Vancouver Fraser Port Authority

Centerm Expansion Project – Air Transportation Impact Study

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1	May 6, 2016		Updated Client's Name
2	Oct. 28, 2016	HT/NS	Revised Executive Summary, and Introduction

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Quality Information

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Design Manager

Executive Summary

The Centerm Container Terminal (Centerm) on the south shore of Vancouver's inner harbour is one of three primary container terminals in the Vancouver area and handles approximately one-fifth of the container goods shipped through Vancouver. DP World Vancouver (DPWV) operates the terminal on federal lands and waters which is leased from the port authority.

Trade of containerized goods shipped through Canada's west coast is increasing; In 2015, container terminals on the west coast of Canada (including Vancouver and Prince Rupert) handled more than 3.8 million Twenty-foot Equivalent Units (TEUs), with nearly 3.1 million TEUs handled by container terminals in the Port of Vancouver. The Port of Vancouver's container terminals (Vanterm, Deltaport, Fraser Surrey Docks, and Centerm) are currently able to handle an estimated 3.9 million TEUs per year.

Independent forecasts completed for the Vancouver Fraser Port Authority (port authority) by international experts in transportation and trade indicate that container traffic through the west coast of Canada will increase by approximately 3.5 million TEUs by 2035. This growth is driven primarily by the growing demand between Canada and Asian markets for imported products such as clothing, food, electronics and manufacturing inputs, such as car parts, and exports of Canadian products such as pulp, paper, lumber and specialty grains.

The proposed Centerm Expansion Project (CEP) is a series of improvements to the Centerm Container Terminal. The proposed infrastructure improvements will increase the number of containers that can be handled at Centerm by approximately two-thirds, from a current maximum annual capacity of 900,000 Twenty-foot Equivalent Units (TEUs) to 1.5 million TEUs. During peak operations, the number of containers that can be handled at the terminal will increase from an annual sustainable capacity of 750,000 TEUs to 1.3 million TEUs. To increase the container capacity of the terminal by 67 per cent, the proposed terminal improvements include an expansion of the terminal footprint by 15 per cent and reconfiguration of the terminal.

The seaplanes and helicopters both operate within the Vancouver Harbour. The Vancouver Harbour Heliport is a terminal for local helicopter businesses and the Vancouver Harbour Flight Center is the terminal for local seaplanes businesses. Both the seaplanes and helicopters have a designated area for their Flight Approach and Take-off (FATO) that is regulated by NAV Canada. Any obstructions within the FATO will cause a safety concern for pilots to navigate in and out of the Vancouver Harbour. The seaplane's FATO is four sided polygon (approximately 0.55km^2) and is located north of Canada Place. The helicopter's FATO is in a triangular shape between 351º and 17º relative to the Magnetic North and is located in the corridor between Canada Place and Centerm.

The port authority's project team held a meeting with the local seaplane and helicopter business representatives to provide additional information regarding the project and to mitigate any foreseeable issues or concerns from the local air transportation business representatives. The seaplane business representatives reviewed the proposed CEP and confirmed that the westward land expansion and the additional cranes at the northwest corner will not create a conflict with the seaplane's FATO. However, the helicopters will have a minor impact since the heliport is located within the embayment between Canada Place and Centerm. Due to the extent of the anticipated construction limits, there is an area that infringes into the Helicopter's FATO and their regulated Obstacle Marking/Lighting area. After additional analysis and meetings with the helicopter business representative at the heliport, it was determined that marine construction vessels used during construction will not be considered as fixed obstructions that could be a potential hazard within the FATO. However, to provide the helicopter businesses with additional safety measures, it is recommend having the marine construction vessels to be marked/flagged (as per NAV Canada standards) and sufficient lighting must be provided if work is being done outside of daylight hours.

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1. Introduction

The Centerm Container Terminal (Centerm) on the south shore of Vancouver's inner harbour is one of three primary container terminals in the Vancouver area and handles approximately one-fifth of the container goods shipped through Vancouver. DP World Vancouver (DPWV) operates the terminal on federal lands and waters which is leased from the port authority.

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Figure 1 shows the proposed expansion of the western end of the Centerm.

Figure 1: Centerm Container Terminal Westward Expansion

Air transportation activities occur within the Burrard Inlet, particularly along the south shore, and are active within the embayment between Canada Place and the Centerm. The air transportation operators require sufficient clearance for their Final Approach and Takeoff (FATO) area to be able to safely navigate in and out of the waterdromes/heliports. However, the proposed CEP will reduce the width of the channel (between Canada Place and Centerm) which could impact the air transportation operator's FATO and creates congestion with other transportation activities within the area.

This Air Transportation Impact Study will discuss the following:

§ Air transportation locations in the vicinity of the project.
§ Highlight the activities taking place in each location.
§ Identify any transportation routes and whether they conflict with any CEP works.

2. Air Transportation Network

This section discuss about the existing air transportation within the vicinity of the CEP.

2.1 Locations

Centerm is located on the south shore of the Burrard Inlet north Main Street. There are several air transportation businesses within the area, and are designated to land at two specified areas in the Vancouver Harbor. The FATO zone for seaplanes is located north of Canada Place with the terminal in Coal Harbour and the Heliport is located east of Canada Place (see Figure 2 below).

Figure 2: Air Transportation Locations

Figure 2 shows the locations of the two air transportation operations within the Vancouver Harbour. The blue area represents the takeoff and landing area for the floatplanes and the green area represents the FATO for the helicopters.

