FORM 5

Application No. :
Reference No. :
(For official use)

FORM 5
ENVIRONMENTAL IMPACT ASSESSMENT ORDINANCE
(CHAPTER 499)
SECTION 13(1)

Application for Variation of an Environmental Permit

PART A PREVIOUS APPLICATIONS

☐ No previous application for variation of an environmental permit.

☑ The environmental permit was previously amended.

Application No. : VEP-587/2020

PART B DETAILS OF APPLICANT

B1. Name : (person or company)

Castle Peak Power Company Limited

[Note : In accordance with section 13(1) of the Ordinance, the person holding an environmental permit or a person who assumes responsibility for the designated project may apply for variation of the environmental permit.]

B2. Business Registration No. : (if applicable) [redacted]

B3. Correspondence Address : [redacted]

B4. Name of Contact Person : [redacted]

B5. Position of Contact Person : [redacted]

B6. Telephone No. : [redacted]

B7. Fax No. : [redacted]

B8. E-mail Address : (if any) [redacted]

PART C DETAILS OF CURRENT ENVIRONMENTAL PERMIT

C1. Name of the Current Environmental Permit Holder :

Castle Peak Power Company Limited

C2. Application No. of the Current Environmental Permit : VEP-587/2020

C3. The Current Environmental Permit was Issued in : month / year

0 1 / 2 0 2 1

Important Notes : Please submit the application together with

(a) 3 copies of this completed form; and

(b) appropriate fee as stipulated in the Environmental Impact Assessment (Fees) Regulation

to the Environmental Protection Department at the following address :

The EIA Ordinance Register Office,
27th floor, Southorn Centre,130 Hennessy Road,
Wan Chai, Hong Kong.

RECEIVED
30 JUL 2021
EIAO Register Office, E.P.D.

☐ Tick (✓) the appropriate box

PART D PROPOSED VARIATIONS TO THE CONDITIONS IN CURRENT ENVIRONMENTAL PERMIT

D1. Condition(s) in the Current Environmental Permit :	D2. Proposed Variation(s) :	D3. Reason for Variation(s) :	D4. Describe the environmental changes arising from the proposed variation(s) :	D5. Describe how the environment and the community might be affected by the proposed variation(s) :	D6. Describe how and to what extent the environmental performance requirements set out in the EIA report previously approved or project profile previously submitted for this project may be affected :	D7. Describe any additional measures proposed to eliminate, reduce or control any adverse environmental impact arising from the proposed variation(s) and to meet the requirements in the Technical Memorandum on Environmental Impact Assessment Process :
Condition 2.9 The Permit Holder shall, no later than 1 month before the commencement of construction of the Project, deposit with the Director 3 hard copies and 1 electronic copy of a pipeline laying method plan of the Project. The pipeline laying method plan shall include but not limited to the detailed design of the pipeline trenches for laying and burying the subsea gas pipeline, methods for laying and burying the subsea gas pipeline, dredging and jetting rate for laying the subsea gas pipeline, types and numbers of dredging and jetting plants for construction of the Project. No more than one Trailing Suction Hopper Dredger shall be used for construction of the subsea gas pipeline. No more than one jetting machine shall be used for construction of the subsea gas pipeline.	Condition 2.9 The Permit Holder shall, no later than 1 month before the commencement of construction of the Project, deposit with the Director 3 hard copies and 1 electronic copy of a pipeline laying method plan of the Project. The pipeline laying method plan shall include but not limited to the detailed design of the pipeline trenches for laying and burying the subsea gas pipeline, methods for laying and burying the subsea gas pipeline, dredging and jetting rate for laying the subsea gas pipeline, types and numbers of dredging and jetting plants for construction of the Project. No more than one Trailing Suction Hopper Dredger shall be used for construction of the subsea gas pipeline. No more than **two jetting machines** shall be used for construction of the subsea gas pipeline.	Shortening the construction period by implementing two jetting machines working concurrently on BPPS Pipeline would facilitate timely project completion which is important in securing adequate competitive gas supply capacity to support increased use of natural gas for electricity generation in Hong Kong to reduce carbon intensity. Also, the total pipeline post-trenching (jetting) period can be shortened from original 8-12 months to 4-6 months. Shorten the construction period would reduce impact to marine mammals. Due to the numerous existing marine facilities along the entire 45km BPPS subsea pipeline route and the route will cross through the busy shipping channels, a number of ocean-going vessels, merchant ships, fishing boats and other small crafts will traverse in proximity to the BPPS pipeline route. These vessels may lower their anchor in the water in the proximity of the pipeline route	Potential environmental impacts associated with the proposed changes to allow two jetting machines have been reviewed and no adverse environmental impacts are anticipated with mitigation measures in place. Please refer to the attached materials for details.	Potential environmental impacts associated with the proposed changes to allow two jetting machines have been reviewed and no adverse environmental impacts are anticipated with mitigation measures in place. No unacceptable impacts to the environment and the community resulting from the proposed variation are expected. Please refer to the attached materials for details.	The environmental performance requirements set out in the approved EIA Report will not be exceeded or violated with the mitigation measures in place. Please refer to the attached materials for details.	In addition to existing relevant mitigation measures, the minimum separation distance between the two jetting machines for avoiding cumulative impact is 5km for most of the pipeline sections, except when one jetting machine is working at the subsea cable sterile corridors (i.e.KP1.49 – KP2.75 and KP3.55 – KP4.43). When one jetting machine is working at the subsea cable sterile corridors, no other jetting machine will work concurrently within KP0.0 -KP14.25, ie, between the Jetty and Adamasta Channel. Also, the Marine Traffic Control Office (MTCO) operate in 7x24 hours basis, with operators responsible for full time monitoring of all working vessels of our project to ensure sufficient distance between the jetting machines.

PART D PROPOSED VARIATIONS TO THE CONDITIONS IN CURRENT ENVIRONMENTAL PERMIT

D1. Condition(s) in the Current Environmental Permit :	D2. Proposed Variation(s) :	D3. Reason for Variation(s) :	D4. Describe the environmental changes arising from the proposed variation(s) :	D5. Describe how the environment and the community might be affected by the proposed variation(s) :	D6. Describe how and to what extent the environmental performance requirements set out in the EIA report previously approved or project profile previously submitted for this project may be affected :	D7. Describe any additional measures proposed to eliminate, reduce or control any adverse environmental impact arising from the proposed variation(s) and to meet the requirements in the Technical Memorandum on Environmental Impact Assessment Process :
The subsea gas pipeline shall be constructed in accordance with the information as contained in the deposited pipeline laying method plan.	The subsea gas pipeline shall be constructed in accordance with the information as contained in the deposited pipeline laying method plan.	during offshore pipeline construction. There are potential risks to the pipe which is laid on the seabed with no protection. By implementation of two jetting machines, the laid pipeline could be buried as early as possible in order to prevent such incident as well as generation and handling of additional waste pipeline and relevant pipeline removal and re-installation works. To prevent the pipes from metal fatigue damage, damage from drop objects or any possible collision, the pipeline laid on seabed is recommended to be trenched /buried and then back-filled, to provide timely protection at the earliest. Alternative options were reviewed and considered not feasible, the use of 2 jetting machines is the SOLE solution to mitigate any risk of additional environmental impact and also gives benefit to the surrounding environment.				The working vessels shall be equipped with tracking devices to record their locations, operating speeds and marine travel routes during construction of the Project. The records will be submitted weekly to the Environmental Team (ET) Leader and Independent Environmental Checker (IEC) for review of the acceptability of additional measures. The records shall be included in the monthly EM&A Reports.

PART E DECLARATION BY APPLICANT

E1. I hereby certify that the particulars given above are correct and true to the best of my knowledge and belief. I understand the environmental permit may be suspended, varied or cancelled if any information given above is false, misleading, wrong or incomplete.

[redacted] | [redacted] | [redacted]

Signature of Applicant | Full Name in Block Letters | Position

on behalf of Castle Peak Power Company Limited — 30 JUL 2021

Company Name and Chop (as appropriate) — Date

NOTES :

1. A person who constructs or operates a designated project in Part I of Schedule 2 of the Ordinance or decommissions a designated project listed in Part II of Schedule 2 of the Ordinance without an environmental permit or contrary to the permit conditions commits an offence under the Ordinance and is liable to a maximum fine of $5,000,000 and to a maximum imprisonment for 2 years.

2. A person for whom a designated project is constructed, operated or decommissioned and who permits the carrying out of the designated project in contravention of the Ordinance commits an offence and is liable to a maximum fine of $5,000,000 and to a maximum imprisonment for 2 years.

Hong Kong Offshore LNG Terminal Project

Proposal for Two (2) Jetting Machines

Contents

Hong Kong Offshore LNG Terminal Project

1. Proposed Variations (BPPS Pipeline)

Environmental Permit (EP) Requirement

Condition 2.9 of FEP-03/558/2018/A stated that:

" The Permit Holder shall, no later than 1 month before the commencement of construction of the Project, deposit with the Director 3 hard copies and 1 electronic copy of a pipeline laying method plan of the Project. The pipeline laying method plan shall include but not limited to the detailed design of the pipeline trenches for laying and burying the subsea gas pipeline, methods for laying and burying the subsea gas pipeline, dredging and jetting rate for laying the subsea gas pipeline, types and numbers of dredging and jetting plants for construction of the Project. No more than one Trailing Suction Hopper Dredger shall be used for construction of the subsea gas pipeline. No more than ***one jetting machine*** *shall be used for construction of the subsea gas pipeline. The subsea gas pipeline shall be constructed in accordance with the information as contained in the deposited pipeline laying method plan."*

We would like to seek EPD's agreement for two (2) jetting machines to be used for construction of BPPS subsea gas pipeline. Application for variation of conditions of an environmental permit will be arranged under section 13 of the EIAO.

Proposed Variations (BPPS Pipeline)

- It is proposed to adopt two jetting machines for the post-trenching operation for BPPS Pipeline. Tentatively, it is planned to have:
  - Jetting Machine 1 to operate between KP26.2 and KP45 (BPPS) (referred as North Section of BPPS Pipeline in this proposal)
  - Jetting Machine 2 to operate between KP26.2 and KP0.0 (Jetty) (referred as South Section of BPPS Pipeline in this proposal)
- Based on the review of the water quality modelling results (see Appendix A), the minimum separation distance between the two jetting machines for avoiding cumulative impact is 5km for most of the pipeline sections, except when one jetting machine is working at the subsea cable sterile corridors (i.e. KP1.49 – KP2.75 and KP3.55 – KP4.43). When one jetting machine is working at the subsea cable sterile corridors, no other jetting machine will work concurrently on the LPS Pipeline and on the BPPS Pipeline at South of Lantau Island between KP0.0 - KP14.25, i.e. between the Jetty and Adamasta Channel (see Appendix A).
- The proposed scenarios for two jetting machines working concurrently are provided in the following slides (Slides 6 - 14).

Proposed Scenarios (BPPS Pipeline)

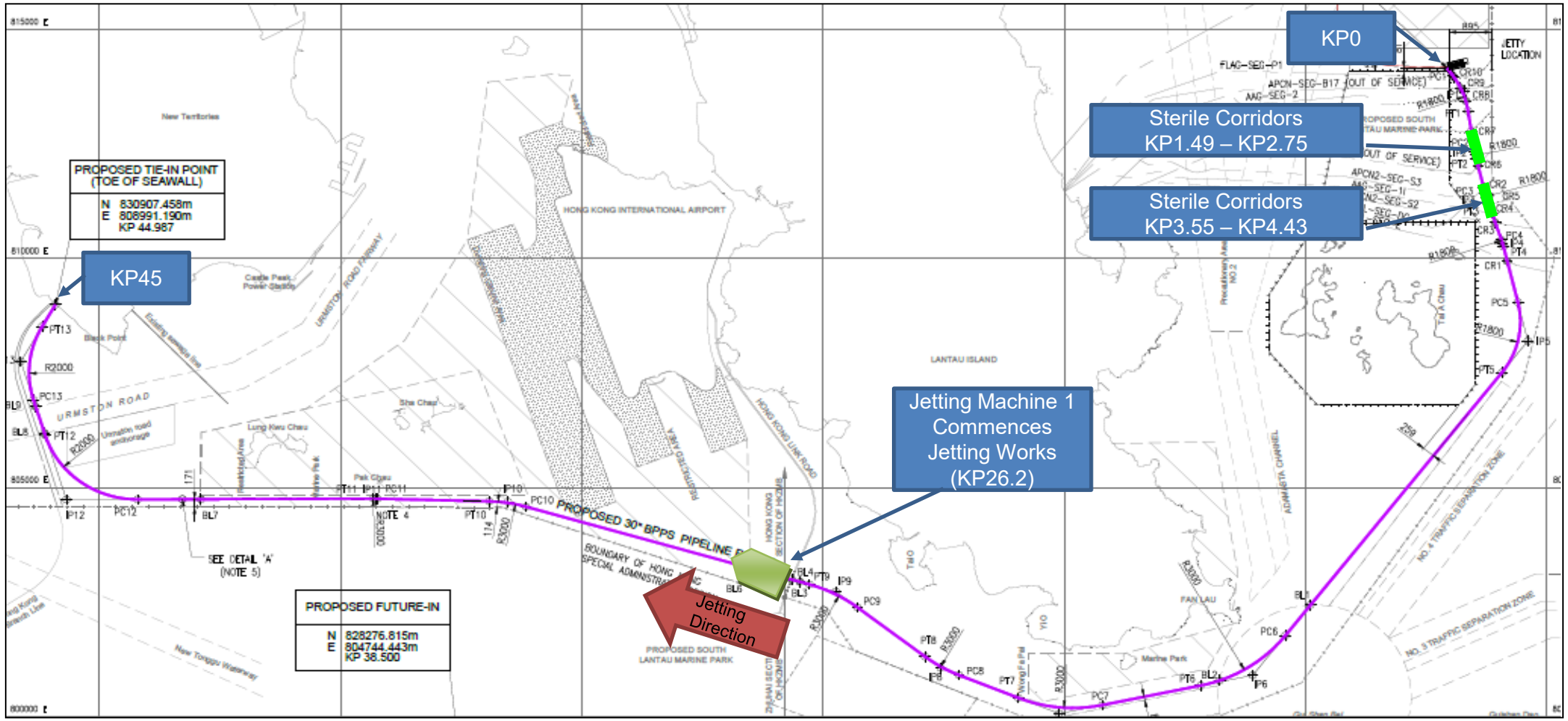
- Scenario 1: Both Jetting Machines 1 & 2 starts at KP26.2 and operates in opposite direction (see Slides 7 - 10)
  - Based on the latest construction schedule, Jetting Machine 1 for the North Section of the BPPS Pipeline is anticipated to commence jetting works first (see Slide 7). Jetting Machine 2 for the South Section is expected to commence later after Jetting Machine 1 has completed at least 5km of the North section and will be further away from each other as jetting works progress (see Slides 8 and 9).
  - When Jetting Machine 2 conducts jetting at the subsea cable sterile corridors (i.e. KP1.49 – KP2.75 and KP3.55 – KP4.43), Jetting Machine 1 will not be working concurrently within KP0.0 - KP14.25 (see Slide 10).
  - In case there is a change of construction schedule and Jetting Machine 2 for the South Section would commence jetting works first, Jetting Machine 1 would not start works until Jetting Machine 2 has completed at least 5km of the South Section.

- Scenario 2: Jetting Machine 1 starts at KP26.2 and Jetting machine 2 commences at KP 0.0 and operates in the same direction (see Slides 11 - 14)
  - While both jetting machines will be jetting in the same direction, the separation distance of the two jetting machines will be maintained at least 5km apart. (see Slides 12 - 14)
  - Jetting Machine 1 will not be working concurrently within KP0.0 - KP14.25 when Jetting Machine 2 is working at the subsea cable sterile corridors (i.e. KP1.49 – KP2.75 and KP3.55 – KP4.43). (see Slides 12 - 14)

- The actual working direction and sequence, and construction programme of the jetting machines would be subject to final review and confirmation by project management team.

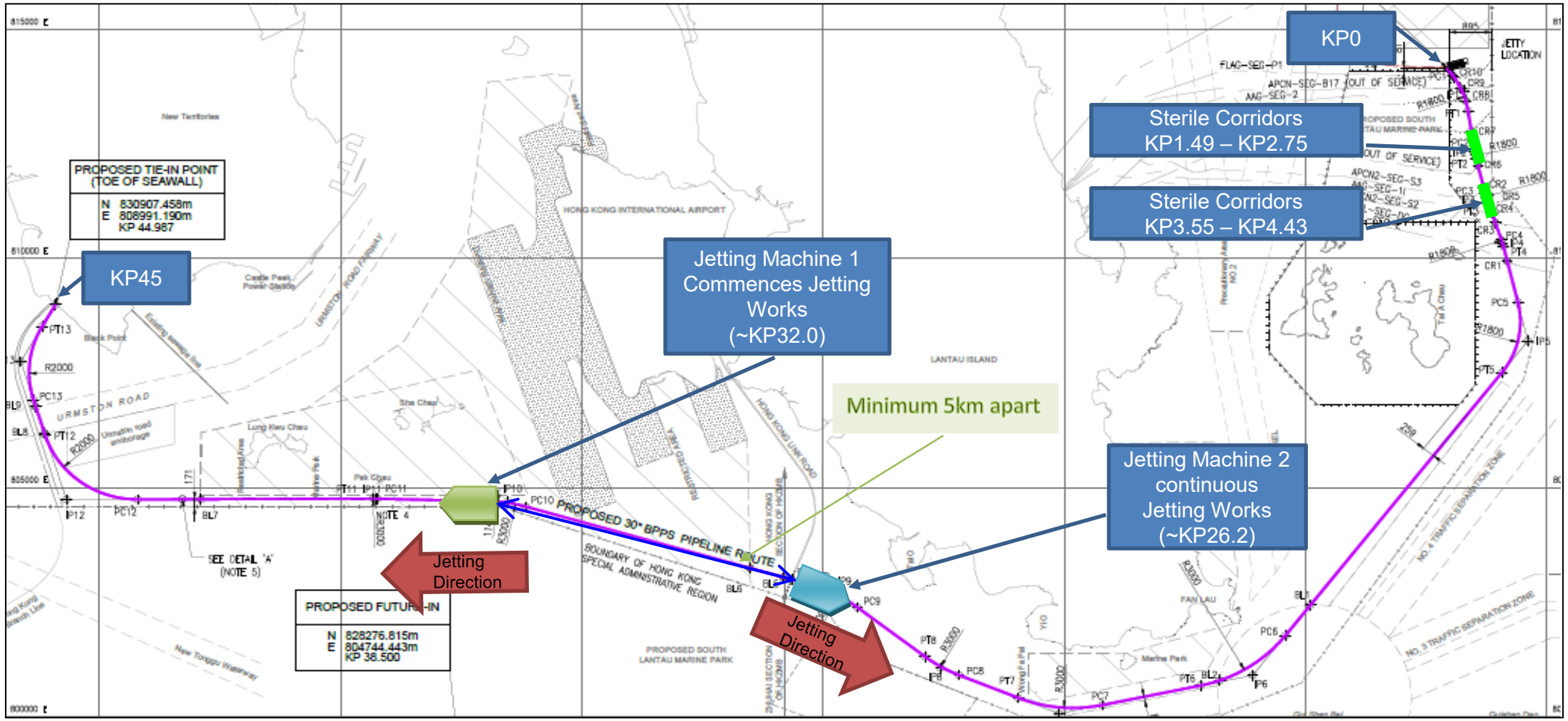
Proposed Variations (BPPS Pipeline) (Scenario 1)

Day 1 - Jetting Machine 1 commences (~ Sep 2021 tentative)



Proposed Variations (BPPS Pipeline) (Scenario 1)

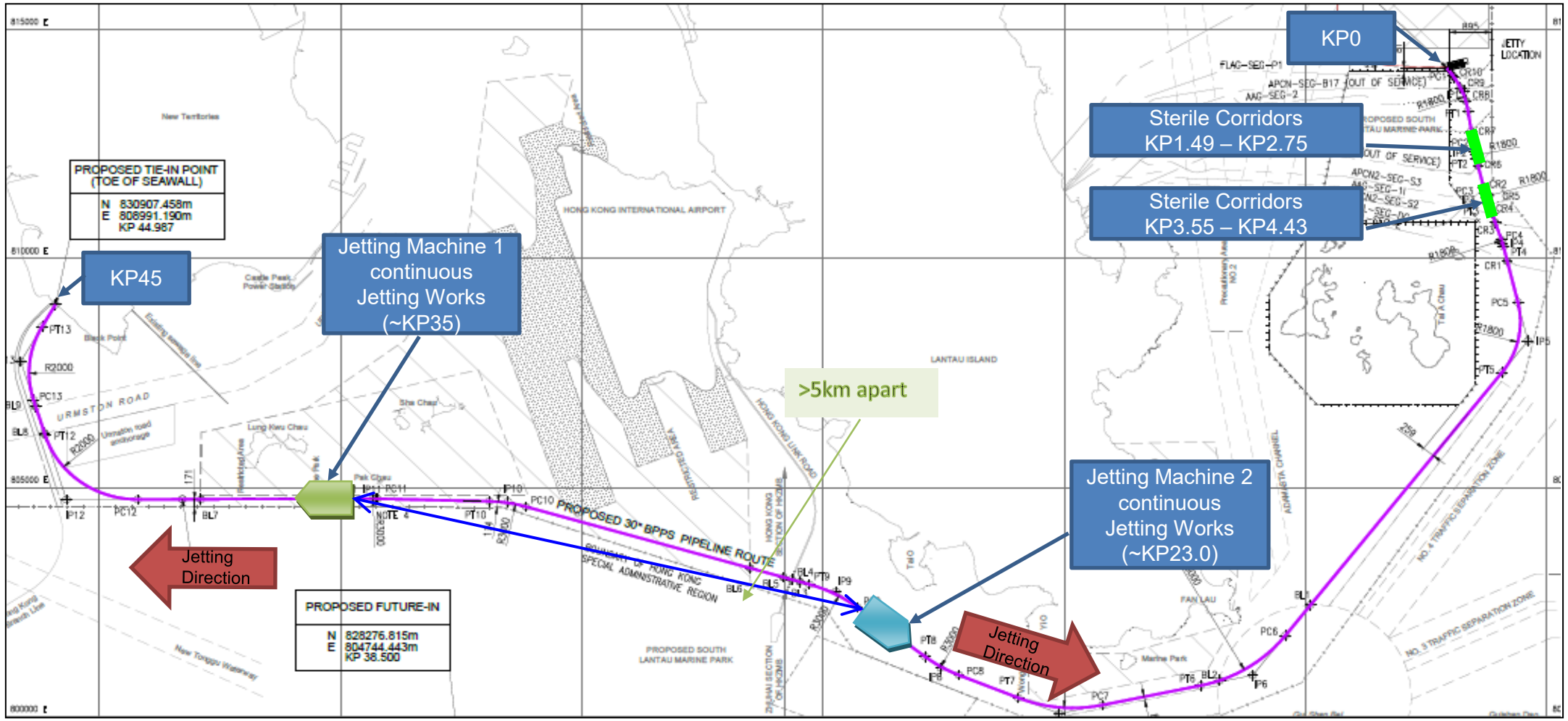
Day 30 - Jetting Machine 1 Processing, Jetting Machine 2 commences (~ Oct 2021 tentative)



* Since the 2 Jetting Machines will be jetting toward opposite direction, Jetting Machine 2 jetting toward the Jetty and Jetting Machine 1 toward the BPPS GRS, hence the **Worst-Case Scenario** will be at the first day when Jetting Machine 2 commences its works.

