williams Road and Steveston Highway during construction, as well as the impact on traffic from construction of various projects in the area, including VAFD Project 	<ul style="list-style-type: none"> Traffic generated during Project construction will be temporary and short-term, and will be managed through a comprehensive Traffic Management Plan (see the draft plan appended to the draft Construction Environmental Management Plan submitted as part of the Project Permit Application). The key objectives of this plan will be to: <ul style="list-style-type: none"> Provide guidance to contractors in their preparation of detailed site/activity-specific Environmental Work Plans (EWPs) and in their implementation of site specific traffic management protocols, monitoring and reporting requirements; Identify construction activities with the potential to cause traffic disruptions, delays, or adverse impacts to the public and/or wildlife;



- Outline procedures and protocols to manage the safety of crews working on the Project as well as the public and wildlife;
- Provide a comprehensive list of Best Management Practices (BMPs) and mitigation measures related to traffic management;
- Provide a communications strategy to inform stakeholders and the public about construction progress and identify methods for providing feedback on issues and concerns;
- Verify compliance with all relevant legislation and regulations; and
- Describe the monitoring and reporting requirements for verifying that BMPs and mitigation are being implemented as intended and are effective.
- Noise, dust, on-road traffic, and other environmental effects will be minimized through our comprehensive Construction Environmental Management Plan, which will include:
 - Coordinating and scheduling construction activities to minimize noise
 - Monitoring construction noise to ensure municipal by-law limits are being followed
 - Notifying potentially affected residents in advance of construction pile driving
 - Restricting construction activities to normal weekday daytime hours
 - Supplying all equipment with appropriate covers, hoods, shields, etc.
 - Providing advance notice of activities through the project website, social media and hotline services
- Potential residual effects of the Project during construction were addressed in the EAC Application and EAO / PMV Assessment Report from a cumulative standpoint. The potential residual effects of this Project were assessed with the location and timing of potential residual effects of other past, present or reasonably foreseeable projects where there was a potential for an additive effect to occur. No significant cumulative traffic effects were identified.
- As noted above, traffic generated during project construction will be temporary and short-term, and will be managed through a comprehensive Traffic Management Plan.
- The first phase of construction is expected to take up to 12 months, and will involve site preparation and ground improvements to provide stability for the tanks to withstand a major seismic event. The second phase of construction, which is expected to take up to two years, will involve construction of the utilities, foundations and structural components of the facility, as well as perimeter and road works, paving, fencing and landscaping.



<ul style="list-style-type: none"> • Concern was expressed about the impacts that the ground vibrations during construction could have on a nearby business. 	<ul style="list-style-type: none"> • Dynamic compaction is not a ground improvement method being considered for the Fuel Receiving Facility. Ground improvement measures will consist of either vibro-densification stone column installation techniques or deep soil mixing (DSM). DSM will not generate significant ground vibrations, even within the ground improvement zone. The vibro-densification stone column installation technique is anticipated to generate minor to negligible ground vibrations at the scale operations – which that are located far (>80 m) from the edge of the proposed ground improvement zone – depending on the vibration tolerance of the scale operation. VAFFC will notify Ecowaste or the scale operators when ground improvement commences. If scale operations are affected VAFFC will work with the operator and contractor on timing and schedule of scale operations and ground improvement to minimize impacts to both processes.
Topic: Facility Operations	
<ul style="list-style-type: none"> • Concern was expressed about the fuel transfer process: <ul style="list-style-type: none"> ○ Will vapour transmissions be present throughout the entire fuel transfer process? ○ How long will the fuel transfer process take? ○ Will somebody answer complaints 24 hours a day if noise or vapours are bothersome? ○ Concern that personnel will only be on site during offloading ○ Tank farm and terminal control systems and instrumentation should be built and operated to highest IEC Safety Integrity Level • A recommendation was made that Safety Policy, Safety Management System and System Safety Plan with Safety Goals should be developed and available for public comment. A Safety Case must be established and maintained during the project’s life. 	<ul style="list-style-type: none"> • Fuel transfer process: <ul style="list-style-type: none"> ○ Vapour emissions at the fuel receiving facility will be generated during the movement of fuel in and out of the tanks (i.e., when fuel shipments are received at the marine terminal in the order of 3 to 5 per month, and when fuel is required at the airport as determined by demand). The tanks will be designed with vapour reduction measures to minimize the amount of emissions released. ○ The duration of the fuel transfer process will depend on the size of the shipment received at the marine terminal. The smaller barge shipments are expected to take approximately 12-18 hours to unload and transfer, while the larger tanker shipments are expected to take up to 36 hours to unload and transfer. • Operations staff will be on-site 24/7 and VAFFC will ensure that concerns can be responded to reasonably. • The fuel receiving facility will incorporate modern control systems featuring redundant power and processing components providing a high level of reliability. The control hardware will be industry standard used throughout the petro-chemical industry, and comply with the Canadian Electrical Code and applicable guidelines for a class II fuel storage facility. • With respect to the recommendation regarding safety policies and plans, the facility’s fire safety plan, and other safety protocols and plans will be filed with the appropriate agencies.