2.2 Activities

Helicopters and float planes are the two modes of air transportation within the Vancouver Harbor. Vancouver Harbour Heliport operates the helicopter activities and Vancouver Flight Harbour Center operates the float plane activities.

2.2.1 Vancouver Harbour Heliport

Vancouver Harbour Heliport is a helicopter terminal that works with the different helicopter businesses to provide helicopter transportation services ranging from sightseeing flights to transportation services. The helicopter landing pad is located at the foot of Cambie Street, east of Canada Place. The different helicopter businesses that operate from the heliports are Helijet, Sky, Talon, and Blackcomb. In addition to the recreational transportation services, the heliport is also used for emergency helicopter landing for medical emergencies and for police aircrafts.

Helijet and Sky are the two busier helicopter businesses in the Vancouver Harbour. SKY helicopter provides sightseeing tours and recreational flights. Helijet provides various helicopter services ranging from scheduled services to tourist sightseeing flights. Helijet operates seven days a week with multiple flights during the day and night from the Vancouver Harbor.

2.2.2 Vancouver Harbour Flight Center (CXH)

Vancouver Harbour Flight Centre (VHFC) is a seaplane terminal located at Coal Harbour east of Canada Place. The VHFC is classified by NAV Canada as an airport and as an airport of entry with CBSA officers onsite. VHFC provides transportation services from sightseeing flights to local airline transportation to the Pacific Northwest's coastal communities with different seaplane airline businesses such as Harbour Air Seaplanes, Salt Spring Air, Seair Seaplanes, Westcoast Air, Whistler Air, Corilair, Kenmore Air, and Tyax Adventures. The seaplanes have a designated landing and takeoff area which is located north of Canada Place (represented as a blue polygon in Figure 2). After the float plane has landed, the pilot will navigate their plane to be docked and store their planes near Coal Harbour.

2.3 Air Transportation Routes

Both the seaplane and helicopter air transportation services are located in the Vancouver Harbor, however they have a different FATO zone.

2.3.1 Seaplanes

Seaplanes operating out of the Vancouver Harbour Flight Center have a different FATO compared to the nearby Heliport. The water landing area is located in the Vancouver Harbor, north of Canada Place with the water landing area approximately 0.55 km^2 as shown in Figure 3.

Figure 3: Seaplane Routes

The seaplane FATO is orientated in an east-west direction. There is a potential conflict at the southern limits of the water landing area where the projected FATO intersect the northwest corner of the proposed Centerm Expansion Project (green circle in Figure 3). The height of the gantry cranes at the west end of the extended berth prevents an obstruction to seaplane's flight paths (purple arrow).

During a meeting on January 18th, 2016 held at Canada Place with operators from the local air transportation services in the Vancouver Harbor, it was determined that the potential obstruction along the southern limit of the FATO is not seen as an issue for seaplanes. Transport Canada will be required to review and amend flight path regulations in the Vancouver Harbour with the westward expansion of Centerm. See Appendix B for the corresponding email from the Harbour Air Seaplanes.

2.3.2 Helicopters

The helicopter's FATO is in a conic shape with Magnetic North bearings between 351° and 17° at the Heliport landing pad east of Canada Place. The helicopter flight path bearing is shown in Figure 4 (source: Canada Flight Supplement /GPH 205).

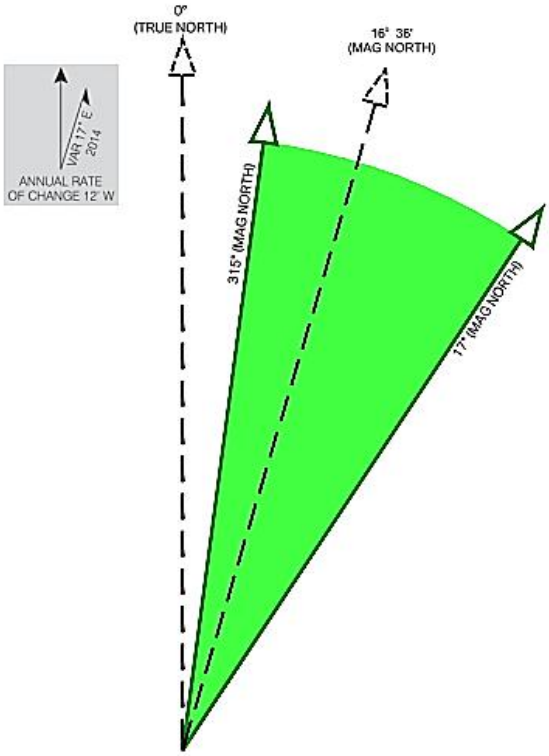


Figure 4: Helicopter Arrival and Departure Bearing

Helicopter operators follow the same regulated approach to the helicopter landing pad as shown in Figure 5. The helicopter FATO (shown in the hatched conic shape) is located at the center of the marked squared shape landing zone. Figure 5 shows that the helicopter's FATO (reference to magnetic north) does not conflict with the proposed westward expansion of Centerm.