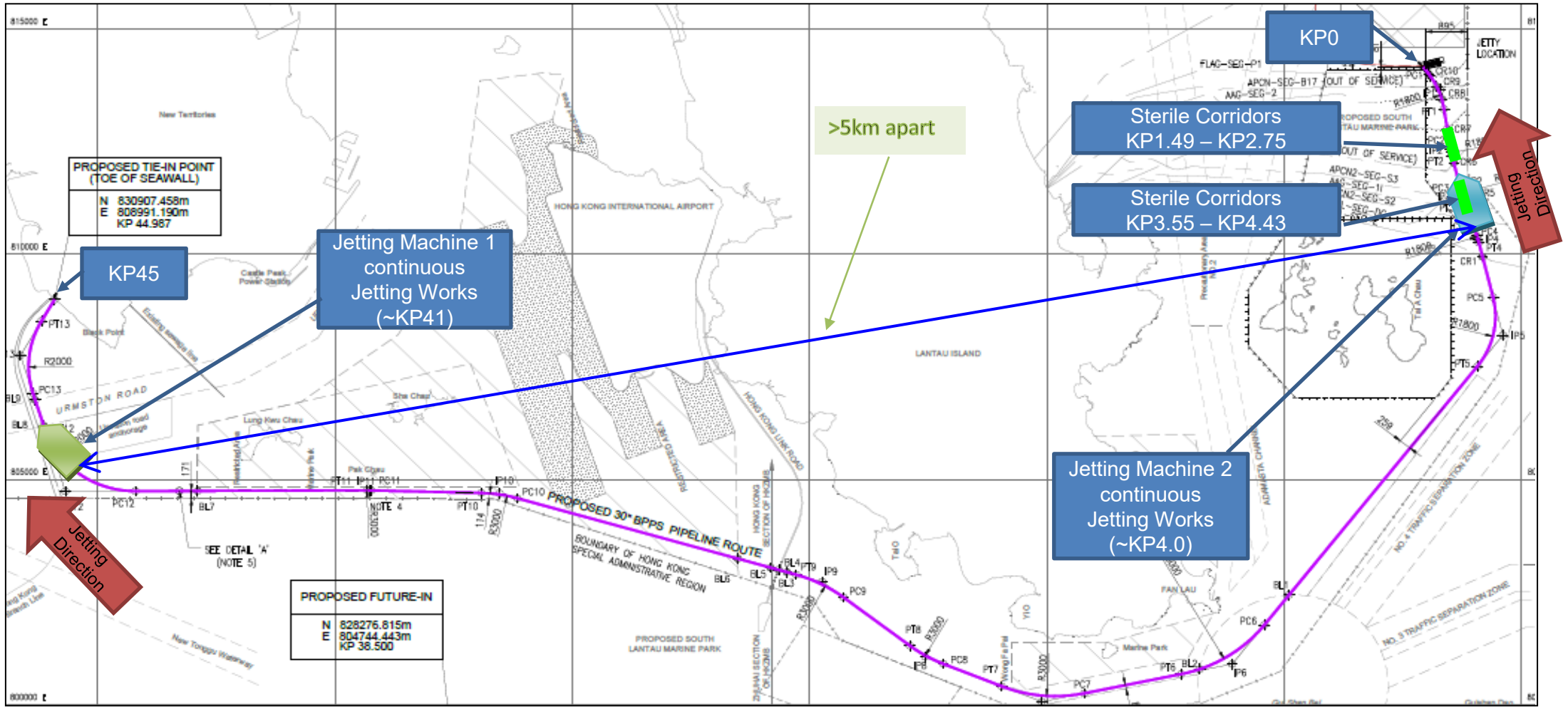
Proposed Variations (BPPS Pipeline) (Scenario 1)

Day 45 - Jetting Machine 1 & 2 Processing (~ Nov 2021 tentative)



Proposed Variations (BPPS Pipeline) (Scenario 1)

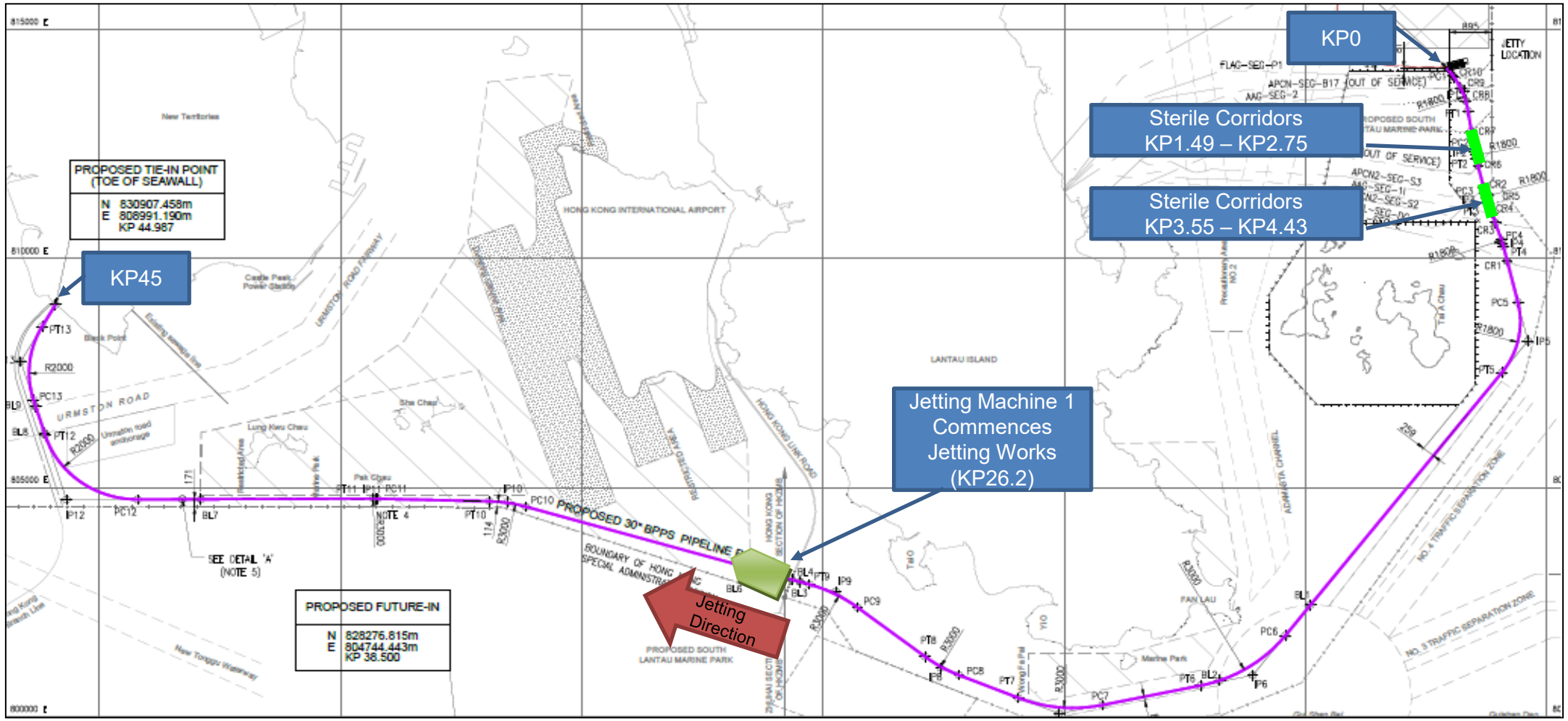
Day 100 - Jetting Machine 1 & 2 Processing (~ Dec 2021 tentative)



* Jetting Machine 2 is expected to be approaching the Jetty in Jan 2022 tentatively.

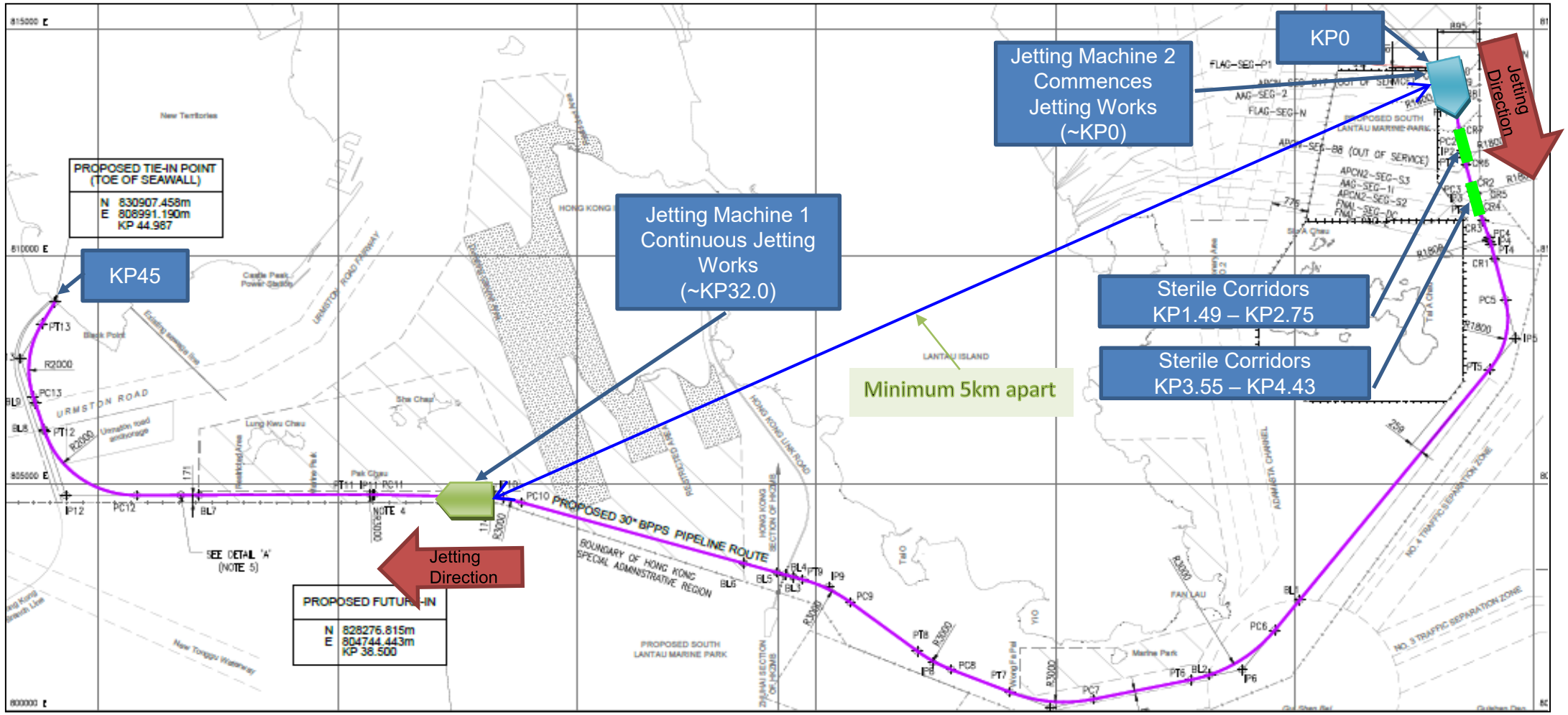
Proposed Variations (BPPS Pipeline) (Scenario 2)

Day 1 - Jetting Machine 1 commences (~ Sep 2021 tentative)



Proposed Variations (BPPS Pipeline) (Scenario 2)

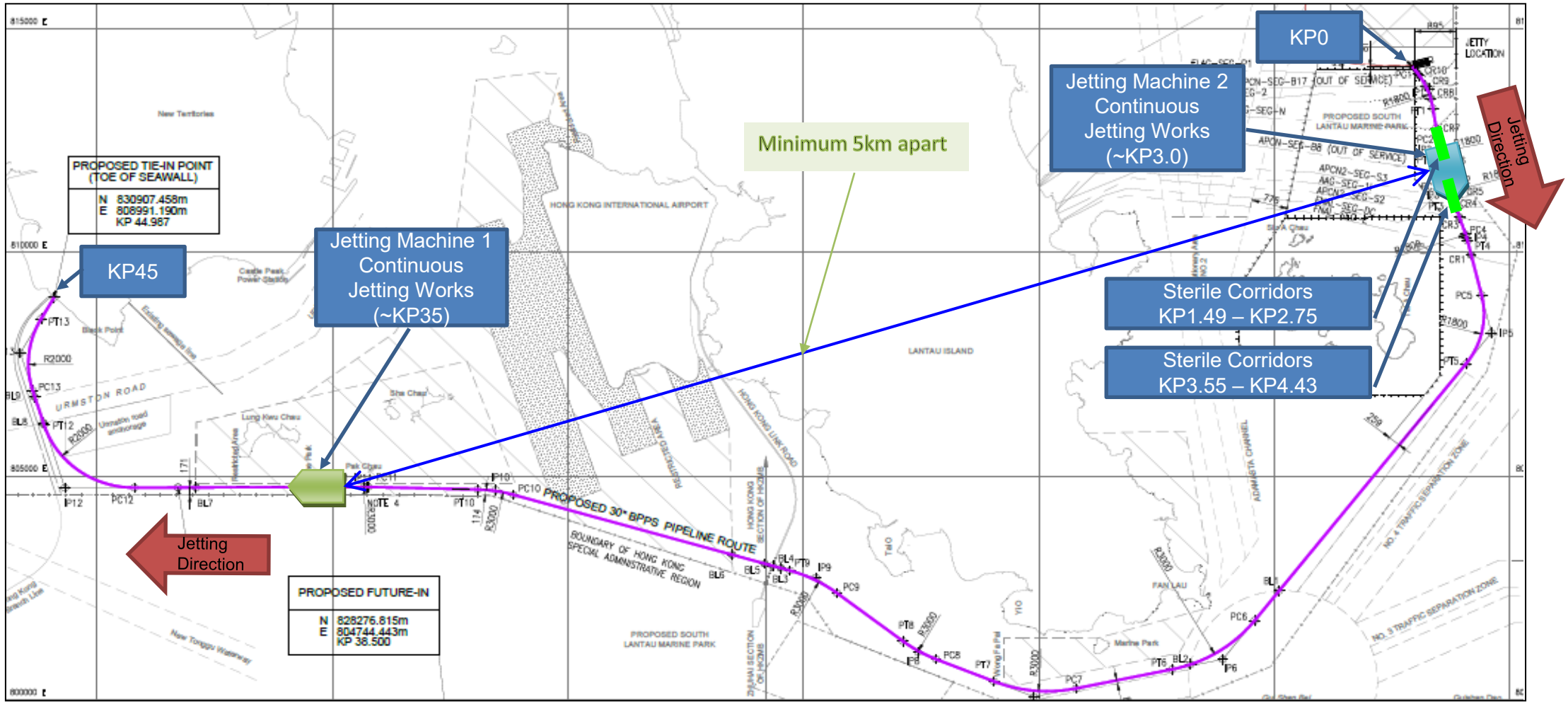
Day 30 - Jetting Machine 1 Processing, Jetting Machine 2 commences (~ Early Oct 2021 tentative)



* In Scenario 2, the Jetting Machine 2 will be commenced at the Jetty side which is approximately 30km apart from the Jetting Machine 1 and separated by the Lantau Island. Hence, cumulative impact from the 2 Jetting Machines is not expected.

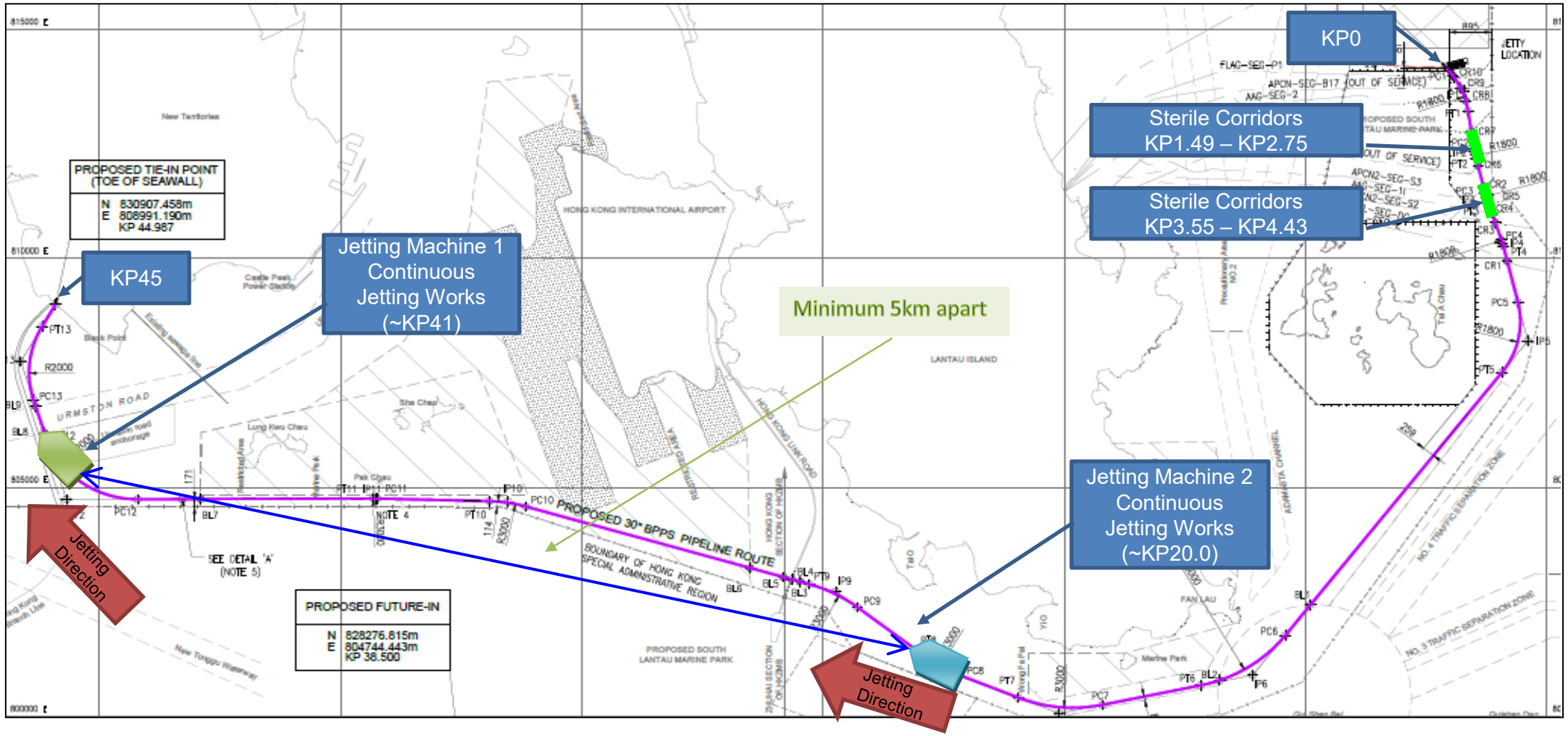
Proposed Variations (BPPS Pipeline) (Scenario 2)

Day 45 - Jetting Machine 1 & 2 Processing (~ End Oct 2021 tentative)



Proposed Variations (BPPS Pipeline) (Scenario 2)

Day 100 - Jetting Machine 1 & 2 Processing (~ Dec 2021 tentative)



Hong Kong Offshore LNG Terminal Project

2. Reasons of Change

Reasons of Change

1. Timely project completion to support HKSAR Government's fuel mix policy:

- As mentioned in Section 2.10 of the approved EIA Report (AEIAR-218/2018), the Project is critical for ensuring a reliable supply of natural gas to fuel the BPPS timely thereby meeting the HKSAR Government's fuel mix policy and reduce carbon emissions.

- Shortening the overall construction period by 4-6 months by implementing two jetting machines working concurrently on BPPS Pipeline would facilitate timely project completion which is important in securing adequate competitive gas supply capacity to support increased use of natural gas for electricity generation in Hong Kong to reduce carbon intensity.

2. Shortening of construction period can minimize impact on marine mammals:

- The *EIAO-TM* specifies the priorities for addressing environmental impacts is avoidance and minimization. We trust that shorten the overall construction period would give benefit to the environment. Moreover, referring to the EIA Report Section 2.8.1, "*It should be noted that reducing the overall duration of exposure to marine construction works by marine mammals is an effective approach to minimize impacts on these animals."* It stated that shorten the construction period would reduce impact to marine mammals.

- By implementation of two jetting machines working concurrently on BPPS Pipeline, the total pipeline jetting period can be shortened from original 8-12 months to 4-6 months. This fulfils the principle adopted in the approved EIA Report in minimizing environmental impact by reducing the duration of exposure to marine construction works by marine mammals.

Reasons of Change

3. Timely pipeline burial to minimize potential risks from third party activities

- Due to the numerous existing marine facilities along the entire 45km BPPS subsea pipeline route and the route will cross through the busy shipping channels, i.e. Urmston Road Fairway, Lantau Channel Traffic Separation Scheme (LCTSS), a number of ocean-going vessels, merchant ships, fishing boats and other small crafts will traverse in proximity to the BPPS Pipeline route. These vessels may lower their anchor in the water in the proximity of the pipeline route during offshore pipeline construction. There are potential risks to the pipe which is laid on the seabed with no protection.

- Further to above, areas such as marine parks, tourist areas and numerous uncertain coastal fishing activity areas may have key potential risks to the pipe from third party activities, mainly including:
  - Ocean-going vessels – normally these kind of vessels would anchoring in a designated area, but considered in case of accidental activities or emergency, ocean-going vessels also have potential risk to the laid pipeline.
  - Tourist vessels - small boats may anchor near the pipeline area for recreational purpose.
  - Fishing activities– the fishing activities at the vicinity of the pipeline may have potential to damage the laid pipeline.
  - Intentionally and unintentionally dropping objects by abovementioned shipping vessels.

- By implementation of two jetting machines, the laid pipeline could be buried as early as possible in order to prevent such incident as well as generation and handling of additional waste pipeline and relevant pipeline removal and re-installation works. The Baseline Traffic Review of BPPS Pipeline is provided in Appendix B.

Reasons of Change

4. Alternative options were reviewed and considered not feasible

- The external coating method has already been considered to avoid corrosion and provide stress protection under corresponding hydrogeological conditions in the design stage of subsea pipeline. However, it does not protect from the potential risks of the subsea pipeline from third party activities.

- Option to temporary protect pipeline with concrete mattress has been studied and deemed to be NOT feasible, as approximately 15,000 pieces of concrete mattresses with total weight of 150,000 Tonnes of concrete waste will be generated for temporary protection on pipeline. The concrete mattress has to be installed and removed at later stage would cause additional disturbance to the seabed and the ecology.

- To prevent the pipes from metal fatigue damage, damage from drop objects or any possible collision, the pipeline laid on seabed is recommended to be trenched / buried and then back-filled, to provide timely protection at the earliest.

- Both using additional concrete mattress or replacement of damaged pipe would arising double handling works which involved additional working vessels where the impact to the environment may be greater than the jetting machine.

Based on the above, the use of 2 jetting machines is the SOLE solution to mitigate any risk of additional environmental impact and also gives benefit to the surrounding environment.

Hong Kong Offshore LNG Terminal Project

3. Key Potential Environmental Implication

Key Potential Environmental Implication

Comprehensive Review of Environmental Impacts Associated with the Proposed 2 Jetting Machines:

Potential Impacts	Associated with the Proposed Variation
Air Quality	✗
Hazard to Life	✗
Noise	✗
Water Quality	✓
Waste Management Implication	✗
Ecology	✓
Fisheries	✓
Visual	✗
Cultural Heritage	✗

Key Potential Environmental Implication

Air Quality

- The jetting operation would conduct fully underwater, no fugitive dust was expected to be generated and would not result in air quality impact.

Hazard to life

- Approved EIA Report (AEIAR-218/2018) – Hazard to Life (Section 5.3.1, p.5-3): “It should be noted that during the construction of the Jetty and both subsea pipelines, LNG, natural gas and other dangerous goods will not be present other than for commissioning purposes. Therefore, construction phase associated risk has not been further assessed.”

Noise

- Approved EIA Report (AEIAR-218/2018) - Noise (Section 6.6.1, p.6-9): “As no NSRs were identified within the 300m Assessment Area and the nearest representative NSRs are located approximately 1.3km away from the Project’s construction works sites, adverse noise impacts due to the construction activities are not anticipated.”
- Refer to EIA S.6.3.3, there is no existing NSR was identified in the vicinity of the BPPS. A planned residential area NSR N3 (Proposed Residential Development in Lung Kwu Tan Reclamation Area) is the only NSR associated with the BPPS Project. As mentioned in S.6.3.3 of the EIA Report, N3 is located at ~1.7km from BPPS screened by the natural terrain. It was concluded in the EIA Report that adverse noise impact due to the construction activities on N3 would not be anticipated. Even though with adoption of 2 jetting machines is proposed, no adverse noise impact due to jetting works on N3 would be anticipated with the proposed variation.

Potential Environmental Implication

Water Quality

- The 2 jetting machines of BPPS Pipeline will be separated **at least 5km apart** when the jetting works are undertaken concurrently. Sediment plume snapshots were provided in Appendix A (Slides 40 - 79) to demonstrate that no cumulative impact was expected with two jetting machines locating >5km apart as the sediment plume of single jetting machine would not extending beyond 2.5km (except for jetting at sterile corridors).

- From the Sediment Plume results provided in Appendix A:

  I. Jetting Works outside Sterile Corridor Section – findings indicated that with 5 km separation, there will not be significant cumulative impact for concurrent operation of 2 jetting machines in terms of SS and sedimentation flux.

  II. Jetting Works within Sterile Corridor Section – to manage the increased SS elevation and sedimentation flux from the jetting works at the sterile corridor sections, no other jetting machine would be working concurrently between BPPS KP0.0 - KP14.25 during jetting at the sterile corridors.

- Under the current offshore construction strategy and latest schedule, the BPPS jetting works at sterile corridors / near the Jetty are anticipated to be in December 2021 / January 2022 (Scenario 1) and in end October 2021 / early October 2021 (Scenario 2). The LPS jetting works was commenced from July 2021 and is expected to be completed in September 2021. As such, concurrent jetting operation of BPPS Pipeline and LPS Pipeline in the vicinity of the Jetty is not anticipated. Thus, potential cumulative environmental impact arising from the above mentioned construction activities is not expected.

Potential Environmental Implication

Ecology (Marine Ecological Resources Excluding Marine Mammals)

- The following impacts to marine ecological resources (excluding marine mammals) were identified in Section 9.5.1 of the approved EIA Report (AEIAR-218/2018) and related to the proposed variation.

1. Temporary habitat loss and disturbance
   - Refer to the EIA Report Section 9.5.1 (p.9-73), short-term direct impacts to subtidal bottom assemblages will occur as a result of the jetting works associated with installation of the pipeline. Once these and subsequent rock armour placement activities have ceased, marine ecological resources are expected to return due to recolonisation of the seabed by benthic fauna.
   - No additional short-term direct impacts to subtidal bottom assemblages resulting from the proposed variation is anticipated. The proposed implementation of 2 jetting machines would shorten the jetting construction period and the recolonization could be commenced earlier.
   - As the proposed 2 jetting machines will work on its localized zone and would not cause cumulative impact, hence unacceptable impacts on marine ecological resources are not expected.

2. Underwater sound from marine construction activities
   - Refer to the EIA Report Section 9.5.1 (p.9-76), *"Waters within the Assessment Area and its vicinity is subject to relatively high levels of marine traffic by similar types of vessels; therefore it is reasonable to assume that fish in these waters are habituated to a relatively high background level of underwater sound, and a small increase in vessel activity associated with the construction of this Project is not anticipated to result in unacceptable impacts on fishes."*
   - Since 2 Jetting Machines will be operating at least 5km apart, cumulative impact of underwater sound resulting from the small increase in vessel activities associated with the proposed variation is not expected.
   - The underwater sound generated from the proposed variation is expected to be temporary and very much similar to those in the area at present from similar marine traffic, and the duration of the jetting construction period would be shortened, hence adverse impact to marine ecology is not anticipated.

3. Short-term changes in water quality from marine construction activities
   - Refer to Slide 22, cumulative impact of water quality is not expected.

4. Accidental spillage/leakage of fuel/chemicals
   - Refer to the EIA Report Section 9.5.1 (p.9-79), the risk of spills and leaks would generally be limited to minor volumes and with implementation of preventative measures including provision of spill kit, no significant impacts to marine ecological resources would be expected.

