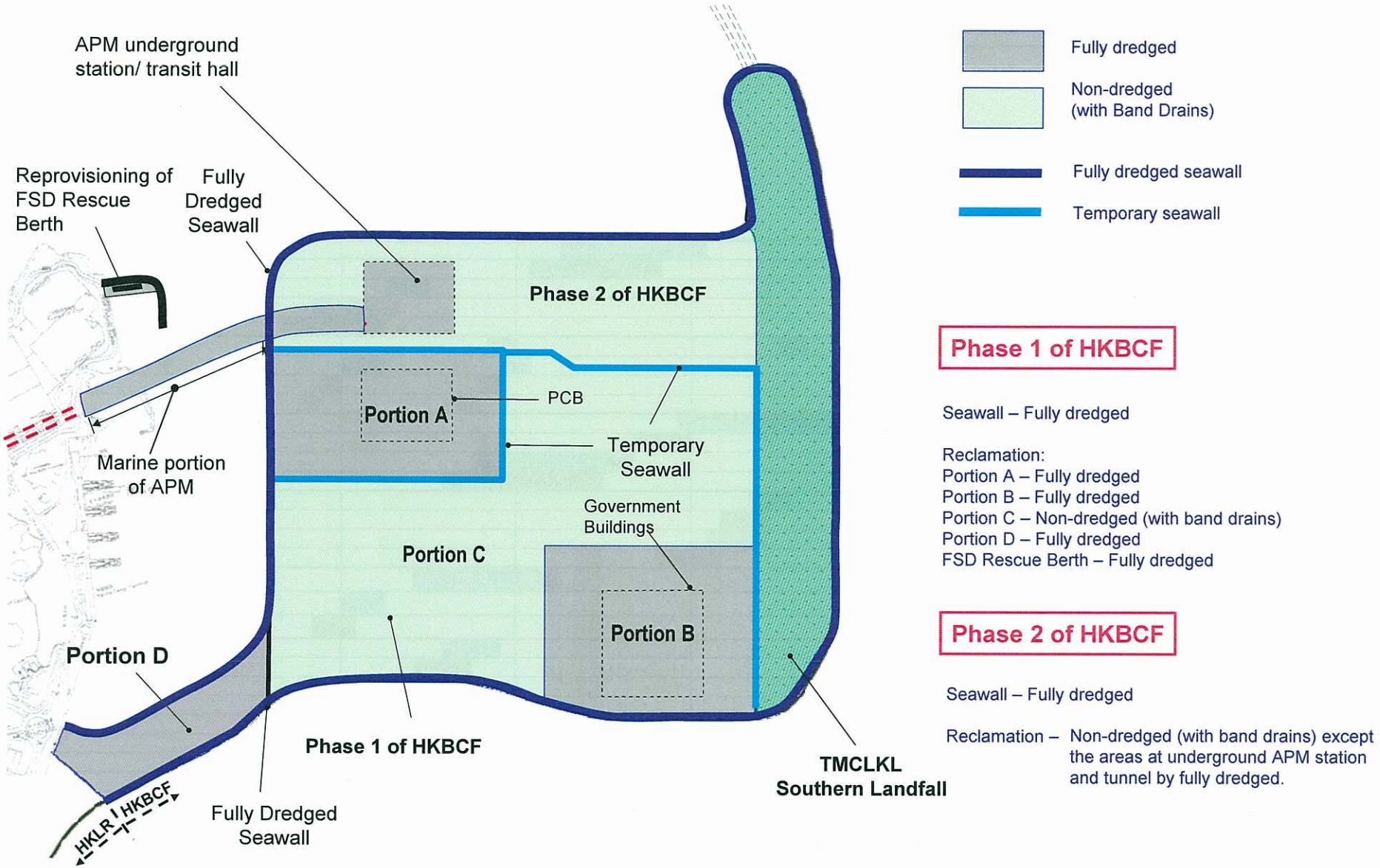
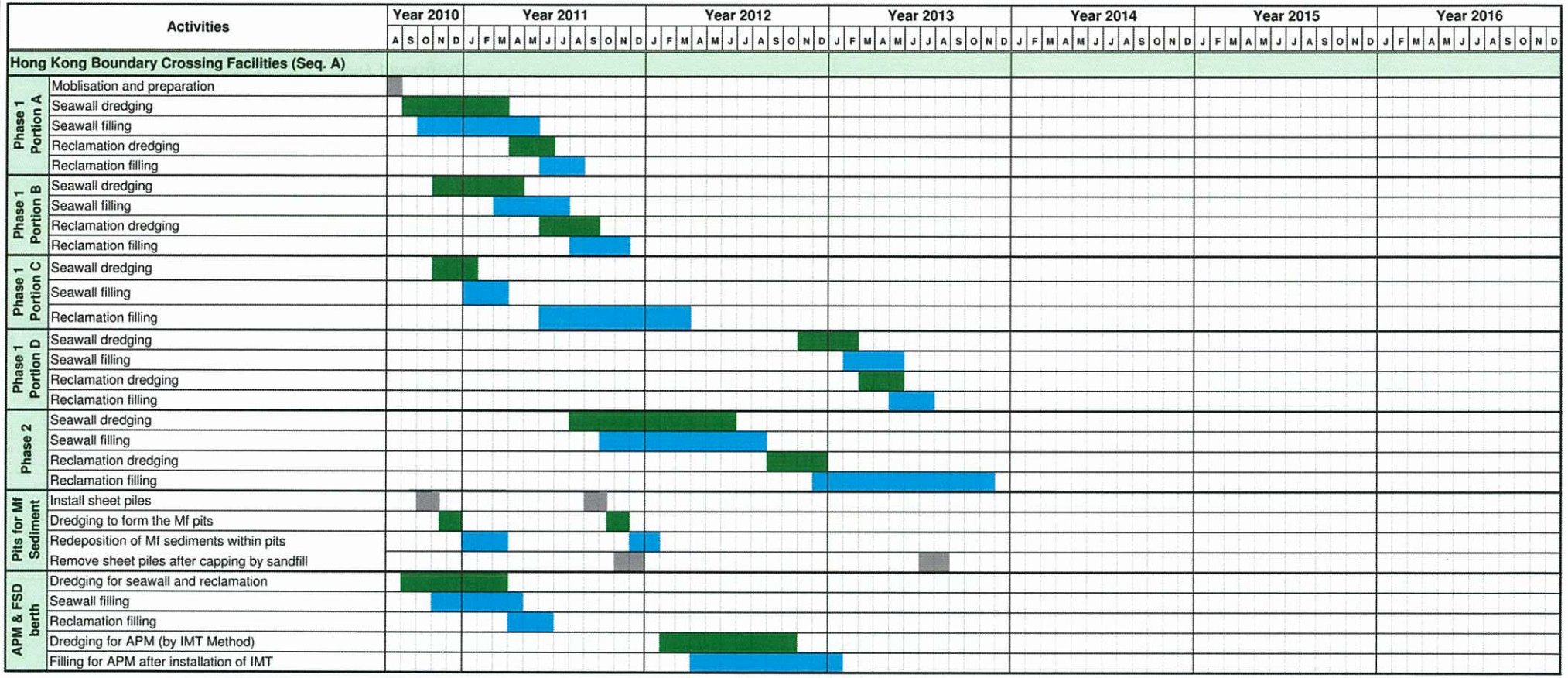
APPENDIX 9A1

Construction Sequence and Construction Programme – HKBCF (Sequence A)



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港珠澳大橋香港工程管理處 Hong Kong - Zhuhai - Macao Bridge Hong Kong Project Management Office

ARUP 奧雅納工程顧問 Ove Arup & Partners Hong Kong Limited

Drawing Title:

Envisaged Program for HKBCF Reclamation (Sequence A)

Drawing No.

Figure 9A1-2

Description of Reclamation Sequence (Sequence A of HKBCF Reclamation)

In general, it is envisaged that the reclamation works would start at Portion A of HKBCF Phase 1 first. In order to minimise the impact to the water quality, Portion A of HKBCF Phase 1 would be enclosed by the temporary seawall with a gap of about 100m for marine access before the reclamation filling. After completion of the reclamation filling in Portion A of HKBCF Phase 1, substantial length of seawalls would have been completed in Portions B and C of HKBCF Phase 1. Then the reclamation would be carried out in the sequence of Portion B, Portion C, Portion D of HKBCF Phase 1 and finally HKBCF Phase 2. Assuming the reclamation of HKBCF commence in Aug 2010, the envisaged reclamation sequence is as follows:

1) Commence dredging for the temporary seawall at the north-west corner of Portion A in HKBCF Phase 1 and then along the perimeter of Portion A in the clockwise direction as shown in Stage 1 of **Drawing 301 in Appendix 9A1**. This dredging activity is anticipated to be carried out from Sept 2010 to Mar 2011. After a portion of seawall trench is dredged, filling for seawall would also start from the north-west corner of Portion A and in the clockwise direction. A gap of about 100m seawall as shown in Stage 3 of **Drawing 302 in Appendix 9A1** would be left for the temporary marine access to enable the reclamation activities in Portion A. This section of seawall would be completed after the dredging and filling for reclamation in Portion A.

2) The dredging and filling for the seawall and reclamation of FSD rescue berth at the western side of HKBCF site would be carried out concurrently with Portion A as shown in Stages 1 and 2 of **Drawing 301 in Appendix 9A1**.

3) Following completion of seawall dredging in Portion A, dredging for the reclamation in Portion A is anticipated to be commenced in Mar 2011. This dredging activity is anticipated to be commenced at the south-east corner of Portion A and in the direction of north-west towards the temporary access at the seawall. Meanwhile, seawall filling is continued at the western side of Portion A. As Portion A is small in area (about 500m X 250m), it is considered that the reclamation dredging and seawall filling in Portion A are carried out at the same time and no leading edge of seawall is assumed in this case.

4) As shown in Stage 3 of **Drawing 302 in Appendix 9A1**, reclamation filling of Portion A is anticipated to be commenced in June 2011 after completion of the seawall filling in Portion A. Therefore, the reclamation filling of Portion A would be carried out within the area enclosed by seawall (except the 100m gap). Reclamation filling of Portion A would start at the south-east corner of Portion A and in the direction of north-west similar to the reclamation dredging of Portion A. The reclamation of Portion A is anticipated to be completed in Aug 2011.

5) While the seawall dredging and filling in Portion A is on-going, the dredging and filling for seawall in Portions B and C are also carried out concurrently. The direction of these activities is from the north-east corner of Portion A and in clockwise direction as shown in Stages 1 to 3 of **Drawings 301 to 302 in Appendix 9A1**. In addition, a short section of seawall in Portion C at the western edge (i.e underneath Portion A) would also be constructed between Jan 2011 to Mar 2011.

6) After completion of the seawall in Portion C and the seawall up to nearly half of the southern edge of HKBCF site in Portion B, the reclamation filling in Portion C and reclamation dredging in Portion B would start at the north-east corner of Portions C and B respectively. The locations and directions of above reclamation dredging and filling

are shown in Stage 3 of **Drawing 302 in Appendix 9A1**. In this case, the leading edge of seawall is about 200m for the above activities.

7) The seawall in Portion B is anticipated to be completed in Jul 2011 leaving a gap for the temporary marine access at the south-west corner of Portions B and C as shown in Stage 4 of **Drawing 302 in Appendix 9A1**. Then the reclamation dredging of Portion B would complete in Sept 2011 and the reclamation filling of Portions B and C would continue in the direction of south-west towards the above temporary marine access. After the completion of seawall in Jul 2011, the reclamation filling of Portions B and C would be carried out in the area enclosed by the seawall (except the 100m gap). The reclamation filling of Portions B and C are anticipated to be completed in Nov 2011 and Mar 2012 respectively.

8) After completion of the seawall in Portions B and C, the seawall dredging of HKBCF Phase 2 would start at the south-west corner of HKBCF Phase 2 and proceed in the clockwise direction. The seawall filling of HKBCF Phase 2 would also start when a portion of seawall trench is dredged and ready to receive the seawall fill. The location and direction of above reclamation dredging and filling are shown in Stage 4 of **Drawing 302 in Appendix 9A1**.

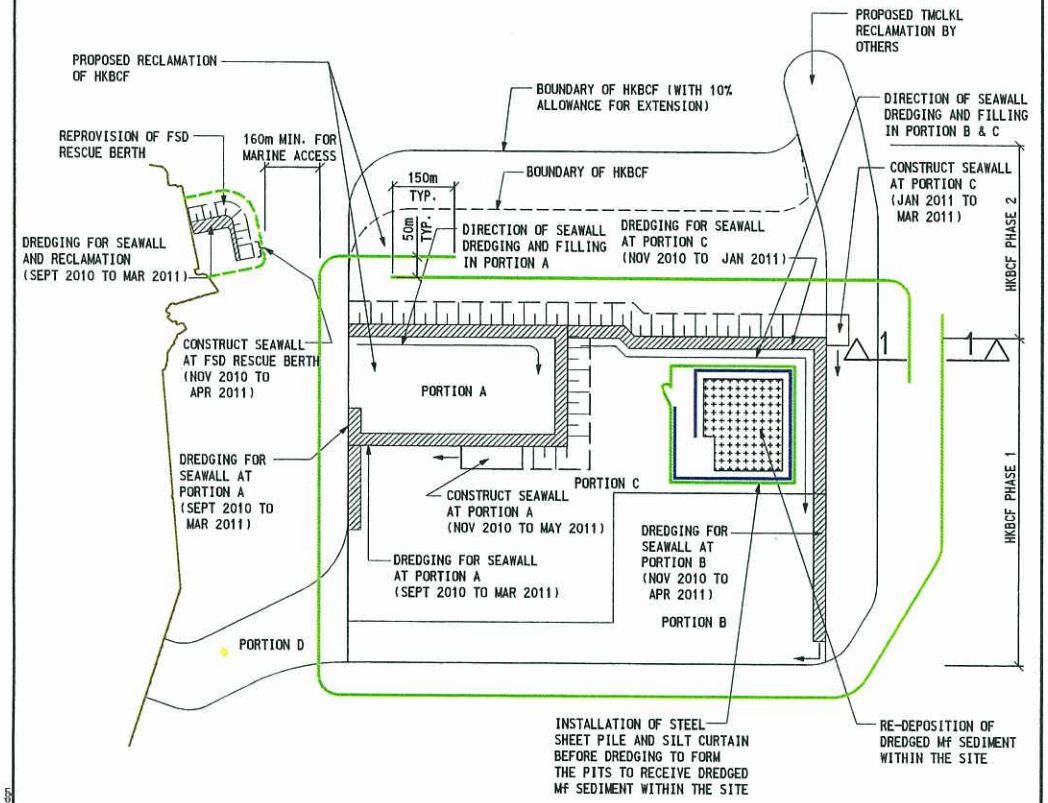
9) Dredging and filling for the installation of immerse tube tunnel of Automatic People Mover (APM) are anticipated to be carried out from Feb 2012 to Jan 2013 which overlaps with the dredging and filling of seawall in HKBCF Phase 2 in Mid 2012.

10) After completion of dredging and filling for the immerse tube tunnel, the construction plant are anticipated to be moved to Portion D of HKBCF Phase 1. The seawall dredging would start at the south-east corner of Portion D and in the clockwise direction. The seawall filling is to follow when a portion of seawall trench is dredged and ready to receive the seawall fill. The seawall at Portion D is anticipated to be completed in May 2013. The temporary marine access mentioned in Paragraph (7) above is moved to the south-east corner of Portion D. This 100m gap of seawall would be completed after the reclamation fill of Portion D is completed.

11) The reclamation dredging in Portion D is from the west to east with some overlapping with the seawall filling activity in Portion D. In this case, no leading edge of seawall is assumed. After completion of the seawall (except the above gap for temporary marine access), the reclamation filling would be carried out in the enclosed area of Portion D.

12) The seawall in HKBCF Phase 2 is anticipated to be completed in August 2012 leaving a gap of about 100m at the north-east corner to allow for the temporary marine access for the reclamation activities in HKBCF Phase 2. After the area of HKBCF Phase 2 is enclosed by the seawall (except the 100m gap), the reclamation dredging for the APM tunnel and underground station within HKBCF Phase 2 would be carried out . The reclamation filling would also be carried out within the area enclosed by the seawall as shown in Stage 7 of **Drawings 304 in Appendix 9A1**.

13) The reclamation of HKBCF is completed after the filling in Phase 2 and completion of remaining section of seawall allow for the temporary marine access.