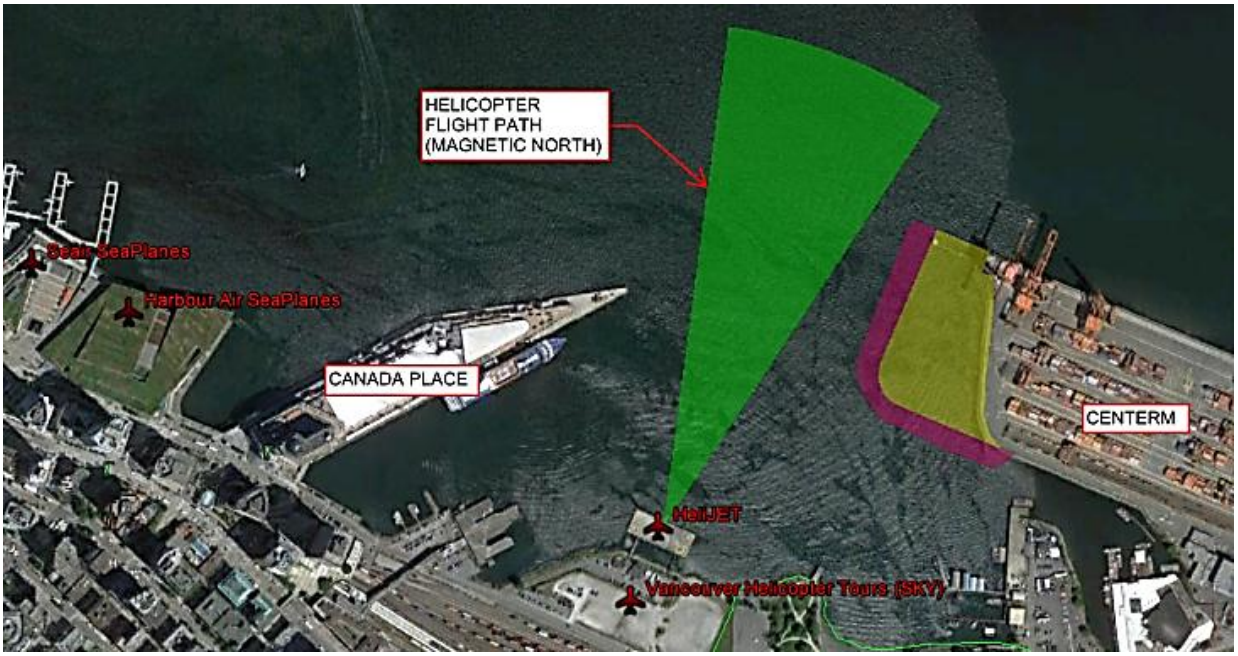


Figure 5: Helicopter Flight Route

2.3.2.1 Helicopter Flight Path Obstructions

The helicopter operator's main concerns are the possible obstructions that could be generated from the expansion project (during construction and completed terminal operation) that might infringe over the helicopter's flight path. Since the corridor between Canada Place and Centerm will be narrowed due to the westward expansion, the air and marine operators will have to share the available spaces and still comply with Transport Canada regulations.

The amount of different modes of transportation (air and marine) within the corridor and the height of obstacles will potentially cause a delay for the helicopter operations. If the area is saturated with marine vessels, then the active helicopter must wait till a flight path is clear before they can land because they are not permitted to fly over any marine vessels. See Figure 6 for the possible construction envelopes/limits relative to the helicopter's flight path.