Potential Environmental Implication

Ecology (Marine Mammals)

- The following impacts to marine mammals were identified in Section 9.6.1 of the approved EIA Report (AEIAR-218/2018) and related to the proposed variation.

1. Temporary habitat loss and disturbance
    - Refer to the EIA report Section 9.6.1 (p.9-88), considering the temporary nature of the disturbance resulting from the construction of BPPS and LPS Pipelines, unacceptable impacts on marine mammals are not expected. Upon cessation of the disturbance, no significant long-term change in marine mammal distribution, abundance and usage pattern in the wider Hong Kong waters is expected.
    - Refer to the EIA report Section 9.6.1, considering the temporary nature of the disturbance and with management of work fronts/sequence, impacts on marine mammals for sections of the BPPS Pipeline (between North of Tai O to Fan Lau, and between South of Soko Islands to LNG Terminal) are expected to be minor to moderate significance. Therefore, pipeline dredging/ jetting works will avoid the peak months of Chinese White Dolphin (CWD) calving (May and June) as a mitigation measures. And pipeline dredging/ jetting works between South of Soko Islands and the Terminal will be restricted to a daily maximum of 12 hours with daytime (0700-1900) operations.
    - As the proposed 2 jetting machines will work on its localized zone and would not cause cumulative impact, hence unacceptable impacts on marine mammals are not expected.

2. Underwater sound from marine construction activities
    - Refer to the EIA Report Section 9.6.1 (p.9-96), dredging, jetting and large works vessel traffic generally results in low frequency noise, which is not expected to acoustically interfere significantly with dolphins or porpoises. Marine mammals may have short-term avoidance of the immediate works areas of sound generating activities, but are expected to return when the disturbance ceases. Unacceptable adverse impacts of increased underwater sound level on marine mammals are not anticipated.
    - Refer to the EIA Report Section 9.16.1, 4th para (p.9-144), "*underwater sound and increase marine traffic generated from other marine construction activities are also not expected to result in unacceptable impacts to marine ecological resources especially marine mammals, considering the relatively small number of works vessels and trips involved, slow-moving nature of these vessels and the habituation of similar sounds by the species in the current underwater soundscape.*"
    - The underwater sound generated from the vessels involved is expected to be temporary and very much similar to those in the area at present from similar marine traffic, and the duration of the jetting construction period would be shortened, hence adverse impact to marine mammals is not anticipated.

Potential Environmental Implication

Ecology (Marine Mammals)

3. Short-term changes in water quality from marine construction activities
   - Refer to Slide 22, cumulative impact of water quality is not expected.

4. Increased Marine Traffic
   - Refer to the EIA Report Section 9.6.1 (p.9-95), the marine construction works of the Project is expected to involve a relatively small number of works vessels (typical < 10 at any one time at each work front) and the frequency/ trip of vessel would also be low (expected to be about 15 trips per day). Marine vessels would make use of designated fairways to access the works areas and would reduce traversing sensitive habitats such as existing and proposed marine parks where practicable. Given the slow-moving nature of the relatively small number of works vessels involved in the construction of the Project, unacceptable adverse impacts of increased marine traffic on marine mammals are not anticipated.
   - The proposed variation would result in minor increase in the number of work vessels when the two jetting machines are working concurrently. Considering the slow speed of the working vessels, it is not expected that there would be a significant risk of vessel strike of marine mammals due to these vessel movements.
   - Marine mammals in these waters are habituated to the background level of underwater sound, and a small increase in vessel activity with 2 jetting machines to be operated at least 5km apart is not anticipated to result in unacceptable impacts on marine mammals.

5. Accidental spillage/leakage of fuel/chemicals
   - Refer to the EIA Report Section 9.6.1 (p.9-96), the risk of spills and leaks would generally be limited to minor volumes and with implementation of preventative measures including provision of spill kit, no significant impacts to marine mammals would be expected.

Potential Environmental Implication

Ecology (Marine Parks)

- The following impacts to Marine Parks were identified in Section 9.7.1 of the approved EIA Report (AEIAR-218/2018) and related to the proposed variation.

1. Underwater sound from marine construction activities
   - The underwater sound characteristics of the vessels involved are very much similar to those in the area at present from similar marine traffic and the impact was discussed in Slides 23 and 24. Unacceptable impacts on the functionality of the existing and proposed marine parks are not anticipated.

2. Short-term Changes in Water Quality
   - Refer to Slide 22, cumulative impact of water quality is not expected. As such, unacceptable impacts on the water quality of the existing and proposed marine parks are not anticipated.

3. Increased Marine Traffic
   - Refer to the EIA Report Section 9.7.1 (p.9-102 – 9-103), the marine construction vessels would make use of designated fairways to access the works areas, and would avoid traversing sensitive habitats such as existing and proposed marine parks where practicable. In case the construction vessels used in the Project need to pass through the existing and proposed marine parks, the 10-knot vessel speed limit of the Marine Parks and Reserves Regulations (Cap. 476A) will be strictly followed. Given the works vessels would be slow moving (< 10 knots) and the Project is expected to involve a relatively small number of works vessels (typical < 10 at any one time at each work front), and the frequency/ trip of vessel would also be low (expected to be about 15 trips per day), unacceptable adverse impacts of increased marine traffic on the functionality of the existing and proposed marine parks are not anticipated.
   - Increase in marine traffic due to the proposed variation is minor and the proposed 2 jetting machines will work on its localized zone, unacceptable impacts of increased marine traffic on the functionality of the existing and proposed marine parks are not anticipated.

4. Accidental spillage/leakage of fuel/chemicals
   - Refer to the EIA Report Section 9.7.1 (p.9-104), the risk of spills and leaks would generally be limited to minor volumes and with implementation of preventative measures including provision of spill kit, no significant impacts to the functionality of marine parks would be expected.

Potential Environmental Implication

Fisheries

- The following impacts were identified in Section 10.5.1 of the approved EIA Report (AEIAR-218/2018) and related to the proposed variation.

1. Direct disturbances of fisheries habitat and fishing ground
    - Considering the temporary nature of the disturbance resulting from the construction BPPS Pipeline and with management of work fronts/sequence, impacts are considered to be of minor significance and unacceptable impacts on fisheries resources, habitats and fishing activities are hence not expected. Fisheries resources are expected to return to the area following the cessation of marine construction activities (p.10-5).
    - The proposed 2 jetting machines will work on its localized zone and are expected to result in minor and temporary disturbance to the fisheries area, hence adverse impacts on fisheries resources, habitats and fishing activities are not anticipated.

2. Underwater sound generate from marine construction activities
    - Waters in the vicinity of the project works area are subject to relatively high levels of marine traffic by similar types of vessels; therefore it is reasonable to assume that fish in these waters are habituated to a relatively high background level of underwater sound, and a small increase in vessel activity associated with the construction of this Project is not anticipated to result in unacceptable impacts on fisheries resources (p.10-6).
    - The underwater sound generated from the proposed 2 jetting machines is expected to be localized, temporary and very much similar to those in the area at present from similar marine traffic, and the duration of the jetting construction period would be shortened, hence adverse impact to fisheries resources is not anticipated.

3. Changes in Water Quality from Marine Construction Activities
    - Refer to Slide 22, cumulative impact of water quality is not expected. As such, unacceptable impact to fisheries resources is not anticipated.

Key Potential Environmental Implication

Visual

- The proposed jetting works are underwater activities, hence no impact on visual will be expected.

Cultural Heritage

- One potential archaeological material was identified in Sections 12.4.2 of the approved EIA Report
- Section 12.6 & 12.9 concluded that the potential archaeological material is over 200m from the centreline of the BPPS Pipeline route and is outside of the impact area, hence no impact on Cultural Heritage will be expected

Hong Kong Offshore LNG Terminal Project

4. Assessment of Proposed Changes against Section 6 of the EIAO-TM

Proposal for Two Jetting Machines

- The proposed changes have been evaluated to consider whether the change in construction methods may constitute a material change to a designated project or to an environmental impact (Section 6 of the EIAO-TM refers).
- The evaluation results are summarised below:

Item	Requirement	Evaluation	Material Change?
6.1(a)	A change to physical alignment, layout or design of the project causing an environmental impact likely to affect existing or planned community, ecologically important areas or sites of cultural heritage.	The proposed change will not result in a change to physical alignment, layout and design of the project.	No
6.1(b)	A physical change resulting in an increase in the extent of reclamation or dredging affecting water flow or quality likely to affect ecologically important areas, or disrupting sites of cultural heritage.	The proposed change only include jetting works and will not result in an increase in the extent of reclamation or dredging affecting water flow or quality likely to affect ecologically important areas, or disrupting sites of cultural heritage.	No

Assessment of Proposed Changes against Section 6 of the EIAO-TM

Proposal for Two Jetting Machines

Item	Requirement	Evaluation	Material Change?
6.1(c)	An increase in pollution emissions or discharges or waste generation likely to violate guidelines or criteria in this technical memorandum without mitigation measures in place.	The proposed two jetting machines will not result in any increase in pollution emissions or discharges or waste generation likely to violate guidelines or criteria in the technical memorandum.	No
6.1(d)	An increase in throughput or scale of the project leading to physical additions or alterations that are likely to violate the guidelines or criteria in this technical memorandum without mitigation measures in place.	The proposed two jetting machines will not result in a change to the throughput and scale of the Project.	No

Assessment of Proposed Changes against Section 6 of the EIAO-TM

Proposal for Two Jetting Machines

Item	Requirement	Evaluation	Material Change?
6.1(e)	A change resulting in physical works that are likely to affect a rare, endangered or protected species, or an important ecological habitat, or a site of cultural heritage.	No impacts beyond those predicted in the approved EIA Report are anticipated to occur on rare, endangered or protected species, or an important ecological habitat, or site of cultural heritage due to proposed two jetting machines.	No

Assessment of Proposed Changes against Section 6 of the EIAO-TM

Proposal for Two Jetting Machines

Item	Requirement	Evaluation	Material Change?
6.2	The environmental impact of a designated project, for which an environmental permit has been issued, is considered to be materially changed if the environmental performance requirements set out in the EIA report for this project may be exceeded or violated, even with the mitigation measures in place.	The above qualitative review at Slides 20-28 concluded that the environmental performance requirements set out in the EIA report for this project would not be exceeded or violated with the mitigation measures in place under the current proposed change.	No

Conclusion:
It is considered that the proposed changes will not lead to a material change to the designated project, or an environmental impact in accordance with Sections 6.1 and 6.2 of the EIAO-TM, respectively. As such, the proposed changes are considered as conforming to the information and requirements set out in the approved EIA Report.

Hong Kong Offshore LNG Terminal Project

5. Review of Proposed Mitigation Measures & Environmental Monitoring and Audit (EM&A) Requirements

Mitigation Measures

Existing relevant mitigation measures as recommended in the approved EIA Report, which include but not limited to:

- Silt curtain will be provided throughout the entire jetting process according to the approved Silt Curtain Deployment Plan and Pipeline Construction Plan. (Refer to Slide 36)
- Marine mammal exclusion zone (MMEZ) not less than 250m radius.
- Use of appropriate dredging and jetting rates with the use of silt curtain where needed as recommended in the Pipeline Construction Plan Table 2.1 to reduce potential water quality impacts from elevated suspended solids (SS) due to the proposed marine works. (Refer to Slide 36)
- Pipeline dredging/ jetting works between North of Tai O and Fan Lau will avoid the peak months of Chinese White Dolphin (CDW) calving (May and June).
- No jetting works for the sections of subsea gas pipelines between South of Shek Kwu Chau and the jetty and between South of Soko Islands and the jetty shall be carried out from 1900 hours to 0700 hours of the following day.
- All vessels will comply with speed restriction of 10 knots in the construction work areas and in areas with high CWD and Finless Porpoise (FP) usage.
- The working vessels will be equipped with tracking devices to record their operating speeds and marine travel routes during construction of the Project.

Mitigation Measures

- Requirement of Silt Curtain and relevant Jetting Rate at different KP stipulated in Table 2.1 of the approved Pipeline Construction Plan:

Table 2.1 Mitigation Measures for the BPPS Pipeline Construction Works

Work Location	Types and No. of Plant Involved	Allowed Maximum Work Rate	Silt Curtain at Plants	Silt Curtain at Water Sensitive Receivers (WSRs)	Other Measures
Pipeline Riser (KP0.0 – 0.1)	1 Grab Dredger	8,000m3 day-1 for 24 hours each day	Yes	Not required	Daily maximum of 12 hours with daylight (0700 – 1900)
Jetty Approach (KP0.1 – 5.0), excluding Subsea Cable Sterile Corridors	1 Jetting Machine	1,000m day-1 for 24 hours each day	Yes	Not required for grab dredging; Two layers at Southern Boundary of the proposed South Lantau Marine Park (KP0.1 – 8.9) for jetting	Daily maximum of 12 hours with daylight (0700 – 1900)
Subsea Cable Sterile Corridors (KP1.49 – 2.75 & KP3.55 – 4.43)	2 Grab Dredgers, followed by 1 Jetting Machine	8,000m3 day-1 for 24 hours each day for each dredger 720m day-1 for 24 hours each day for jetting machine	Yes		
South of Soko Islands (KP5.0 – 8.9)	1 Jetting Machine	1,000m day-1 for 24 hours each day	Yes		
Southwest of Soko Islands (KP8.9 – 12.1)	1 Jetting Machine	1,000m day-1 for 24 hours each day	Yes	Not required	
Adamasta Channel (KP12.1 – 15.6)	1 Jetting Machine	1,000m day-1 for 24 hours each day	Yes	Not required	
Southwest Lantau (KP15.6 – 21.3)	1 Jetting Machine	1,500m day-1 for 24 hours each day	Yes	Not required	Avoid the peak months of Chinese White Dolphin calving (May and June)
West of Tai O to West of HKIA (KP21.3 – 31.5)	1 Jetting Machine	1,500m day-1 for 24 hours each day from KP26.2 to 21.3 720m day-1 for 24 hours each day from KP31.5 to 26.2	Yes	Not required	
Sha Chau to Lung Kwu Chau (KP31.5 – 36.0)	1 Jetting Machine	720m day-1 for 24 hours each day	Yes	Two layers at Western Boundary of the Sha Chau and Lung Kwu Chau Marine Park (KP31.5 – 36.0)	
Sha Chau to Lung Kwu Chau (KP36.0 – 37.5)	1 Jetting Machine	720m day-1 for 24 hours each day	Yes	Two layers at Western Boundary of Sha Chau and Lung Kwu Chau Marine Park (KP36.0 – 37.5)	
Lung Kwu Chau to Urmston Anchorage (KP37.5 – 41.1)	1 Jetting Machine	1,000m day-1 for 24 hours each day	Yes	Two layers at NW corner of Sha Chau and Lung Kwu Chau Marine Park (KP37.5 – 41.1)	
Urmston Road (KP41.1 – 42.9)	1 Grab Dredger	8,000m3 day-1 for 24 hours each day	Yes	Not required	
West of BPPS (KP42.9 – 44.9)	1 Jetting Machine	1,000m day-1 for 24 hours each day	Yes	Two layers at CR1, CR2 (Note 1)	
Pipeline shore approach at BPPS (KP44.9 – 45.0)	1 Grab Dredger	1,500m3 day-1 for 24 hours each day	Yes	Two layers at CR1, CR2 (Note 1)	

Note: (1) CR1 and CR2 denote the coral colonies identified at the artificial seawall at BPPS.

Additional Monitoring Measures

Refer to Scenario 1 (Slides 7-10) of this information pack, since 2 Jetting Machines will be jetting toward opposite direction. Hence the Worst-Case Scenario will be at the first day when Jetting Machine 2 commences its works, 2 jetting machines will work concurrently with at least 5km apart.

For Scenario 2 (Slides 11-14), the Jetting Machine 2 will be commenced at the Jetty side which is approximately 30km apart from the Jetting Machine 1 and separate by the Lantau Island. Hence, cumulative impact from 2 Jetting Machines is not expected.

Refer to Water Quality Section (Slide 22) & Appendix A, with separation of 5 km (except for jetting works at the sterile corridor sections), there will not be significant cumulative impact for concurrent operation of two jetting machines in terms of SS elevation and sedimentation flux. For sterile corridor sections, no other jetting machine would be working concurrently on the LPS Pipeline and on the BPPS Pipeline at South of Lantau Island between BPPS KP0.0 - KP14.25 (i.e. between the Jetty and Adamasta Channel) during jetting at the sterile corridors.

In order to ensure the above mitigation measures has been implemented properly, we have established below additional monitoring measures:

Marine Traffic Control Office (MTCO)

- The MTCO operate in 7x24 hours basis, with operators responsible for full time monitoring of all working vessels of our project.
- **Monitor real-time** track of each operating vessels using the Marine Surveillance System (web-based) which **manually** monitor the distance between 2 jetting machines in a 7x24 basis.
- The MTCO operator will remind the vessel captains of the jetting machines to maintain sufficient separation distance once he found that they are approaching close.

EM&A Requirement

The working vessels shall be equipped with tracking devices to record their locations, operating speeds and marine travel routes during construction of the Project. The records will be submitted weekly to the Environmental Team (ET) Leader and Independent Environmental Checker (IEC) for review of the acceptability of additional measures. The records shall be included in the monthly EM&A Reports.

Hong Kong Offshore LNG Terminal Project

6. Final Remarks

Final Remarks

Proposed variation to the number of jetting machines during construction

Condition 2.9 of FEP-03A/558/2018/A:

" The Permit Holder shall, no later than 1 month before the commencement of construction of the Project, deposit with the Director 3 hard copies and 1 electronic copy of a pipeline laying method plan of the Project. The pipeline laying method plan shall include but not limited to the detailed design of the pipeline trenches for laying and burying the subsea gas pipeline, methods for laying and burying the subsea gas pipeline, dredging and jetting rate for laying the subsea gas pipeline, types and numbers of dredging and jetting plants for construction of the Project. No more than one Trailing Suction Hopper Dredger shall be used for construction of the subsea gas pipeline. No more than ~~***one***~~ ***two jetting machines*** *shall be used for construction of the subsea gas pipeline. The subsea gas pipeline shall be constructed in accordance with the information as contained in the deposited pipeline laying method plan."*

- **To allow two (2) jetting machines to be used for the construction of BPPS subsea gas pipeline.**

Hong Kong Offshore LNG Terminal Project

Appendix A – Extraction of Water Quality Modelling Results for the Potential Change of Jetting Works

Content

1. Introduction
2. Approach
3. Key assumptions
4. Results
    a) Suspended Solids
    b) Sedimentation Flux
    c) Dissolved Oxygen
    d) Release of Sediment-bounded Contaminants
    e) Release of Sediment-bounded Nutrients
5. Conclusion

Introduction

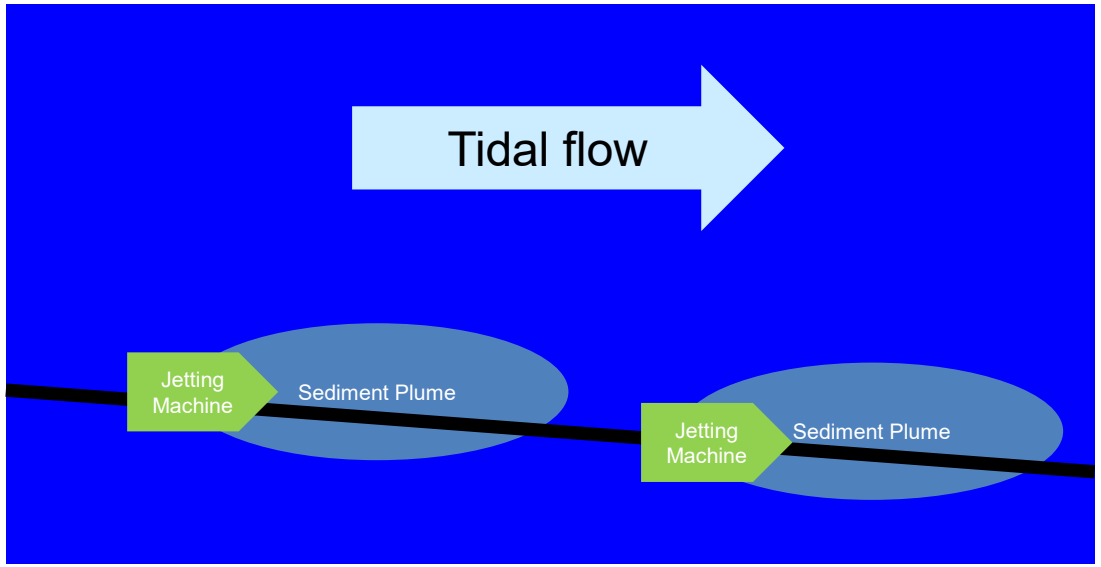
- To speed up the installation of gas pipeline connecting the HKOLNG Terminal and the BPPS, COOEC proposed to use two jetting machines concurrently for the jetting works of the BPPS Pipeline
- In the approved Environmental Impact Assessment (EIA) for the HKOLNG Terminal Project (AEIAR-218/2018) and the Environmental Review Report (ERR) for BPPS Pipeline Construction Options appended in the Pipeline Construction Plan submitted under FEP-03/558/2018/A, it was assumed that only one jetting machine would work on the BPPS Pipeline
- Therefore, the proposed used of additional jetting machine is a variation from the assessed scenarios in the approved EIA and the ERR
- This review intended to provide justification on the use of two jetting machines (at distance of at least 5 km apart) based on the modelling results from the modelling exercises conducted in the approved EIA and the ERR

Approach

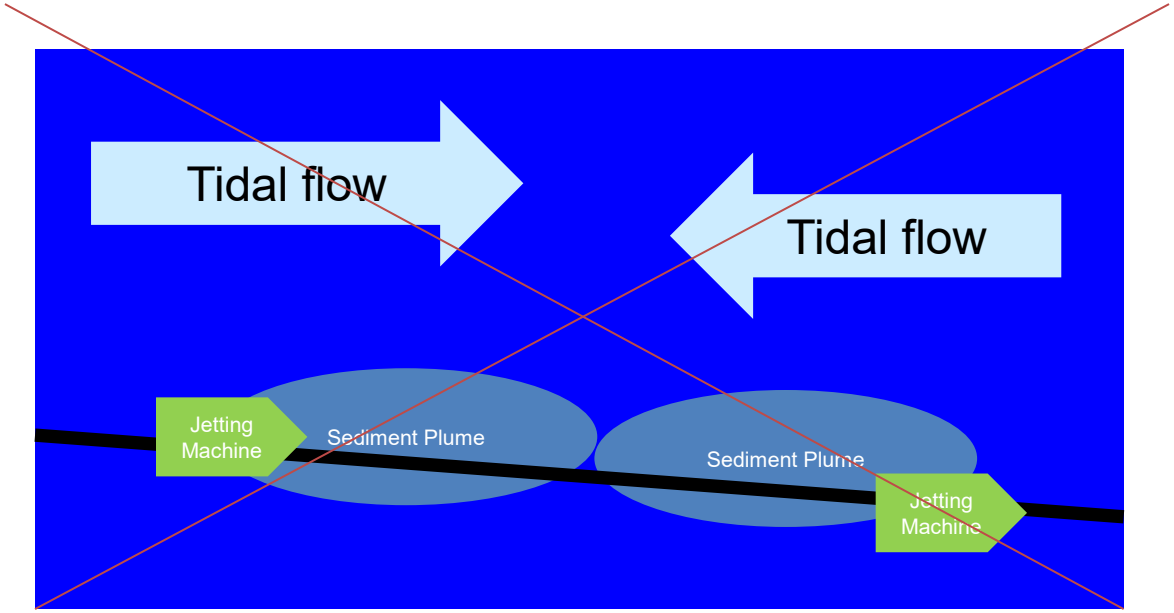
- To demonstrate there would be no significant change in level of water quality impact, snapshots of instantaneous depth-averaged SS elevation was prepared from the Delft3D WAQ Map output files.
- These snapshots were overlaid with a 2.5 km radius circle at the centre of the jetting machine to allow easy determination whether sediment plume extended beyond 2.5 km from the jetting machine.
- By demonstrating a single jetting machine will not result in sediment plume extending beyond 2.5 km, it can be concluded that two jetting machines working concurrently at >5 km apart will not result in notable cumulative impact.
- The same approach applied to the interpretation of sedimentation flux results. Since assessment criterion for sedimentation flux is 200 g/m^2/day, the sedimentation flux generated from each jetting machine shall be <100 g/m^2/day for jetting occur at 2.5 km away from the jetting machine.

Approach (cont.)

- Note that this is a conservative assumption, as sediment plume generally follows the flow of tide.
- It is unlikely that the sediment plume from the two jetting machines flow in the opposite direction and meet the other in the middle.



Possible (Conservative Assumption)



Not possible

Key Assumptions

- In this review, 3 snapshots of instantaneous suspended solid (SS) elevation and sedimentation flux were taken at both ends (2 snapshots) and near the middle (1 snapshot) of each section of pipeline assessed in the approved EIA and the ERR.
- Results were taken from the mitigated scenarios for both seasons (Scenarios C02, C03, C04, C05, C07, C05E, C08, C09A).
- The snapshots were taken in the second round of the jetting, unless otherwise specified (i.e. for Scenario C05E / F / G).
- Since the jetting machine (modelled as a sediment source) would stay in the same model grids for multiple simulation hours, a representative output time step (elongated and does not encroach to shoreline) was taken among these hours.

Key Assumptions (cont.)