NOTE:

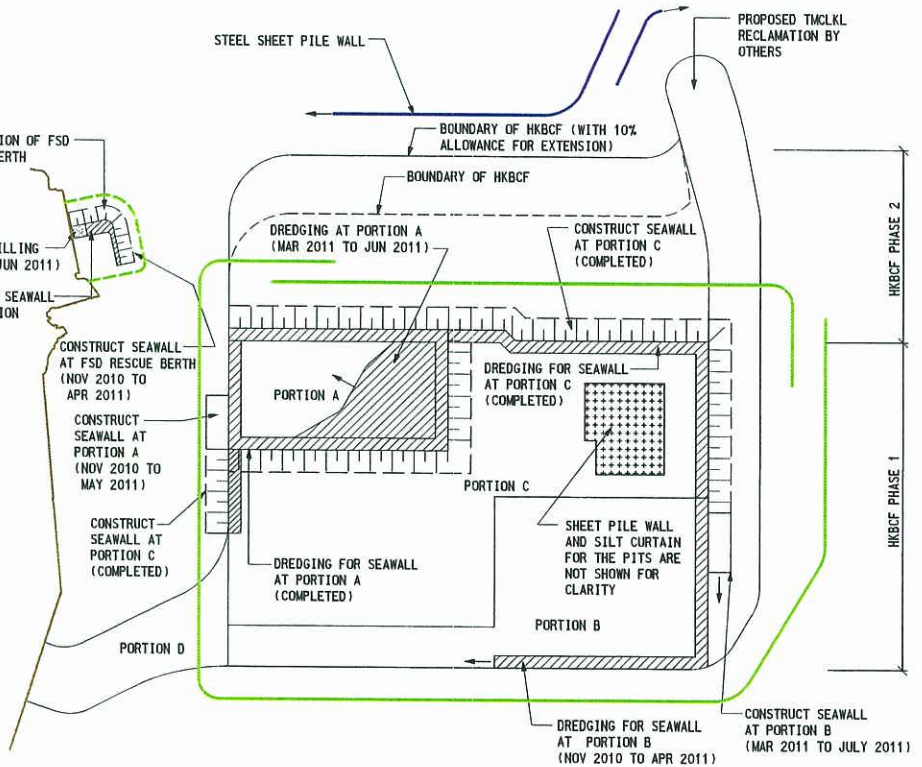
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SECOND MEASURE: SINGLE SILT CURTAIN AROUND THE SITE (SEE TYPICAL SECTION ATTACHED)

LEGEND:

- STEEL SHEET PILE WALL
- SINGLE SILT CURTAIN
- DREDGED AREA
- COMPLETED SLOPING SEAWALL
- RE-DEPOSITION OF DREDGED Mf SEDIMENT

STAGE 1 (ON FEB 2011)



NOTE:

FIRST MEASURE: CAGE TYPE SILT CURTAIN FOR ALL GRAB DREDGERS (SEE TYPICAL SECTION ATTACHED)

SECOND MEASURE: SINGLE SILT CURTAIN AROUND THE SITE (SEE TYPICAL SECTION ATTACHED)

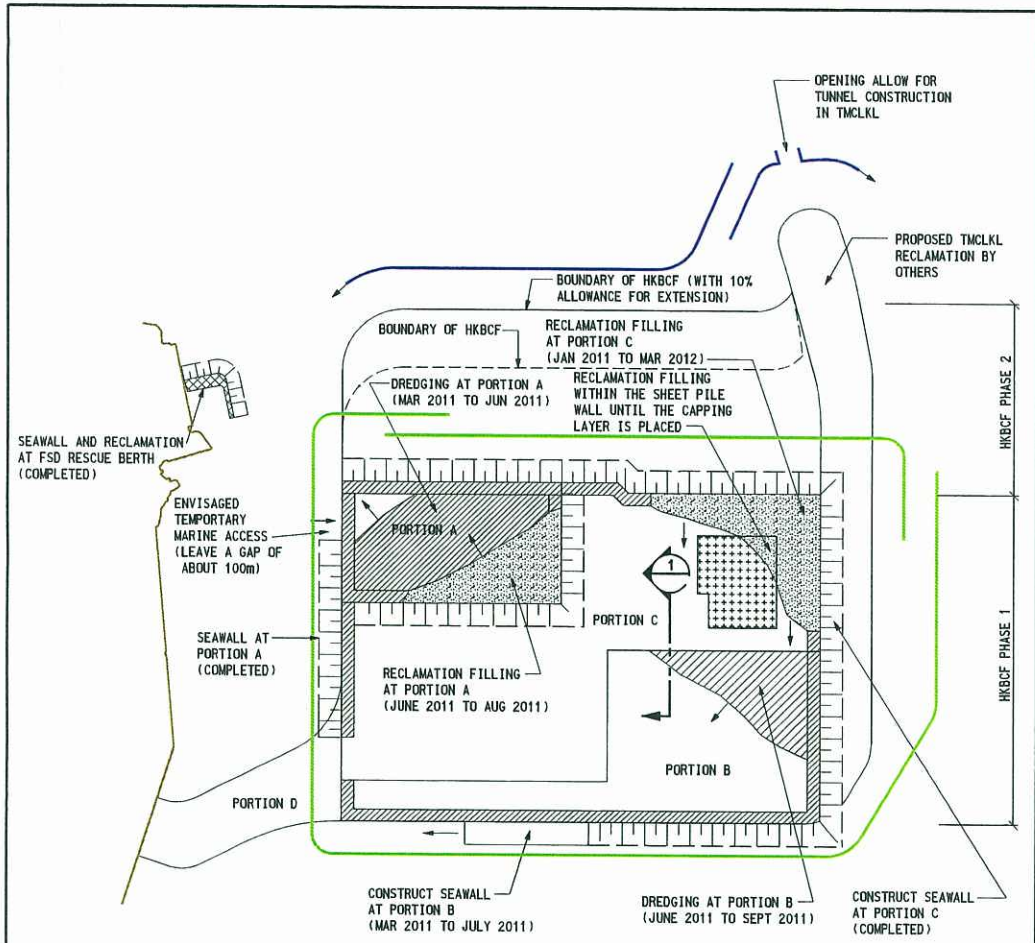
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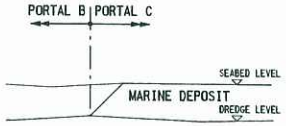
- STEEL SHEET PILE WALL
- SINGLE SILT CURTAIN
- DREDGED AREA
- COMPLETED SLOPING SEAWALL
- RE-DEPOSITION OF DREDGED Mf SEDIMENT

STAGE 2 (ON APRIL 2011)

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SECTION A
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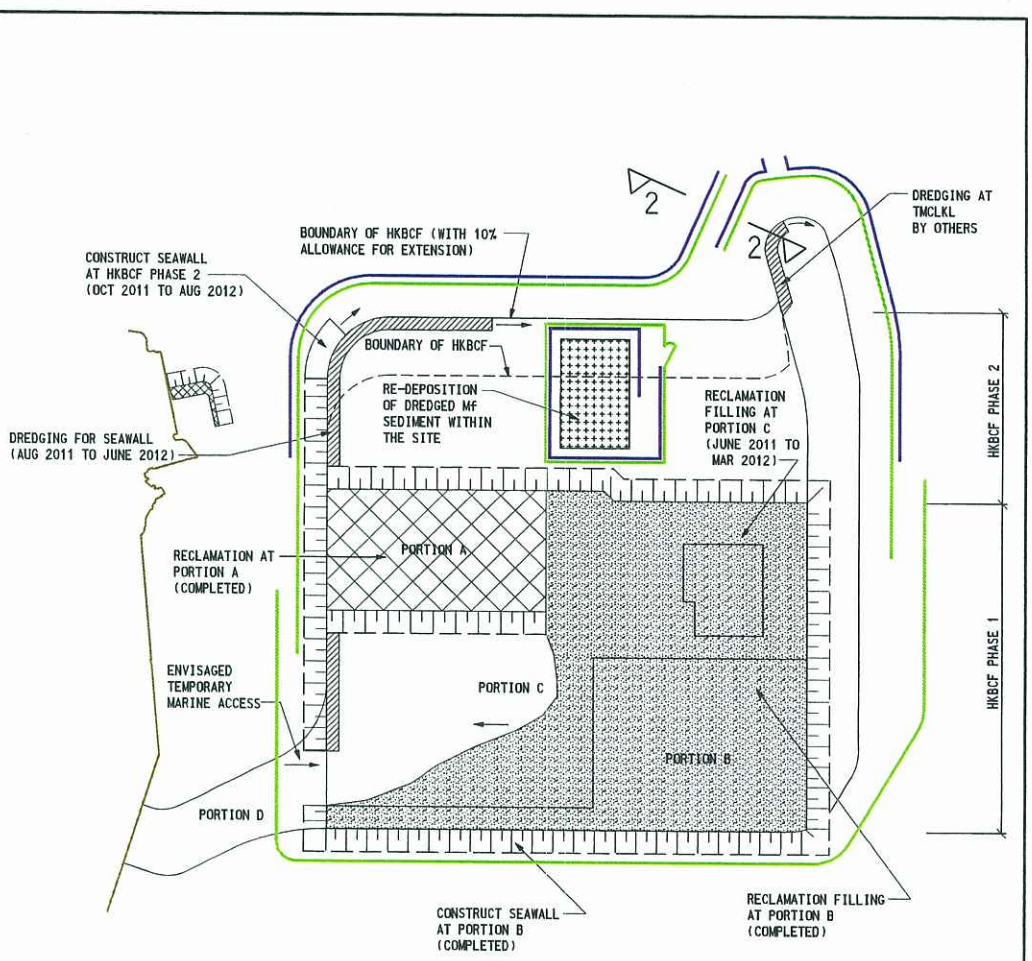
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SECOND MEASURE: SINGLE SILT CURTAIN AROUND THE SITE (SEE TYPICAL SECTION ATTACHED)

LEGEND:

- STEEL SHEET PILE WALL
- SINGLE SILT CURTAIN
- DREDGED AREA
- COMPLETED SLOPING SEAWALL
- RECLAMATION WORKS COMPLETED
- RECLAMATION FILLING AREA
- RE-DEPOSITION OF DREDGED Mf SEDIMENT

STAGE 3 (ON JUNE 2011)



NOTE:

FIRST MEASURE: CAGE TYPE SILT CURTAIN FOR ALL GRAB DREDGERS (SEE TYPICAL SECTION ATTACHED)

SECOND MEASURE: SINGLE SILT CURTAIN AROUND THE SITE (SEE TYPICAL SECTION ATTACHED)

LEGEND:

- STEEL SHEET PILE WALL
- SINGLE SILT CURTAIN
- DREDGED AREA
- COMPLETED SLOPING SEAWALL
- RECLAMATION WORKS COMPLETED
- RECLAMATION FILLING AREA
- RE-DEPOSITION OF DREDGED Mf SEDIMENT

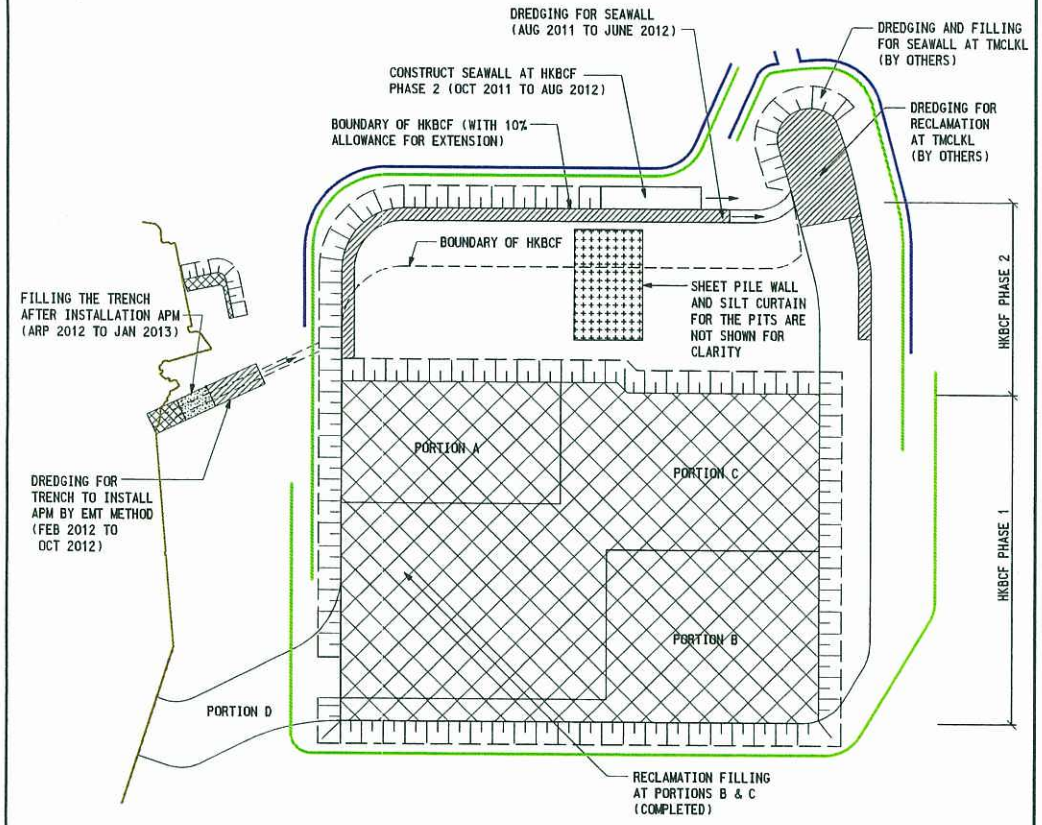
STAGE 4 (ON DEC 2011)

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Rev.	Description	Date
A	FIRST ISSUE	02/09

Drawn: CN	Date: 02/09	Drawing No.: 25308/041/302	
Checked: SK	Approved: AK		
Scale: 1:12500 on A3		Status: PRELIMINARY	Rev.: A



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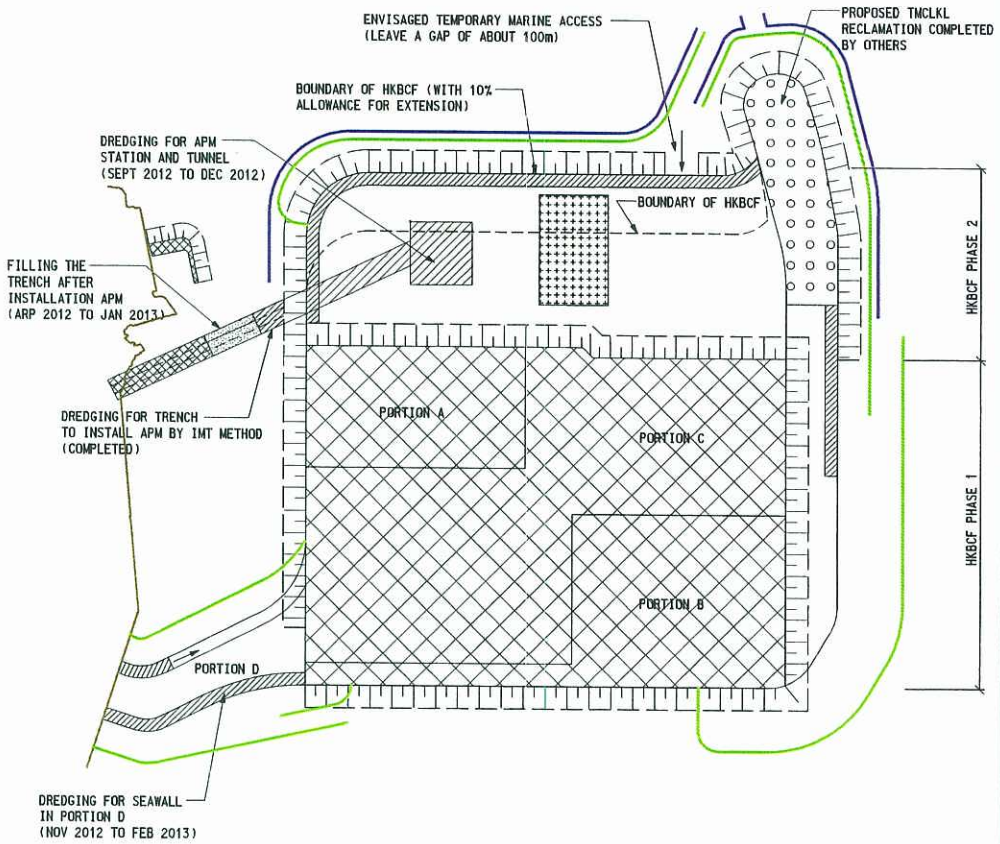
- STEEL SHEET PILE WALL
- SINGLE SILT CURTAIN
- DREDGED AREA
- COMPLETED SLOPING SEAWALL
- RECLAMATION WORKS COMPLETED
- RECLAMATION FILLING AREA
- RE-DEPOSITION OF DREDGED Mf SEDIMENT

NOTE:

FIRST MEASURE: CAGE TYPE SILT CURTAIN FOR ALL GRAB DREDGERS (SEE TYPICAL SECTION ATTACHED)

SECOND MEASURE: SINGLE SILT CURTAIN AROUND THE SITE (SEE TYPICAL SECTION ATTACHED)

STAGE 5 (ON APR 2012)



LEGEND:

- STEEL SHEET PILE WALL
- SINGLE SILT CURTAIN
- DREDGED AREA
- COMPLETED SLOPING SEAWALL
- COMPLETE TMCLKL RECLAMATION BY OTHERS
- RECLAMATION WORKS COMPLETED
- RECLAMATION FILLING AREA
- RE-DEPOSITION OF DREDGED Mf SEDIMENT

NOTE:

FIRST MEASURE: CAGE TYPE SILT CURTAIN FOR ALL GRAB DREDGERS (SEE TYPICAL SECTION ATTACHED)

SECOND MEASURE: SINGLE SILT CURTAIN AROUND THE SITE (SEE TYPICAL SECTION ATTACHED)

STAGE 6 (ON DEC 2012)

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Hong Kong - Zhuhai - Macao Bridge
Hong Kong Project Management Office

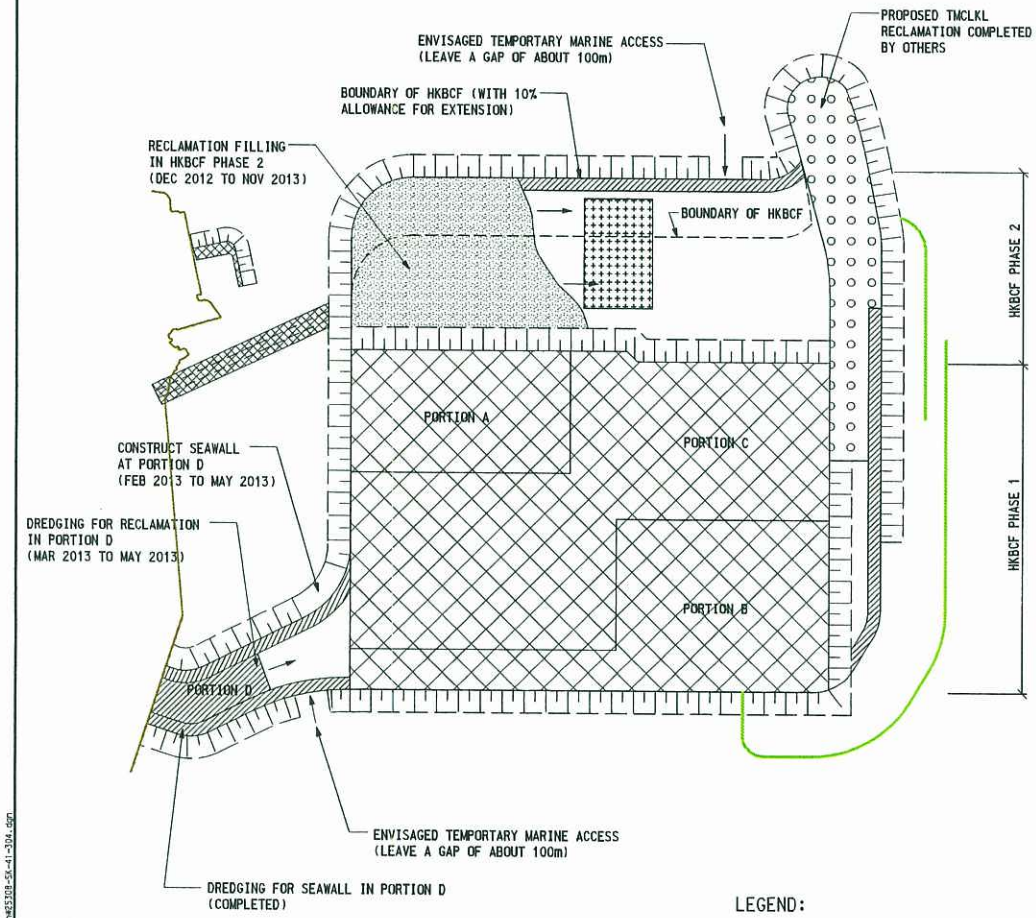
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Job Title
Agreement No. CE 14/2008 (CE)
Hong Kong-Zhuhai-Macao Bridge Hong Kong
Boundary Crossing Facilities – Investigation