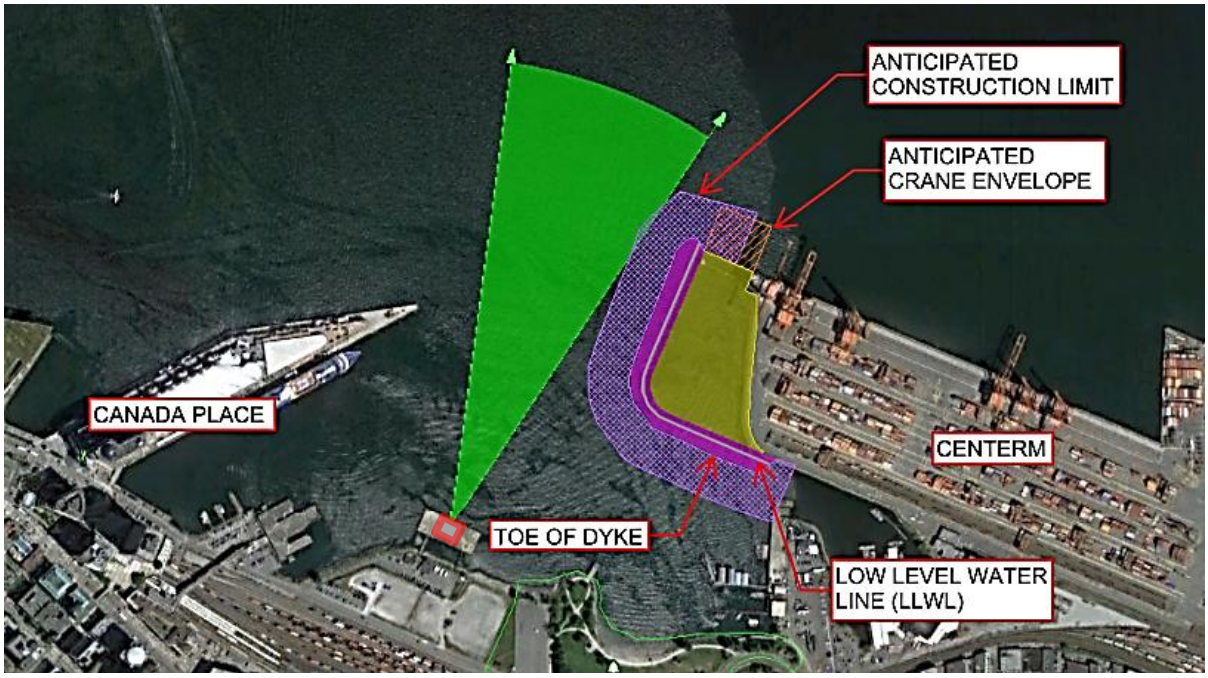


Figure 6: Anticipated Obstructions

The purple hatched area shown in Figure 6 is the anticipated construction limits. There is a short section of the construction zone that might encroach into the flight path. It is assumed that approximately 31 meter high (100 feet) marine dredging construction vessels could be operating within the construction zone during construction. The anticipated crane envelope shows the expected crane boundaries at the western end of the Centerm Terminal which does not appear to affect the helicopter's FATO. The Low Level Water Line (LLWL) is estimated to be the typical water level after the expansion project is complete. Everything below the LLWL is expected to be submerged in water. Refer to Appendix A for more details.

The anticipated section of construction boundary that appears to encroach on to the helicopter's FATO is approximately 473 meters north of the helicopter landing pad and it is estimated that the encroachment is approximately 60 meters in length and is approximately 7 meters wide. The construction encroachment is based on construction equipment that is up to 31 meters in height (100 feet). See Figure 7 for the plan view and Figure 8 for the elevation sketch. Refer to Appendix A for more details.

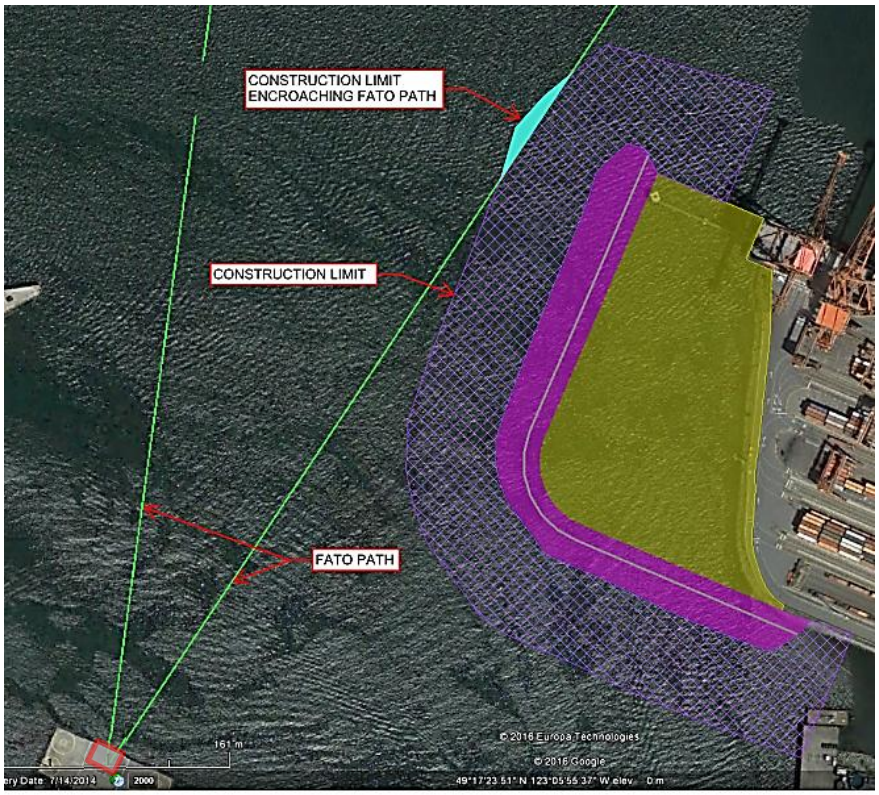


Figure 7: Construction Limit Encroachment Plan

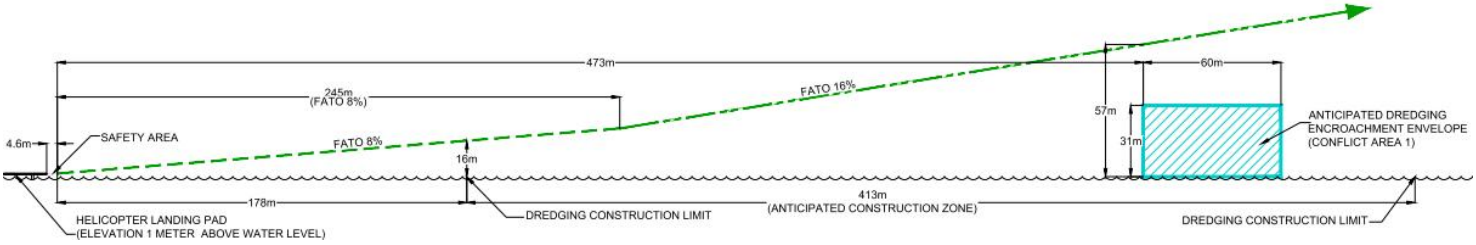


Figure 8: Construction Limit Encroachment Elevation View

The helicopter FATO will take off at 8% from the helicopter pad to 245m then the FATO will increase to 16%. Based on the elevation view, the construction dredging vessels within the anticipated conflict area does not appear to obstruct the helicopter FATO. The maximum height within the anticipated conflict area is 57m (187ft) before any obstructions will infringe into the FATO. Therefore, the Centerm Expansion Project would not cause any impact or disruptions to the helicopter operations during construction.