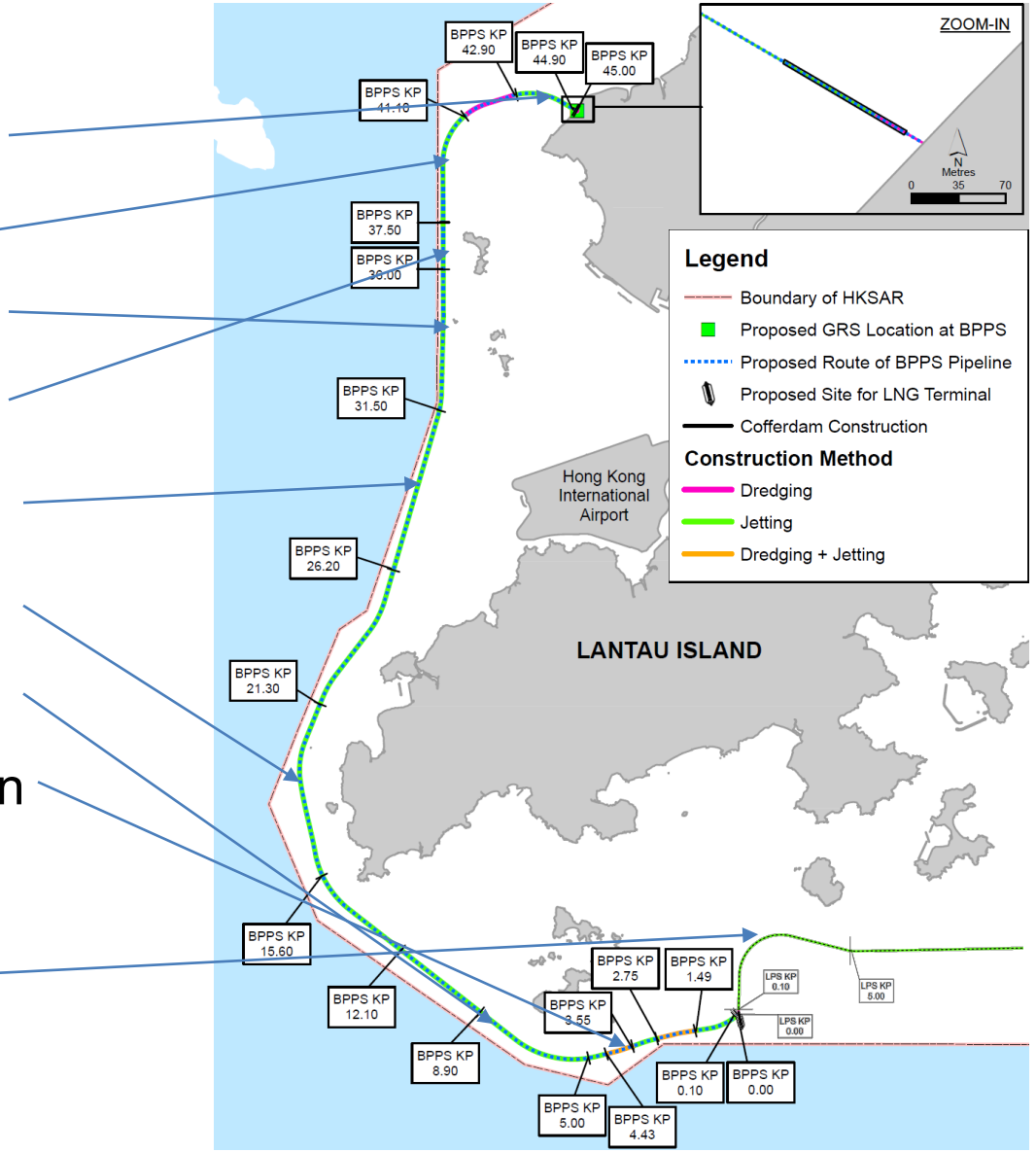
- Note that in the approved EIA and the ERR, contour plots for maximum depth-averaged SS elevation were presented
- This means by definition any instantaneous sediment plume would be smaller than those shown in the approved EIA and the ERR
- In general, sediment plume is generally very small in any single instance
- Instantaneous sedimentation flux level was generally larger in extent as sedimentation occurred only when current velocity is below the critical stress limit (i.e. relatively large amount of entrained sediment may settle in short burst when current velocity is below the said limit). But the dimension for 100 g/m^2/day plume is still very small.

Key Assumptions (cont.)

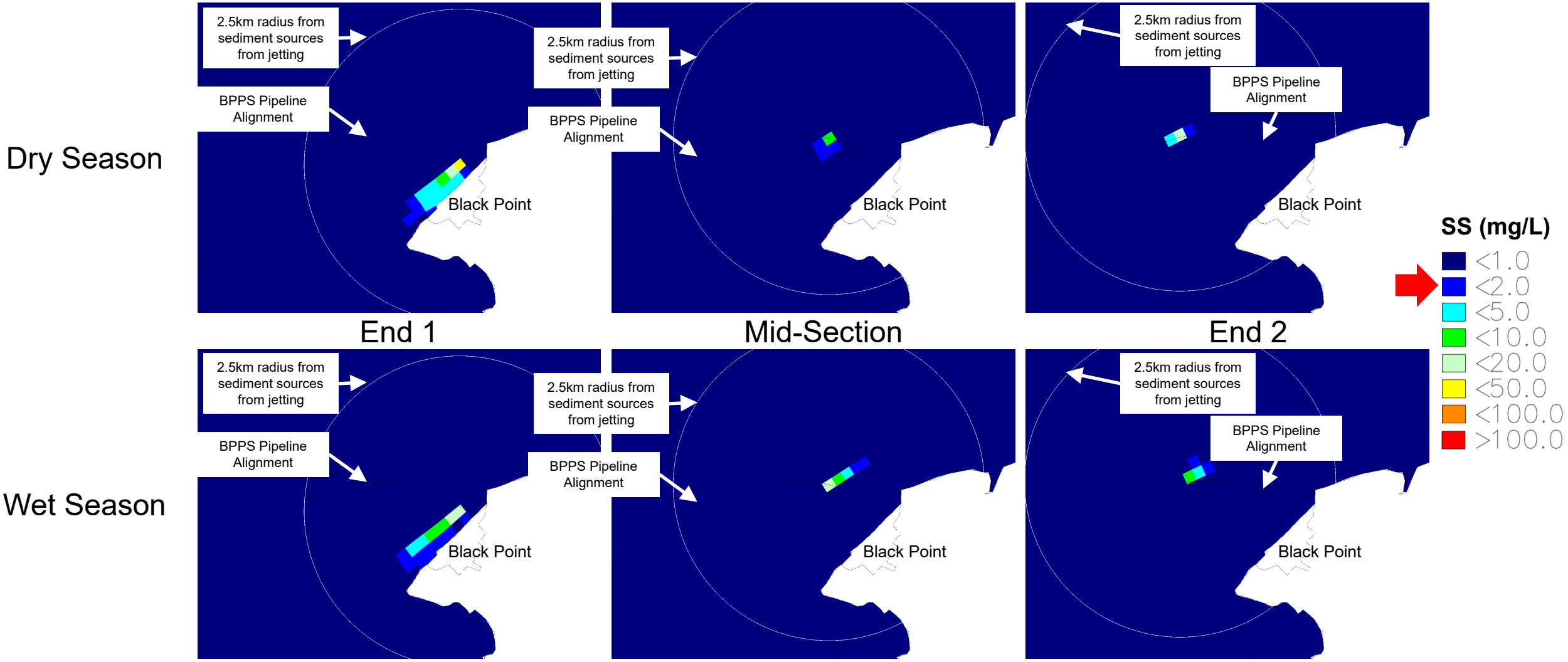
- In the approved EIA and the ERR, contour plots were prepared using post-processing tool Delft3D GPP based on Statistics Map output (small file size).
- In this exercise, contour plots were prepared based on much larger Map output that contain results of the entire simulation period.
- Such files size exceeds the limits of Delft3D GPP and therefore another post-processing tool Delft3D QUICKPLOT was used.
- The general look was slightly different and the contour interpolation is different as well. (QUICKPLOT does not interpolate across grid cells)
- Other than this, there should be no material difference on the presentation of data.

Results

- Scenario C02 – SS Elevation & Sedimentation Flux
- Scenario C03 – SS Elevation & Sedimentation Flux
- Scenario C07 – SS Elevation & Sedimentation Flux
- Scenario C08 – SS Elevation & Sedimentation Flux
- Scenario C04 – SS Elevation & Sedimentation Flux
- Scenario C09A – SS Elevation & Sedimentation Flux
- Scenario C05 – SS Elevation & Sedimentation Flux
- Scenario C05E/ F/ G – SS Elevation & Sedimentation Flux
- Scenario C06 – SS Elevation & Sedimentation Flux



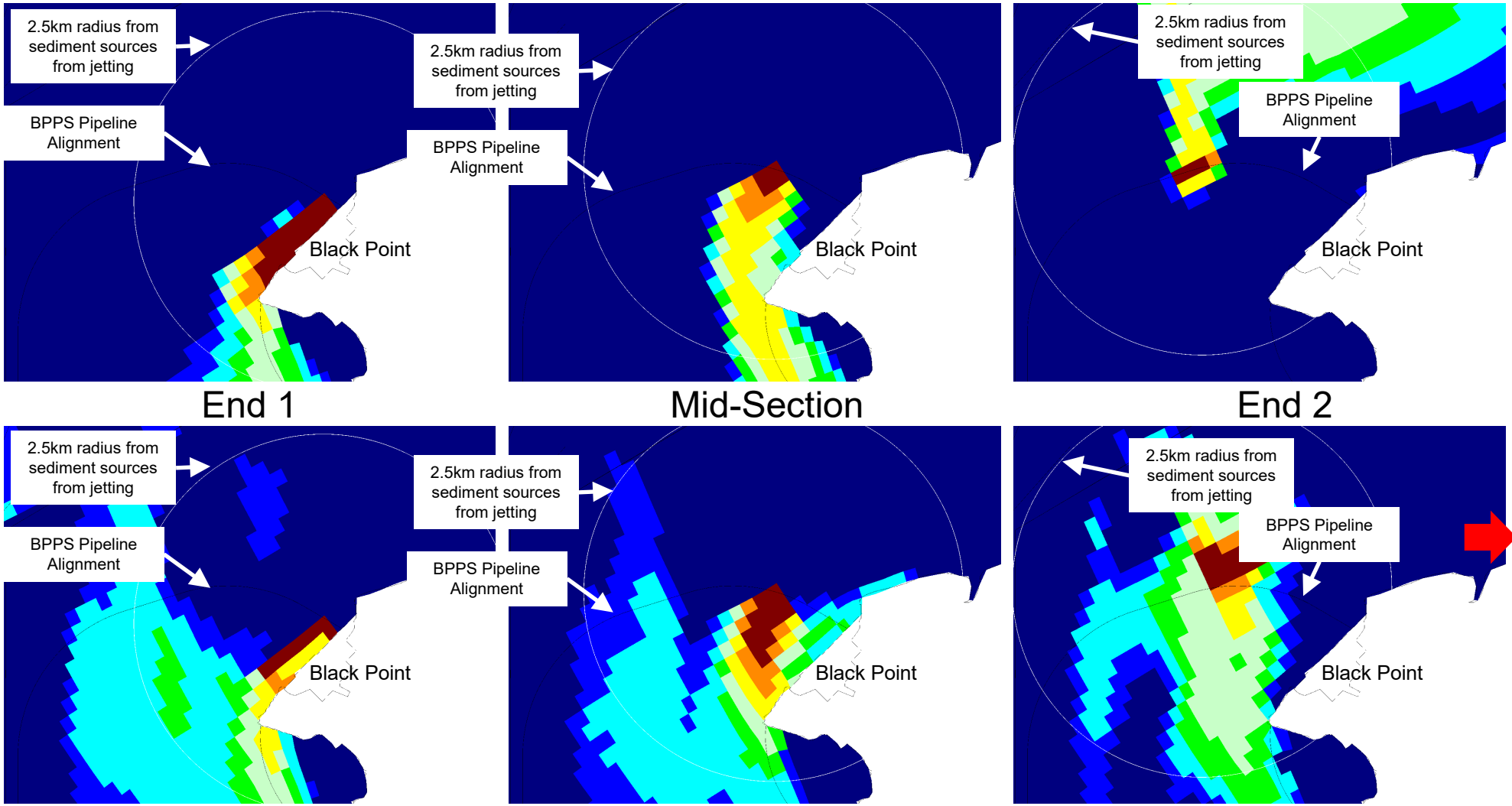
Scenario C02 – SS Elevation



Scenario C02 – Sedimentation Flux

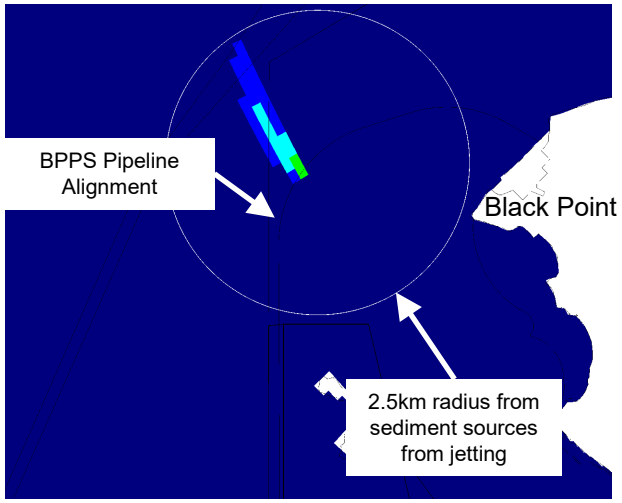
Dry Season

Wet Season

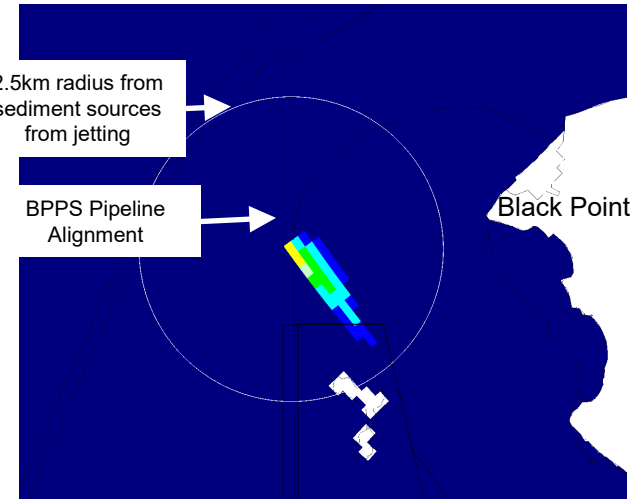


Scenario C03 – SS Elevation

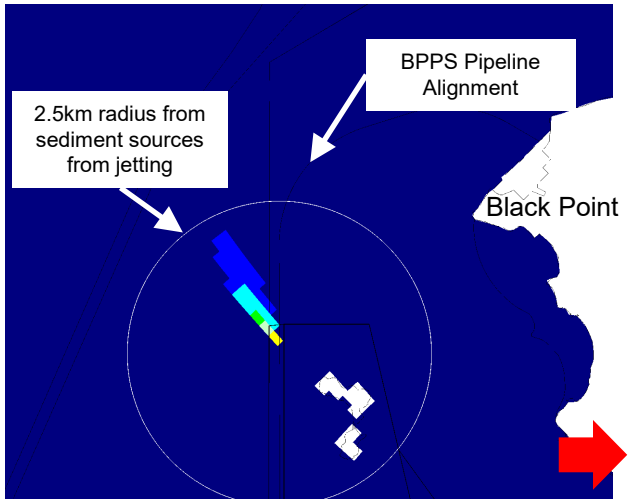
Dry Season



End 1



Mid-Section

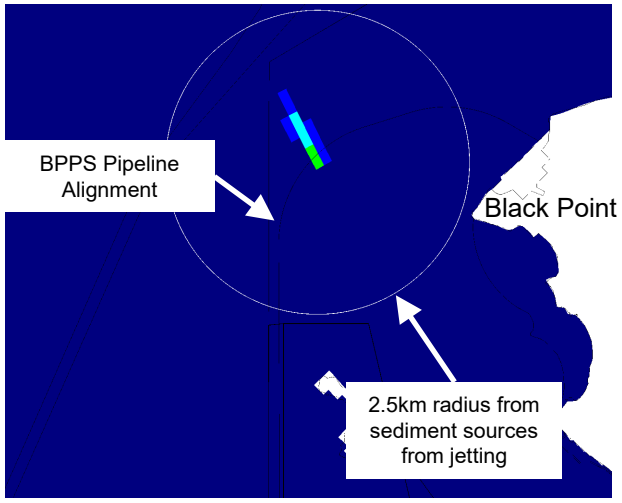


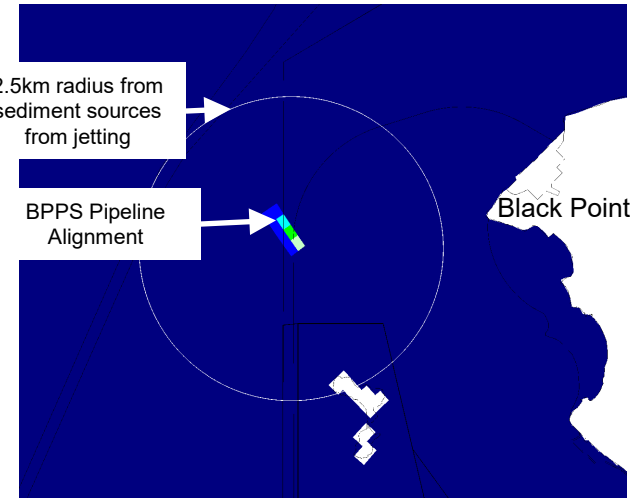
End 2

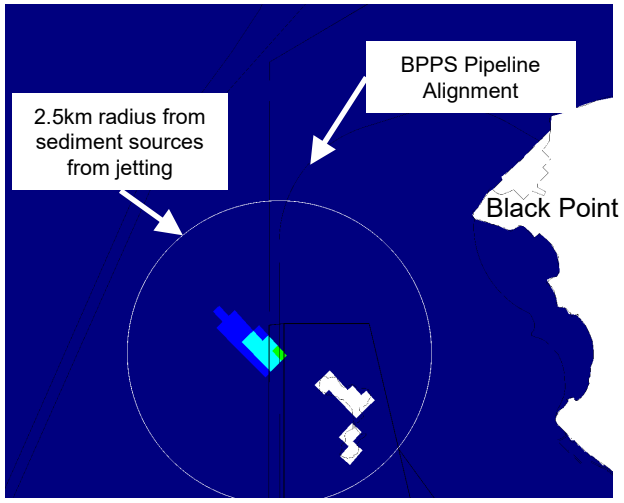
SS (mg/L)

- <1.0
- <2.0
- <5.0
- <10.0
- <20.0
- <50.0
- <100.0
- >100.0

Wet Season

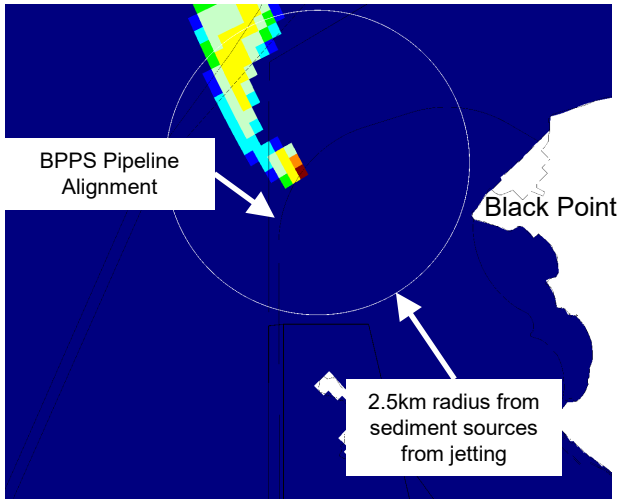




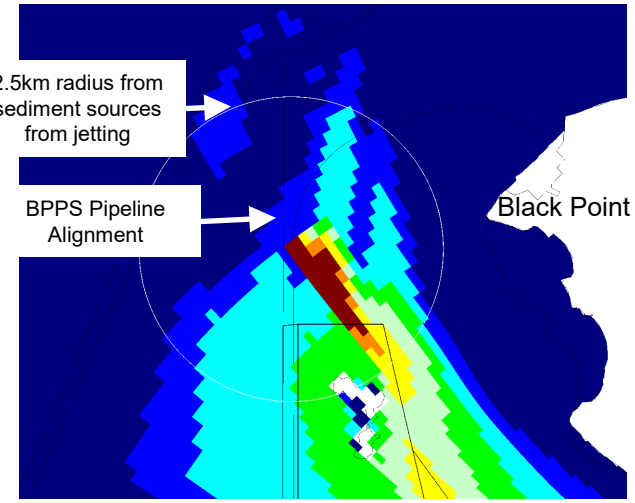


Scenario C03 – Sedimentation Flux

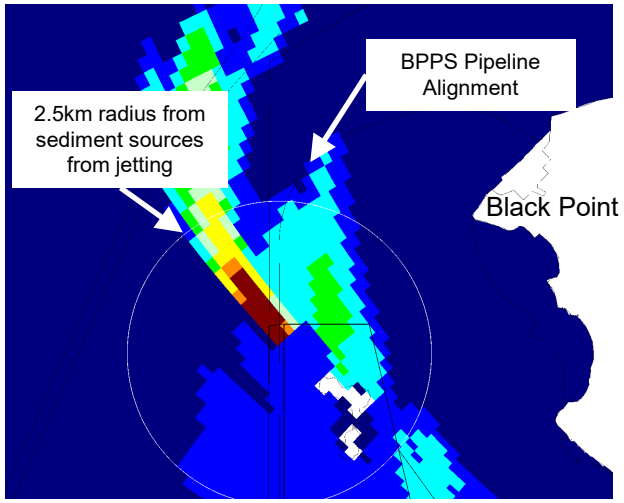
Dry Season



End 1

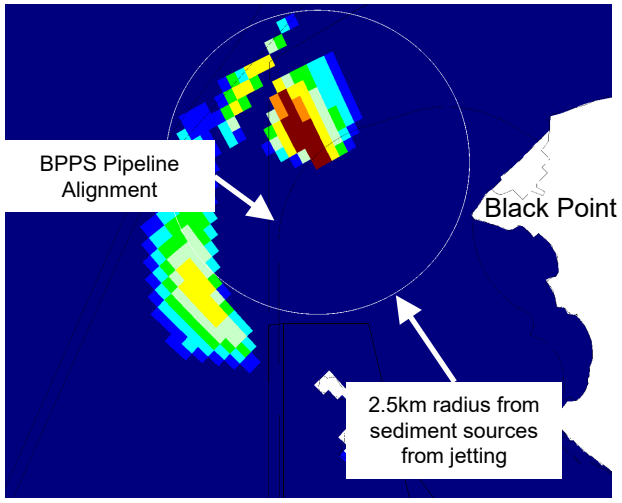


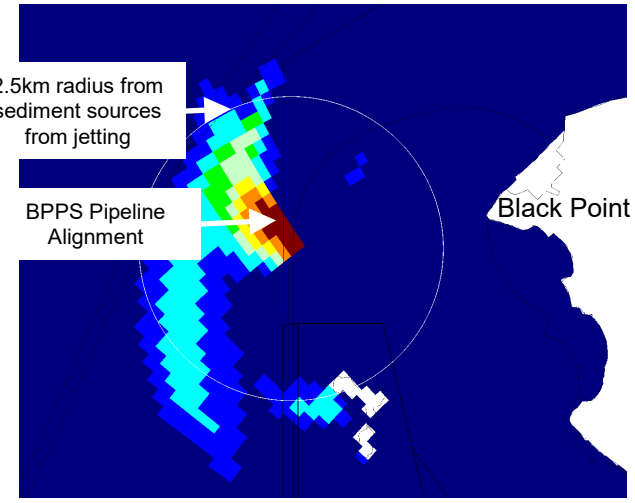
Mid-Section

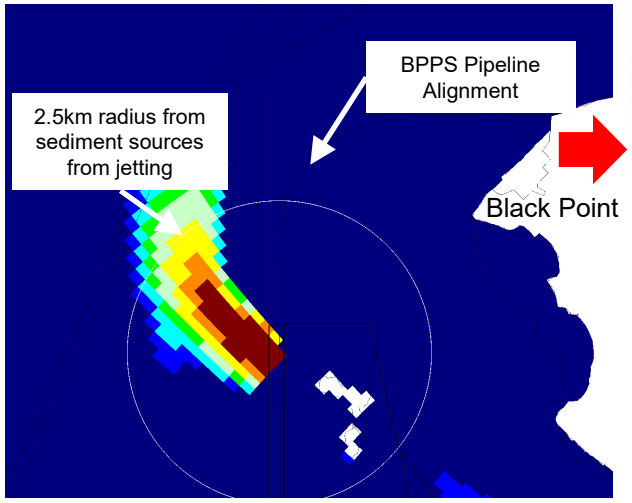


End 2

Wet Season







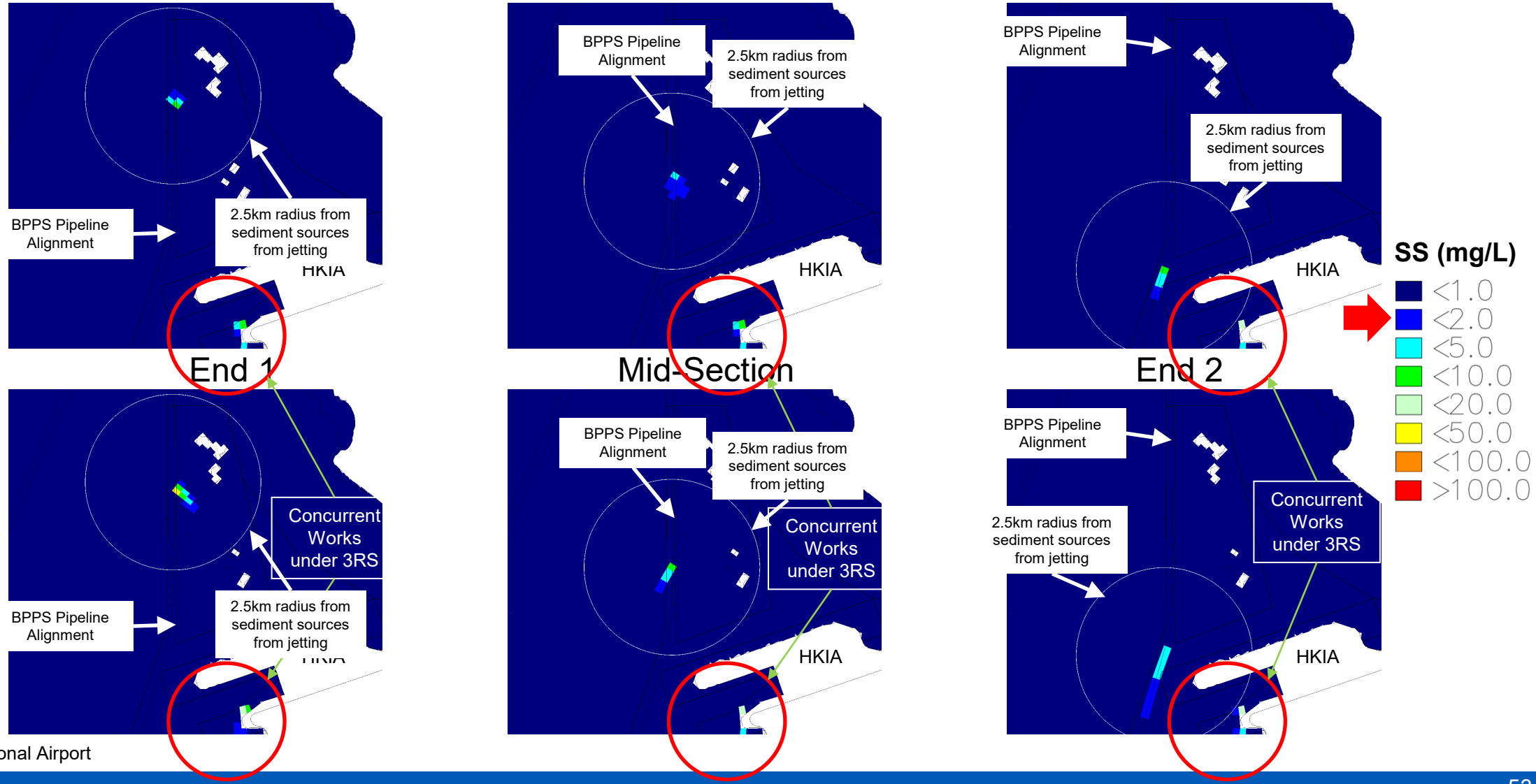
Sedimentation flux (g/m²/day)