Drawing Title
ANTICIPATED CONSTRUCTION
SEQUENCE OF HKBCF (SEQUENCE A)

Rev.	Description	Date
A	FIRST ISSUE	02/09

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Checked: SK | Approved: AK
Scale: 1:12500 on A3
Drawing No.: 25308/041/303
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LEGEND:

- SINGLE SILT CURTAIN
- DREDGED AREA
- COMPLETED SLOPING SEAWALL
- COMPLETE TMCLKL RECLAMATION BY OTHERS
- RECLAMATION WORKS COMPLETED
- RECLAMATION FILLING AREA
- RE-DEPOSITION OF DREDGED Mf SEDIMENT

NOTE:

FIRST MEASURE: CAGE TYPE SILT CURTAIN FOR ALL GRAB DREDGERS (SEE TYPICAL SECTION ATTACHED)

SECOND MEASURE: SINGLE SILT CURTAIN AROUND THE SITE (SEE TYPICAL SECTION ATTACHED)

STAGE 7 (ON APR 2013)

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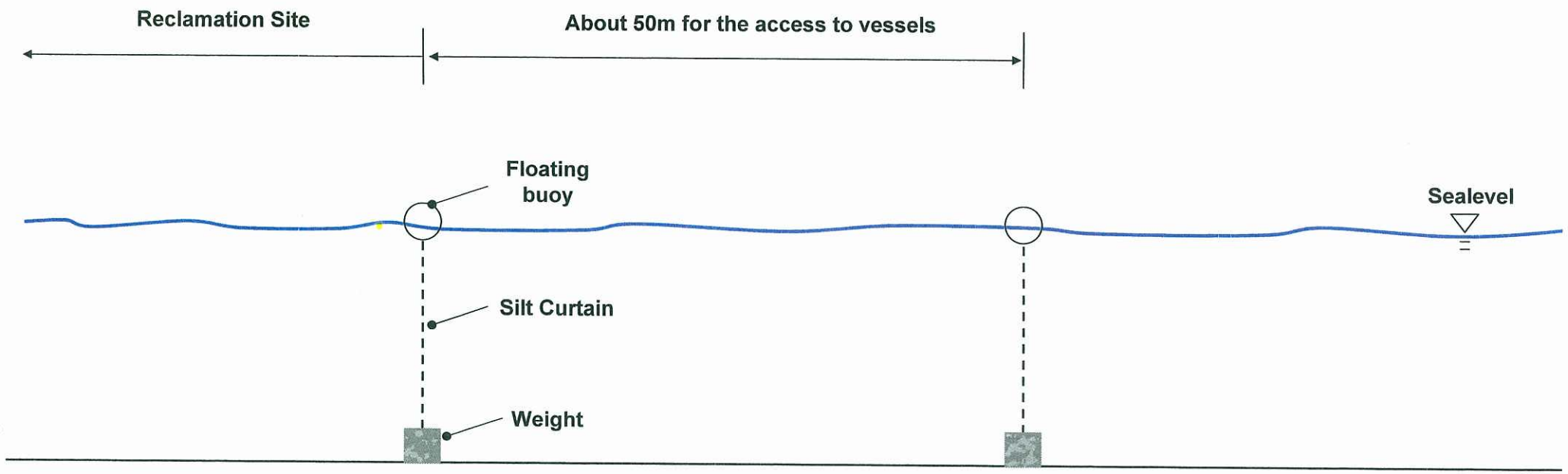
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Job Title
Agreement No. CE 14/2008 (CE)
Hong Kong-Zhuhai-Macao Bridge Hong Kong Boundary Crossing Facilities – Investigation

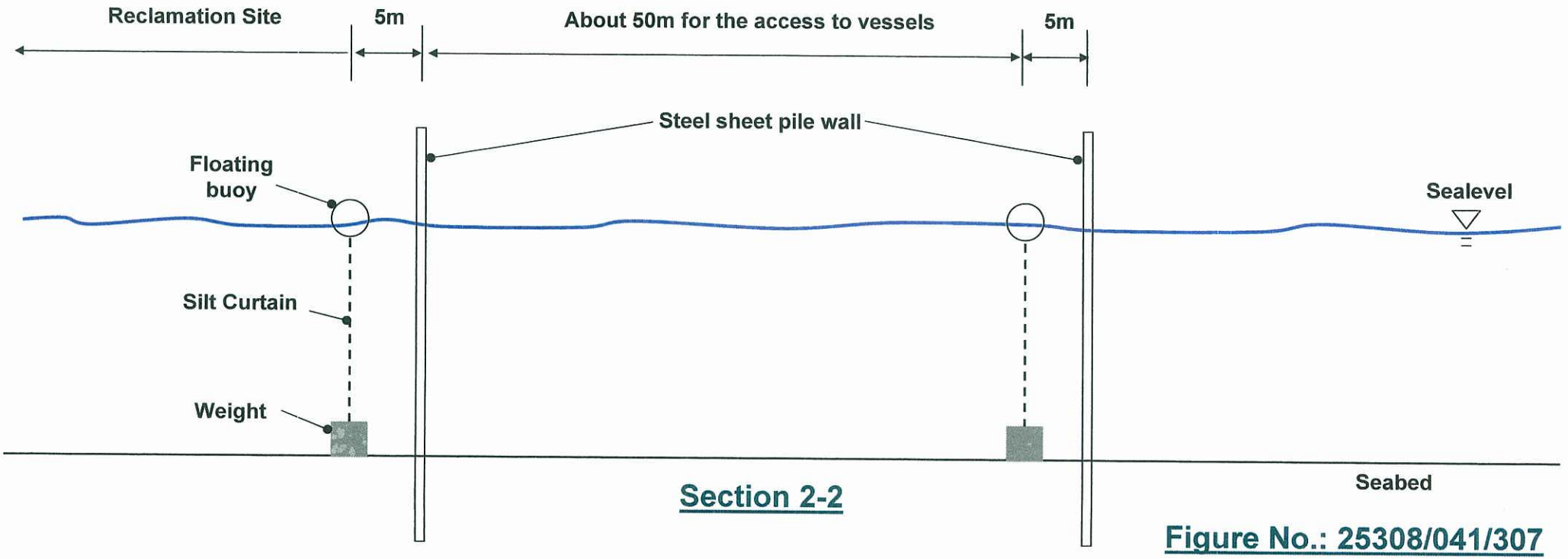
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Rev.	Description	Date
A	FIRST ISSUE	02/09

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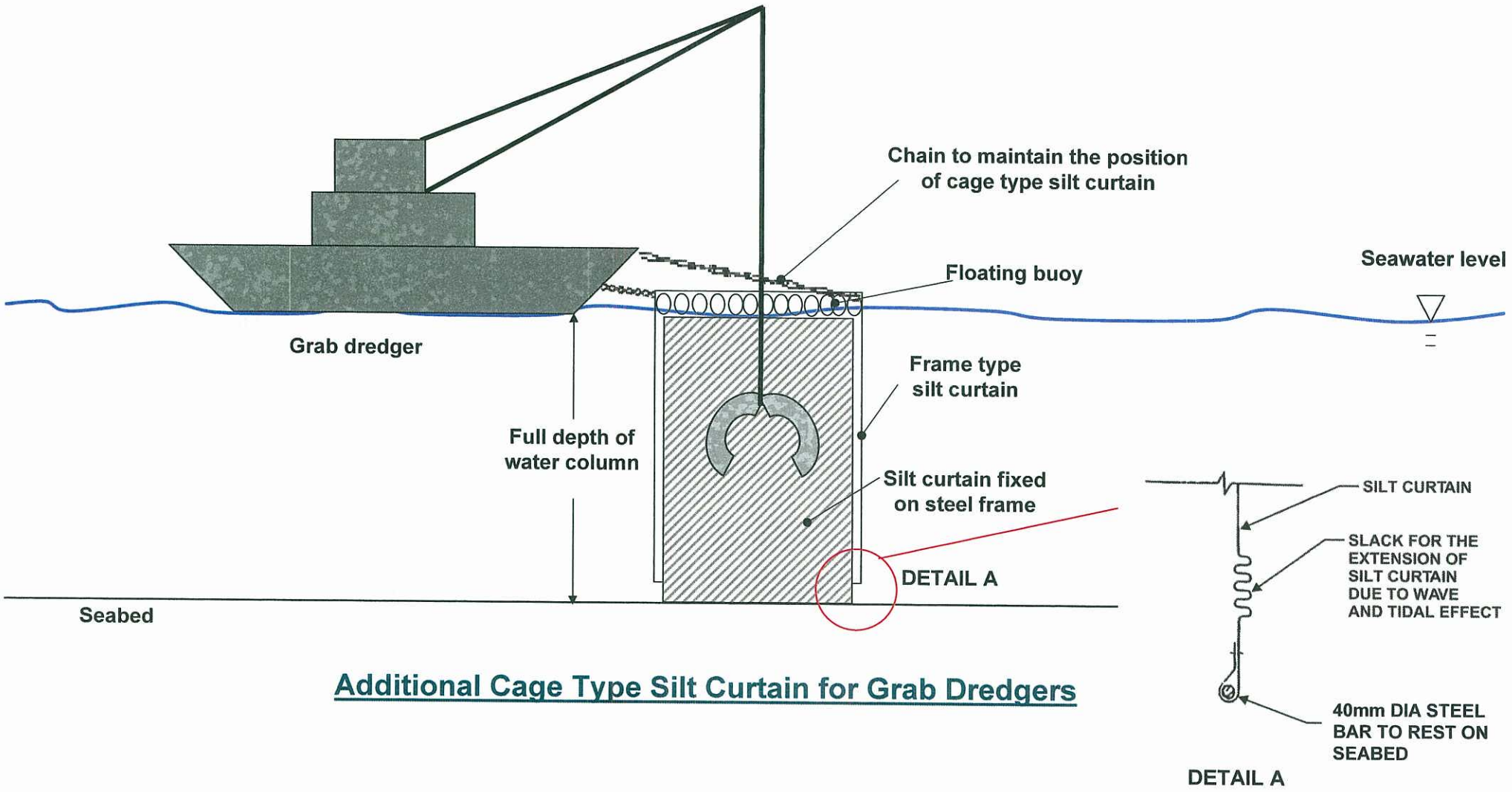


Section 1-1



Section 2-2

Figure No.: 25308/041/307

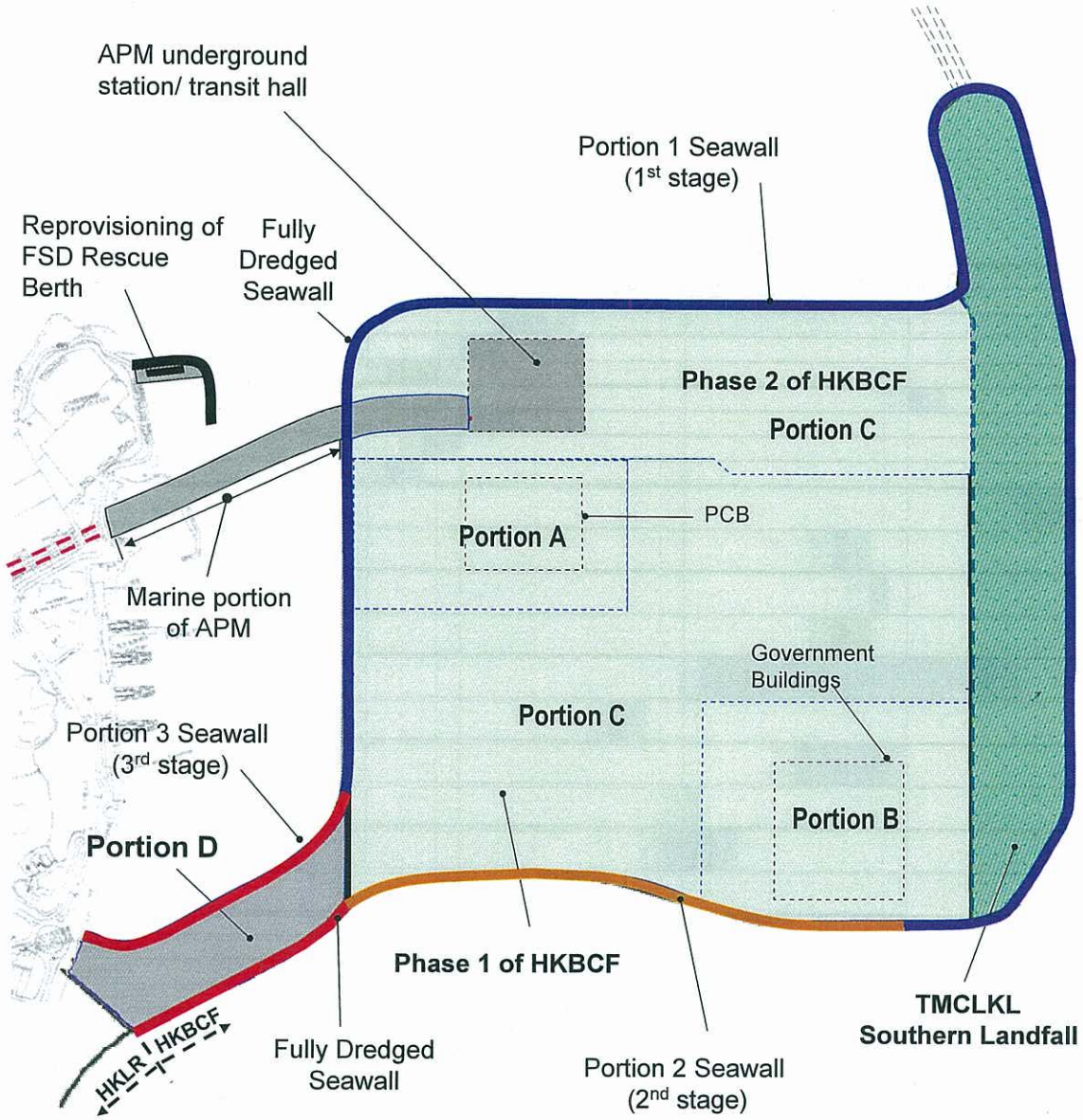


Additional Cage Type Silt Curtain for Grab Dredgers

Figure No.: 25308/041/308

APPENDIX 9A2

Construction Sequence and Construction Programme – HKBCF (Sequence B)



Fully dredged

Non-dredged (with Band Drains)

Portion 1 seawall
Portion 2 seawall
Portion 3 seawall
} Fully dredged

Phase 1 of HKBCF

Seawall – Fully Dredged

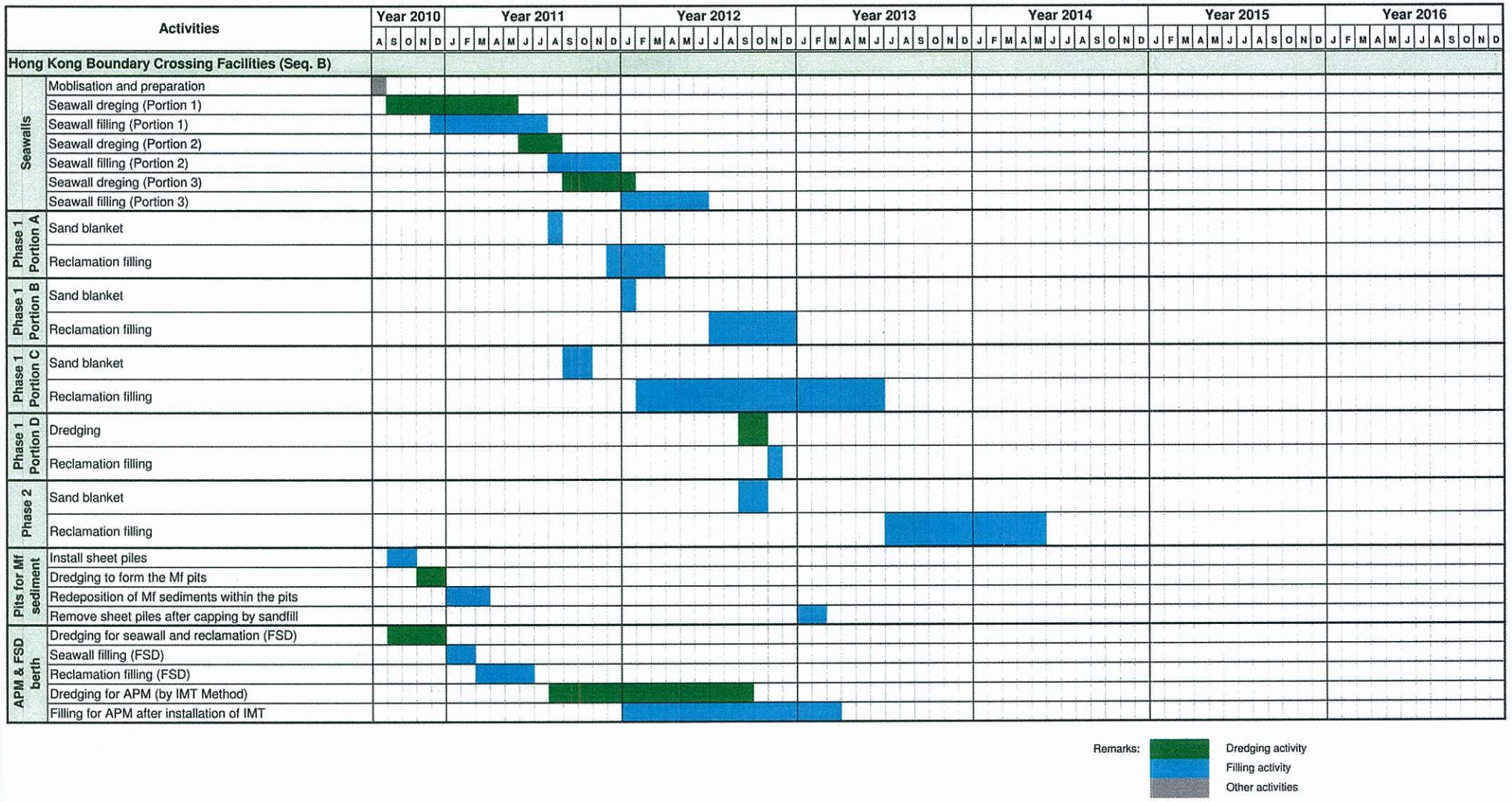
Reclamation:
Portion A – Non-dredged (with band drains)
Portion B – Non-dredged (with band drains)
Portion C – Non-dredged (with band drains)
Portion D – Fully dredged
FSD Rescue Berth – Fully dredged

Phase 2 of HKBCF

Seawall – Fully dredged

Reclamation – Non-dredged (with band drains) except the areas at underground APM station and tunnel by fully dredged.