2.3.2.2 Helicopter Obstacle Marking and Lighting

Obstacles within or near the flight path can be a potential hazard for helicopters. There are a few sources of information that were used to analyze the regulations for obstacle marking and lighting. Sources that were reviewed for this report are:

§ Transport Canada website for Obstacle Limitation Surfaces
§ Canadian Aviation Regulations Part III - Aerodromes, Airports and Heliports Subpart 5
§ Standard 325 – Heliports
Standard 621-Obstruction Marking and Lighting.

The Canadian Aviation Regulations Part 3 was used to identify the boundary for the obstacle marking and lighting area at the helipad in the Vancouver Harbour. The helicopter landing area was modified to present a square landing zone at the Vancouver Harbour. The criteria for obstacle marking and lighting from the Canadian Aviation regulation (section 325.37, Figure 6-1) is shown in Figure 9 and the modified zone as applied to the Heliport in the Vancouver Harbour is shown in Figure 10.

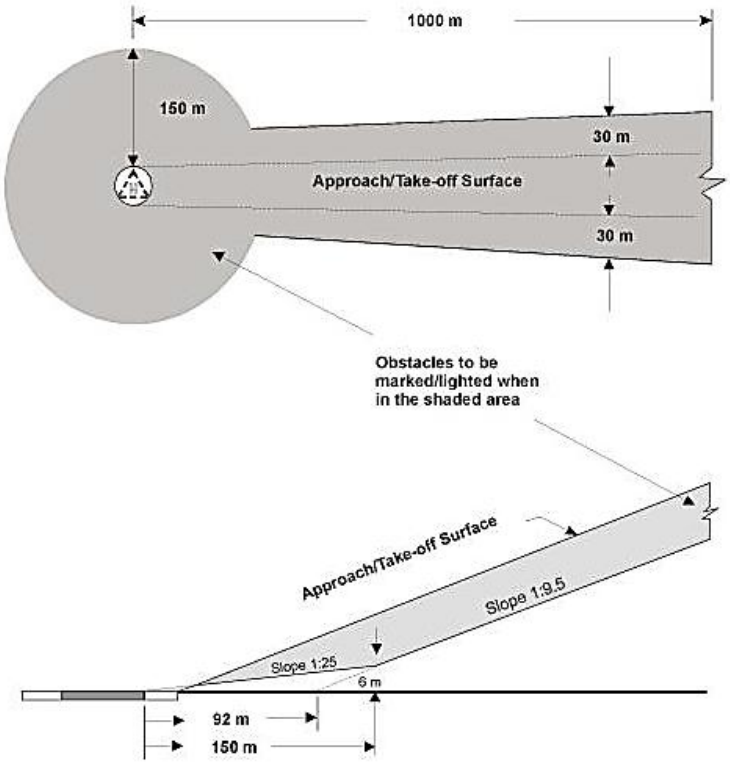


Figure 9: Obstacle Marking and Lighting Area Regulation (Canadian Aviation Regulation Part 3)

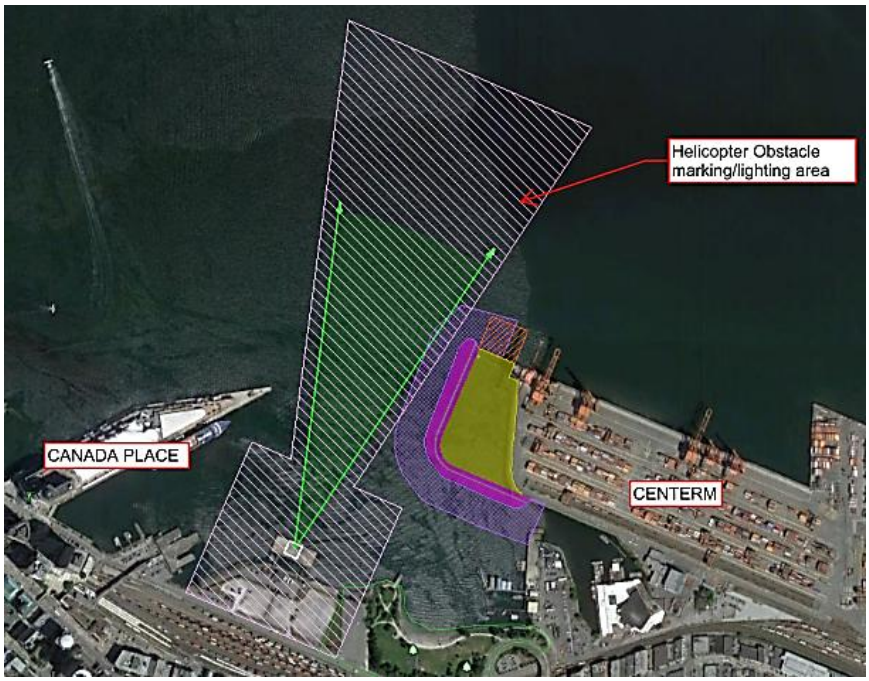


Figure 10: Vancouver Harbour Heliport Obstacle Marking and Lighting Area

It is noted that any obstacle within the area (fixed or in motion) will be required to be marked and have sufficient lighting to provide helicopter pilots with adequate visual warning.