- <1.0
- <2.0
- <5.0
- <10.0
- <20.0
- <50.0
- <100.0
- >100.0

Scenario C07 – SS Elevation

Dry Season

Wet Season

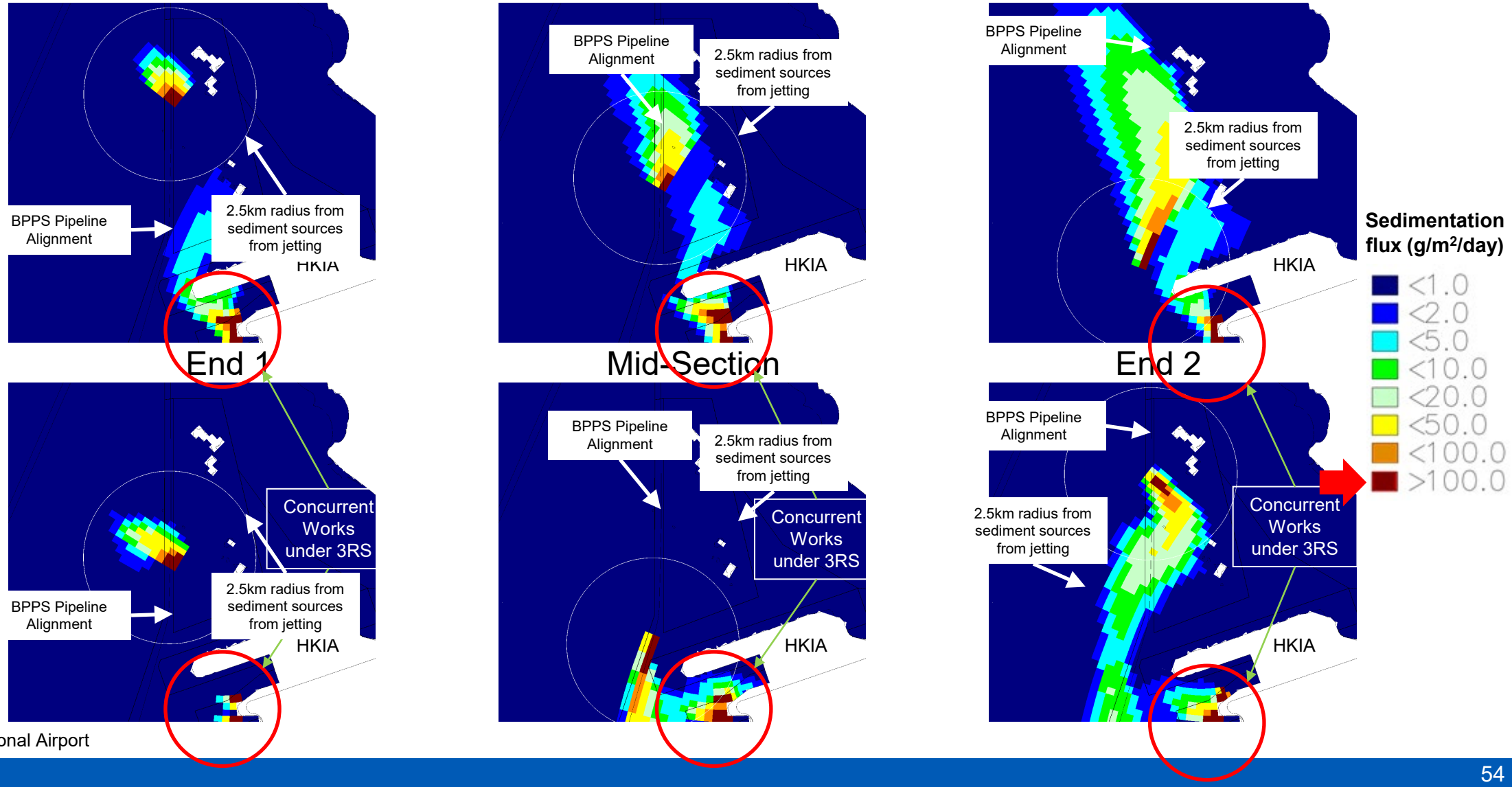


HKIA: Hong Kong International Airport

Scenario C07 – Sedimentation Flux

Dry Season

Wet Season

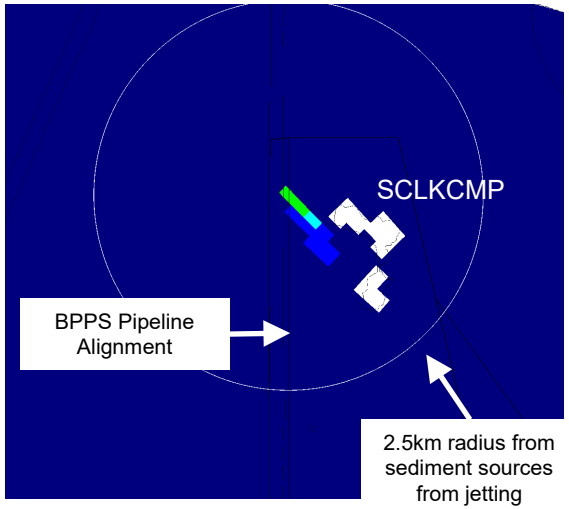


HKIA: Hong Kong International Airport

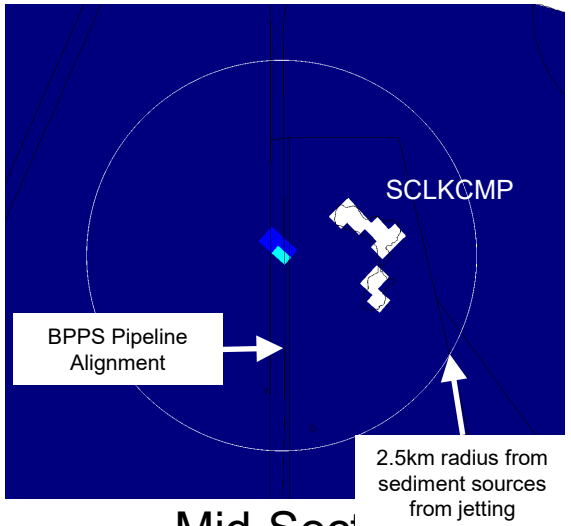
Scenario C08 – SS Elevation

Dry Season

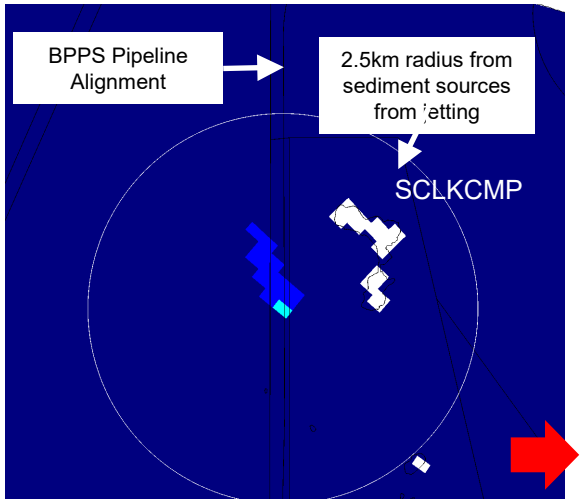
Wet Season



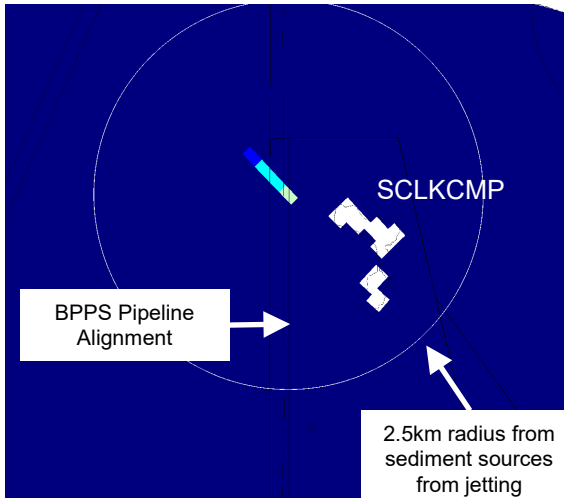
End 1

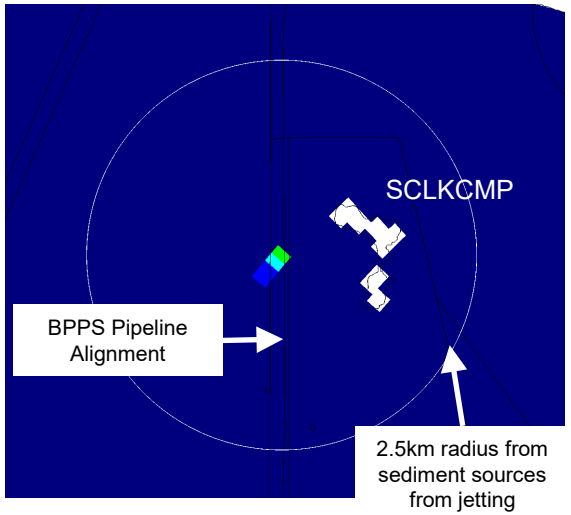


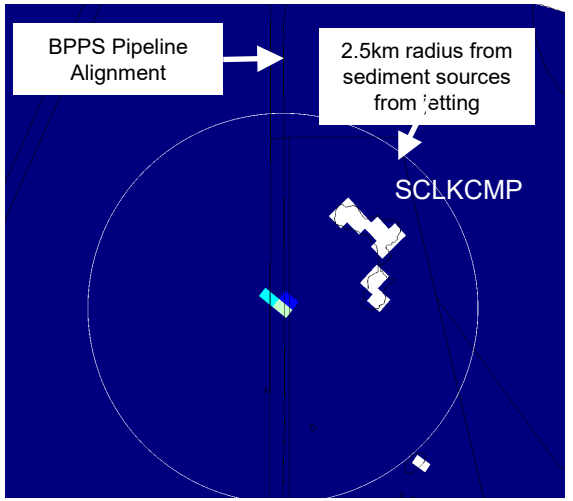
Mid-Section



End 2



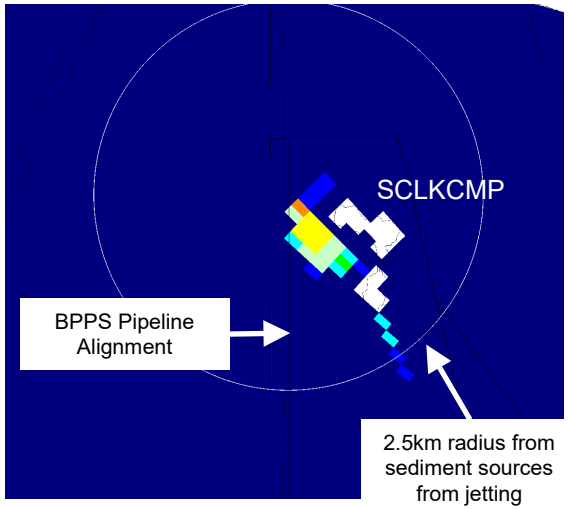




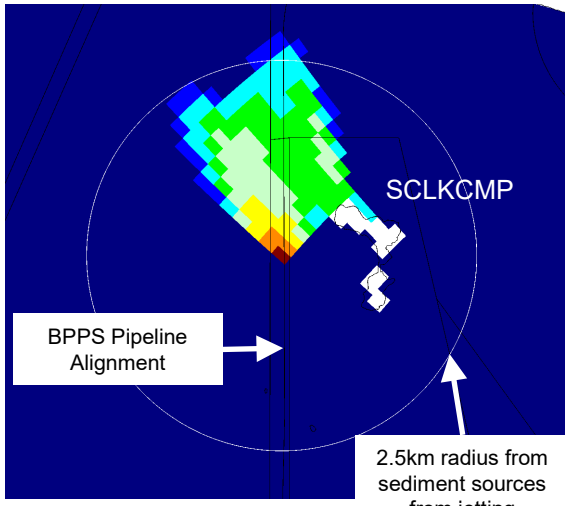
* SCLKCMP: Sha Chau and Lung Kwu Chau Marine Park

Scenario C08 – Sedimentation Flux

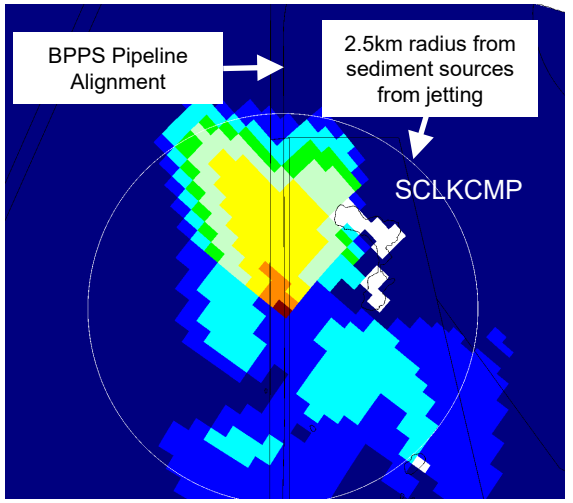
Dry Season



End 1

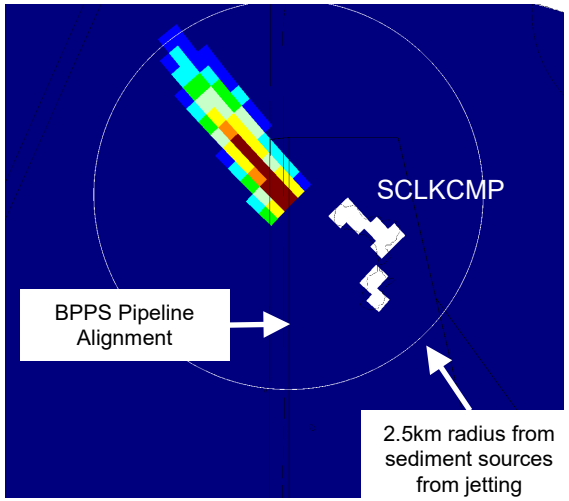


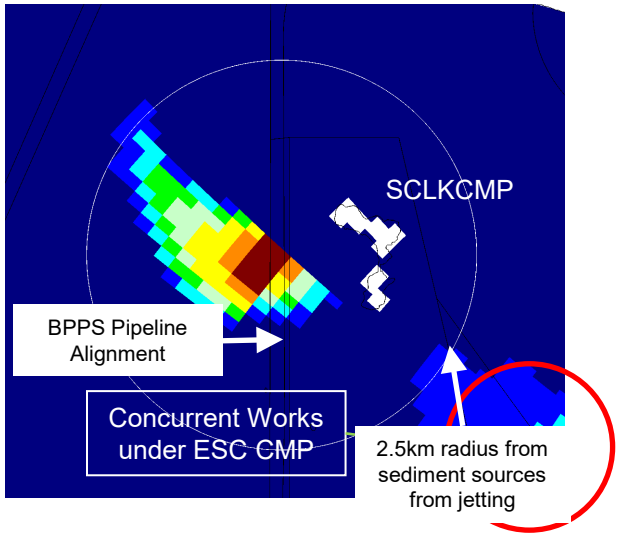
Mid-Section

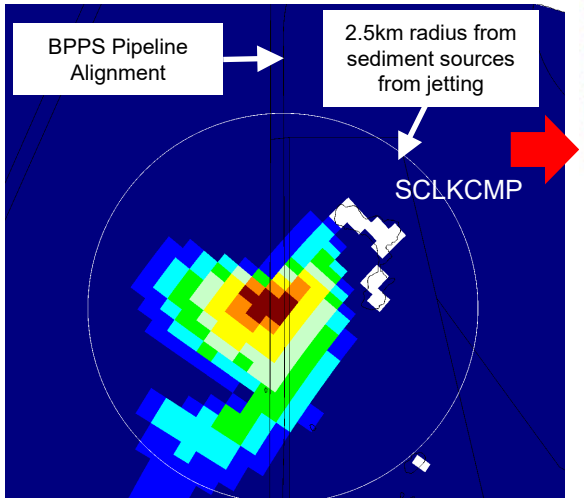


End 2

Wet Season





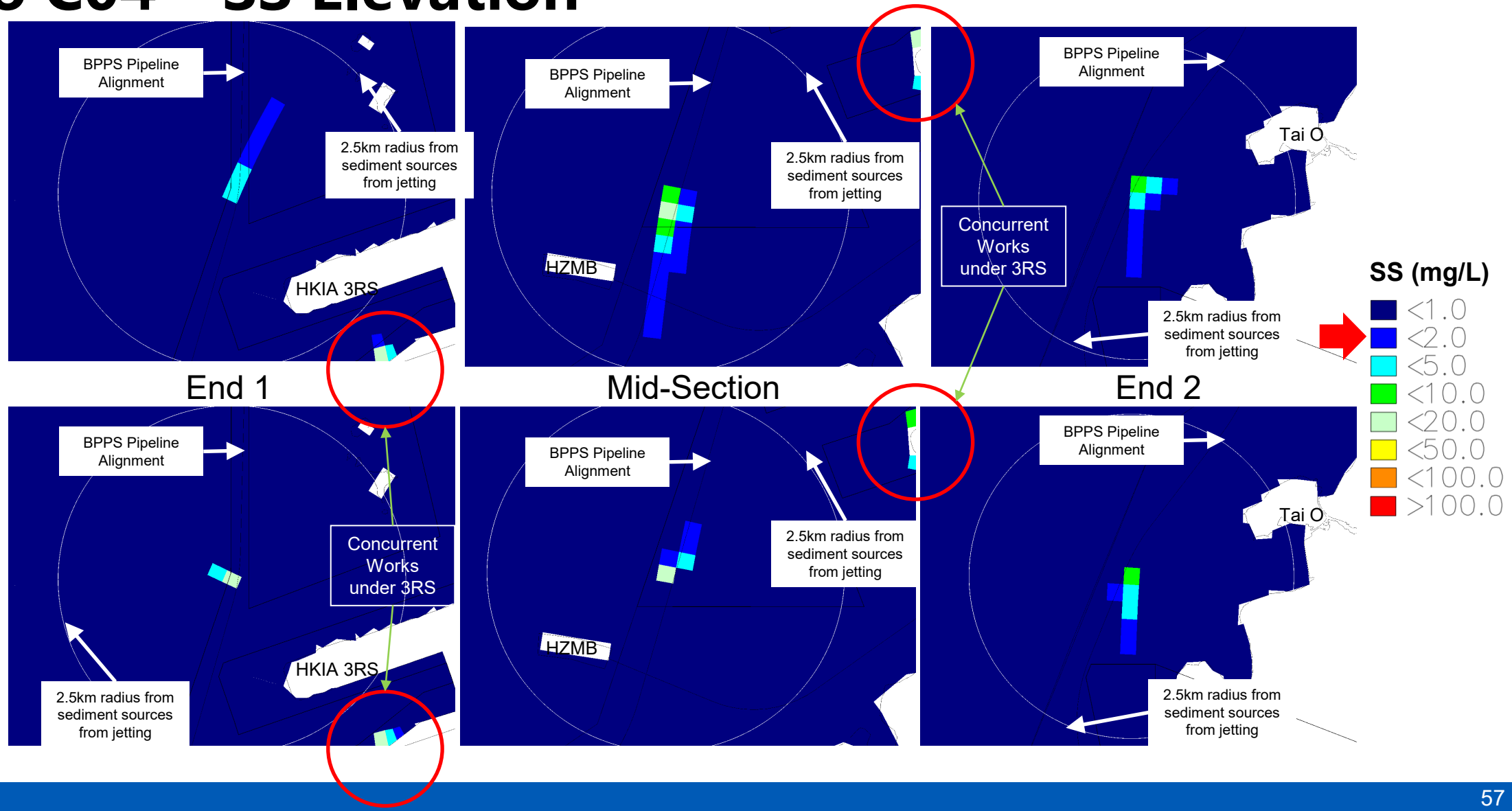


Sedimentation flux (g/m²/day)

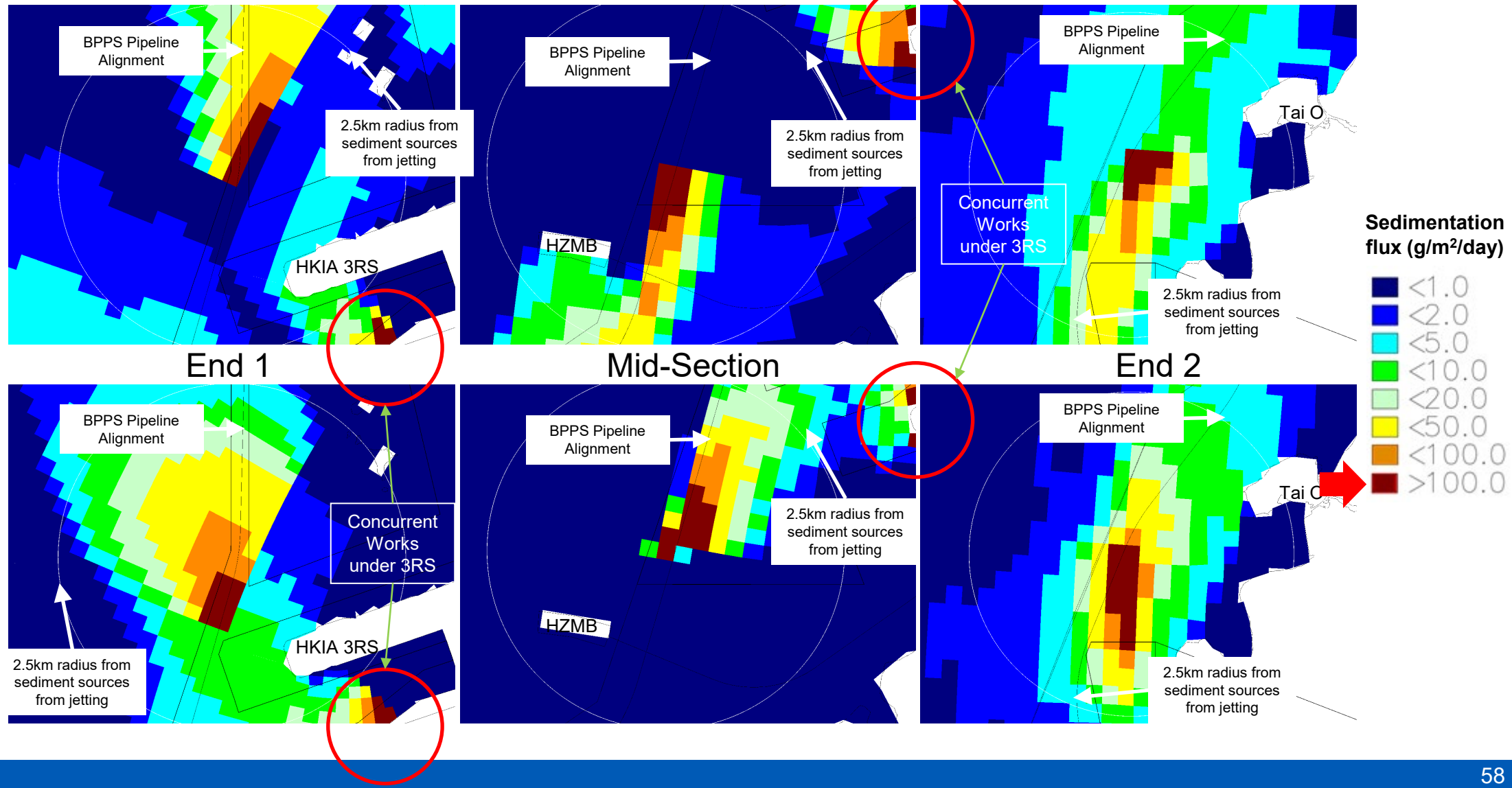
- <1.0
- <2.0
- <5.0
- <10.0
- <20.0
- <50.0
- <100.0
- >100.0