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ARUP 奧雅納工程顧問 Ove Arup & Partners Hong Kong Limited

Drawing Title

Envisaged Program for HKBCF Reclamation (Sequence B)

Drawing No.

Figure 9A2-2

Hong Kong-Zhuhai-Macao Bridge **Appendix 9A2**
Hong Kong Boundary Crossing Facilities
Description of Reclamation Sequence (Sequence B)

The reclamation sequence of HKBCF (Sequence B) and the layout of mitigation measures including temporary steel sheet pile walls and silt curtain are shown on **Drawings 301A to 304A** in **Appendix 9A2**. In general, the seawall at the peripheral of HKBCF site is anticipated to be carried out first and the reclamation would start when substantial length of seawall is constructed to protect the reclamation filling. Temporary steel sheet pile wall near the northern edge of HKBCF site would be installed to protect silt curtain against strong current. Assuming the reclamation of HKBCF commence in Aug 2010, the envisaged reclamation sequence is as follows:

1) Install the temporary steel sheet pile wall near the northern edge of site and the silt curtain around the site as shown in Stage 1 of **Drawing 301A** in **Appendix 9A2**. In order to enable the commencement of reclamation works before the sheet pile wall is installed, the northern side of silt curtain would be installed near to HKBCF Phase 1 where it would not be affected by the current. Moreover, the temporary steel sheet pile wall and silt curtain would also be installed for forming the pits to receive the Mf sediment dredged from the site.

2) Portion 1 seawall is to be constructed first by commencing the dredging at the south-east and south-west corners of the site as shown in Stage 1 of **Drawing 301A** in **Appendix 9A2**. The dredging for the seawall and reclamation of FSD Rescues Berth at the western side of HKBCF site would be carried out at the same time.

3) After installation of sheet pile wall, the northern side of silt curtain would be shifted to the area outside the northern edge of HKBCF site. Dredging would be carried out to form the pits to receive Mf sediment as shown in Stage 2 of **Drawing 301A** in **Appendix 9A2**. According to the current ground investigation information, the dredging at northern seawall would involve some Mf sediment and it would be deposited to the pits within the sheet pile wall and silt curtain as shown in Stage 3 of **Drawing 301A** in **Appendix 9A2**.

4) It is anticipated that the seawall filling for Portion 1 seawall and FSD Rescue Berth would commence in December 2010 and January 2011 respectively. A gap of about 100m at the northern seawall as shown in Stage 4 of **Drawing 302A** in **Appendix 9A2** would be left for the temporary marine access to enable the reclamation works in HKBCF. After completion of the northern seawall, the northern temporary sheet pile wall would then be removed.

5) As shown in Stages 4 and 5 of **Drawings 302A and 303A** in **Appendix 9A2**, it is anticipated that the dredging and filling of Portion 2 seawall would commence in June 2011 and August 2011 respectively. After substantial length of Portion 2 seawall is completed, the reclamation filling (i.e. sand blanket) at Portion A and Portion C (Phase 1) is anticipated to start in August 2011 and September 2011 respectively.

6) Following completion of Portion 2 seawall, the filling of Portion 3 seawall would commence in January 2012. A gap of about 100m at Portion 2 seawall as shown in Stage 5 of **Drawing 303A** in **Appendix 9A2** would be left for the temporary marine access to enable the reclamation works in HKBCF.

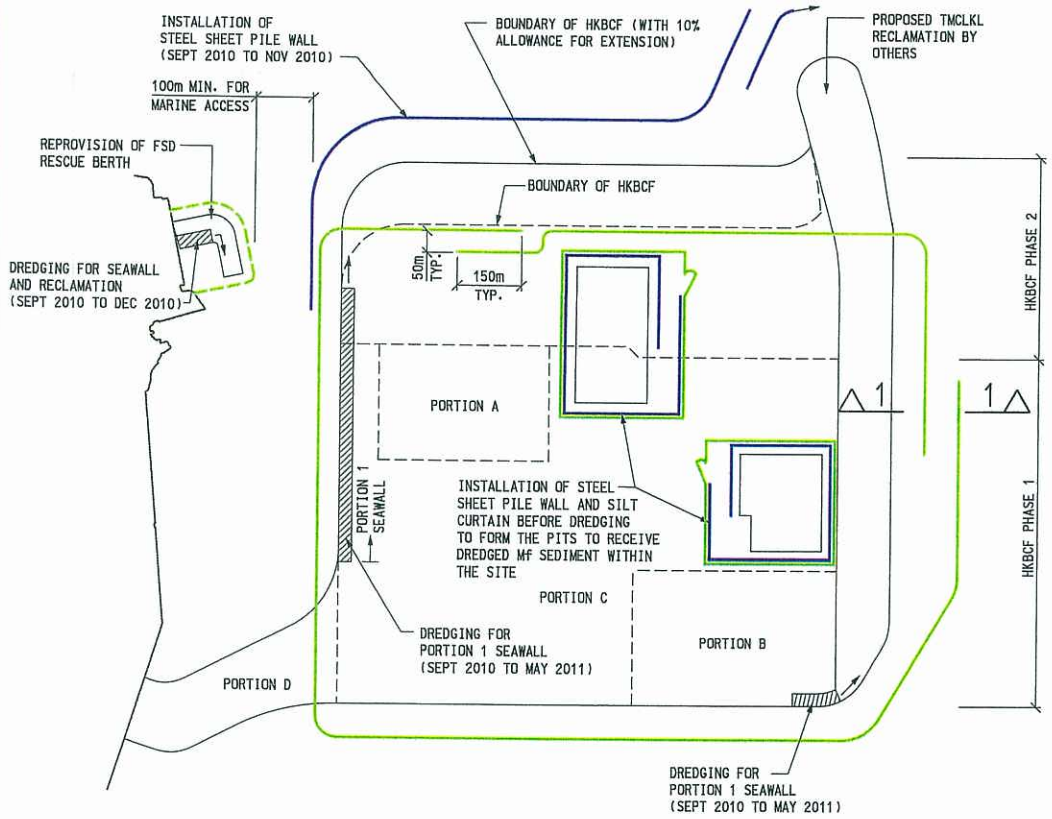
7) Dredging and filling for the installation of immerse tube tunnel of Automatic People Mover (APM) and underground station are anticipated to be carried out August 2011 to March 2013.

8) As shown in Stages 6 and 7 of **Drawings 303A and 304A** in **Appendix 9A2**, the reclamation filling of HKBCF Phase 1 is generally in the direction from the east to west except that reclamation filling at Portion A is to be completed earlier in March 2012 so as to allow more time for the construction of Passenger Clearance Building (PCB). In addition, the direction of dredging and filling in Portion D is from the west to east to suit the temporary access at the seawall. The filling at the Mf pits would be carried out within the temporary sheet pile wall and silt curtain at the same time with the reclamation filling outside the pits. After 2m thick sandfill has been placed to protect and cover the Mf sediment within the pits, the sheet piles would be cut and then removed for the reclamation to proceed.

9) Construction of seawall is anticipated to be completed in Stage 7 as shown on **Drawing 304A** in **Appendix 9A2** except the temporary openings for marine access mentioned in (4) and (6) above. As the reclamation filling is fully enclosed by the seawall, the silt curtain at the peripheral of HKBCF site is no longer required.

10) After completion of HKBCF Phase 1, the reclamation filling would proceed to HKBCF Phase 2 as shown in Stage 8 of **Drawing 304A** in **Appendix 9A2**.

11) The reclamation of HKBCF is completed after the filling in Phase 2 and completion of remaining section of seawall allowed for the temporary marine access.



NOTE:

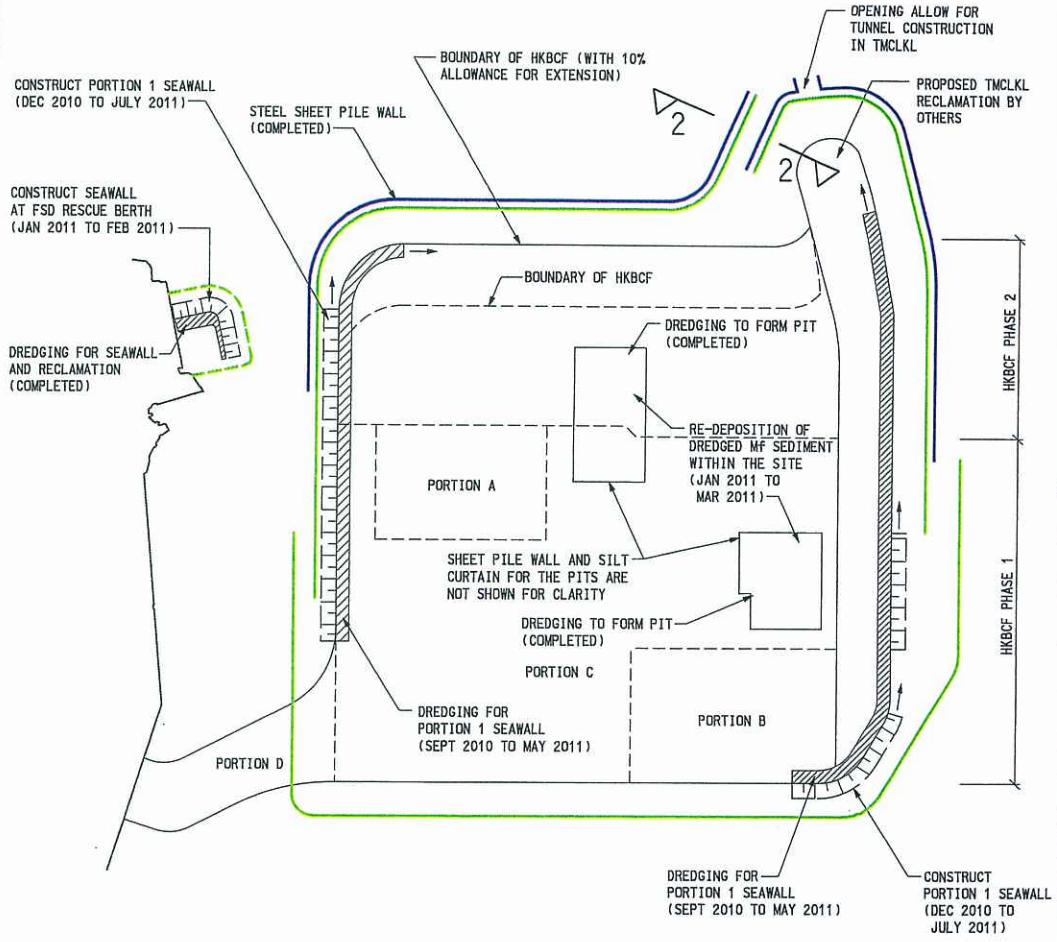
FIRST MEASURE: CAGE TYPE SILT CURTAIN FOR ALL GRAB DREDGERS (SEE TYPICAL SECTION ATTACHED)

SECOND MEASURE: SINGLE SILT CURTAIN AROUND THE SITE (SEE TYPICAL SECTION ATTACHED)

LEGEND:

- STEEL SHEET PILE WALL
- SINGLE SILT CURTAIN
- DREDGED AREA

STAGE 1 (ON OCT 2010)



NOTE:

FIRST MEASURE: CAGE TYPE SILT CURTAIN FOR ALL GRAB DREDGERS (SEE TYPICAL SECTION ATTACHED)

SECOND MEASURE: SINGLE SILT CURTAIN AROUND THE SITE (SEE TYPICAL SECTION ATTACHED)

LEGEND:

- STEEL SHEET PILE WALL
- SINGLE SILT CURTAIN
- DREDGED AREA
- COMPLETED SLOPING SEAWALL
- RE-DEPOSITION OF DREDGED Mf SEDIMENT

STAGE 2 (ON FEB 2011)

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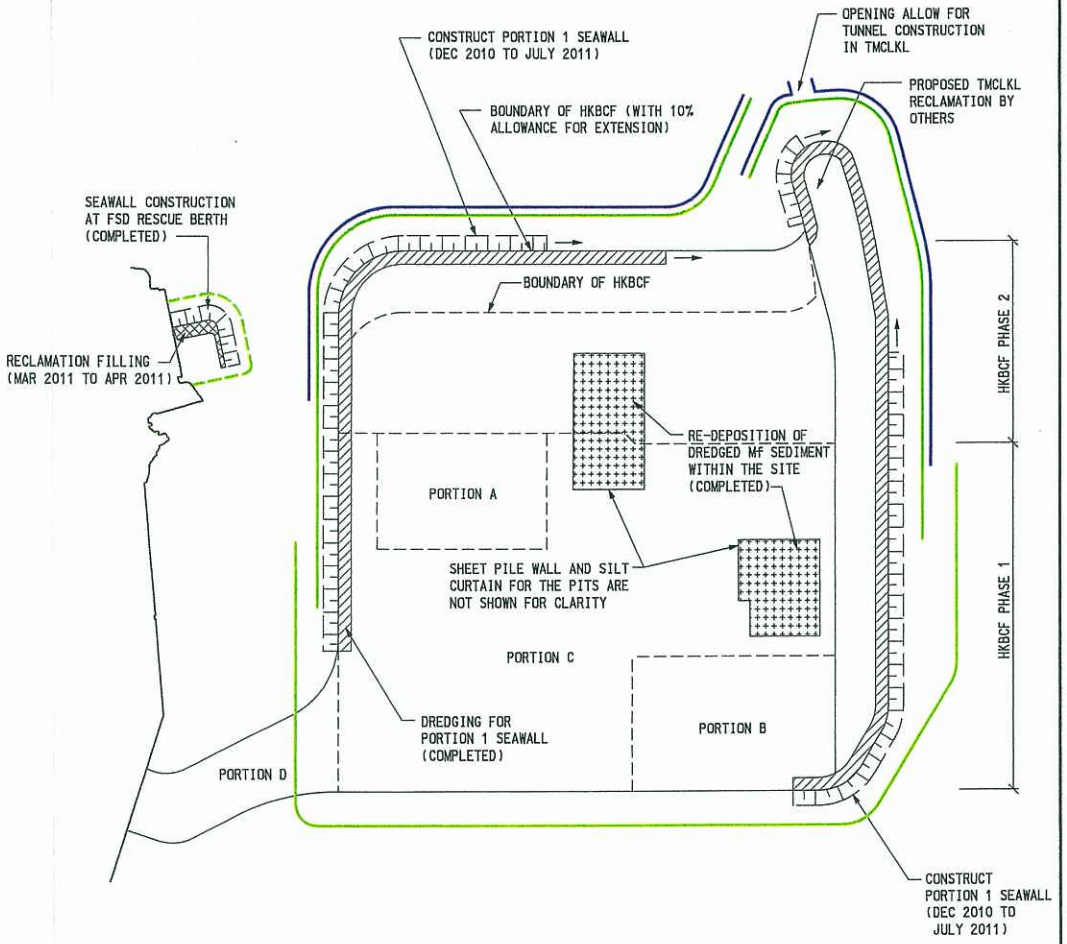
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Job Title
Agreement No. CE 14/2008 (CE)
Hong Kong-Zhuhai-Macao Bridge Hong Kong Boundary Crossing Facilities – Investigation

Drawing Title
ANTICIPATED CONSTRUCTION SEQUENCE OF HKBCF (SEQUENCE B)

Rev.	Description	Date
A	FIRST ISSUE	02/09

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Date	02/09
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Approved	AK
Scale	1:12500 on A3
Drawing No.	25308/041/301A
Status	PRELIMINARY
Rev.	A



NOTE:

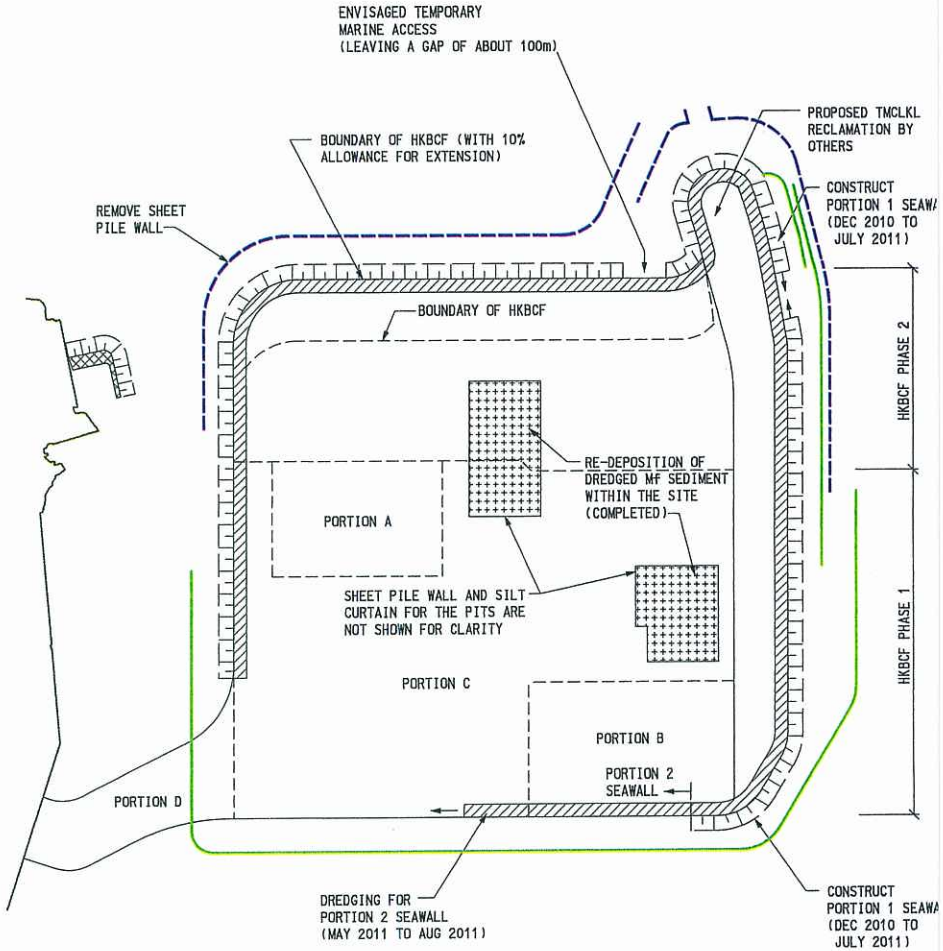
FIRST MEASURE: CAGE TYPE SILT CURTAIN FOR ALL GRAB DREDGERS (SEE TYPICAL SECTION ATTACHED)