The obstacle marking and lighting area in Figure 11 below shows a potential conflict area where marine construction may infringe into the obstacle marking and lighting area and Figure 12 shows the elevation view. The encroachment area is approximately 336m north of the helicopter landing pad and is estimated to be approximately 245m in length and up to 36m wide. Refer to Appendix A for additional details. The purple hatched represents the construction limit and dredging vessels could be in the area periodically. The area would not likely have any fixed obstruction that could be a hazard to the helicopters. It is assumed that the marine construction vessels would be up to 31m high (100ft) when accounting for anchoring spuds.

Figure 11: Obstacle Marking and Lighting Area Encroachment

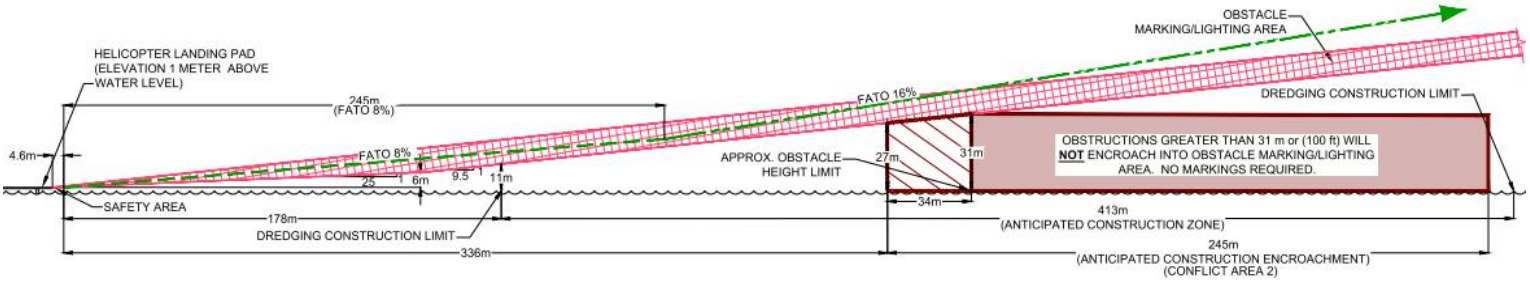


Figure 12: Obstacle Marking and Lighting Encroachment Elevation

According to Canadian Aviation Regulations Part III - Aerodromes, Airports and Heliports Regulations under Section 325.37 Clause 1b, an obstacle does not need to be marked if it is less than 150m above the surrounding ground and is lighted by a medium intensity light or in the day. The marine construction vessels are expected to be less than 150m above the surrounding ground and will not be considered as a fixed object. In addition, the construction activities within the anticipated area would likely be during daylight hours. Therefore, lighting and marking would not be applicable. The cranes at the north side of CEP would be considered as fixed objects, however the cranes will not be within the obstacle marking and lighting area and the cranes are less than 150m above ground.

Per Canadian Aviation Regulations Part III - Aerodromes, Airports and Heliports Regulations under Section 325.38 Clause 1bi, mobile objects will be required to be marked with flags in accordance with section 621. The marine construction vessels are considered as obstacles in motion and will likely encroach over the marking and lighting area periodically during construction of CEP. Therefore, it is recommended that these vessels and other construction equipment to be flagged when they encroach on to the obstacle marking/lighting boundary.

A conference call meeting had taken place on March 22, 2016 with Transport Canada and with a representative from Helijet to discuss the final analysis for the helicopter impacts. The anticipated impacts during construction was

brought to Transport Canada's attention, and it was conclude that the Centerm Expansion Project does not appear to be a safety concern and obstructions seems to be minor issues. Adequate flagging and lightings will still be provided during construction to give the helicopter pilots better visibility and warnings. The project team will keep the Helijet business operations informed of the construction activities within the corridor.

In addition to the anticipated helicopter operation conflicts, the potential conflict for the Seaplane was also discussed during the meeting with Transport Canada. The Seaplane FATO conflict with the cranes at the northwest corner of Centerm was discussed and it was concluded that no formal amendments to the Seaplane operating regulations will be required since the Seaplane operators are aware of the possible obstruction from the Project and the Seaplane operators will avoid the area.

3. Recommendations

Having reviewed air transportation operations adjacent to Centerm, it has been concluded that the expansion of the terminal will have limited impact to continued operations.

- Seaplane operations have a potential conflict at the northwest corner of the terminal, however the operator has confirmed that this does not present a concern for continued operations. Transport Canada confirmed that no formal amendments would be required since the Seaplane operators will avoid the conflict at the southern FATO boundary.
- The westward expansion brings the terminal edge closer to the heliport FATO, however it remains beyond the zone of impact. During construction, vessels are anticipated to enter the FATO, but will not be a fixed object. Construction vessels will be flagged and marked according to Transport Canada regulations and sufficient lighting will be provided if construction vessels encroaching the FATO outside of daylight hours to provide better visibility for all obstruction especially during the Fall and Winter season.
- The project team will remain in contact with Helijet as a stakeholder and keep the helicopter operations informed of the construction activities within the corridor.