<ul style="list-style-type: none"> • A recommendation was made that the control system for all project components should be designed to fail safe and tolerate power loss for two weeks. • Concern was expressed that taxpayers will subsidize the project through road improvements, specialized fire-fighting equipment, additional personnel, and possibly a new fire hall and fire boat. • Comment was made that the facility should not be located on the proposed site 	<ul style="list-style-type: none"> • The control system does incorporate fail safe devices. Backup power systems and redundant control systems will shut down and isolate the fuel storage in the event of emergency or power failure. Backup power system can maintain certain operations indefinitely. • This project will contribute approximately \$500,000 each year in tax revenue to the city of Richmond. It will not impose any new costs to taxpayers. • The Fuel Receiving Facility is located on Port Metro Vancouver land that is zoned for industrial use.
<p>Topic: Emergency Response</p>	
<ul style="list-style-type: none"> • Questions and concerns were received about the emergency response plan <ul style="list-style-type: none"> ○ What is the expected response time and who are the responders? ○ Concerned that traffic congestion in Richmond will delay response times. ○ Only enough foam to fight one tank fire is insufficient to fight any fire that may occur at the facility. ○ Richmond Fire Rescue does not have specialized equipment to handle a fuel fire. ○ Insufficient amount of foam fire retardant on-site – only enough for one tank fire. ○ No automatic fire suppression. 	<ul style="list-style-type: none"> • Emergency response: <ul style="list-style-type: none"> ○ The combined Marine Terminal and Fuel Receiving Facility sites will be manned 24/7. On-site staff would be the primary responders in the event of an emergency situation. That response time would be immediate. ○ In the event of a fire or emergency, the on-site staff will activate the fire protection system. The fire detection system includes heat detection cables located within the cable trays and heat detection within the tank itself. In the event of an alarm, the staff will investigate further and if a true emergency exists, they will activate the foam fire protection system, which will release foam into the specific tank that requires it. ○ Richmond Fire Rescue will be notified upon an alarm condition so they can respond to the site while VAFFC staff investigate the cause of the alarm. ○ Fire Hall No.7 is located to the north of the facility on No.6 Road and Westminster Highway. The travel distance from this Fire Hall to the facility is approximately 5 km away. Fire Hall No. 4 is located at No. 4 Road and Williams, approximately 6 km away. ○ Richmond Fire and Rescue are best placed to answer questions regarding their response time to the facility. ○ VAFFC will have specialized equipment on-site. Richmond Fire Rescue will have access to that equipment.