SECOND MEASURE: SINGLE SILT CURTAIN AROUND THE SITE (SEE TYPICAL SECTION ATTACHED)

LEGEND:

- STEEL SHEET PILE WALL
- SINGLE SILT CURTAIN
- DREDGED AREA
- COMPLETED SLOPING SEAWALL
- RE-DEPOSITION OF DREDGED Mf SEDIMENT
- RECLAMATION WORKS COMPLETED

STAGE 3 (ON APR 2011)



NOTE:

FIRST MEASURE: CAGE TYPE SILT CURTAIN FOR ALL GRAB DREDGERS (SEE TYPICAL SECTION ATTACHED)

SECOND MEASURE: SINGLE SILT CURTAIN AROUND THE SITE (SEE TYPICAL SECTION ATTACHED)

LEGEND:

- STEEL SHEET PILE WALL
- SINGLE SILT CURTAIN
- DREDGED AREA
- COMPLETED SLOPING SEAWALL
- RE-DEPOSITION OF DREDGED Mf SEDIMENT
- RECLAMATION WORKS COMPLETED

STAGE 4 (ON JUNE 2011)

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Hong Kong - Zhuhai - Macao Bridge
Hong Kong Project Management Office

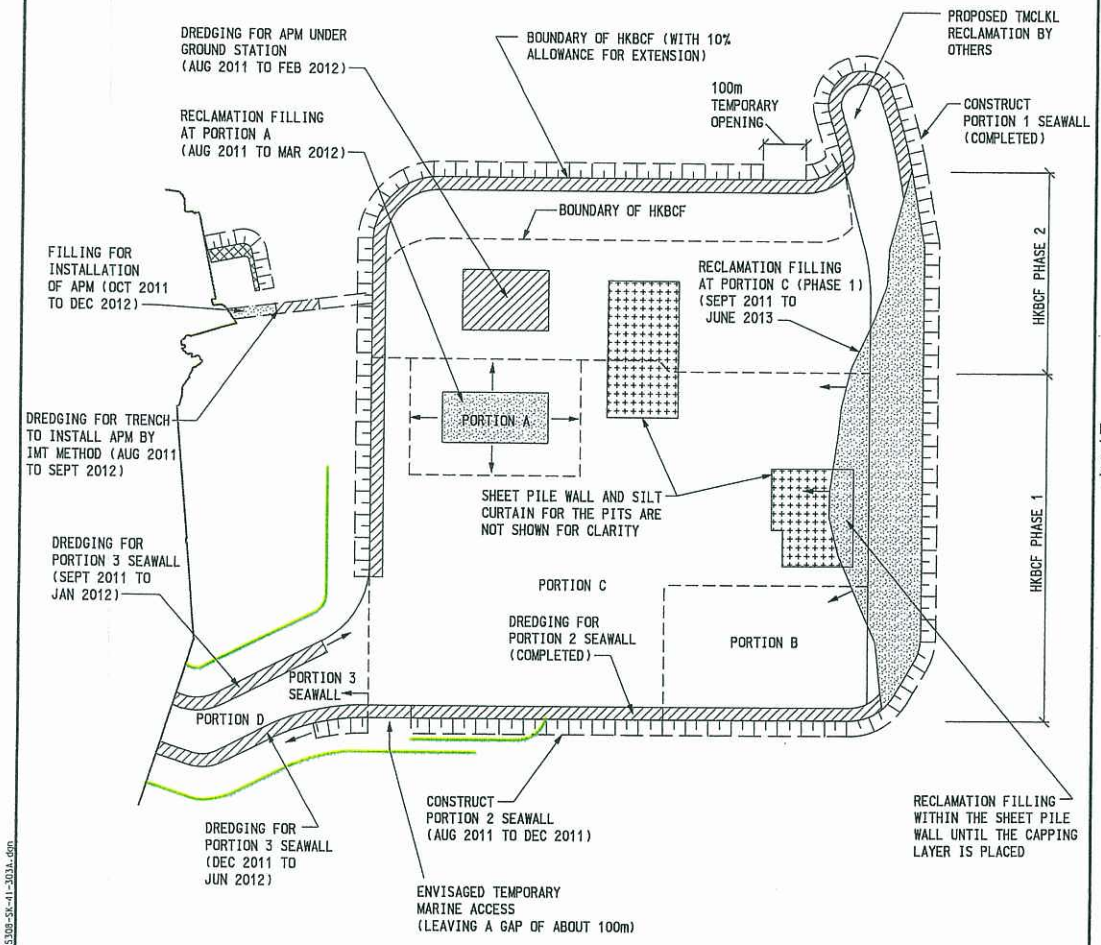
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Job Title
Agreement No. CE 14/2008 (CE)
Hong Kong-Zhuhai-Macao Bridge Hong Kong
Boundary Crossing Facilities – Investigation

Drawing Title
ANTICIPATED CONSTRUCTION
SEQUENCE OF HKBCF (SEQUENCE B)

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A	FIRST ISSUE	02/09

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Scale	1:12500 on A3
Drawing No.	25308/041/302
Status	PRELIMINARY
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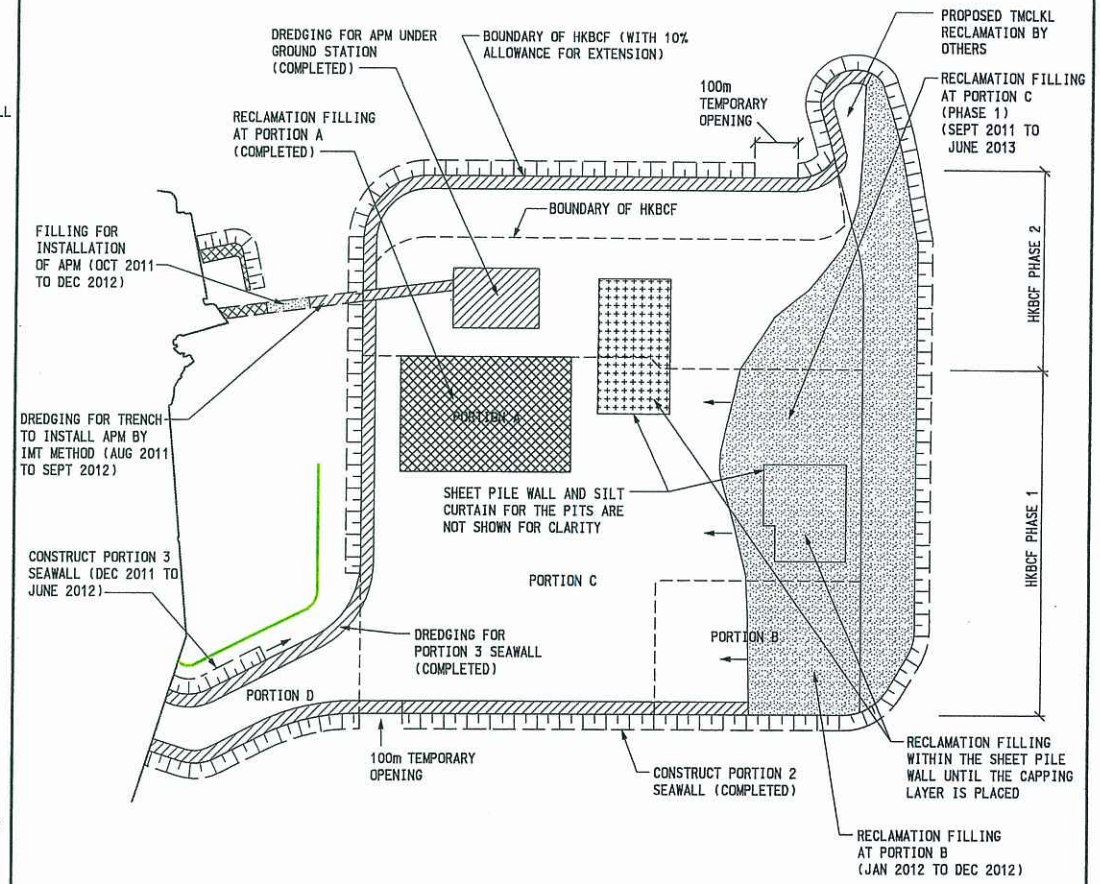
- STEEL SHEET PILE WALL
- SINGLE SILT CURTAIN
- DREDGED AREA
- COMPLETED SLOPING SEAWALL
- RECLAMATION FILLING AREA
- RECLAMATION WORKS COMPLETED
- RE-DEPOSITION OF DREDGED Mf SEDIMENT

NOTE:

FIRST MEASURE: CAGE TYPE SILT CURTAIN FOR ALL GRAB DREDGERS (SEE TYPICAL SECTION ATTACHED)

SECOND MEASURE: SINGLE SILT CURTAIN AROUND THE SITE (SEE TYPICAL SECTION ATTACHED)

STAGE 5 (ON DEC 2011)



LEGEND:

- SINGLE SILT CURTAIN
- DREDGED AREA
- COMPLETED SLOPING SEAWALL
- RECLAMATION FILLING AREA
- RECLAMATION WORKS COMPLETED
- RE-DEPOSITION OF DREDGED Mf SEDIMENT

NOTE:

FIRST MEASURE: CAGE TYPE SILT CURTAIN FOR ALL GRAB DREDGERS (SEE TYPICAL SECTION ATTACHED)

SECOND MEASURE: SINGLE SILT CURTAIN AROUND THE SITE (SEE TYPICAL SECTION ATTACHED)

STAGE 6 (ON APR 2012)

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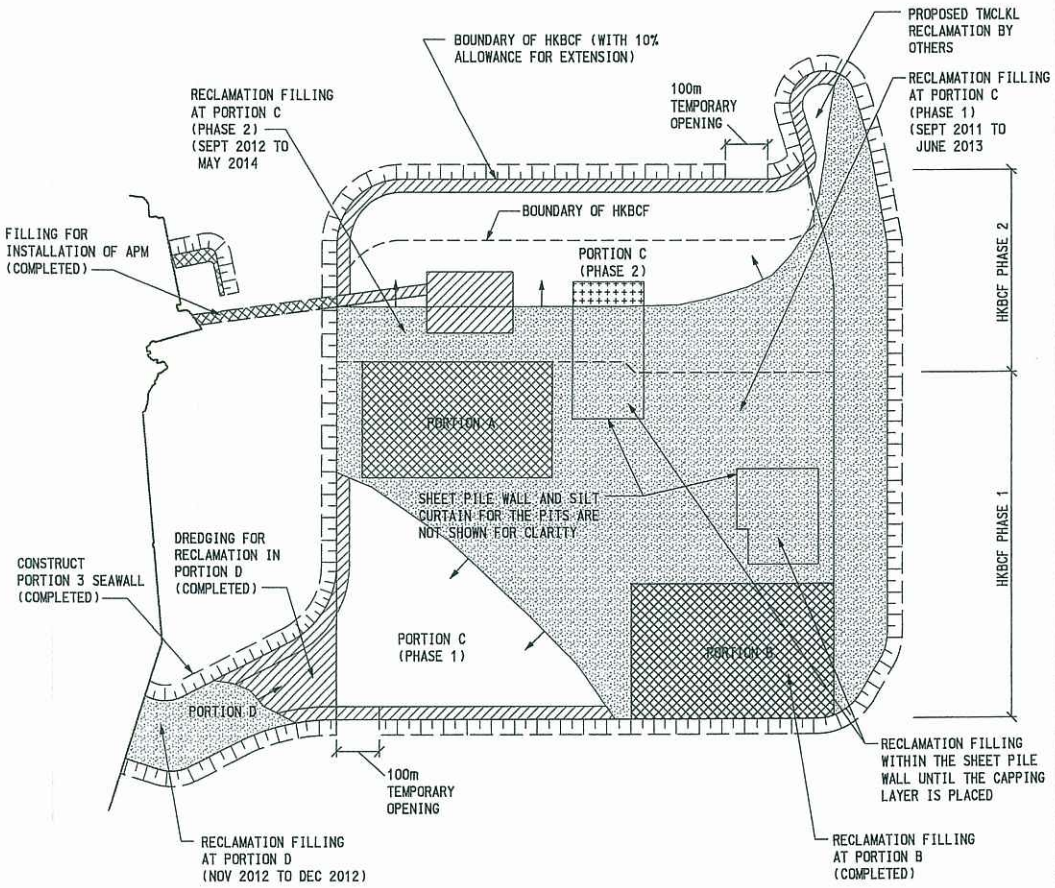
Job Title
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Drawing Title
ANTICIPATED CONSTRUCTION SEQUENCE OF HKBCF (SEQUENCE B)

Rev.	Description	Date
A	FIRST ISSUE	02/09

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Scale	1:12500 on A3		

Drawing No. 25308/041/303A
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NOTE:

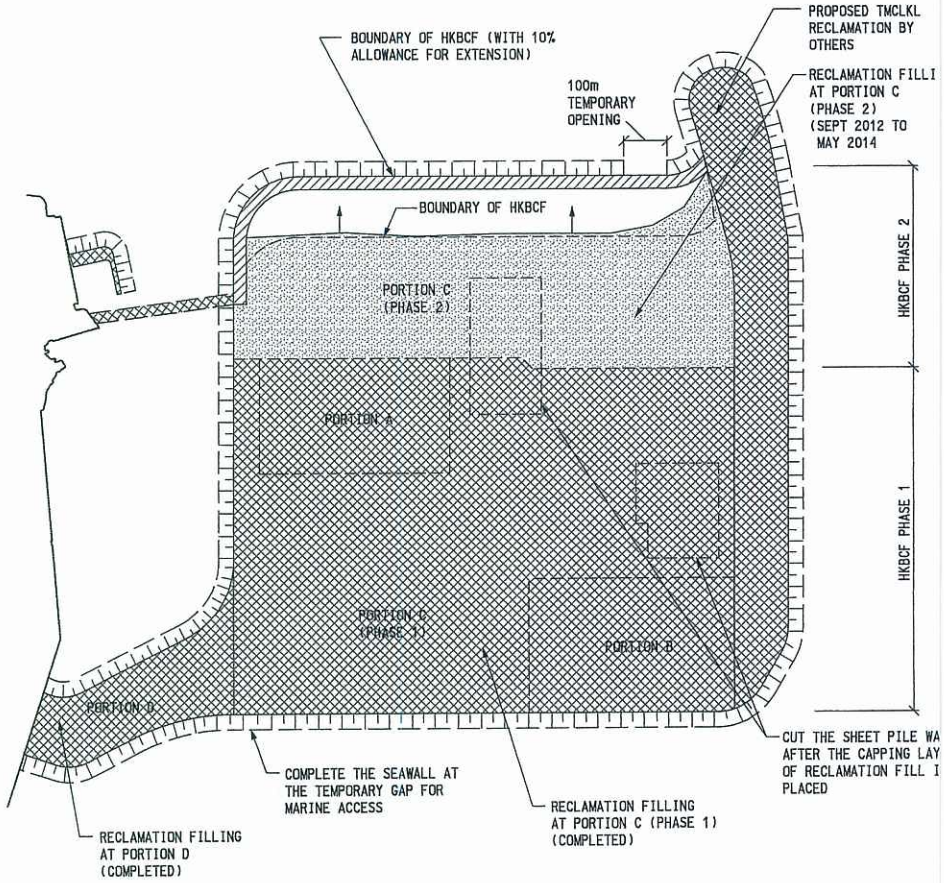
FIRST MEASURE: CAGE TYPE SILT CURTAIN FOR ALL GRAB DREDGERS (SEE TYPICAL SECTION ATTACHED)

SECOND MEASURE: SINGLE SILT CURTAIN AROUND THE SITE (SEE TYPICAL SECTION ATTACHED)

LEGEND:

- DREDGED AREA
- COMPLETED SLOPING SEAWALL
- RECLAMATION FILLING AREA
- RECLAMATION WORKS COMPLETED
- RE-DEPOSITION OF DREDGED Mf SEDIMENT

STAGE 7 (ON DEC 2012)



NOTE:

FIRST MEASURE: CAGE TYPE SILT CURTAIN FOR ALL GRAB DREDGERS (SEE TYPICAL SECTION ATTACHED)

SECOND MEASURE: SINGLE SILT CURTAIN AROUND THE SITE (SEE TYPICAL SECTION ATTACHED)

LEGEND:

- DREDGED AREA
- COMPLETED SLOPING SEAWALL
- RECLAMATION FILLING AREA
- RECLAMATION WORKS COMPLETED
- RE-DEPOSITION OF DREDGED Mf SEDIMENT