Appendix A

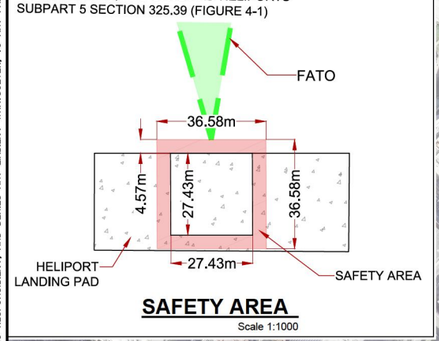
Drawings

REFERENCE:
CANADIAN AVIATION REGULATIONS PART III -
AERODROMES, AIRPORTS AND HELIPORTS SUBPART 5
SECTION 325.37 (FIGURE 6-1)

OBSTACLE MARKING/LIGHTING AREA

Scale 1:5000

REFERENCE:
CANADIAN AVIATION REGULATIONS PART III
- AERODROMES, AIRPORTS AND HELIPORTS
SUBPART 5 SECTION 325.39 (FIGURE 4-1)



SAFETY AREA

Scale 1:1000

LEGEND:
- MARINE CONSTRUCTION ZONE
- PROPOSED PERIMETER DYKE
- LAND RECLAMATION
- HELICOPTER FATO
- ESTIMATED LOW LEVEL WATER LINE
- OBSTACLE MARKING/LIGHTING AREA
- HELIPORT SAFETY AREA

REFERENCE:

1. CANADA FLIGHT SUPPLEMENT / GPH 205
2. CANADIAN AVIATION REGULATIONS PART III
   - AERODROMES, AIRPORTS AND HELIPORTS SUBPART 5

2016 MAGNETIC NORTH VARIANCE:
12' (w) x 2 = 24' (w)

Magnetic North + annual variance:
17° 0' (e)
- 0° 24' (w)
16° 36' (e)

VAR 17° E 2014
ANNUAL RATE OF CHANGE 12' W

OBSTACLES GREATER THAN 31m (100 ft) WILL NOT ENCROACH INTO OBSTACLE MARKING/LIGHTING AREA. NO MARKINGS REQUIRED.

OBSTACLES LESS THAN 31m (100 ft) WILL NOT ENCROACH INTO OBSTACLE MARKING/LIGHTING AREA. NO MARKINGS REQUIRED.

APPROX. OBSTACLE HEIGHT LIMIT

185m
365m
0° TRUE NORTH
351° (MAGNETIC NORTH)
16° 36' MAGNETIC NORTH
17° (MAGNETIC NORTH)
16°36'
9°
17°
336m
473m
245m
60m
55m
7m
36m
60m
34m
24m
10m
34m
81m
78m
76m
407m
180m
APPROX. CONSTRUCTION LIMIT
APPROX. CONSTRUCTION LIMIT
PROPOSED EXPANDED CRANE ENVELOPE
PROPOSED LAND RECLAMATION
LOW LEVEL WATER LINE (LLWL)
TOE OF DYKE
DREDGING CONSTRUCTION AREA
SAFETY AREA
CANADA PLACE
OBSTACLE MARKING/LIGHTING AREA
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Klohn Crippen Berger
PBX ENGINEERING

LEAD CONSULTANT
AECOM

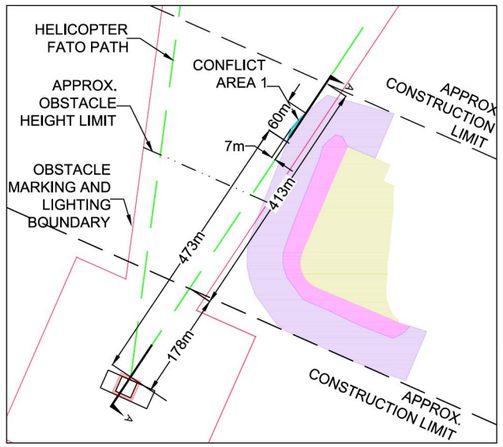
DP WORLD Vancouver

PORT METRO vancouver

DESIGN BY	AY
DRAWN BY	AY
APPROVED	NS
DATE	2016/03/23
SCALE	AS NOTED
PMV SITE	

CENTERM EXPANSION PROJECT
EXISTING AIR TRANSPORTATION
HELICOPTER PATH (MAGNETIC NORTH)

SIZE D | DWG. 2016-03-23-CEP-SK-ACL-003 | SHEET 1 of 1 | REV. –



CONFLICT WITH HELICOPTER FATO

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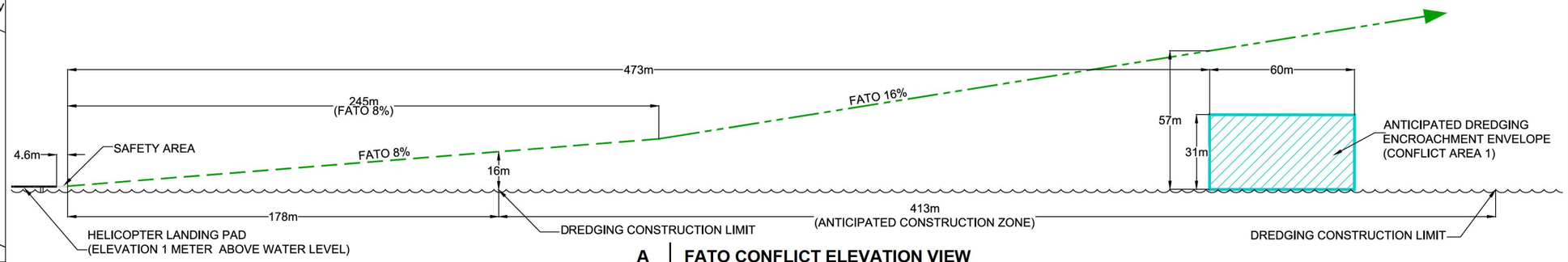