* SCLKCMP: Sha Chau and Lung Kwu Chau Marine Park

Scenario C04 – SS Elevation



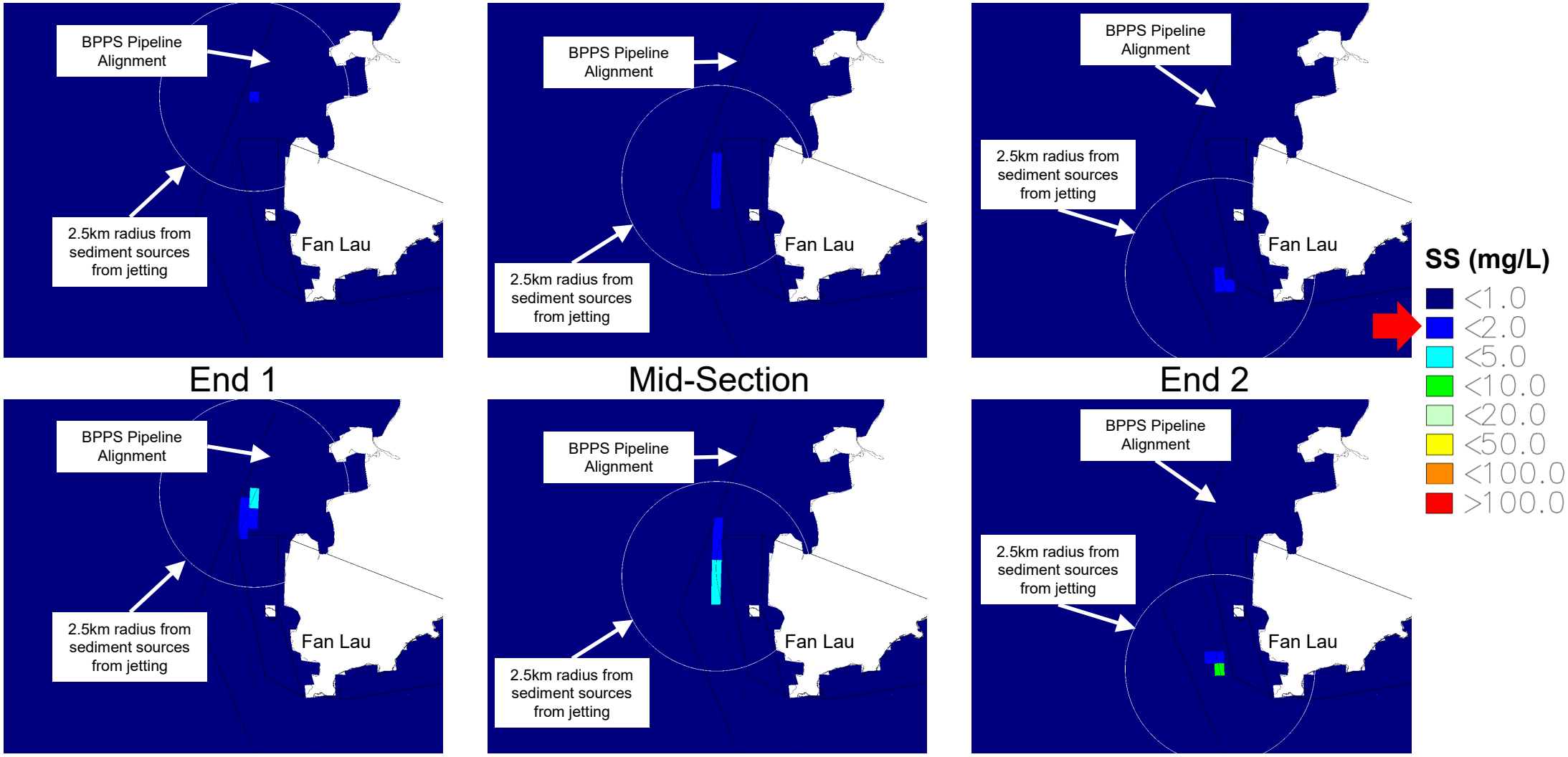
Scenario C04 – Sedimentation Flux



Scenario C09A – SS Elevation

Dry Season

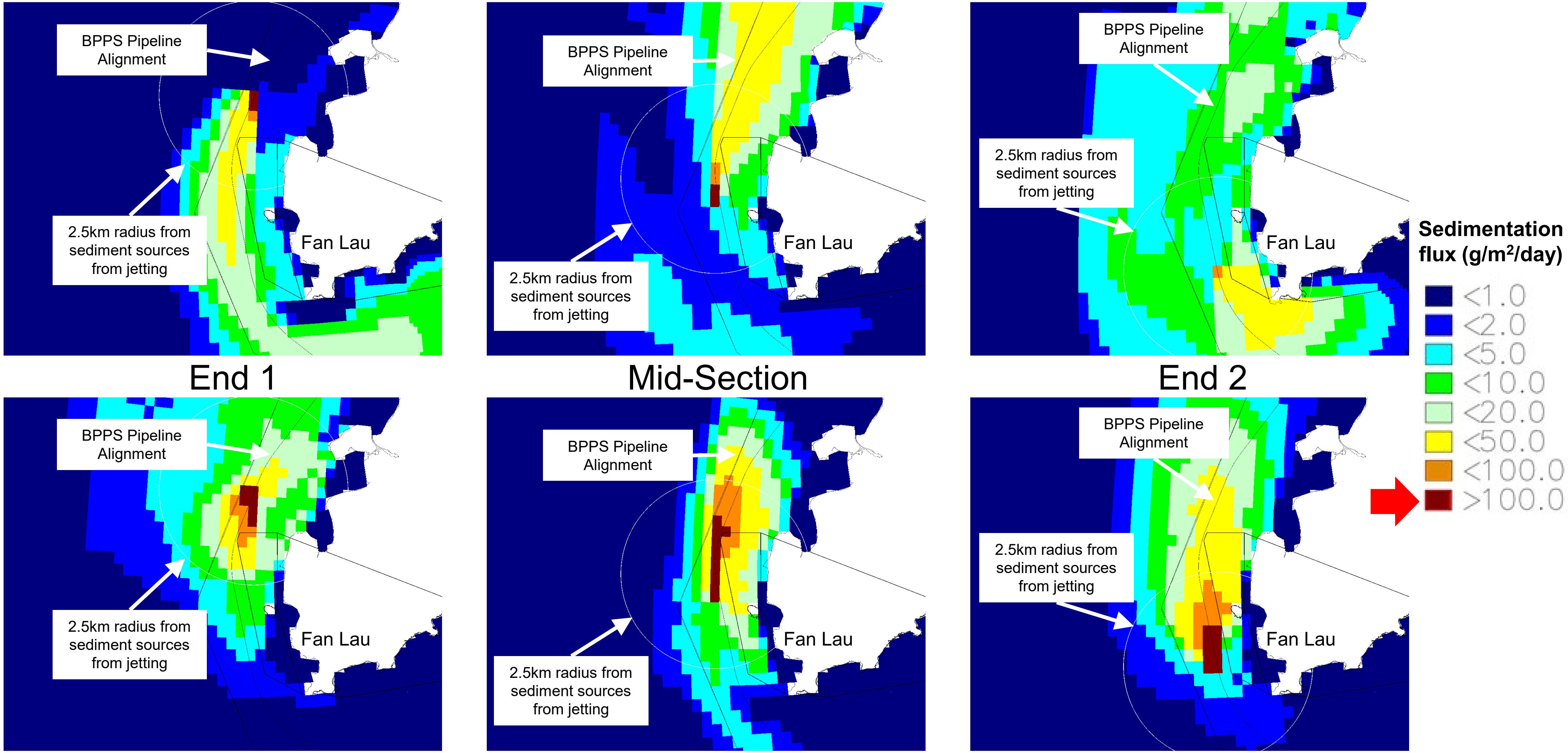
Wet Season



Scenario C09A – Sedimentation Flux

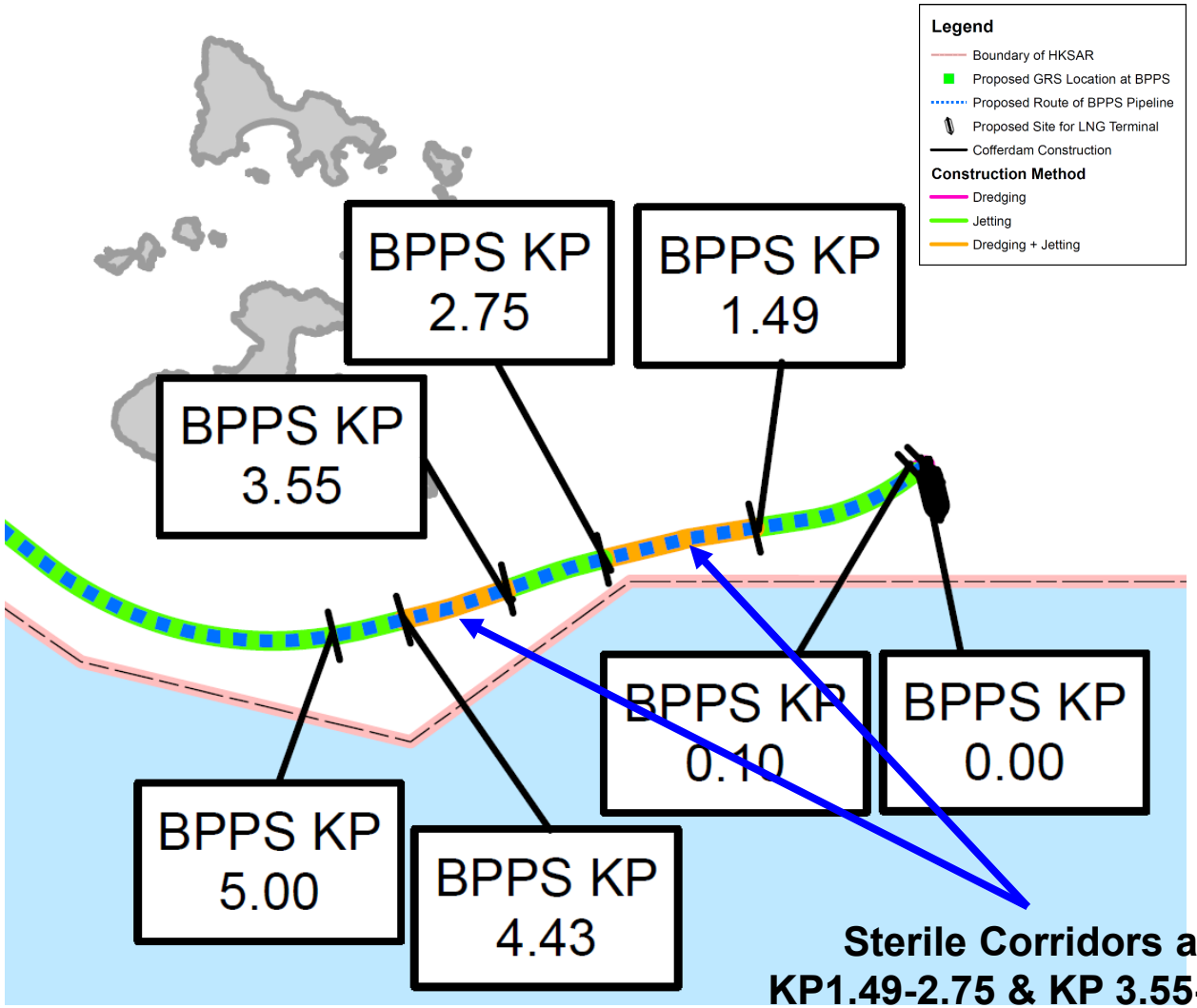
Dry Season

Wet Season



Scenario C05 and Its Variations

- A number of variations have been considered for the pipeline sections as presented in the ERR for the BPPS Pipeline Construction Options.
- Key difference is about the jetting method at subsea cable sterile corridors.



Scenario C05 and Its Variations (Cont.)

- In Scenario C05 under the approved EIA, there is no specific consideration.
- In Scenario C05E, grab dredging would be conducted, followed jetting with 7 passes and progressively larger cross sectional area fluidized (up to 50.8 m^2 with sediment loss rate of 8.890 kg/s) at the sterile corridors.
- In Scenario C05F, only jetting would be conducted with 7 passes and progressively larger cross sectional area fluidized (up to 64.0 m^2 with sediment loss rate of 11.200 kg/s) at the sterile corridors.
- In Scenario C05G, only jetting would be conducted with 5 passes and progressively larger cross sectional area fluidized (up to 64.0 m^2 with sediment loss rate of 11.200 kg/s) at the sterile corridors.

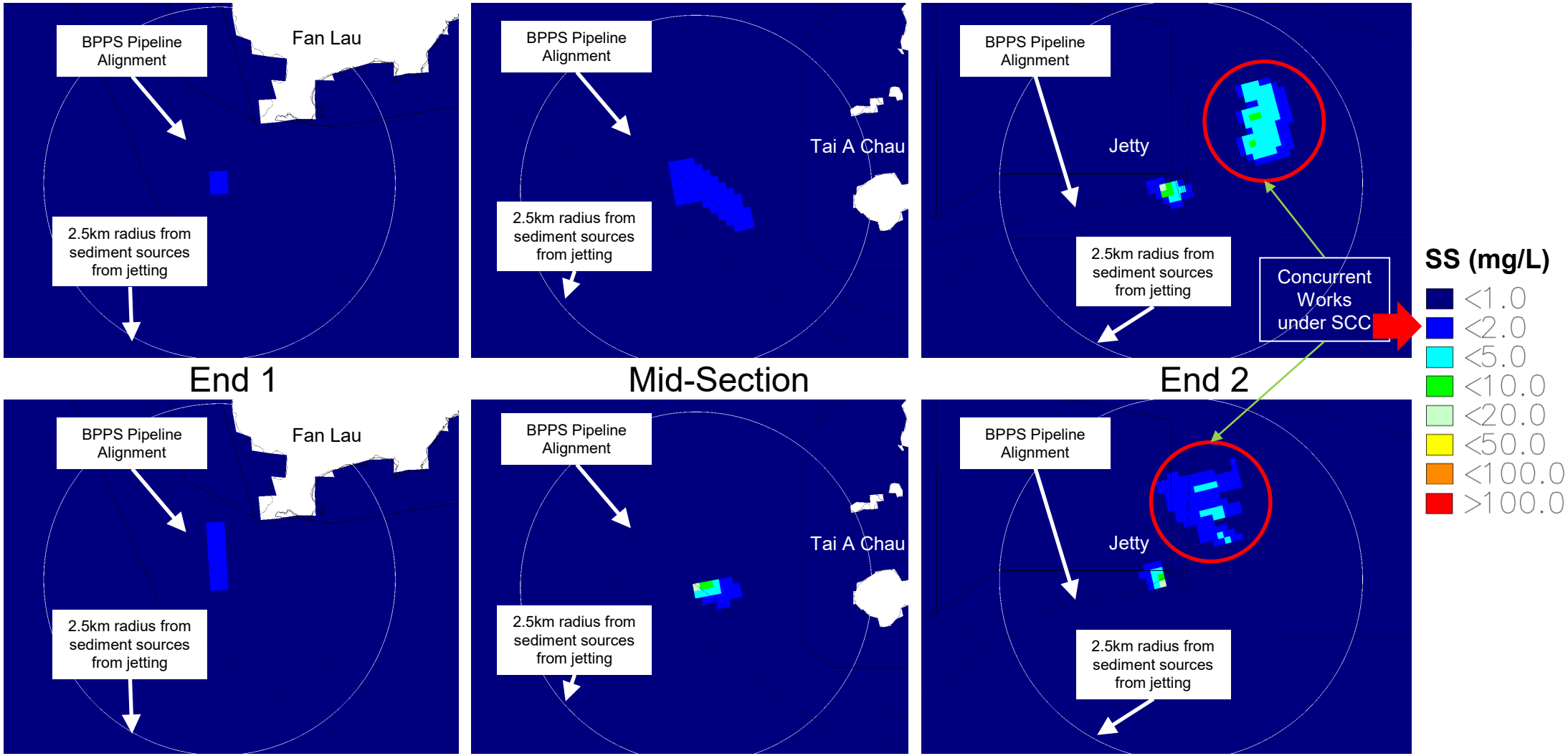
Scenario C05 and Its Variations (Cont.)

- Outside of the sterile corridors, three passes are assumed and the jetting loss rate is the same as that of Scenario 5 assessed in the approved EIA.
- For this reason, the snapshots at both ends as well as the mid-section of this section of pipeline alignment modelled in Scenario 5 of the approved EIA should be representative of that of Scenarios C05E / F / G.
- Snapshots at both ends as well as the mid-section in Scenario 5 would be presented.
- In addition, additional snapshots showing jetting at the sterile corridor section would be provided at the last jetting pass to demonstrate the extent of impact from the increase sediment loss rate.

Scenario C05 – SS Elevation

Dry Season

Wet Season

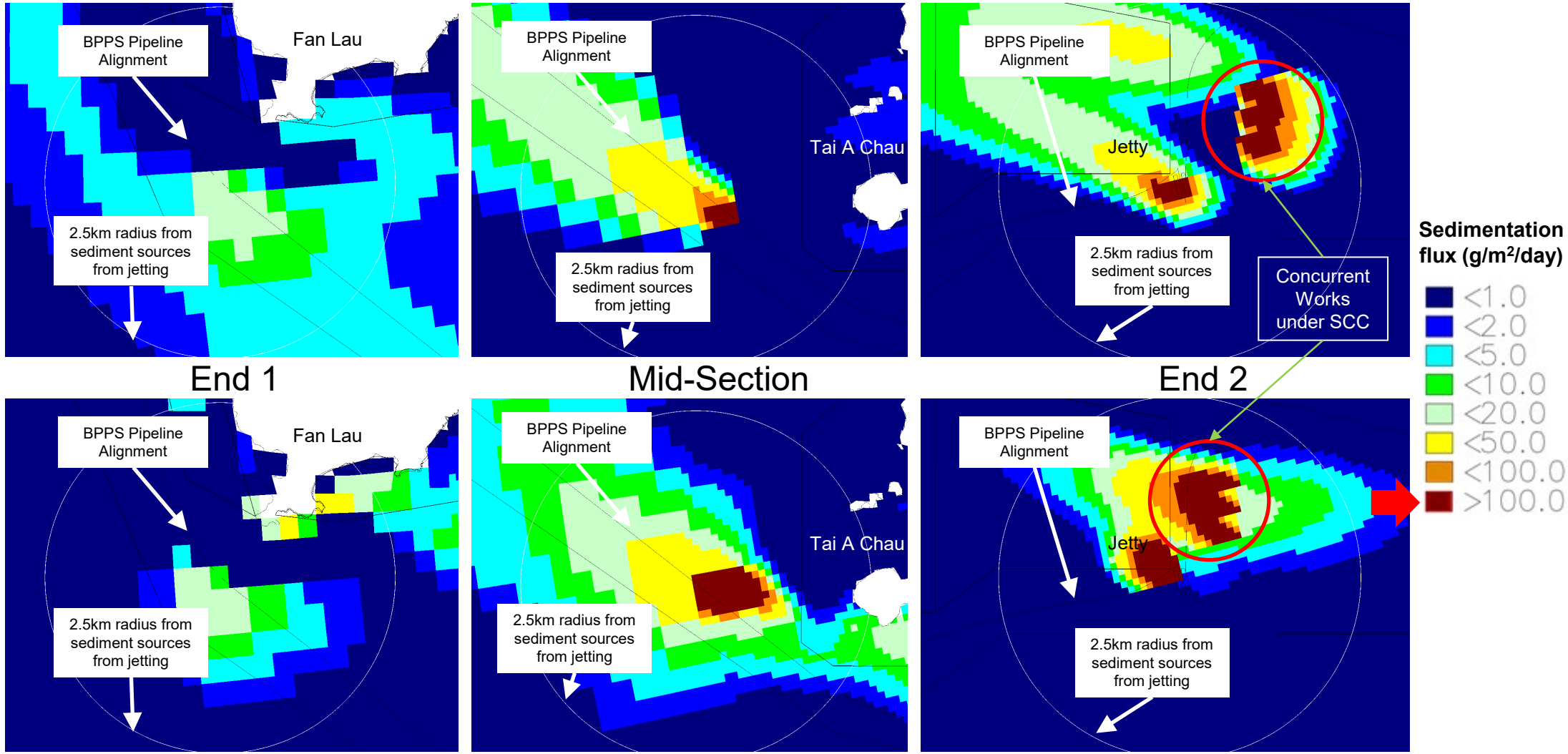


* SCC: South Cheung Chau Sediment Disposal Facility

Scenario C05 – Sedimentation Flux

Dry Season

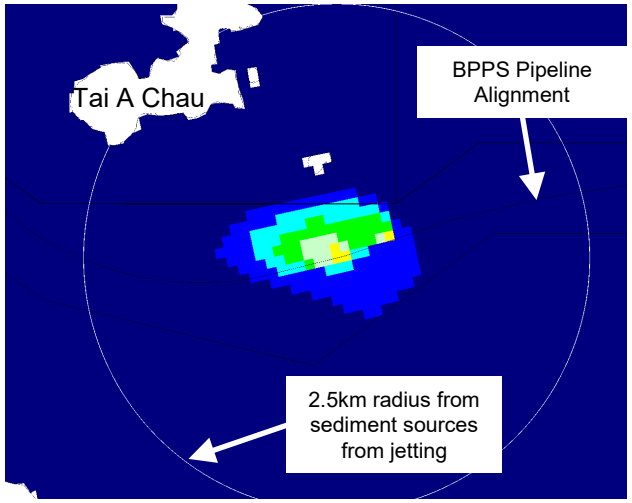
Wet Season



SCC: South Cheung Chau Mud Pit

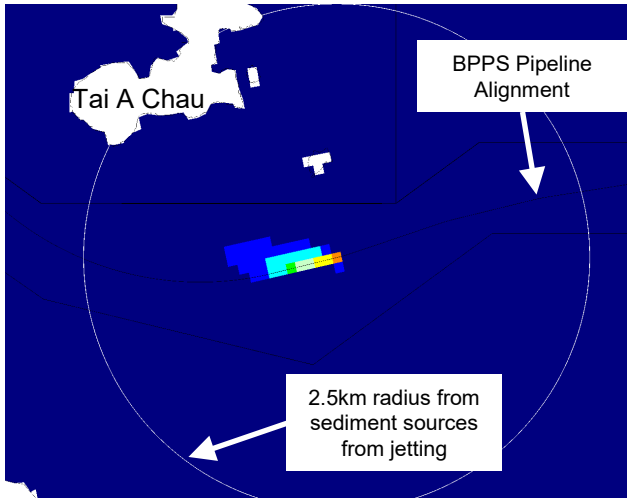
Scenario C05E – SS Elevation and Sedimentation Flux (Sterile Corridors)

Dry Season



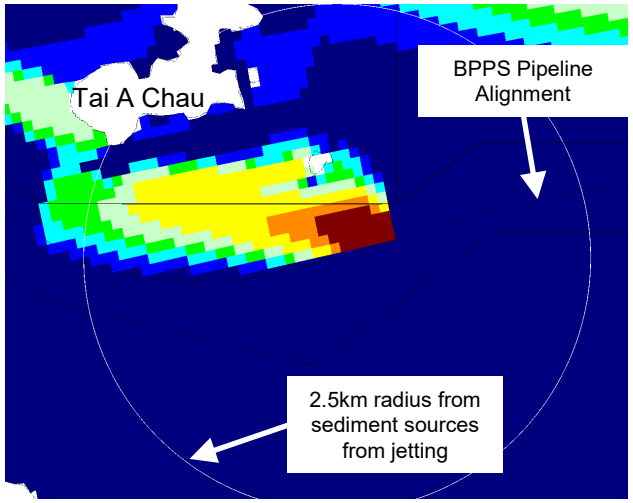
SS Elevation

Wet Season

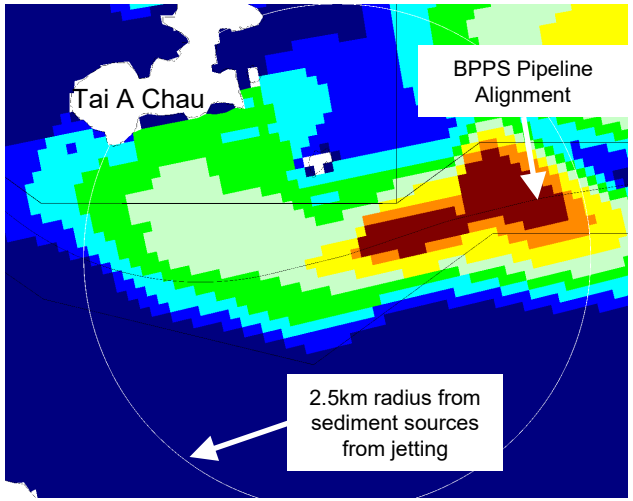


SS (mg/L)

- <1.0
- <2.0
- <5.0
- <10.0
- <20.0
- <50.0
- <100.0
- >100.0



Sedimentation Flux

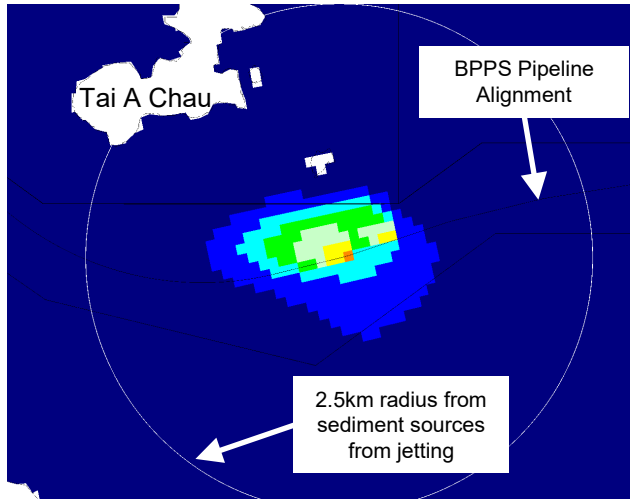


Sedimentation flux (g/m²/day)