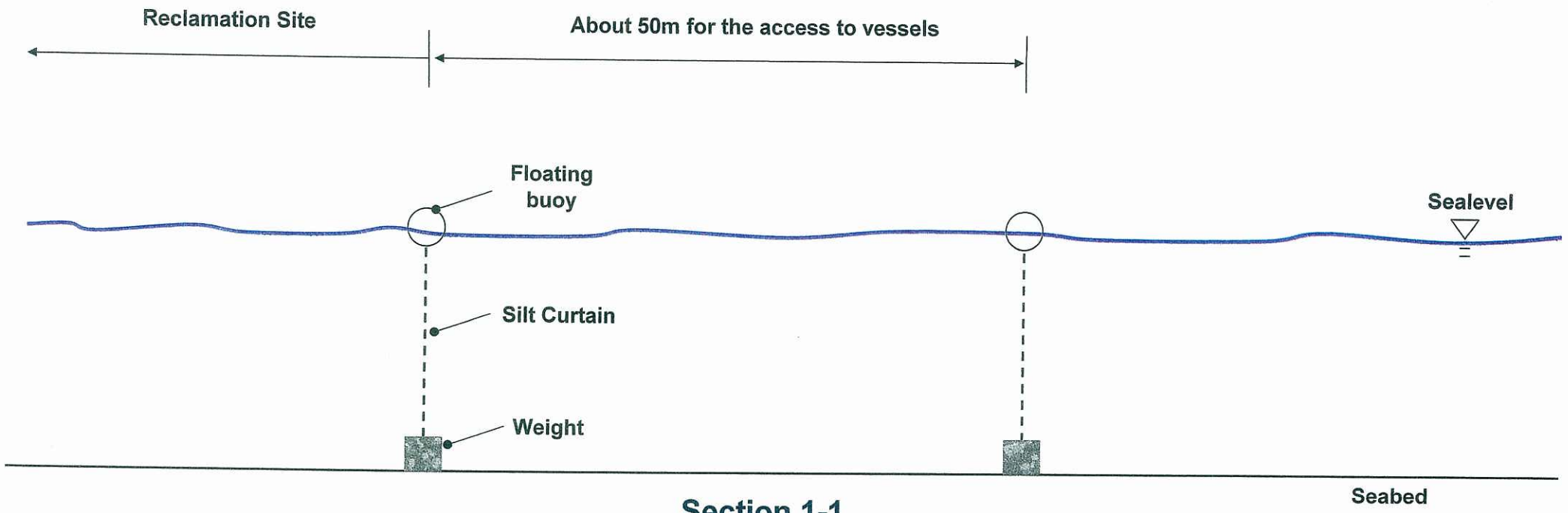
STAGE 8 (ON DEC 2013)

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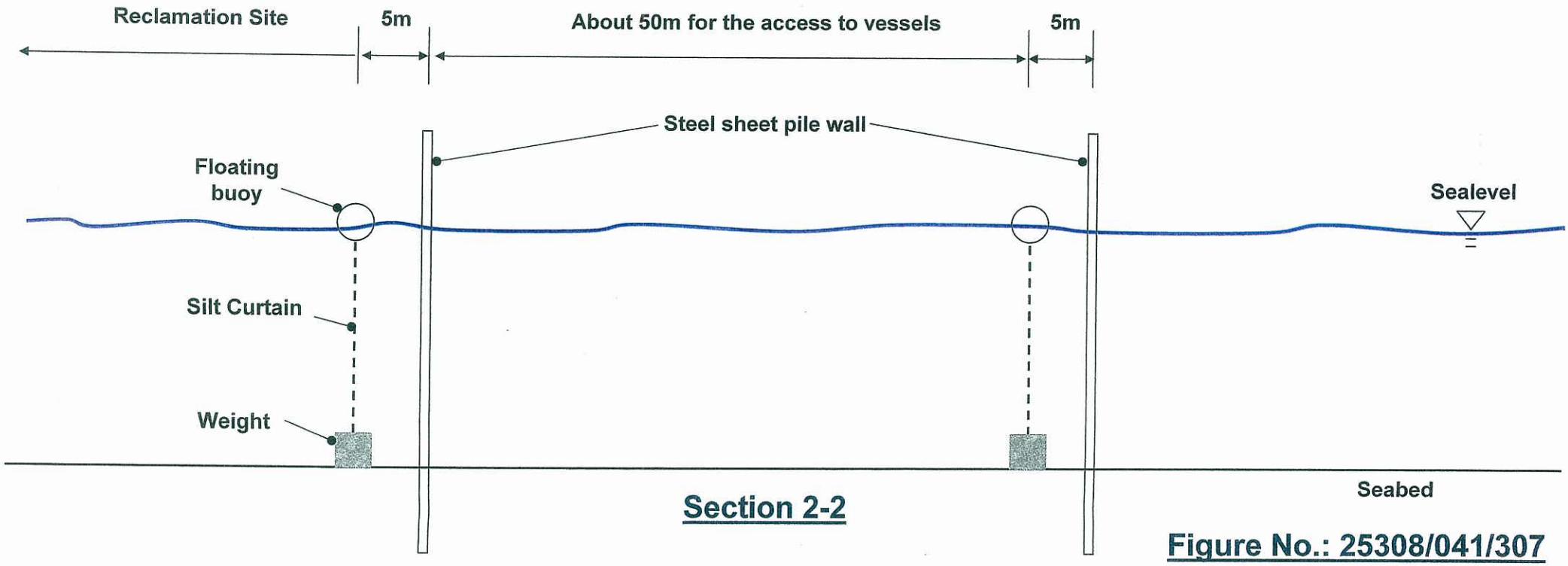
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Rev.	Description	Date
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Checked: SK	Approved: AK		
Scale: 1:12500 on A3	Status: PRELIMINARY	Rev.	A

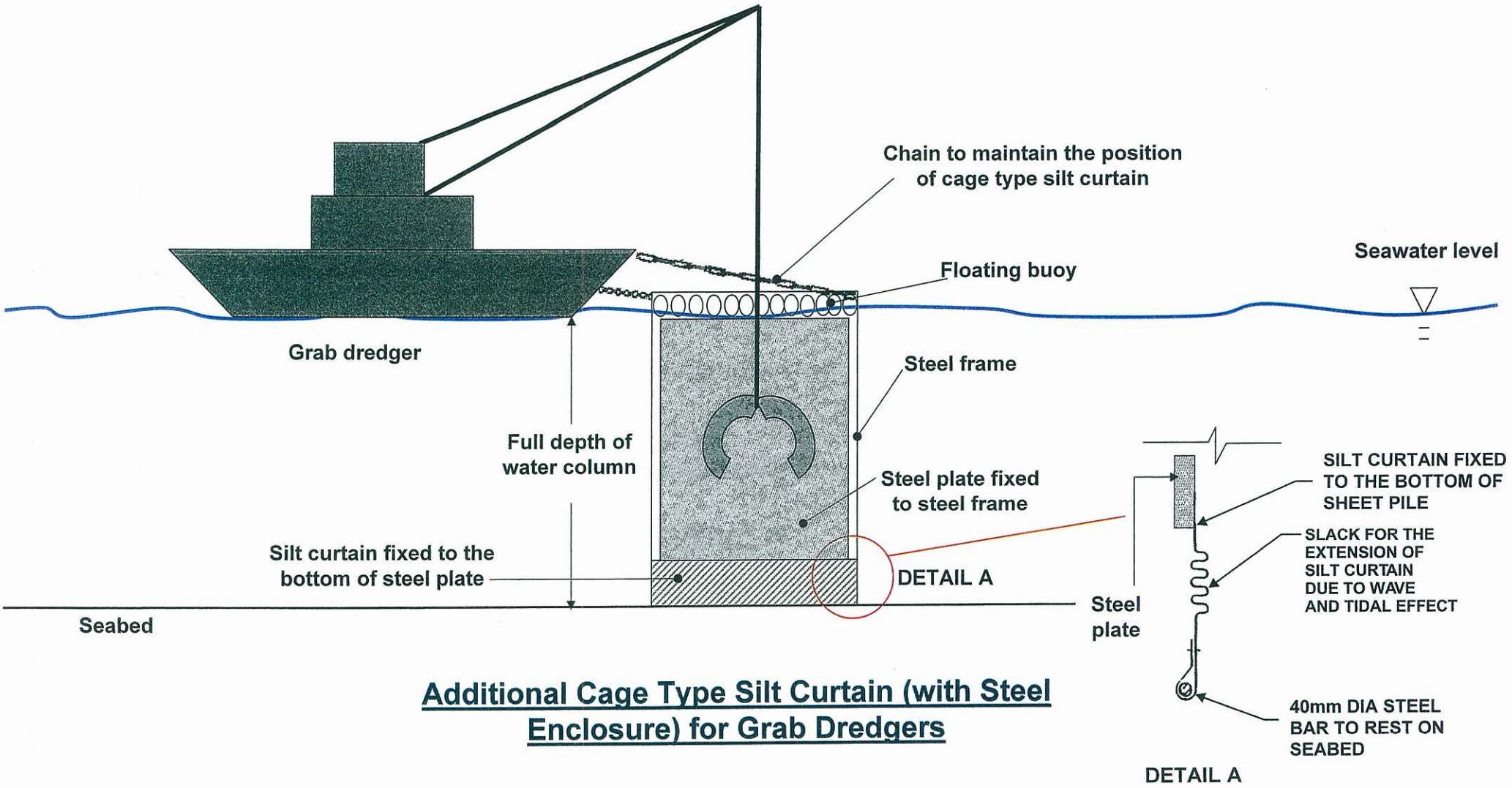


Section 1-1



Section 2-2

Figure No.: 25308/041/307



Additional Cage Type Silt Curtain (with Steel Enclosure) for Grab Dredgers

Figure No.: 25308/041/308a

APPENDIX 9B

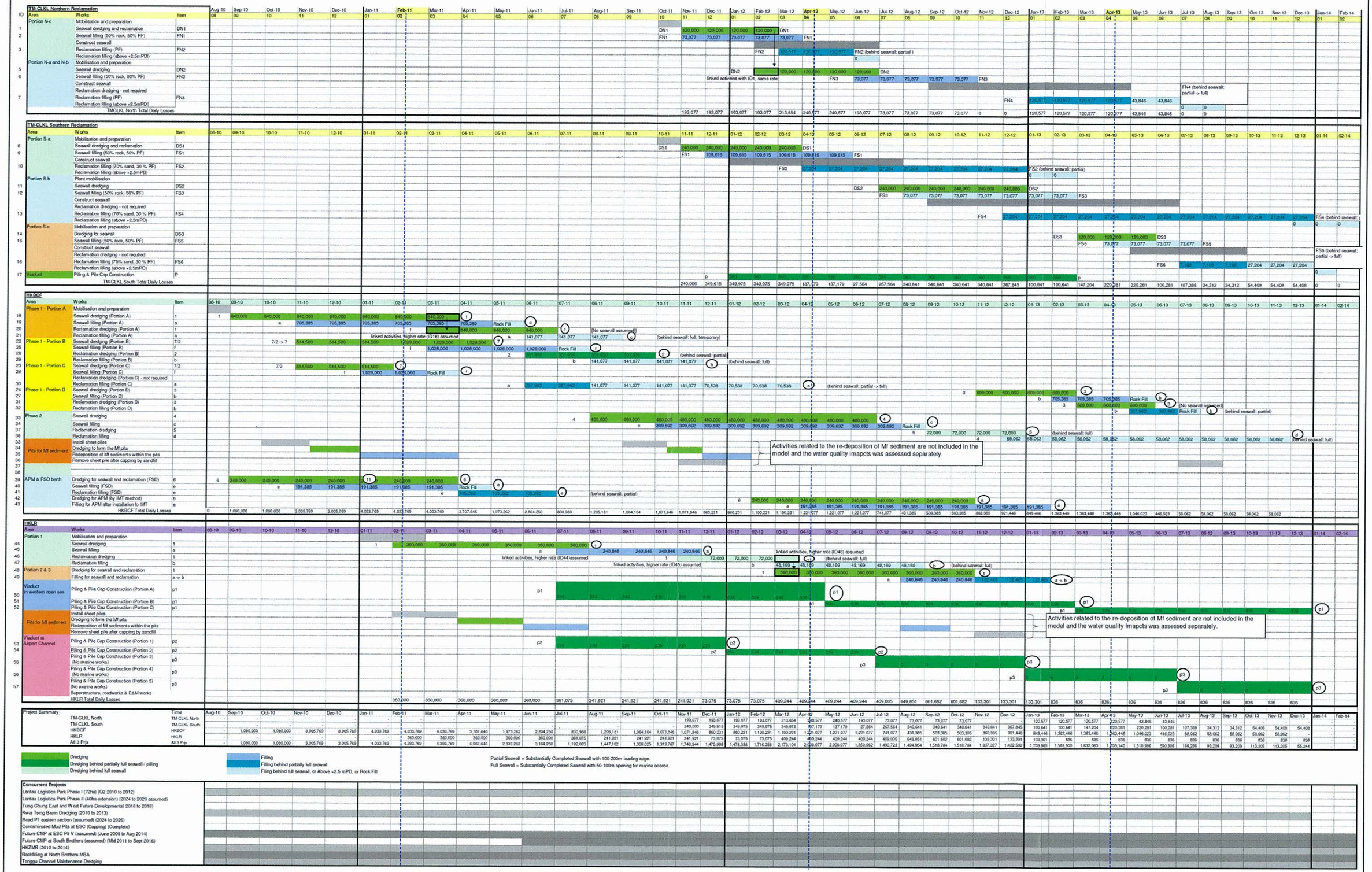
Comparison of Sediment Loss Rate of Sequence A and Sequence B

HKBCF Sediment Loss Rates - No Mitigation (Sequence A)

Work Item	Plant	No. of Plant	Daily Work Time (Hr)	Daily Work Time (min) **	Working Rate: per Grab or TSHD (m3/day) or per Barge (per trip)	Loss Rate (kg/m3)	Reduction Due to Seawalls	Reduction Due to Silt Curtain	Combined Mitigaiton Reduction	Sediment Losses (kg/s) per grab, TSHD or barge	No. of events per grab/barge per day	Total Losses (kg/day) all plant	Material Given	Material Assumed
Dredging														
(1)	grab dredger	7	16	960	6,000	20	0%	0%	0%	2.08	-	840,000	-	-
(1)	grab dredger (behind partial seawall)	7	16	960	6,000	20	45%	0%	45%	1.15	-	462,000	-	-
(2)	TSHD (9,000m3) (behind partial seawall)	1	24	60	27,000	7	45%	0%	45%	9.6	3	103,950	-	-
(2)	grab dredger (behind partial seawall)	3	16	960	6,000	20	45%	0%	45%	1.15	-	198,000	-	-
(7)	TSHD (9,000m3)	1	24	60	27,000	7	0%	0%	0%	17.5	3	189,000	-	-
(7)	grab dredger	7	16	960	6,000	20	0%	0%	0%	2.08	-	840,000	-	-
(3)	grab dredger	5	16	960	6,000	20	0%	0%	0%	2.08	-	600,000	-	-
(3)	grab dredger (behind partial seawall)	5	16	960	6,000	20	45%	0%	45%	1.15	-	330,000	-	-
(4)	grab dredger	4	16	960	6,000	20	0%	0%	0%	2.08	-	480,000	-	-
(5)	grab dredger (behind full seawall)	3	16	960	6,000	20	80%	0%	80%	0.42	-	72,000	-	-
(6)	grab dredger	2	16	960	6,000	20	0%	0%	0%	2.08	-	240,000	-	-
(8)	grab dredger (11 m3)	6	24	1440	11,250	20	0%	0%	0%	2.60		1,350,000		
Filling														
(a)	filling barge	44	16	32.27	769		0%	0%	0%	20.19	2	705,385	PF / Sand	
	dump barge	14	16	5	769	5% of 25% fines	0%	0%	0%	60.90	2	511,538	PF	PF
	pelican barge	30	16	45	769	5% of 5% fines	0%	0%	0%	1.20	2	193,846	Sand	Sand
(a)	filling barge (behind partial seawall)	44	16	32.27	769		45%	0%	45%	11.11	2	387,962	PF / Sand	0
	dump barge	14	16	5	769	5% of 25% fines	45%	0%	45%	33.49	2	281,346	PF	PF
	pelican barge	30	16	45	769	5% of 5% fines	45%	0%	45%	0.66	2	106,615	Sand	Sand
(a)	filling barge (behind full seawall)	44	16	32.27	769		80%	0%	80%	4.04	2	141,077	PF / Sand	0
	dump barge	14	16	5	769	5% of 25% fines	80%	0%	80%	12.18	2	102,308	PF	PF
	pelican barge	30	16	45	769	5% of 5% fines	80%	0%	80%	0.24	2	38,769	Sand	Sand
(b)	filling barge	44	16	32.27	769		0%	0%	0%	20.19	2	705,385	PF / Sand	0
	dump barge	14	16	5	769	5% of 25% fines	0%	0%	0%	60.90	2	511,538	PF	PF
	pelican barge	30	16	45	769	5% of 5% fines	0%	0%	0%	1.20	2	193,846	Sand	Sand
(b)	filling barge (behind partial seawall)	44	16	32.27	769		45%	0%	45%	11.11	2	387,962	PF / Sand	0
	dump barge	14	16	5	769	5% of 25% fines	45%	0%	45%	33.49	2	281,346	PF	PF
	pelican barge	30	16	45	769	5% of 5% fines	45%	0%	45%	0.66	2	106,615	Sand	Sand
(b)	filling barge (behind full seawall)	44	16	32.27	769		80%	0%	80%	4.04	2	141,077	PF / Sand	0
	dump barge	14	16	5	769	5% of 25% fines	80%	0%	80%	12.18	2	102,308	PF	PF
	pelican barge	30	16	45	769	5% of 5% fines	80%	0%	80%	0.24	2	38,769	Sand	Sand
(f)	filling barge	66	16	32.88	769		0%	0%	0%	19.29	2	1,028,000	PF / Sand	0
	dump barge	20	16	5	769	5% of 25% fines	0%	0%	0%	60.90	2	730,769	PF	PF
	pelican barge	46	16	45	769	5% of 5% fines	0%	0%	0%	1.20	2	297,231	Sand	Sand
(c)	filling barge	20	16	33.00	769		0%	0%	0%	19.11	2	309,692	PF / Sand	0
	dump barge	6	16	5	769	5% of 25% fines	0%	0%	0%	60.90	2	219,231	PF	PF
	pelican barge	14	16	45	769	5% of 5% fines	0%	0%	0%	1.20	2	90,462	Sand	Sand
(c)	filling barge (behind full seawall)	20	16	33.00	769		80%	0%	80%	3.82	2	61,938	PF / Sand	0
	dump barge	6	16	5	769	5% of 25% fines	80%	0%	80%	12.18	2	43,846	PF	PF
	pelican barge	14	16	45	769	5% of 5% fines	80%	0%	80%	0.24	2	18,092	Sand	Sand
(d)	filling barge (behind full seawall)	17	16	30.88	769		80%	0%	80%	4.45	2	58,062	PF / Sand	0
	dump barge	6	16	5	769	5% of 25% fines	80%	0%	80%	12.18	2	43,846	PF	PF
	pelican barge	11	16	45	769	5% of 5% fines	80%	0%	80%	0.24	2	14,215	Sand	Sand
(e)	filling barge	11	16	30.45	769		0%	0%	0%	22.91	2	191,385	PF / Sand	0
	dump barge	4	16	5	769	5% of 25% fines	0%	0%	0%	60.90	2	146,154	PF	PF
	pelican barge	7	16	45	769	5% of 5% fines	0%	0%	0%	1.20	2	45,231	Sand	Sand
(e)	filling barge (behind partial seawall)	11	16	30.45	769		45%	0%	45%	12.60	2	105,262	PF / Sand	0
	dump barge	4	16	5	769	5% of 25% fines	45%	0%	45%	33.49	2	80,365	PF	PF
	pelican barge	7	16	45	769	5% of 5% fines	45%	0%	45%	0.66	2	24,877	Sand	Sand
(g)	TSHD (9,000m3) filling	2	24	5	6,667	5% of 5% fines	0%	0%	0%	93.33	3	168,000	Sand	Sand
(h)	filling barge	36	16	32.78	769		0%	0%	0%	19.44	2	563,462	PF / Sand	PF
	dump barge	11	16	5	769	5% of 25% fines	0%	0%	0%	60.90	2	401,923	PF	PF
	pelican barge	25	16	45	769	5% of 5% fines	0%	0%	0%	1.20	2	161,538	Sand	Sand

Note All plants assume daily working for 16 hour, excep TSHD in which 24 hour is assumed ** per event time for barge or TSHD
Each pelican barge assumes unload in 45 minutes, each dump barge assumes unload in 5 minute.
Partial Seawall = substantially completed seawall with 200m leading edge.
Full Seawall = completed seawall with 50-100m opening gap for marine access.