	<ul style="list-style-type: none"> ○ An independent, third-party hazard and risk assessment concluded that a fire occurring in the process area or a tank fire are the potential scenarios for which the response measures should be designed. Statistically, neither have a probability of occurring over the life of the project. ○ The assessment also calculated that the safe perimeter in the unlikely event of a tank fire is 69 metres, while the response planning safe perimeter is 130 metres from the centre of all the tanks, well short of any residential or heavily occupied properties. The Marine Terminal and Fuel Receiving Facility will be manned 24 hours a day, providing immediate response to fires or other emergency situations. ○ The facility will be equipped with state-of-the-art fire detection and suppression systems. Among these are automatic detection systems, and semi-automatic foam suppression and tank cooling systems (requiring Operator activation). In addition, the facility will have a sufficient amount of foam as recommended by National Fire Prevention Association (NFPA) guidelines.
<p>Topic Area: Hazard and Risk Assessment</p>	
<ul style="list-style-type: none"> ● Concern was expressed about the response planning safe perimeter: <ul style="list-style-type: none"> ○ What would be the impacts of a multi-tank fire or a single tank fire on the west side and the impact it could have on the neighbouring property 	<ul style="list-style-type: none"> ● An independent, third-party hazard and risk assessment concluded that a fire occurring in the process area or a tank fire are the potential scenarios for which the response measures should be designed. Statistically, neither have a probability of occurring over the life of the project. ● The assessment also calculated that the safe perimeter in the unlikely event of a tank fire is 69 metres. This distance does not affect the property to the west of the Fuel Receiving Facility.
<ul style="list-style-type: none"> ● Question was asked about the potential risks associated with the Tilbury LNG plant in Delta – “What are the risks that LNG Tilbury will influence (sic) the PMV/VAFFC facility?” 	<ul style="list-style-type: none"> ● VAFFC believes the operation of the Tilbury LNG plant will not affect the Vancouver Fuel Delivery Project. Questions regarding the expansion of the Tilbury LNG plant should be directed to the project proponent, Fortis BC.
<ul style="list-style-type: none"> ● Recommendations were made: <ul style="list-style-type: none"> ○ A risk-based land use study that examines the worst possible case impact and hazard footprint of a jet fuel vapour cloud explosion’s blast wave and fire at the tank farm should be conducted. 	<ul style="list-style-type: none"> ● A risk-based study was conducted relative to worst possible/credible impact of fire and explosion on the surrounding area of the Fuel Facility in the “Vancouver Airport Fuel Delivery Project, Risk and Hazard Analysis for Fuel Receiving Facility” Report. The risk quantification did not identify the hypothesized scenario (noted in the comment) as credible for purposes of design considering the higher flashpoint and stable characteristics of jet fuel.