- <1.0
- <2.0
- <5.0
- <10.0
- <20.0
- <50.0
- <100.0
- >100.0

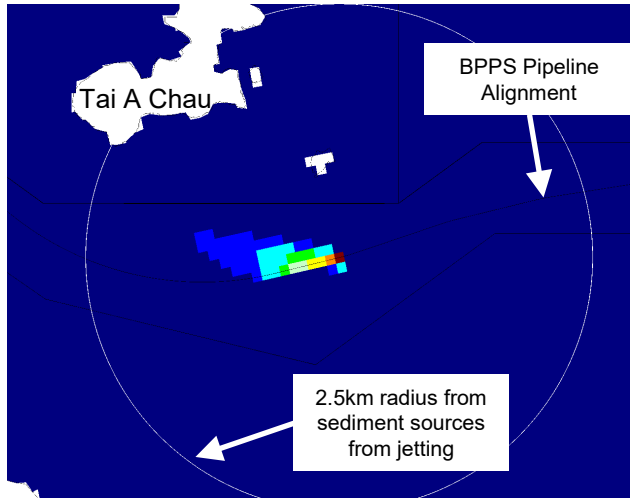
Scenario C05F – SS Elevation and Sedimentation Flux (Sterile Corridors)

Dry Season

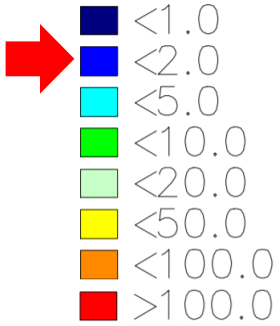


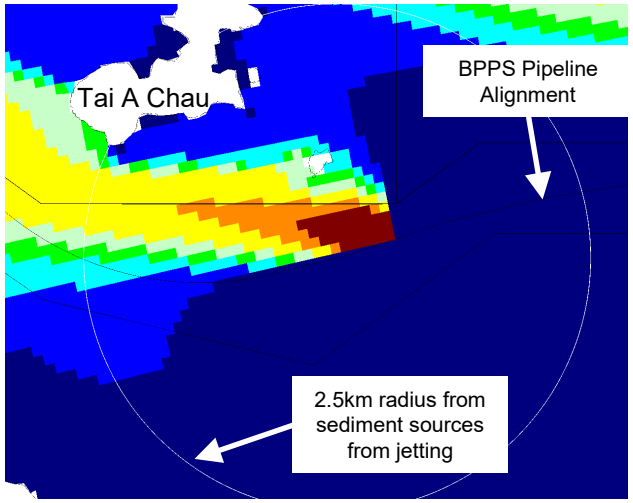
SS Elevation

Wet Season

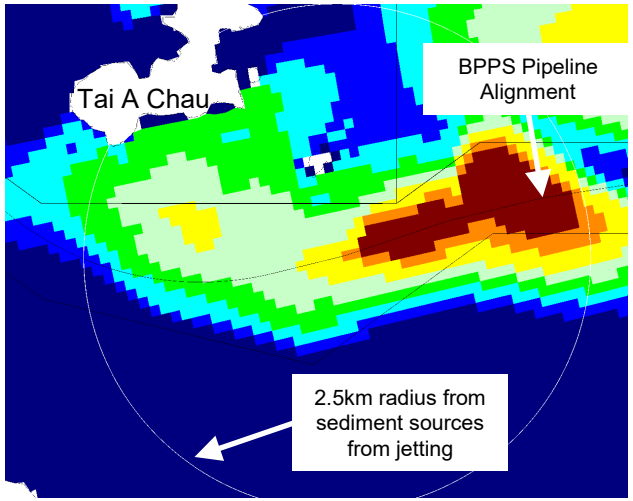


SS (mg/L)

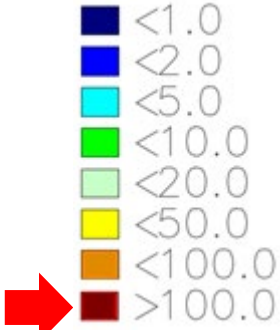




Sedimentation Flux

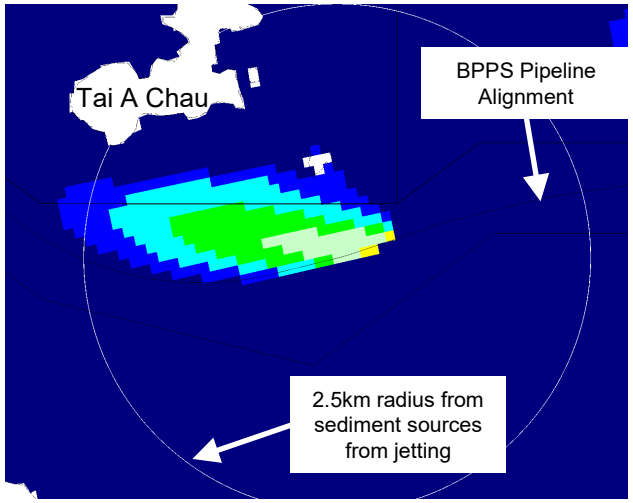


Sedimentation flux (g/m²/day)



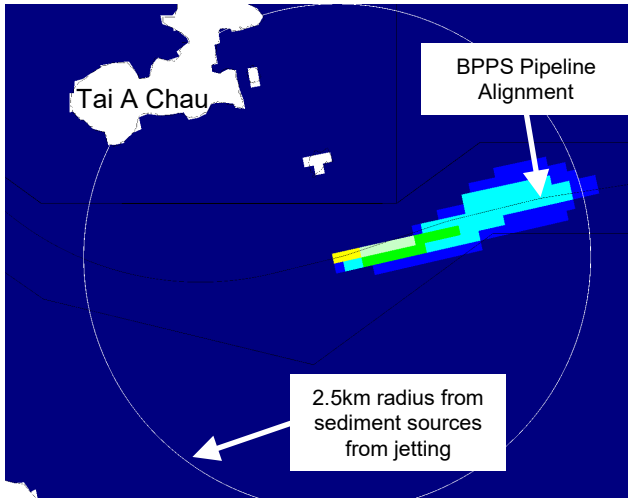
Scenario C05G – SS Elevation and Sedimentation Flux (Sterile Corridors)

Dry Season



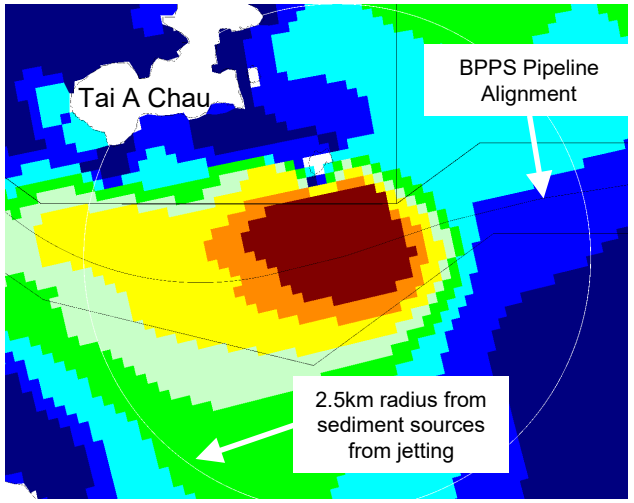
SS Elevation

Wet Season

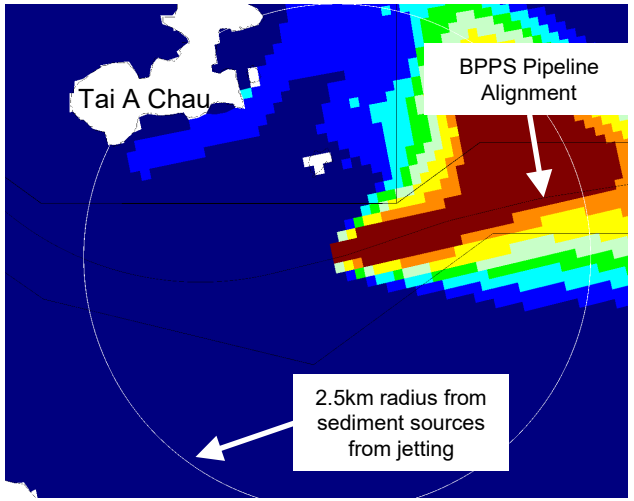


SS (mg/L)

- <1.0
- <2.0
- <5.0
- <10.0
- <20.0
- <50.0
- <100.0
- >100.0



Sedimentation Flux

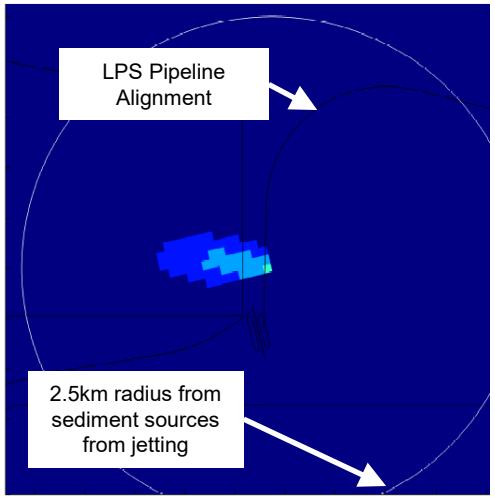


Sedimentation flux (g/m²/day)

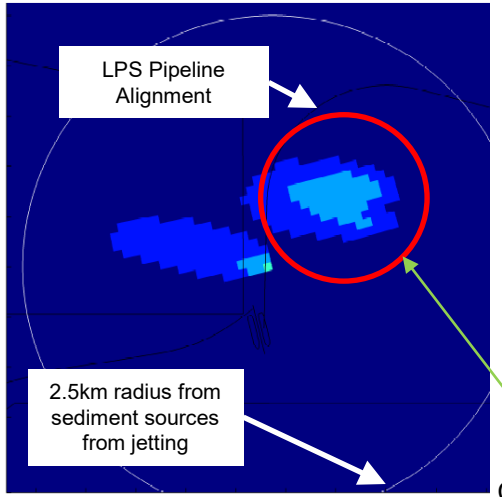
- <1.0
- <2.0
- <5.0
- <10.0
- <20.0
- <50.0
- <100.0
- >100.0

Scenario C06 – SS Elevation

Dry Season

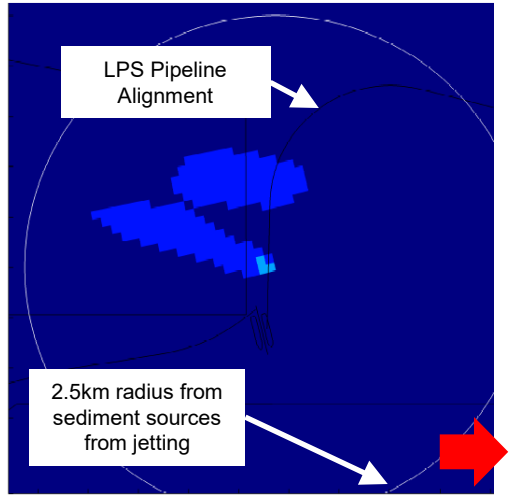


Before SCC Disposal



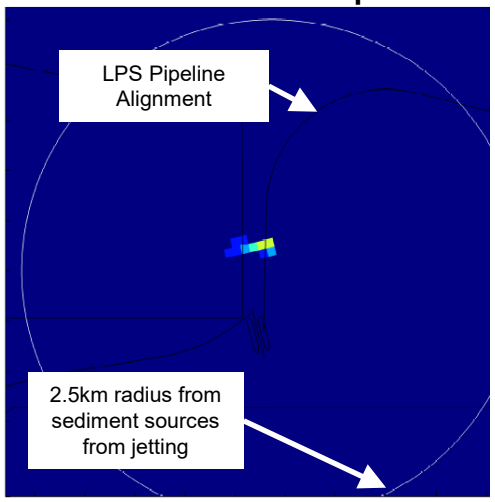
During SCC Disposal

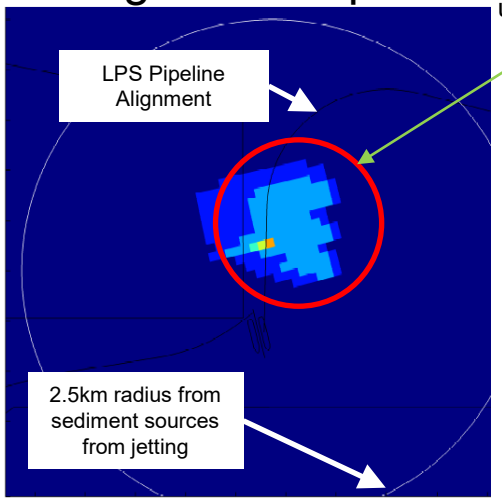
Concurrent Works under SCC

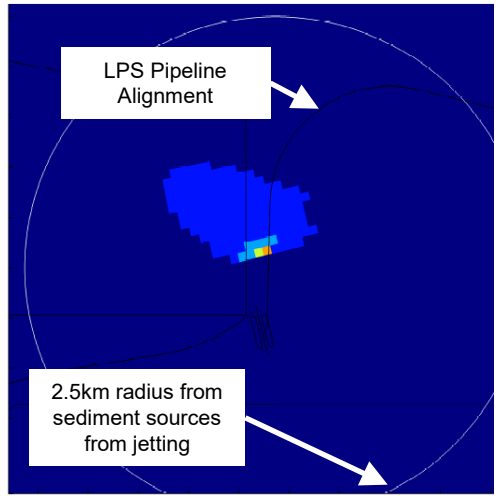


1 hr afterwards

Wet Season







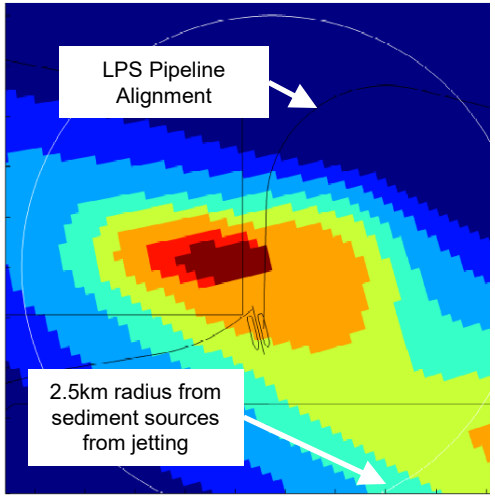
SS (mg/L)

- <1.0
- <2.0
- <5.0
- <10.0
- <20.0
- <50.0
- <100.0
- >100.0

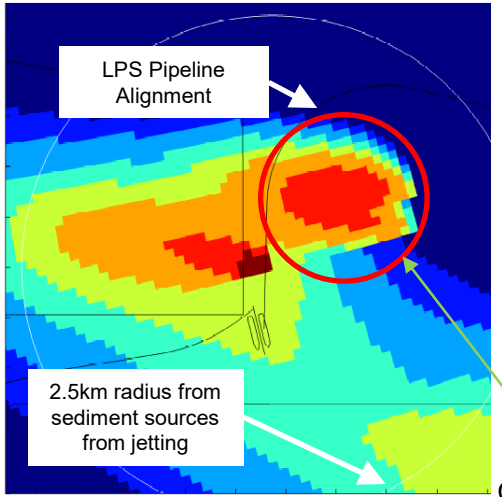
* SCC: South Cheung Chau Sediment Disposal Facility

Scenario C06 – Sedimentation Flux

Dry Season

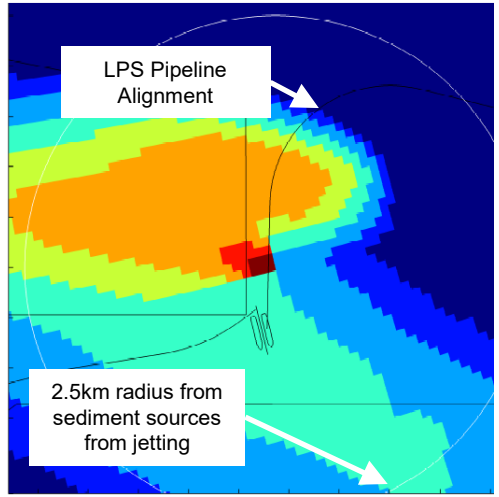


Before SCC Disposal



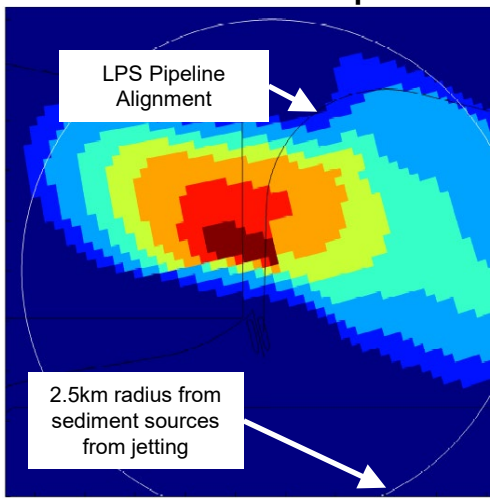
During SCC Disposal

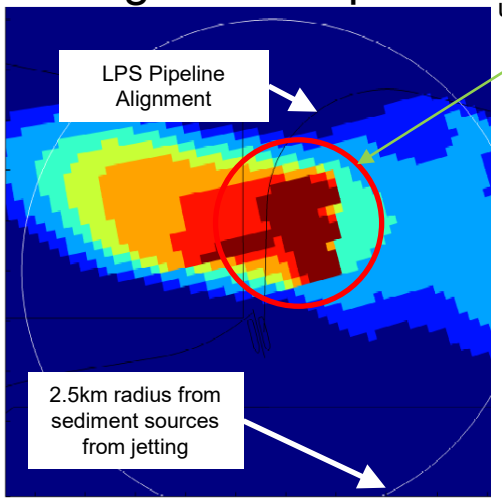
Concurrent Works under SCC

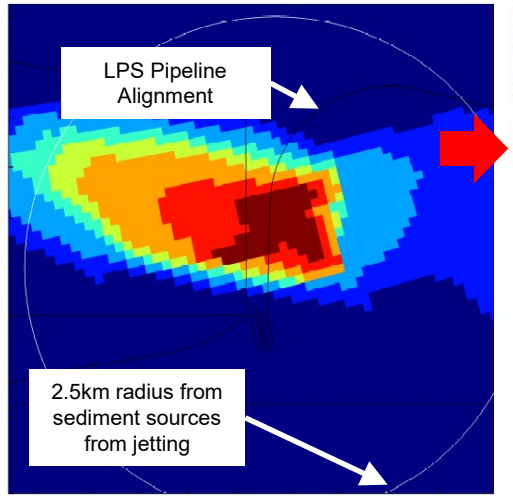


1 hr afterwards

Wet Season







Sedimentation flux (g/m²/day)

- <1.0
- <2.0
- <5.0
- <10.0
- <20.0
- <50.0
- <100.0
- >100.0

* SCC: South Cheung Chau Sediment Disposal Facility

Summary for SS Elevation and Sedimentation Flux

- Snapshots indicated plume of SS elevation (> 1 mg/L) from jetting (for both BPPS and LPS Pipelines) is generally very small at any instance and stay close (within 2.5 km) to the sediment sources in all scenarios.
- This means there would not be significant overlapping of sediment plume if two jetting machines are allowed to work concurrently 5 km apart from each other (except for jetting at sterile corridors), no matter for BPPS or LPS Pipelines.
- Also, snapshots also indicated the extent where sedimentation flux exceeded 100 g/m^2/day is also very small and stay close (within 2.5 km) to the sediment sources in all scenarios.
- This means there will not be any location where two jetting machines work concurrently 5 km apart resulting in sedimentation flux exceeding the assessment criterion of 200 g/m^2/day (except for jetting at sterile corridors).

Summary for SS Elevation and Sedimentation Flux (cont.)

- There are notable exceptions for the above due to the increased sediment loss rate at the cable sterile corridors.
- Sediment plume of >1 mg/L and sedimentation flux of 100 g/m^2/day occasionally extended beyond 2.5 km from the sediment source. Therefore, cumulative impacts could be resulted if one of the jetting machines works on the sterile corridors while the other one is located 5 km away from the 1st jetting machine.
- Based on the latest information, it is anticipated that there will not be concurrent jetting works for the LPS Pipeline when the BPPS jetting machine is working at the sterile corridors, and so there would not be cumulative impact from the LPS Pipeline construction works.
- Should there be a need for the jetting operation of LPS Pipeline to be conducted concurrently when the BPPS jetting machine is working outside the sterile corridors, the BPPS jetting machine will be at least 5 km from the LPS jetting machine.

Summary for SS Elevation and Sedimentation Flux (cont.)

- Additional control is proposed to be implemented for jetting at the cable sterile corridors section. No other jetting machine would be working concurrently for the BPPS Pipeline at South of Lantau Island (between BPPS KP 0.0-KP14.25, i.e. between the Jetty and Adamasta Channel) during the jetting works at the cable sterile corridors. This will ensure sufficient separation between the two jetting machines and no unacceptable cumulative SS and sedimentation flux impact would occur to the water sensitive receivers.
- The separation up to KP14.25 is considered appropriate considering:
  - It is >9 km from western end of the cable sterile corridors, ensuring there will not be overlapping of sediment and sedimentation flux with concurrent jetting from beyond.
  - The area off Fan Lau (KP14.25) has relatively strong current. Sediment plume would be strongly diluted beyond KP14.25 and unacceptable water quality impact from the jetting works at the cable sterile corridors would not be expected.
  - The BPPS Pipeline beyond KP14.25 would be shielded by the Lantau Island landmass from the sediment generated from the cable sterile corridors.

Depletion of Dissolved Oxygen

- Additional elevation of 1 mg/L of SS would result in 0.015 mg/L additional DO depletion based on sediment oxygen demand of 15,342 mg DO/kg SS (adopted in EIA).
- Since there would be no significant overlapping of sediment plume (after taking into account for the restriction for scenarios C05E / F / G), the additional SS elevation from the proposed concurrent operation of two jetting machines would be insignificant.
- The potential additional increase in DO depletion is negligible and not expected to result in notable change in water quality.

Release of Sediment-bounded Contaminants

- In the approved EIA, the worst case in term of sediment-bounded contaminants was assessed with tracer dispersion modelling combined with the worst case sediment contaminant level (i.e. PCB).
- Tracer dispersion modelling results indicated that in the worst case scenario, the maximum PCB elevation experienced at the most impacted WSR (MPA-3) would only be 1.07×10^{-5} μg L^{-1} and 1.53×10^{-4} μg L^{-1} of total PCBs in dry and wet seasons respectively, which is significantly below the corresponding assessment criterion of 0.03 μg L^{-1} (Annex 7E of the approved EIA refers).

Release of Sediment-bounded Contaminants (cont.)

- This means even if the two jetting machines are working at the same location (i.e. distance = 0 m, essentially doubling the loss rate), the predicted PCB level at the worst impacted WSR MPA-3 would only be 2.14×10^{-5} μg L^{-1} and 3.06×10^{-4} μg L^{-1} respectively, which is still much lower than the assessment criterion.
- This means release of contaminants is not a critical concern for the proposed additional jetting machine, regardless of distance between the two jetting machines.

Release of Sediment-bounded Nutrients

- Similar to the case of sediment-bounded contaminants, the release of sediment-bounded nutrients was assessed with tracer dispersion modelling.
- Tracer dispersion modelling results indicated that in the worst case scenario, the maximum TIN elevation experienced at the most impacted WSR (MPA-3, located at North Western WCZ) would only be 0.003 mg L^{-1} in wet season.
- In dry season, the estimated TIN elevation would be <0.001 mg L^{-1} at all WSRs.
- Having two jetting machines working at immediate proximity may double the TIN elevation at WSRs, which is still significantly below the corresponding WQO of 0.5 mg L^{-1}.
- It should be noted that the TIN WQO at the Southern and Outer Subzone of the Deep Bay WCZs are 0.1 mg L^{-1} and 0.5 mg L^{-1}, respectively. The results of maximum TIN elevation at the WSRs at the Southern and Outer Subzone of the Deep Bay WCZs also complied with the corresponding WQO.

Release of Sediment-bounded Nutrients (cont.)

- For unionized ammonia (UIA), the estimated UIA elevation at all water sensitive receivers (WSRs) is <0.001 mg L^{-1} at all WSRs in the approved EIA.
- Assessment criterion for UIA varies, but is generally >0.010 mg L^{-1} at most WSRs and at least 0.002 mg L^{-1} at H8 (Ngau Hom Shek).
- This means having two jetting machines working at immediate proximity may double the UIA elevation at WSRs, which is still below the corresponding Water Quality Objective (WQO) for UIA.
- This means release of nutrients is not a critical concern for the proposed additional jetting machine, regardless of distance between the two jetting machines.

Conclusion

- A review of modelling results from the approved EIA and the ERR for the BPPS Pipeline.
- Findings indicated that with a separation of 5 km (except for jetting works at the sterile corridor sections), there will not be significant cumulative impact for concurrent operation of two jetting machines in terms of SS elevation and sedimentation flux.
- To manage the increased SS elevation and sedimentation flux from the jetting works at the sterile corridor sections, no other jetting machine would be working concurrently on the LPS Pipeline and on the BPPS Pipeline at South of Lantau Island between BPPS KP0.0 - KP14.25 (i.e. between the Jetty and Adamasta Channel) during jetting at the sterile corridors.
- Potential increase in oxygen depletion, release of sediment-bounded contaminants and nutrients are found to be minimal and not expected to result in adverse impact to water quality.