Remark: For the details of the calcualtions of sediment loss rates for HKBCF (Sequence A or Sequence B), HKLR and TMCLKL, please refer to Appendices 9D5 and 9E.



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HIGHWAYS DEPARTMENT
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Hong Kong - Zhuhai - Macao Bridge
Hong Kong Project Management Office

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Ove Arup & Partners
Hong Kong Limited

Drawing Title

Envisaged Programmed of Reclamation & Sediment Loss Rates (Unmitigated) for HKBCF (Sequence A)+HKLR+TMCLKL

Drawing No.

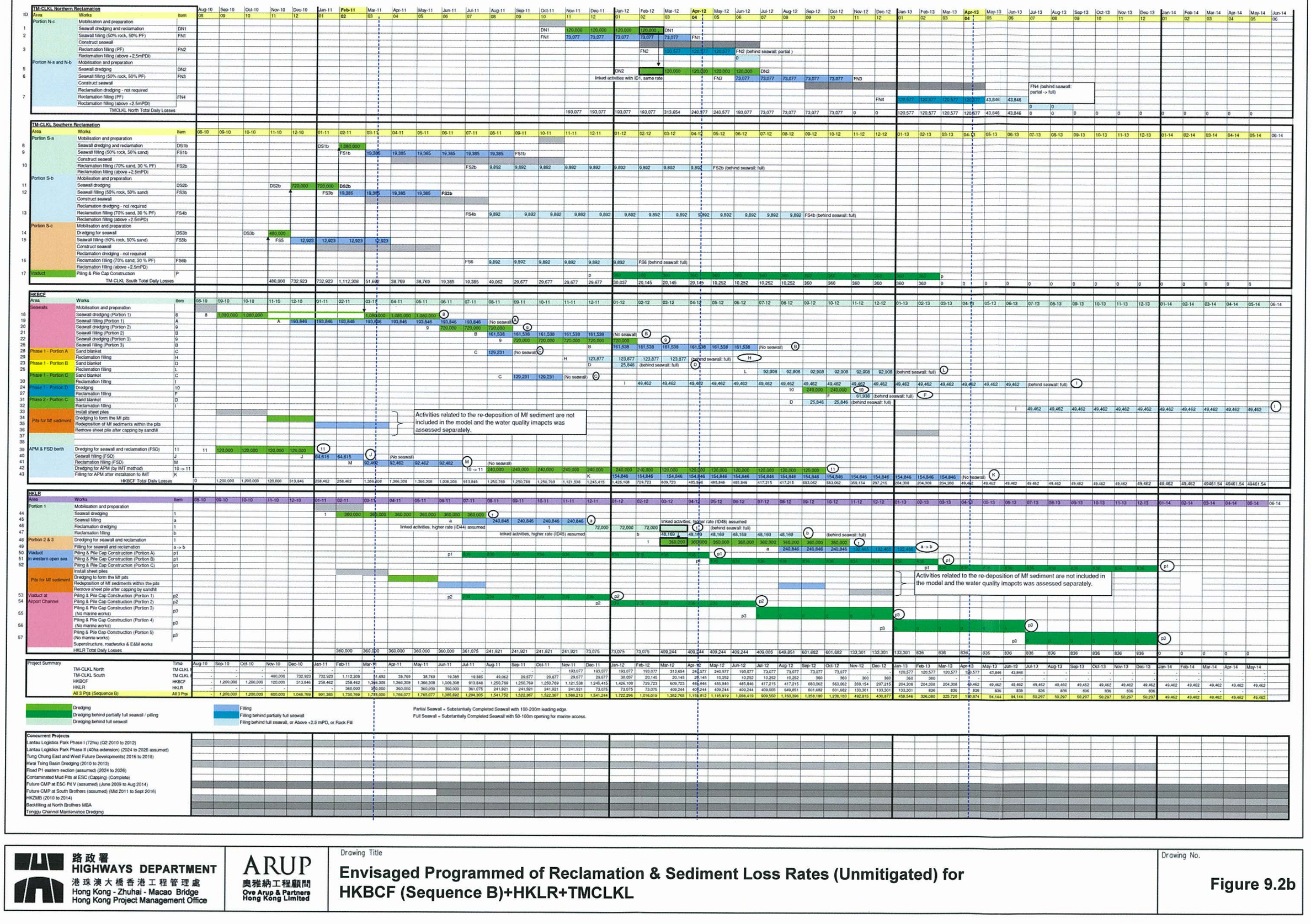
Figure 9.2a

HKBCF Sediment Loss Rates - No Mitigation (Sequence B)

Work Item	Plant	No. of Plant	Daily Work Time (Hr)	Working Rate: per Grab or TSHD (m3/day) or per Barge (per trip)	Loss Rate (kg/m3)	Reduction Due to Seawalls	Reduction Due to Silt Curtain	Combined Mitigaiton Reduction	Sediment Losses (kg/s) per grab, TSHD or barge	No. of events per grab/barge per day	Total Losses (kg/day) all plant	Material Given	Material Assumed
Dredging													
(8)	grab dredger (11 m3)	9	16	6,000	20	0%	0%	0%	2.08		1,080,000	-	-
(9)	grab dredger (11 m3)	6	16	6,000	20	0%	0%	0%	2.08		720,000	-	-
(10)	grab dredger (11 m3)	2	16	6,000	20	0%	0%	0%	2.08		240,000	-	-
(11)	grab dredger (11 m3)	1	16	6,000	20	0%	0%	0%	2.08		120,000	-	-
Filling													
(A)	filling barge	30	16	769	5% of 5% fines	0%	0%	0%	1.20	2	193,846	Sand	Sand
	dump barge	0	16	769	5% of 25% fines	0%	0%	0%	60.90	2	0	PF	PF
	pelican barge	30	16	769	5% of 5% fines	0%	0%	0%	1.20	2	193,846	Sand	Sand
(B)	filling barge	25	16	769	5% of 5% fines	0%	0%	0%	1.20	2	161,538	Sand	Sand
	dump barge	0	16	769	5% of 25% fines	0%	0%	0%	60.90	2	0	PF	PF
	pelican barge	25	16	769	5% of 5% fines	0%	0%	0%	1.20	2	161,538	Sand	Sand
(C)	filling barge	20	16	769	5% of 5% fines	0%	0%	0%	1.20	2	129,231	Sand	Sand
	dump barge	0	16	769	5% of 25% fines	0%	0%	0%	60.90	2	0	PF	PF
	pelican barge	20	16	769	5% of 5% fines	0%	0%	0%	1.20	2	129,231	Sand	Sand
(D)	filling barge (behind full seawall)	20	16	769	5% of 5% fines	80%	0%	80%	0.24	2	25,846	Sand	Sand
	dump barge	0	16	769	5% of 25% fines	80%	0%	80%	12.18	2	0	PF	PF
	pelican barge	20	16	769	5% of 5% fines	80%	0%	80%	0.24	2	25,846	Sand	Sand
(E)	filling barge (not in programme)	20	16	769	5% of 5% fines	0%	0%	0%	19.11	2	309,692		
	dump barge	6	16	769	5% of 25% fines	0%	0%	0%	60.90	2	219,231	PF	PF
	pelican barge	14	16	769	5% of 5% fines	0%	0%	0%	1.20	2	90,462	Sand	Sand
(F)	filling barge (behind full seawall)	20	16	769	5% of 5% fines	80%	0%	80%	3.82	2	61,938		
	dump barge	6	16	769	5% of 25% fines	80%	0%	80%	12.18	2	43,846	PF	PF
	pelican barge	14	16	769	5% of 5% fines	80%	0%	80%	0.24	2	18,092	Sand	Sand
(L)	filling barge (behind full seawall)	30	16	769	5% of 5% fines	80%	0%	80%	3.82	2	92,908		
	dump barge	9	16	769	5% of 25% fines	80%	0%	80%	12.18	2	65,769	PF	PF
	pelican barge	21	16	769	5% of 5% fines	80%	0%	80%	0.24	2	27,138	Sand	Sand
(H)	filling barge (behind full seawall)	40	16	769	5% of 5% fines	80%	0%	80%	3.82	2	123,877		
	dump barge	12	16	769	5% of 25% fines	80%	0%	80%	12.18	2	87,692	PF	PF
	pelican barge	28	16	769	5% of 5% fines	80%	0%	80%	0.24	2	36,185	Sand	Sand
(I)	filling barge (behind full seawall)	15	16	769	5% of 5% fines	80%	0%	80%	4.22	2	49,462		
	dump barge	5	16	769	5% of 25% fines	80%	0%	80%	12.18	2	36,538	PF	PF
	pelican barge	10	16	769	5% of 5% fines	80%	0%	80%	0.24	2	12,923	Sand	Sand
(J)	filling barge	10	16	769	5% of 5% fines	0%	0%	0%	1.20	2	64,615		
	dump barge	0	16	769	5% of 25% fines	0%	0%	0%	60.90	2	0	PF	PF
	pelican barge	10	16	769	5% of 5% fines	0%	0%	0%	1.20	2	64,615	Sand	Sand
(K)	filling barge	10	16	769	5% of 5% fines	0%	0%	0%	19.11	2	154,846		
	dump barge	3	16	769	5% of 25% fines	0%	0%	0%	60.90	2	109,615	PF	PF
	pelican barge	7	16	769	5% of 5% fines	0%	0%	0%	1.20	2	45,231	Sand	Sand
(M)	filling barge	5	16	769	5% of 5% fines	0%	0%	0%	25.08	2	92,462		
	dump barge	2	16	769	5% of 25% fines	0%	0%	0%	60.90	2	73,077	PF	PF
	pelican barge	3	16	769	5% of 5% fines	0%	0%	0%	1.20	2	19,385	Sand	Sand

Note All plants assume daily working for 16 hour, excep TSHD in which 24 hour is assumed ** per event time for barge or TSHD
Each pelican barge assumes unload in 45 minutes, each dump barge assumes unload in 5 minute.
Partial Seawall = substantially completed seawall with 200m leading edge.
Full Seawall = completed seawall with 50-100m opening gap for marine access.

Remark: For the details of the calcualtions of sediment loss rates for HKBCF (Sequence A or Sequence B), HKLR and TMCLKL, please refer to Appendices 9D5 and 9E.



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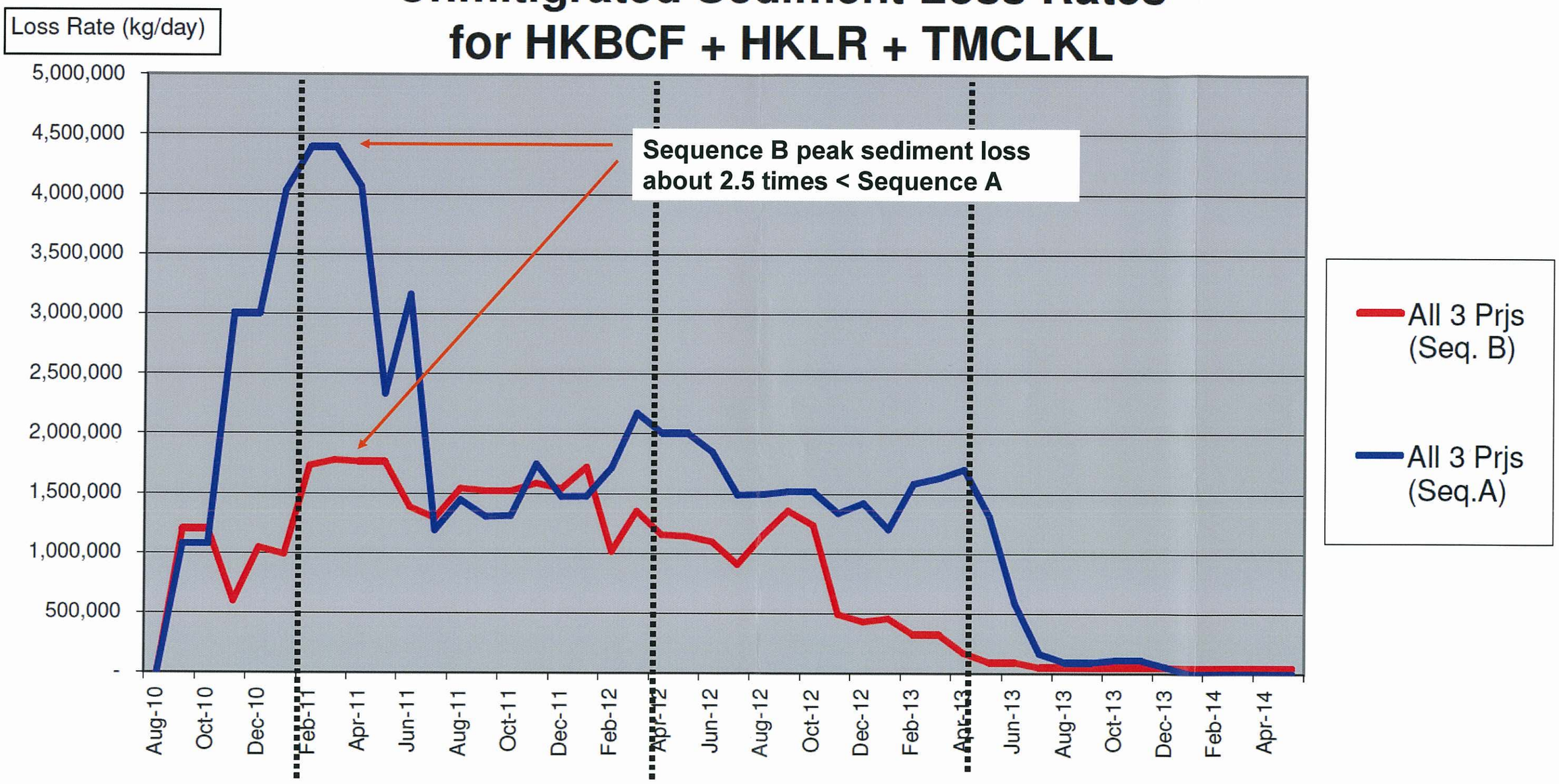
Drawing Title

Envisaged Programmed of Reclamation & Sediment Loss Rates (Unmitigated) for HKBCF (Sequence B)+HKLR+TMCLKL

Drawing No.