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| <ul style="list-style-type: none">○ Joint Review Panel should be created to recommend that PMV, EAO, and VAFFC make use of the NASA System Safety Handbook.○ Public should know what level of risk of fatalities, injuries and damage to the ecosystem is deemed acceptable by Review Panel, MV and BCEAO. <ul style="list-style-type: none">● Questions related to Hazard and Risk Assessment were made:<ul style="list-style-type: none">○ What is a fixed fire protection system that is not required (sic)?○ Explain why floating roof tanks storing any liquid do not require protection?○ Ambient air temperature does not necessarily match internal tank temperature. How much will they differ if a dark tank is heated by the sun on a windless day?○ What project lifetime is assumed for risk assessment?○ What level of redundancy and failure rate are assumed for sensors and communications protocols?○ How far is the evacuation required?○ How often is the periodic inspection required?○ Convert seismic event to Richter scale.○ What are the limits from smoke inhalation?○ How many fatalities are considered acceptable during the 60 year life of the project? | <ul style="list-style-type: none">● The recommendations regarding the establishment of a Joint Review Panel and the level of risks deemed acceptable by regulatory agencies would have to be addressed by the regulatory agencies.● The project completed a rigorous four-year coordinated federal and provincial environmental assessment review in accordance with the Canada-British Columbia Agreement for Environmental Assessment Cooperation (2004) and pursuant to the <i>Canadian Environmental Assessment Act</i> and the <i>BC Environmental Assessment Act</i>.● The review was led and administered by the BC Environmental Assessment Office (EAO) and included the involvement of close to 20 federal, provincial, regional and municipal agencies and departments, including Fisheries and Oceans Canada, Environment Canada, Health Canada, Transport Canada, Canadian Coast Guard, Port Metro Vancouver, Metro Vancouver, Richmond, Delta, BC Oil and Gas Commission, BC Ministry of Environment, Vancouver Airport Authority, and 12 First Nations.● An independent, third-party hazard and risk assessment undertaken in 2015 – “Vancouver Airport Fuel Delivery Project, Risk and Hazard Analysis for Fuel Receiving Facility” – concluded that a fire occurring in the process area or a tank fire are the potential scenarios for which the response measures should be designed. The assessment also calculated that the safe perimeter in the unlikely event of a tank fire is 69 metres, while the response planning safe perimeter is 130 metres from the centre of all the tanks, well short of any residential or heavily occupied properties.● The Marine Terminal and Fuel Receiving Facility will be manned 24 hours a day, providing immediate response to fires or other emergency situations.● The facility will incorporate the following features:<ul style="list-style-type: none">○ fixed fire protections systems for detection, cooling water, and foam suppression○ floating roofs which greatly reduce the vapour space above the fuel○ free venting of remaining head space and light coloured paint (reduces temperature differential)● A fixed fire protection system for tank storage is designed and constructed in accordance with good engineering practice as described in:<ul style="list-style-type: none">○ NFPA 11, “Low-, Medium-, and High-Expansion Foam,”○ NFPA 15, “Water Spray Fixed Systems for Fire Protection,” and○ NFPA 69, “Explosion Prevention Systems.” |
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- As outlined in Section 3.2.5 of the “Vancouver Airport Fuel Delivery Project, Risk and Hazard Analysis for Fuel Receiving Facility” Report, and Sentence 4.3.2.5.(2) of the 2010 National Fire Code of Canada, a fixed fire protection system is not required by Canadian Codes for a storage tank where the diameter is 45 m or less. The Fuel Facility storage tanks will have a diameter of 35.05 m. However, fixed fire suppression is being proposed for this project.
- The National Fire Code of Canada and the US-based standard NFPA 30, which is referenced by the NFCC, does not require a fire protection system for floating-roof tank storing any liquid. Floating roof tanks are considered to limit the available surface area of the fuel that can participate in combustion.
- Jet A1 fuel has a high flashpoint and no substantial likelihood based on Richmond weather data to be heated above its flashpoint during storage or transfer operations due to ambient conditions, even during periods of increased temperature comparative to Richmond summer norms. Further, the exterior of the tanks are intended to be painted white to minimize solar heating.
- The risk assessment detailed in the “Vancouver Airport Fuel Delivery Project, Risk and Hazard Analysis for Fuel Receiving Facility” Report does not assume a project lifetime. Section 4.5 of this report notes that based on historical statistics and six storage tanks, the return period for a fire in any one tank is 138.9 years. However, this data includes all types of volatile hydrocarbons including those that are more prone to ignition than Jet A1, and also includes all types of failures and modes of ignition. Jet A1 is much less volatile than many other types of hydrocarbons, will be stored in internal floating roof tanks intended to be protected with a foam suppression system; therefore, the probability of a fire event is anticipated to be much lower for the Fuel Receiving Facility.
- The risk assessment detailed in the “Vancouver Airport Fuel Delivery Project, Risk and Hazard Analysis for Fuel Receiving Facility” Report does not assume a level of redundancy or failure rates for sensors and communication protocols. The report anticipated failure of groups of systems relative to establishing credible fire scenarios. If it is anticipated that only a component in a group of system fails as suggested in the comment, the risk of incidence and consequence would be further reduced than those provided in the report. The analysis completed is therefore more conservative than the comment seems to anticipate.
- The risk assessment detailed in the “Vancouver Airport Fuel Delivery Project, Risk and Hazard Analysis for Fuel Receiving Facility” Report does not specify an evacuation distance, but provides distance related to heat effects due to fire as they relate to life safety which assists in addressing emergency planning for extreme



incidents. The determination of an evacuation beyond the site is at the discretion of the Fire Department and would need to be determined based on the specific parameters of the event. This relates predominantly to the potential for smoke from fire, as fires and deflagration-type explosions are expected to be predominantly limited to the site.

- The applicable building/fire codes require safe evacuation to a public thoroughfare (e.g. street). The Fuel Receiving Facility will comply with these requirements.
- The requirement for periodic inspections of fire protection equipment is regulated by Canadian Codes. Depending on the equipment and the nature of the inspection, there are several levels of inspection and corresponding frequencies. These include daily, weekly, monthly, quarterly, or annual inspections that will be defined and tracked.
- No limits of smoke inhalation have been assumed in the analysis of this facility. There are no Canadian guidelines quantifying acceptable levels of smoke and its impact when inhaled.
- The risk assessment detailed in the “Vancouver Airport Fuel Delivery Project, Risk and Hazard Analysis for Fuel Receiving Facility” Report does not correlate potential fatalities with facility lifecycle in the context suggested in the comment. Risk to life and property is established relative to the levels inherent to the building and fire regulations that define the acceptable risk. The development of the National Building and Fire Codes is an open public forum whereby anyone can propose changes, and national committees made up of various stakeholders from across industry and geographical region review the proposals for changes, amendment to the codes. By exceeding the proposed codes and standards in the design of this facility, the developers of this project hope to minimize any potential for loss of life due to a fire in this facility.