A FATO CONFLICT ELEVATION VIEW

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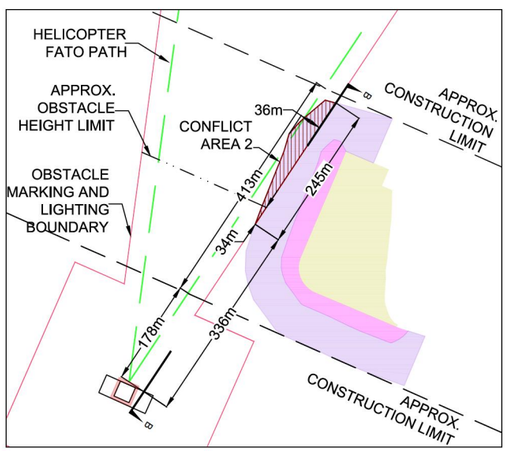

OBSTACLE MARKING BOUNDARY CONFLICT

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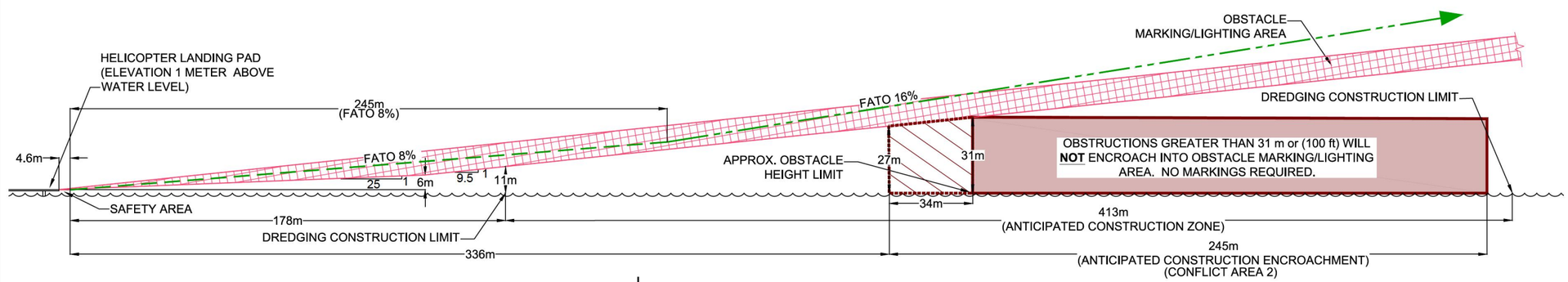

B OBSTACLE MARKING CONFLICT ELEVATION VIEW

Scale 1:1000

REFERENCE:

1. CANADA FLIGHT SUPPLEMENT / GPH 205
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No.	Date	REVISION	Dr'n	Ch'd
1	2016/03/23	FOR INFORMATION ONLY	AY	NS

FOR INFORMATION
2016/03/23

Klohn Crippen Berger
PBX ENGINEERING

LEAD CONSULTANT
AECOM

DP WORLD Vancouver

PORT METRO vancouver

DESIGN BY	AY
DRAWN BY	AY
APPROVED	NS
DATE	2016/03/23
SCALE	AS NOTED
PMV SITE	

CENTERM EXPANSION PROJECT
AIR TRANSPORTATION STUDY
HELICOPTER PATH VERTICAL PROFILE

SIZE	DWG.	SHEET	REV.
D	2016-03-23-CEP-SK-ACL-001	1 of 1	–

Appendix B

Harbour Air Seaplanes Confirmation Email

[redacted]

From: [redacted]
Sent: Wednesday, February 10, 2016 10:06 AM
To: Snowball, Neil
Cc: [redacted]
Subject: Re: Centerm Expansion - Follow up

Good Morning Neil,

Thank you for the follow up from the meeting. I see no real impact on our operation with the expansion you are proposing as our departure and landing paths are not in a direct line with the cranes.

The only possible impact would most likely be during the construction phase with water vessels or delayed landing clearances with Helijet that could delay our departures.

Thank You,

[redacted]
Harbour Air Seaplanes I Harbour Air Group
4760 Inglis Drive, Richmond, BC, Canada V7B 1W4
[redacted]
www.harbourairgroup.com

On Feb 9, 2016, at 6:46 PM, Snowball, Neil [redacted] wrote:

[redacted]
I wanted to follow up with you on the potential impacts of the Centerm Expansion Project and its anticipated filling of the Burrard inlet on the end of the existing terminal.
At the initial meeting on January 18th, we understood that Harbour Air are not unduly concerned by the proposed works as the impact is outside the FATO for the harbour waterdrome and that the existing quay cranes at the terminal already pose a constraint to flight paths. Harbour Air, as a result, does not perform FATO manoeuvres towards the terminal at present and has no plans to do so in the future.

We'd welcome your confirmation of this, and any additional comments that you wish to share.

regards

Neil Snowball, P.Eng
OE Design Manager – Centerm Expansion Project
[redacted]

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[redacted]
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