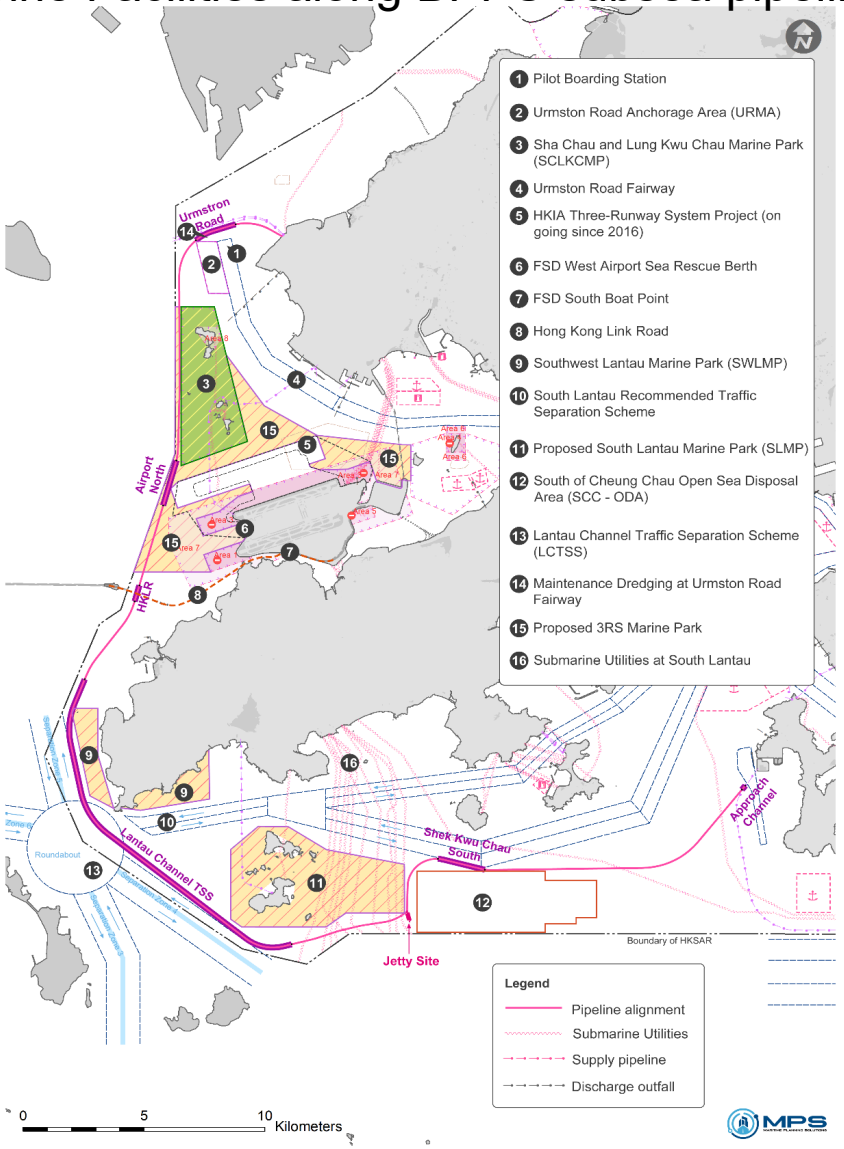
Hong Kong Offshore LNG Terminal Project

Appendix B – Baseline Traffic Review of BPPS Subsea Pipeline

Marine Facilities

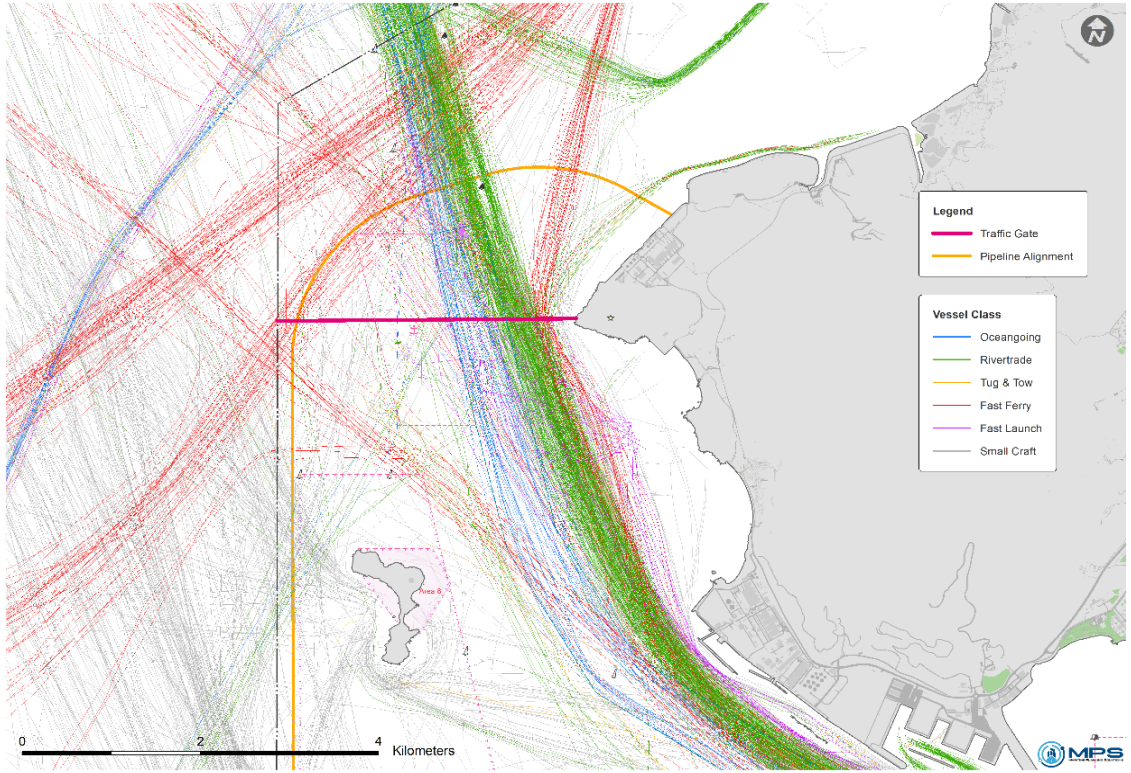
1. Pilot Boarding Station (Area off Lam Kok Tsui (Black Point) in Urmston Road)
2. Urmston Road Anchorage Area (URMA) - anchorage of 190 ha, operated 24 hours daily, mainly for ocean-going vessels.
3. Sha Chau and Lung Kwu Chau Marine Park (SCLKCMP) - under the management of the Agriculture, Fisheries and Conservation Department (AFCD), the authority enforces the Marine Parks Ordinance (Cap. 476) and the Marine Parks and Marine Reserves Regulation (Cap 476A). Limited activities, particularly by power-driven vessels, are permitted within designated marine parks to preserve marine ecology.
4. Urmston Road Fairway - principal marine artery linking Hong Kong to ports in the Pearl River Delta and the gateway to the Shenzhen port cluster.
5. HKIA Three-Runway System Project (on going since 2016) - expansion of Hong Kong International Airport (HKIA) into a three-runway system (3RS) involving Reclamation of approximately 650 hectares of land north of the existing airport island.
6. FSD West Airport Sea Rescue Berth - base for catamaran command vessels and rigid inflatable rescue craft.
7. FSD South Boat Point - the boat launching points used by Airport Fire Contingent (AFC) of the Fire Services Department for marine rescue operation.
8. Hong Kong Link Road (HKLR) - section between HKSAR Boundary and Scenic Hill comprises a 9.4km long viaduct section going from the HKSAR boundary to Scenic Hill on the Airport Island.
9. Southwest Lantau Marine Park (SWLMP) - two sea areas of about 650 hectares located in the southwestern waters of Lantau of the HKSAR to preserve marine ecology.
10. South Lantau Recommended Traffic Separation Scheme - major channel south of Lantau featuring cross-boundary ferry transits and Rivertrade vessels transiting towards Macau/western Shenzhen.
11. Proposed South Lantau Marine Park (SLMP) - a proposed sea area of about 2,000 hectares located in the southern waters of Lantau of the HKSAR covering the Soko Islands and east of the islands to preserve marine ecology and compensate the potential permanent loss of important habitat for Finless Porpoise due to Integrated Waste Management Facilities (IWMF) Phase I project.
12. South of Cheung Chau Open Sea Disposal Area (SCC – ODA) - open sea floor disposal area used for disposal of uncontaminated sediment.
13. Lantau Channel Traffic Separation Scheme (LCTSS) - is located at south of Fan Lau in the southwest of Lantau Island. Parts of the No.4 Traffic lane, No.3 Precautionary Area and No. 5 Traffic lanes lie within the Hong Kong waters. The TSS has been established to regulate mixed traffic and separating the traffic following the route for Hong Kong-Macau ferries from other traffic bound.
14. Maintenance Dredging at Urmston Road Fairway – to be undertaken at the termination of Urmston Road Fairway, which is approximately at the north of URMA.
15. Proposed 3RS Marine Park – locates at North of Lantau and comprises an area of approximately 2,400 ha and provide critical linkages between the current SCLKCMP and the Brothers Marine Park.
16. Submarine Utilities at South Lantau – locates mainly at the south of Lantau including submarine cables.

Marine Facilities along BPPS subsea pipeline

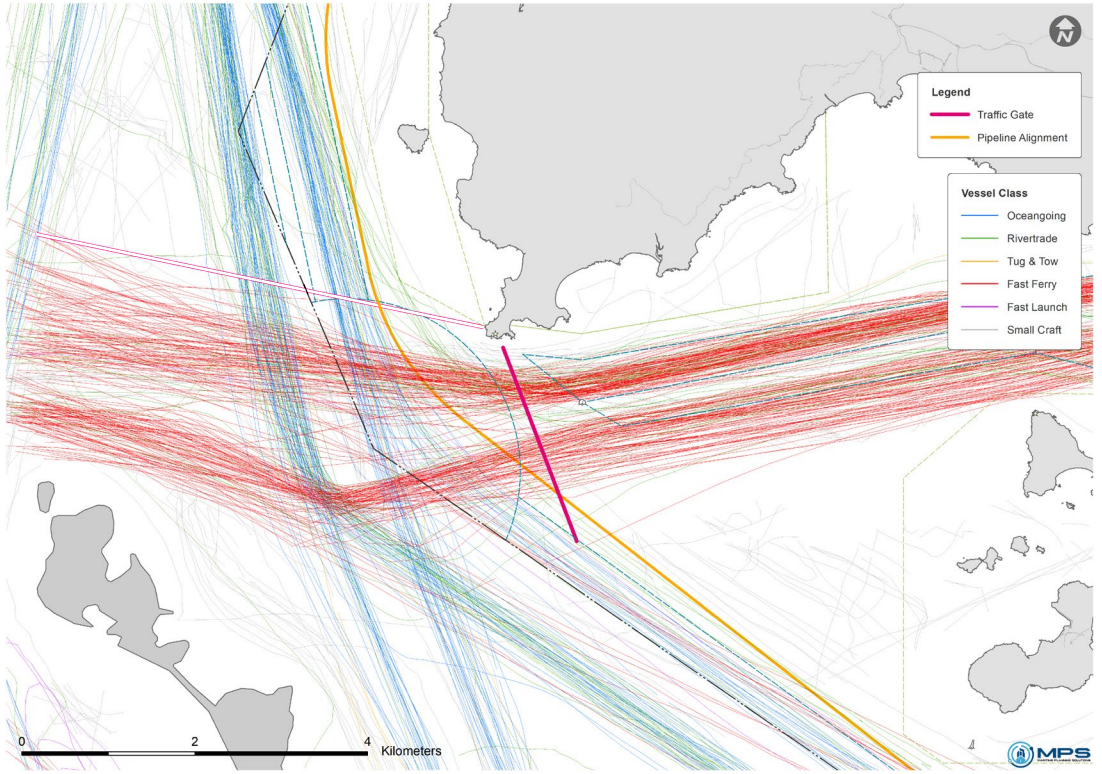


AIS & Radar Data Review

Following the visual survey conducted in 2019 under the Conditional MTIA Report for Construction, the average daily vessel activates along the focus areas have been identified and reviewed from AIS & Radar data dated 1 – 31 December 2019, with site specific analysis of vessel types and the corresponding traffic tracks of a typical day.

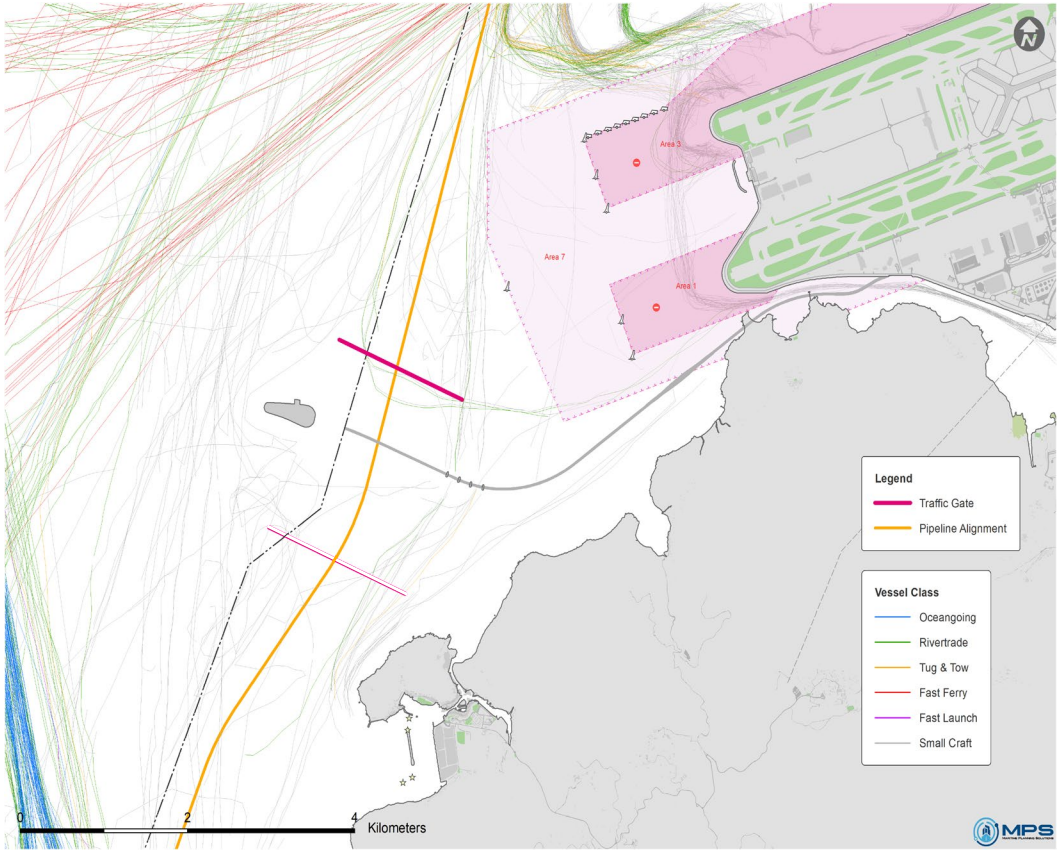


Daily Vessel Traffic along BPPS Pipeline at Urmston Road

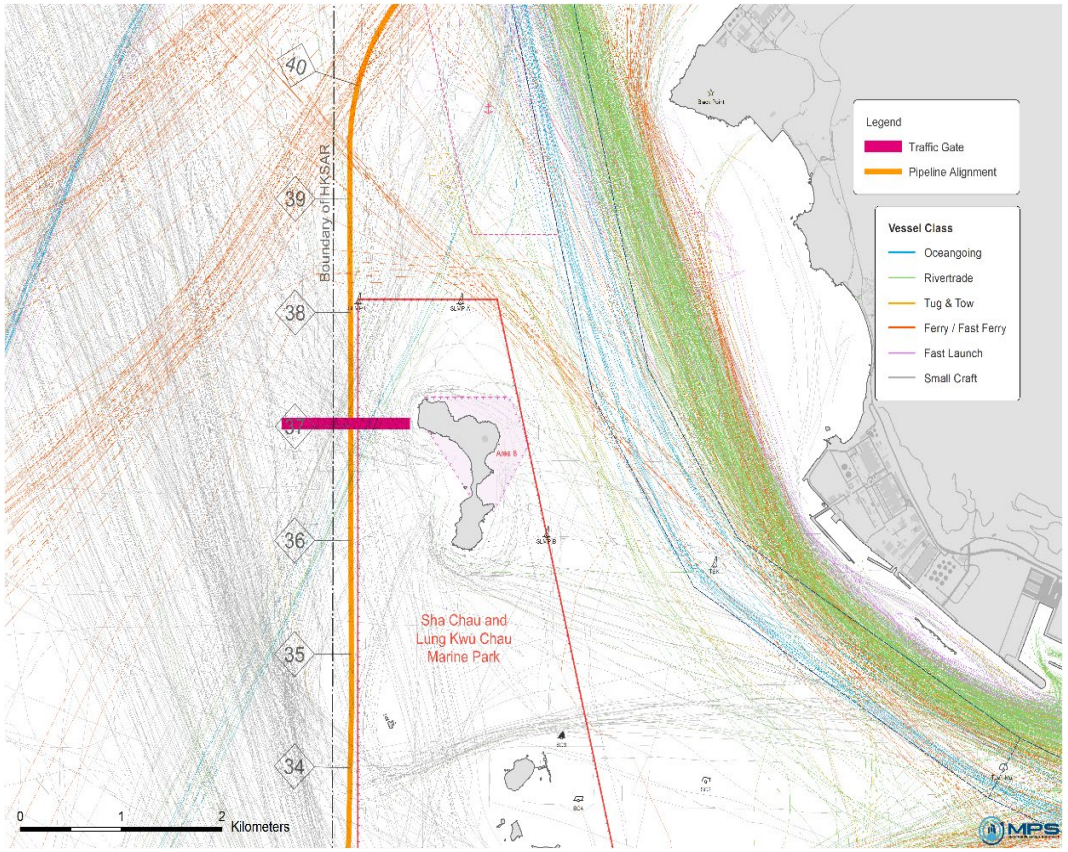


Daily Vessel Traffic along BPPS Pipeline at Lantau TSS

AIS & Radar Data Review

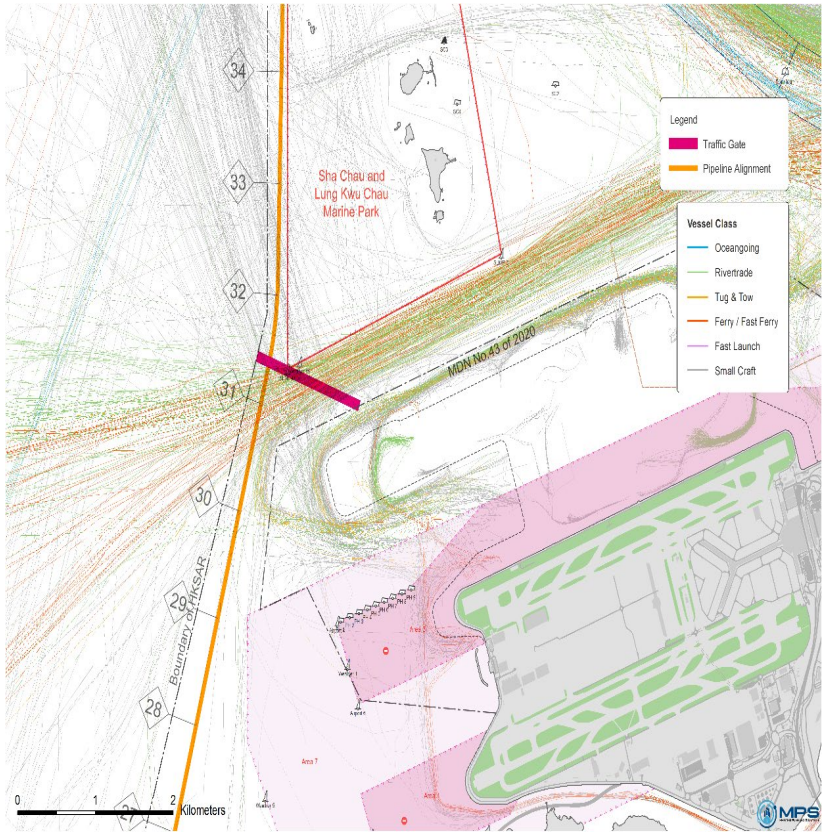


Daily Vessel Traffic along BPPS Pipeline at HKLR

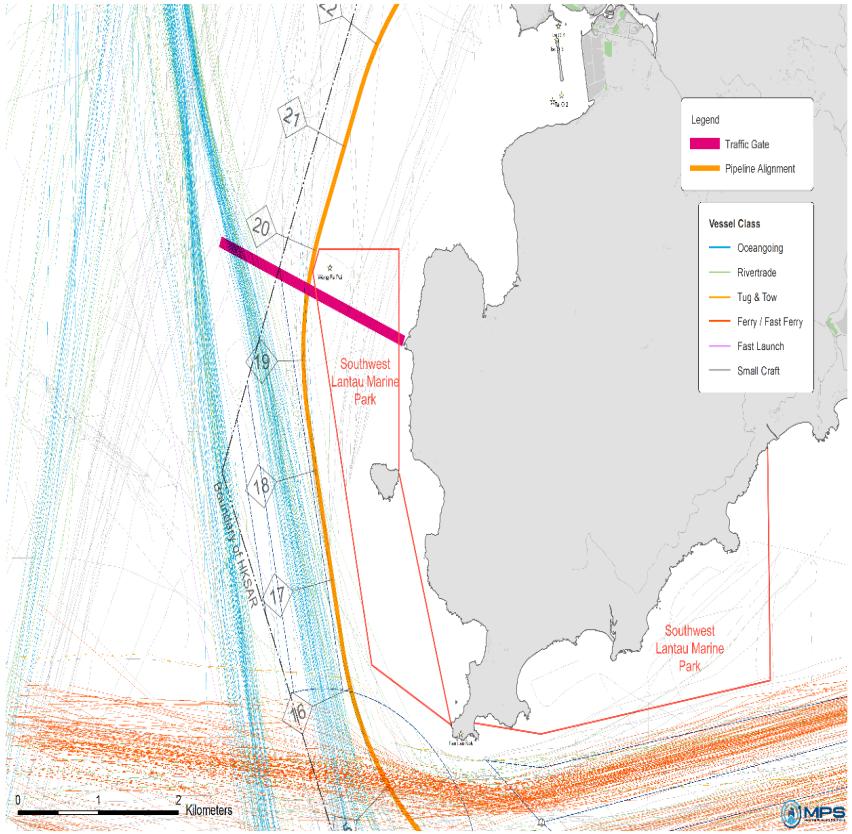


Daily Vessel Traffic along BPPS Pipeline at SCLKCMP

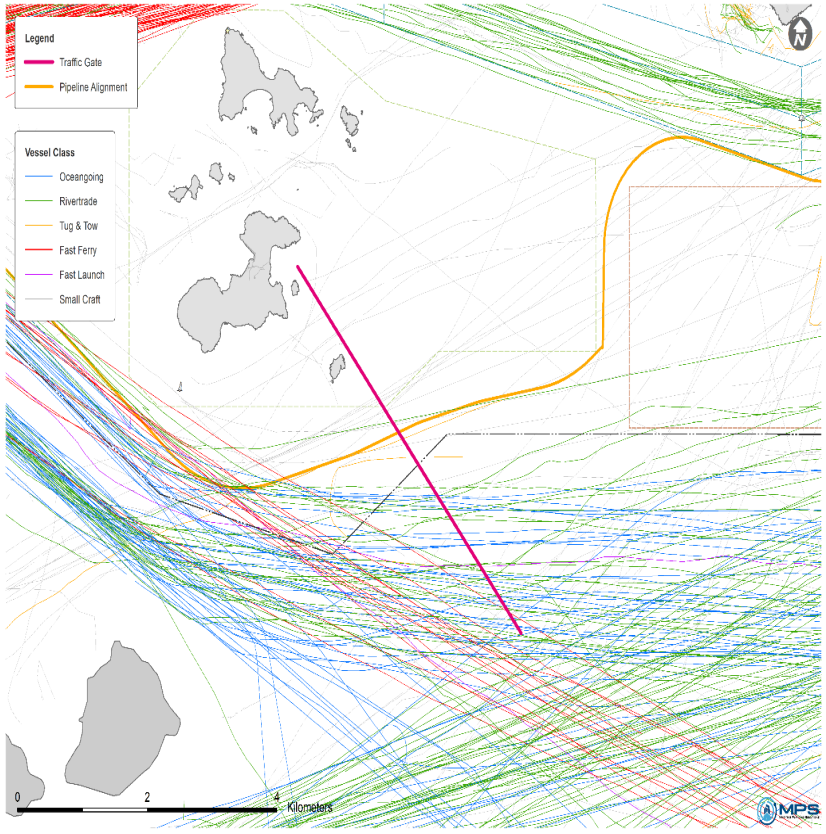
AIS & Radar Data Review



Daily Vessel Traffic along BPPS Pipeline at North of HKIA



Daily Vessel Traffic along BPPS Pipeline at West of SWLMP



Daily Vessel Traffic along BPPS Pipeline at Cable Crossing

Average Daily Traffic in proximity to BPPS

The Table below summarises the average daily numbers of vessels that traverse in proximity to the BPPS Pipeline processed from the AIS & radar data across the Focus Area.

#	Focus Sections	Ocean-going Vessel	River Trade Vessel	Tug & Tow	Fast Ferry	Fast Launch	Small Craft	Total
1	Urmston Road	21	146	8	74	26	110	**385**
2	Hong Kong Link Road	0	1	1	0	0	5	**7**
3	Lantau Channel TSS	45	36	3	140	2	62	**288**
4	Cable Crossing	15	15	1	2	1	48	**82**
5	Sha Chau Marine Park	1	8	1	1	1	110	**122**
6	North of HKIA	0	42	6	26	2	52	**128**
7	West of South-west Lantau Marine Park	25	20	2	1	1	30	**79**