Questions/Comments Outside the Scope of the PMV Process

A number of comments were received that are not related directly to the permit process for the Fuel Receiving Facility, such as the Marine Terminal and pipeline components of the Project. These have either been addressed through the Environmental Review process or will be addressed through other permit application processes.

Stakeholder Input	VAFFC Consideration of Input
<ul style="list-style-type: none"> The EC decision indicates there are likely no significant adverse effects to human health. Define “significant” and “likely” in terms. 	<ul style="list-style-type: none"> Following their review and assessment of the robust information filed on the Project record, both EAO and PMV concluded in their Assessment Report / Screening Report that “...based on the above analysis and having regard to the recommended conditions (which, if approved, would become legally binding as a condition of a certificate), EAO and VFPA are satisfied that the proposed Project is not likely to have significant adverse effects to human health...”. In addressing what may constitute a “significant” adverse effect to human health, EAO and VFPA considered the application of effective mitigation and legally-binding conditions if an EAC was to be issued. They also considered the following factors each of which has a predefined threshold for a Valued Component (VC) (e.g., Human Health), which is in accordance with widely accepted EA practice: the magnitude or severity of a potential effect, the geographic extent of a potential effect, duration and frequency of a potential effect, whether a potential effect may or may not be reversible, the ability for a receptor to accept a change caused by a potential effect, and how likely it would be for a potential effect to occur in the absence of certainty. If a potential effect was expected or predicted to occur on a frequent basis then it would be described as “likely”. Conversely, if a potential effect was expected or predicted to occur infrequently then it would be described as “unlikely”. In reaching their determinations of “likely” and “significant” the EAO and VFPA spent an extensive amount of time (i.e., 5 years) gathering input and facilitating discussions with technical expert working group members, interested parties, the public and First Nations. The conclusion of “significance” and “likely” in the context of the Human Health VC is supported by robust studies and is defensible by any reasonable measure. For more information on the definitions of “significant” and “likely,” please refer to the <i>BC Environmental Assessment Act</i> and <i>Canadian Environmental Assessment Act</i>.



<ul style="list-style-type: none"> Expand the tank farm on Sea Island, with terminal on north arm or off the coast 	<ul style="list-style-type: none"> In 2001, VAFFC began studying alternate long-term fuel delivery systems to serve YVR. In all, 14 options were identified and assessed based on the potential economic, environmental, social and regulatory impacts associated with their construction and operation. The proposed project emerged as the preferred option because it best met safety, environmental, technical and economic criteria, and offered long-term reliability of fuel supply to YVR.
<ul style="list-style-type: none"> Does the project require the removal of the George Massey Tunnel? How many ships per month/day/year are anticipated? 	<ul style="list-style-type: none"> The project was designed with the George Massey Tunnel in place, and entered the environmental review process before the B.C. Government’s announcement that the tunnel will be replaced by a new bridge. The project can operate to its maximum design vessel with or without the tunnel in place. The new delivery system will require only three to five vessel deliveries on the river each month. Most of these deliveries will be by barges. The largest vessel size will be Panamax class, which is no larger than many vessels currently transiting the river.
<ul style="list-style-type: none"> Adjacent business doesn’t want the pipeline crossing its property. 	<ul style="list-style-type: none"> VAFFC is applying for an amendment to its Environmental Assessment Certificate to change the route near the Fuel Receiving Facility that will resolve this concern.
<ul style="list-style-type: none"> Vessels should be limited to barges only. 	<ul style="list-style-type: none"> The new delivery system will require only three to five vessel deliveries on the river each month. Most of these deliveries will be by barges. The largest vessel size will be Panamax class, which is no larger than many vessels currently transiting the river. An independent Fraser River Tanker Traffic Study commissioned by Port Metro Vancouver and released in 2012 made recommendations and concluded that aviation fuel can be transported safely on the river.
<ul style="list-style-type: none"> Opposed to the pipeline across Richmond – added that “community environment and safety is our number one priority. If we have to use more expensive jet fuel delivery service, I cannot see why we cannot just pass on the cost to those users. 	<ul style="list-style-type: none"> Safety and environmental protection area a priority for this project. On a stand-alone basis, the risks of this project are few and will be managed to insignificant levels with well understood and proven risk management methods and best practices.
<ul style="list-style-type: none"> Concerned about the cumulative impact of various projects on the Fraser River and Terminal 2. 	<ul style="list-style-type: none"> Cumulative effects were assessed during the Environmental Assessment process, which was completed in December 2013.



<ul style="list-style-type: none"> • Opposed to the project: <ul style="list-style-type: none"> ○ Concerned about spill risk on the river; wants a pipeline to Cherry Point refinery. ○ Four existing terminals in Burnaby and along Burrard inlet are better options. ○ Work with Chevron, IOCO, Shell and Petro-Canada to meet the airport’s needs through existing routes. • Proposed fuel delivery project on the North Arm was rejected in 1997 by the federal Environment Minister. Why hasn’t the BC Minister of the Environment done the same thing for this project? 	<ul style="list-style-type: none"> • The spill response capabilities for the project will add significant spill response equipment, planning, training, and operational expertise that currently does not exist and will benefit all users of the Fraser River. The marine terminal will have two response boats equipped with boom and skimmers during vessel arrival and offloading. These response boats will be deployed once a vessel enters the Fraser River, and would be on stand-by to deploy boom on the open river if required. Before a vessel is unloaded, the boom and skimmers will be placed around the vessel to contain a spill in the unlikely event of a release from the vessel, and sorbents would be used to absorb any product. In addition, certified river pilots, escort tugs and double-hulled vessels will contribute to a very high level of safety. In the event of a spill, the marine terminal is required to promptly notify the Canadian Coast Guard, and federal and provincial authorities. • Cherry Point was one of 14 options that were studied by VAFFC. It has many weaknesses compared with the existing project, such as a much larger environmental footprint and social impact, more complex regulatory framework (due to the cross border route), higher cost to build and maintain, and it would not provide access to other off-shore sources of aviation fuel. • Chevron is the only one of the four refineries that still operates. • The project completed a rigorous four-year coordinated federal and provincial environmental assessment review in accordance with the Canada-British Columbia Agreement for Environmental Assessment Cooperation (2004) and pursuant to the <i>Canadian Environmental Assessment Act</i> and the <i>BC Environmental Assessment Act</i>. The review was led and administered by the BC Environmental Assessment Office (EAO) and included the involvement of close to 20 federal, provincial, regional and municipal agencies and departments, including Fisheries and Oceans Canada, Environment Canada, Health Canada, Transport Canada, Canadian Coast Guard, Port Metro Vancouver, Metro Vancouver, Richmond, Delta, BC Oil and Gas Commission, BC Ministry of Environment, Vancouver Airport Authority, and 12 First Nations.
<ul style="list-style-type: none"> • Is project linked to Northern Gateway or Kinder Morgan projects? 	<ul style="list-style-type: none"> • This project is not linked to the proposed Enbridge or Kinder Morgan pipeline projects in B.C.
<ul style="list-style-type: none"> • Questions were asked about the pipeline portion of the project. 	<ul style="list-style-type: none"> • Questions about the pipeline portion of the Project will be addressed through the BC Oil and Gas permit process. They are outside the scope of this application.



<ul style="list-style-type: none"> • Concern was expressed about airport growth: <ul style="list-style-type: none"> ○ Will this growth path continue indefinitely? The environmental footprint of the airport continues to expand and there is a limit to the environment to absorb this expansion. This is an important planning exercise the airport should be engaging in. 	<ul style="list-style-type: none"> • The Airport Authority has a comprehensive planning process to guide Vancouver International Airport's growth. A major component is the Master Plan. • The YVR: Your Airport 2027, 20-Year Master Plan, approved by the Federal Minister of Transport, is a medium-term roadmap, outlining how Vancouver Airport Authority will: <ul style="list-style-type: none"> ○ accommodate growth in passenger aircraft and cargo volumes ○ meet the needs of YVR's stakeholders and the communities it serves ○ achieve its gateway strategy and sustainability objectives while supporting the airport's longer-term viability • The 20-Year Master Plan identifies what must be done to meet air travel needs in 2027 and the Airport Authority's recommendations for meeting those needs. • The Master Plan is updated regularly. Earlier this year, the Airport Authority introduced YVR 2057, the public consultation process whereby the community and stakeholders can provide input into the development of YVR's new Master Plan. • The Airport Authority should be contacted for more information about its planning process.
<ul style="list-style-type: none"> • Veracity of employment benefits was questioned. 	<ul style="list-style-type: none"> • The project represents a \$100 million investment in the local construction industry, and will result in direct and indirect jobs. It will also greatly improve the fuel delivery system to the airport, enhancing its status as a top tier Pacific gateway. YVR employs more than 24,000 people and, according to a 2012 survey by the Airport Authority, an estimated 24 per cent of them live in Richmond.
<ul style="list-style-type: none"> • Comment was made that removing tanker truck traffic is a positive benefit of the project. • A comment was made that tanker trucks currently on roads is a minor issue. 	<ul style="list-style-type: none"> • Removing the tanker trucks will result in safer roads and less GHG emissions. Without the new system, the only way to meet YVR's growing demand is to add more tanker truck deliveries. For example, adding one new daily flight to Asia would require about 800 more tanker truck deliveries each year.
<ul style="list-style-type: none"> • Complaint was made about flights arriving and departing between 12 am and 7 am and that Richmond is too big. 	<ul style="list-style-type: none"> • This concern is outside the scope of the PMV application review.
<ul style="list-style-type: none"> • Comment made that a larger pipeline will not be safer if it is not thicker. 	<ul style="list-style-type: none"> • Modern pipeline systems have the benefit of precise locating technologies, new materials and coatings, and innovative installation techniques to reduce disturbances during construction and reduce risk of spills and damage during operations.



	<ul style="list-style-type: none"> • A larger pipeline generally comes with a thicker wall to meet applicable strength requirements. Larger pipelines can also operate at lower pressures to achieve the same delivery performance. • The pipeline system will: <ul style="list-style-type: none"> ○ Be regulated by the BC Oil and Gas Commission ○ Be constructed with resilient materials to current seismic design standards ○ Be controlled and monitored by operations personnel during all fuel transfer activities ○ Include state-of-the-art corrosion protection and leak detection technologies ○ Be buried underground and well-marked, mapped and electronically located for reference by municipal and private contractors ○ Be monitored by a control system using pressure sensors and automatic flow shutoff devices
<ul style="list-style-type: none"> • Comment was made that analysis of alternate fuel delivery options was insufficient. • Comment was made that the Project should require an environmental impact study from Environment Canada 	<ul style="list-style-type: none"> • VAFFC contracted Golder Associates and Ausenco-Sandwell, both well respected firms with marine and environmental engineering experience, to undertake an independent and transparent comparative analysis of four main options to deliver jet fuel to YVR. The analysis was undertaken to address concerns raised by the City of Richmond and public regarding the original analysis conducted by VAFFC. The options selected for further evaluation were based on the majority of specific inquiries received throughout the BC Environmental Assessment Office’s review of the project. The comparative analysis concluded that proposed project was the best option when environmental, socio-economic, First Nations, operations and economic factors are considered together. • The project completed a rigorous four-year coordinated federal and provincial environmental assessment review in accordance with the Canada-British Columbia Agreement for Environmental Assessment Cooperation (2004) and pursuant to the <i>Canadian Environmental Assessment Act</i> and the <i>BC Environmental Assessment Act</i>. The review was led and administered by the BC Environmental Assessment Office (EAO) and included the involvement of close to 20 federal, provincial, regional and municipal agencies and departments, including Fisheries and Oceans Canada, Environment Canada, Health Canada, Transport Canada, Canadian Coast Guard, Port Metro Vancouver, Metro Vancouver, Richmond, Delta, BC Oil and Gas Commission, BC Ministry of Environment, Vancouver Airport Authority, and 12 First Nations.



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	<ul style="list-style-type: none">• Environment Canada lauded the spill modelling approach taken by VAFFC in planning for the project as being state-of-the-art for spill modelling and potential incident preparation.
<ul style="list-style-type: none">• Comment was made that tankers must be twin screw design with two independent engines.	<ul style="list-style-type: none">• The <i>Canada Shipping Act</i> governs what types of vessels are permitted in Canadian waters.