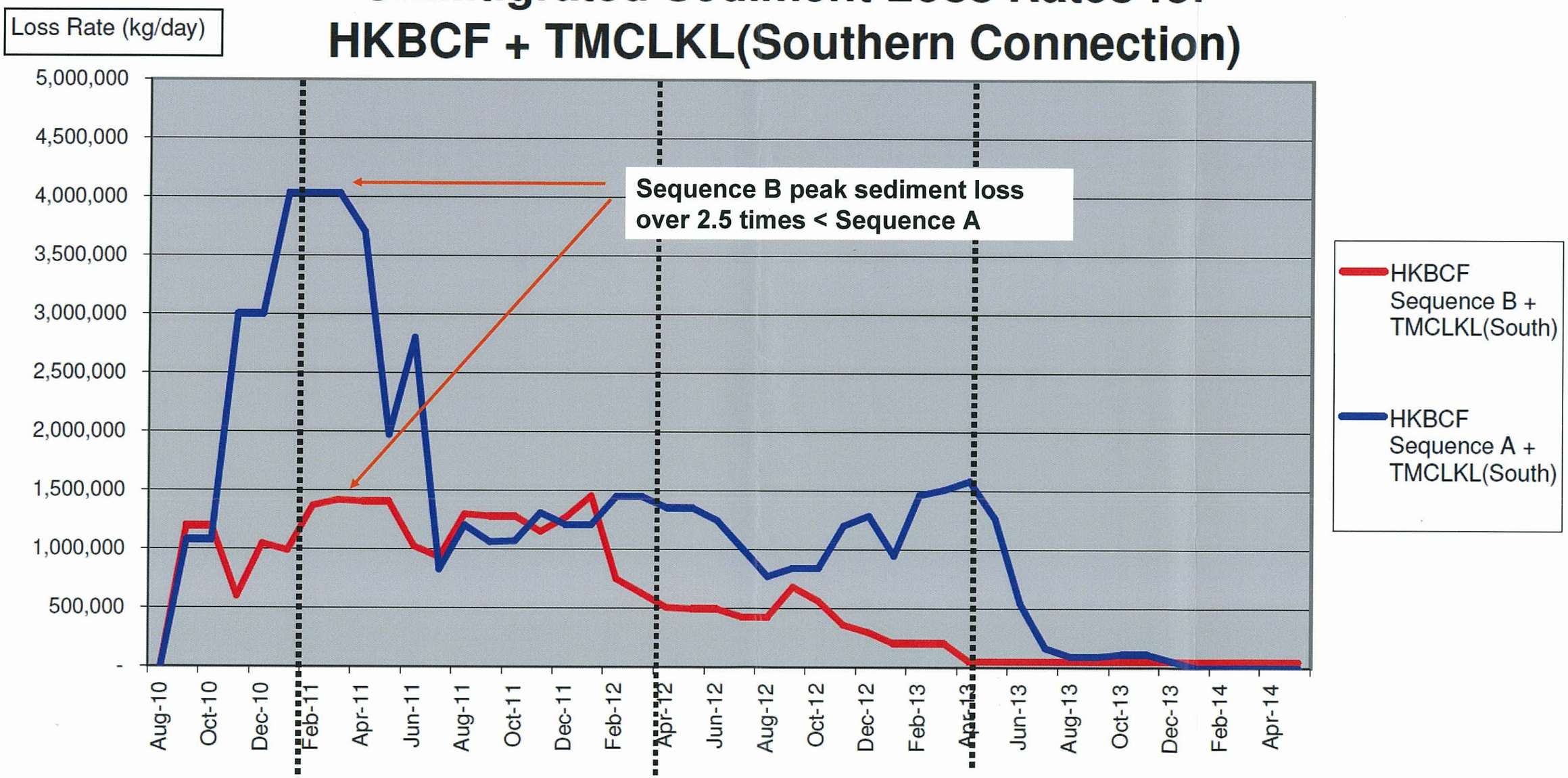
Figure 9.2b

Unmitigrated Sediment Loss Rates for HKBCF + HKLR + TMCLKL



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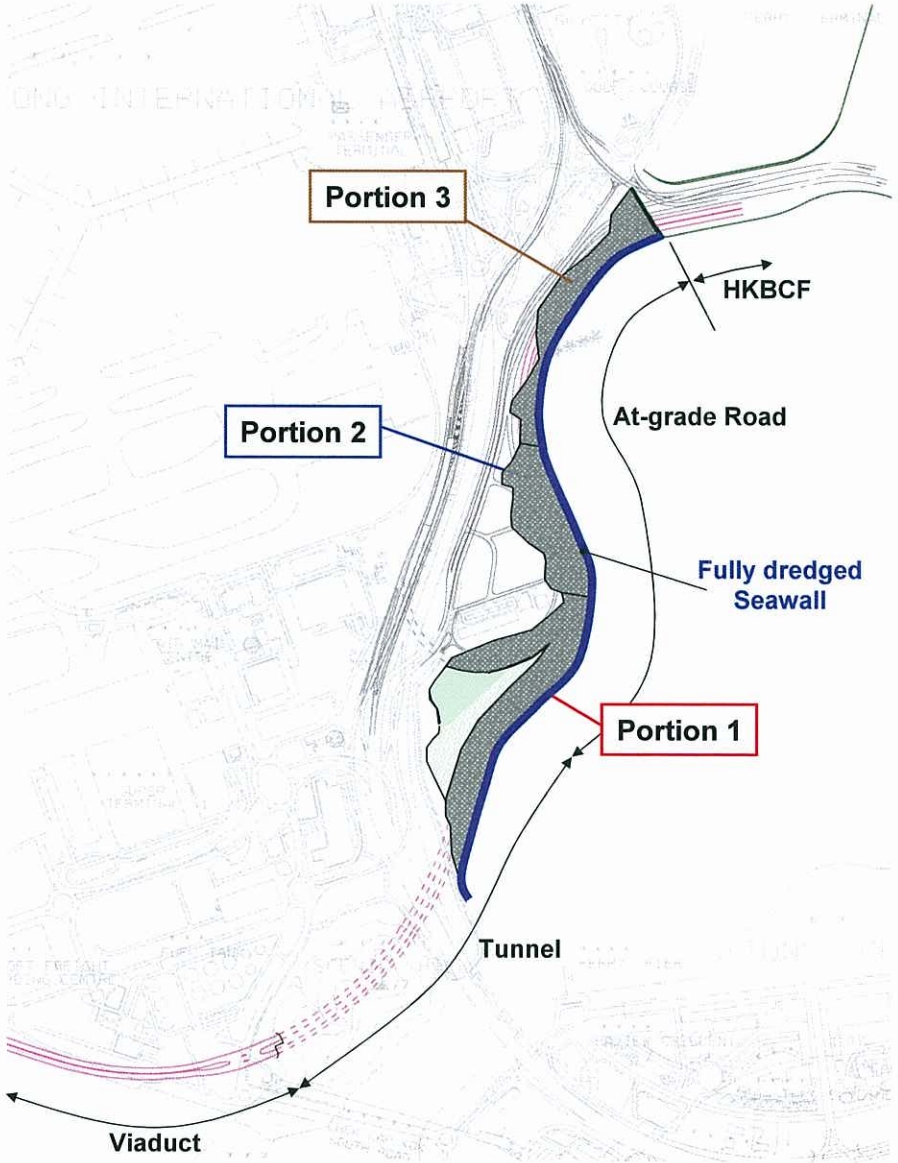
Unmitigrated Sediment Loss Rates for HKBCF + TMCLKL(Southern Connection)



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APPENDIX 9C

Construction Sequence and Construction Programme – HKLR Reclamation



Seawall – Fully Dredged

Reclamation:

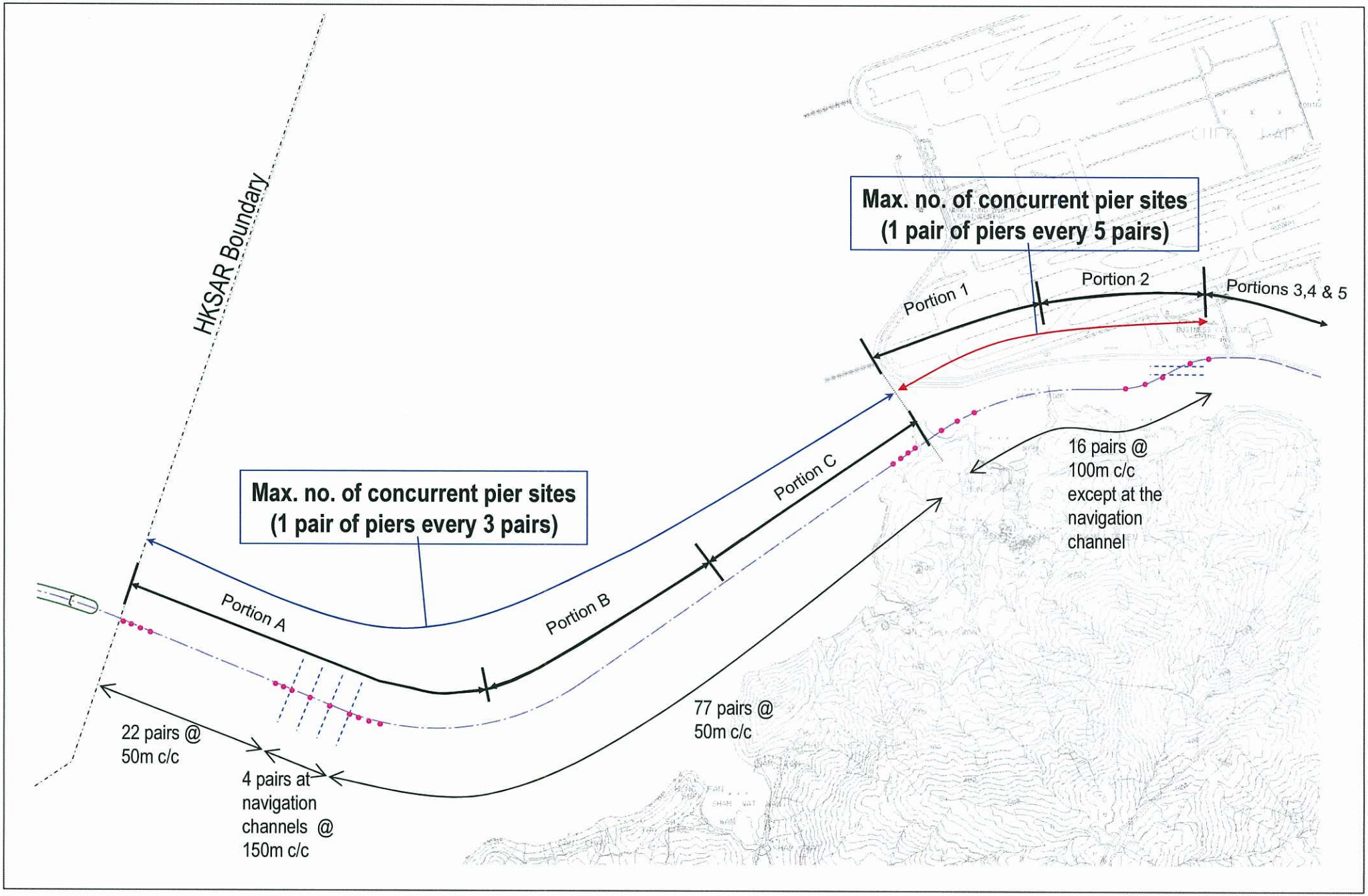
Portion 1
- Full-dredged at seawall, tunnel area and mud pit to receive Mf sediment
- Non-dredged at other area

Portion 2 - Fully Dredged
Portion 3 - Fully Dredged

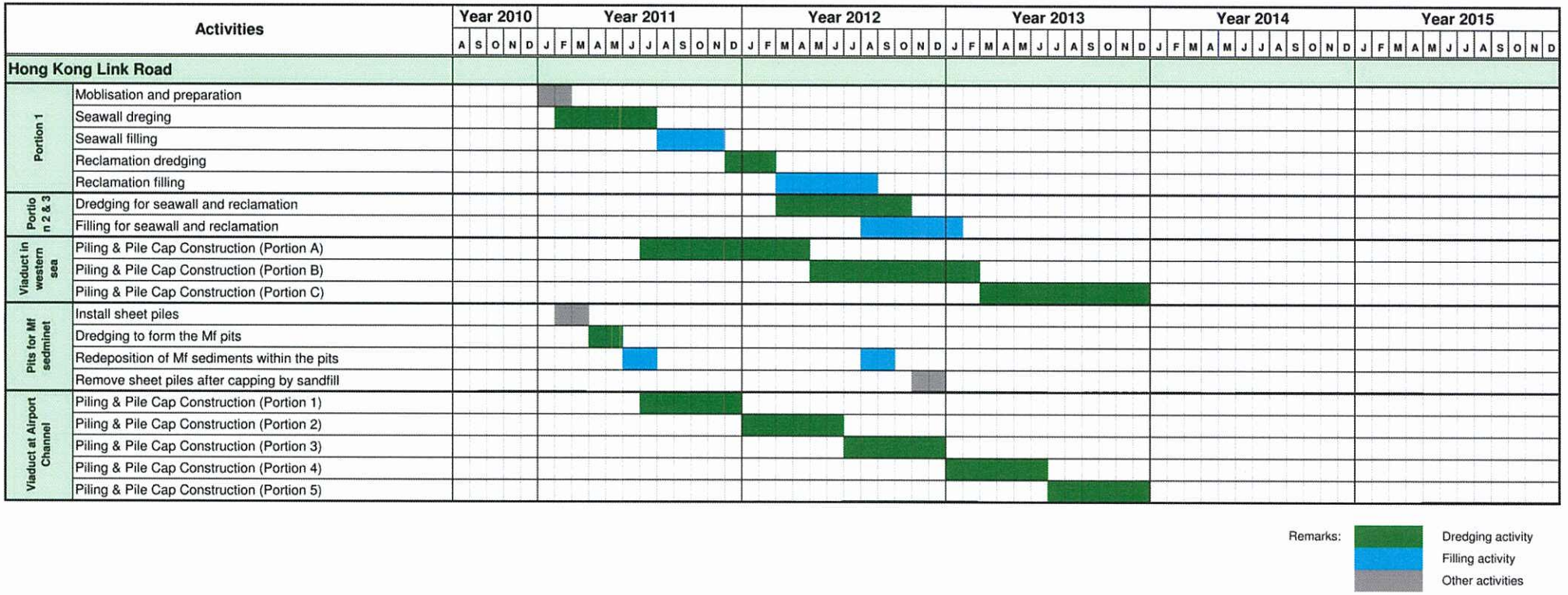
Fully dredged

Reclamation area to received dredged Mf sediment within the site

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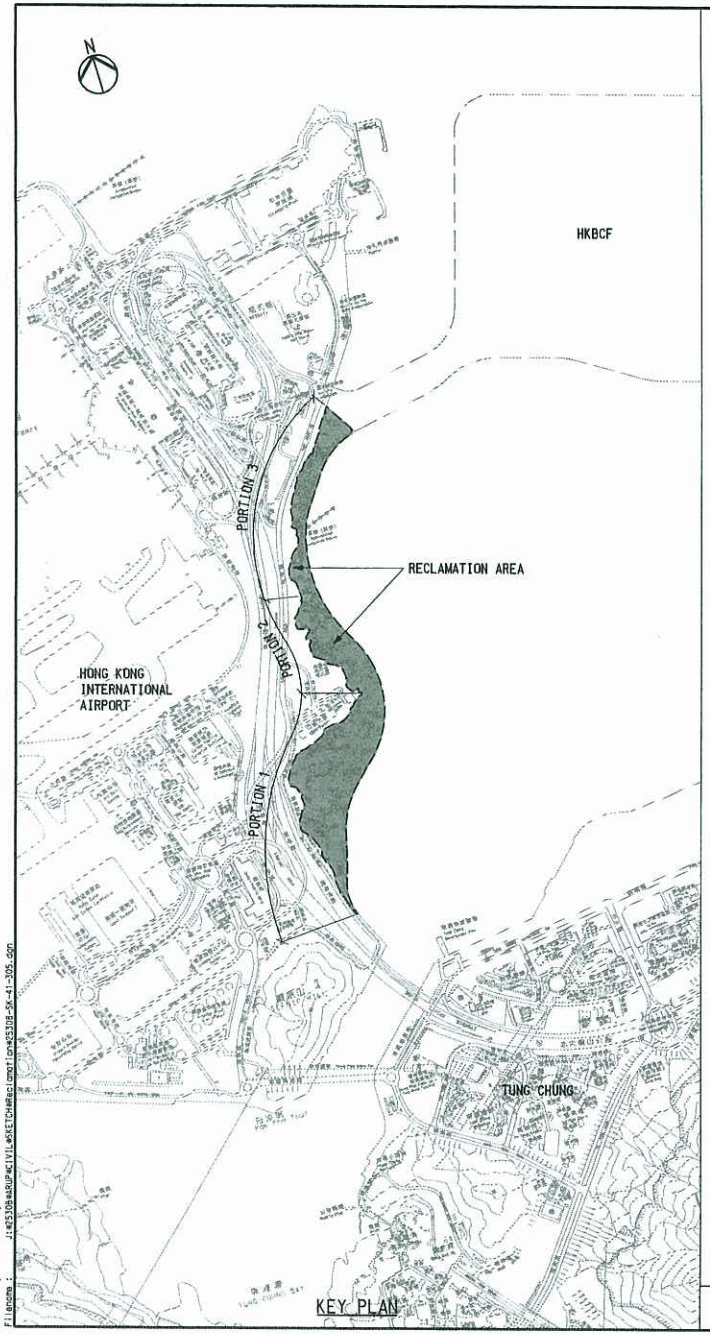
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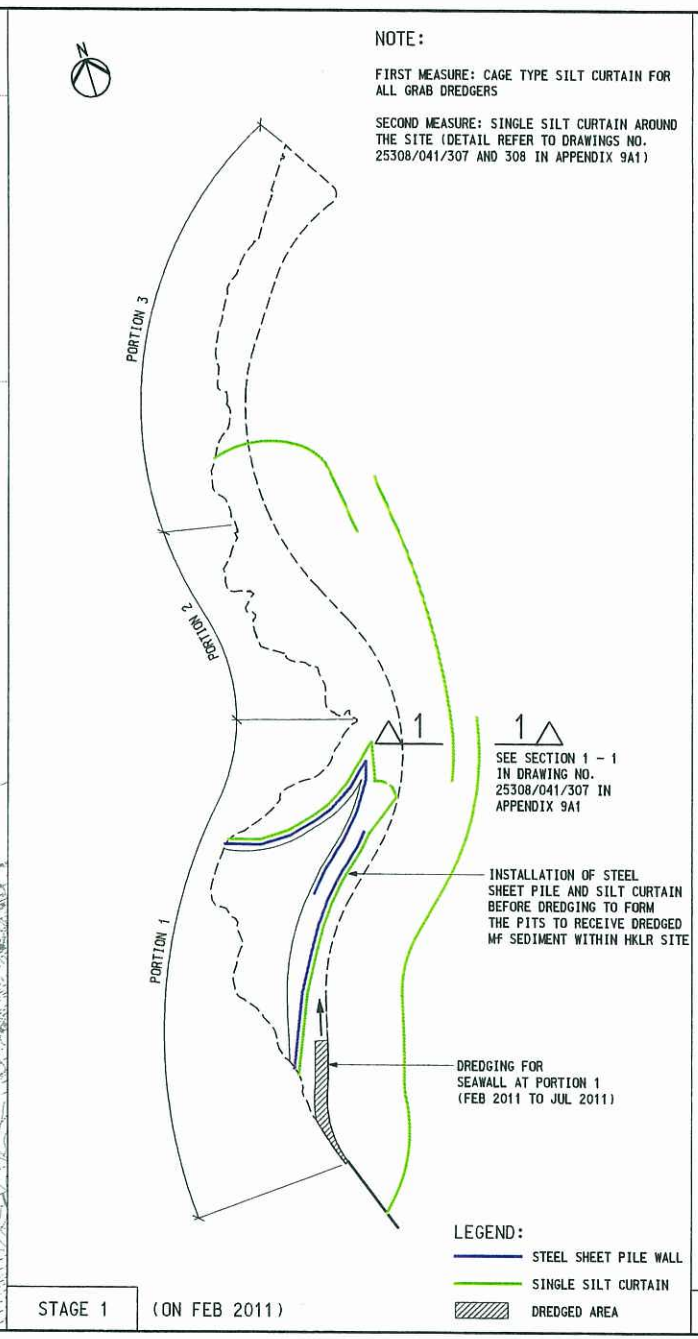
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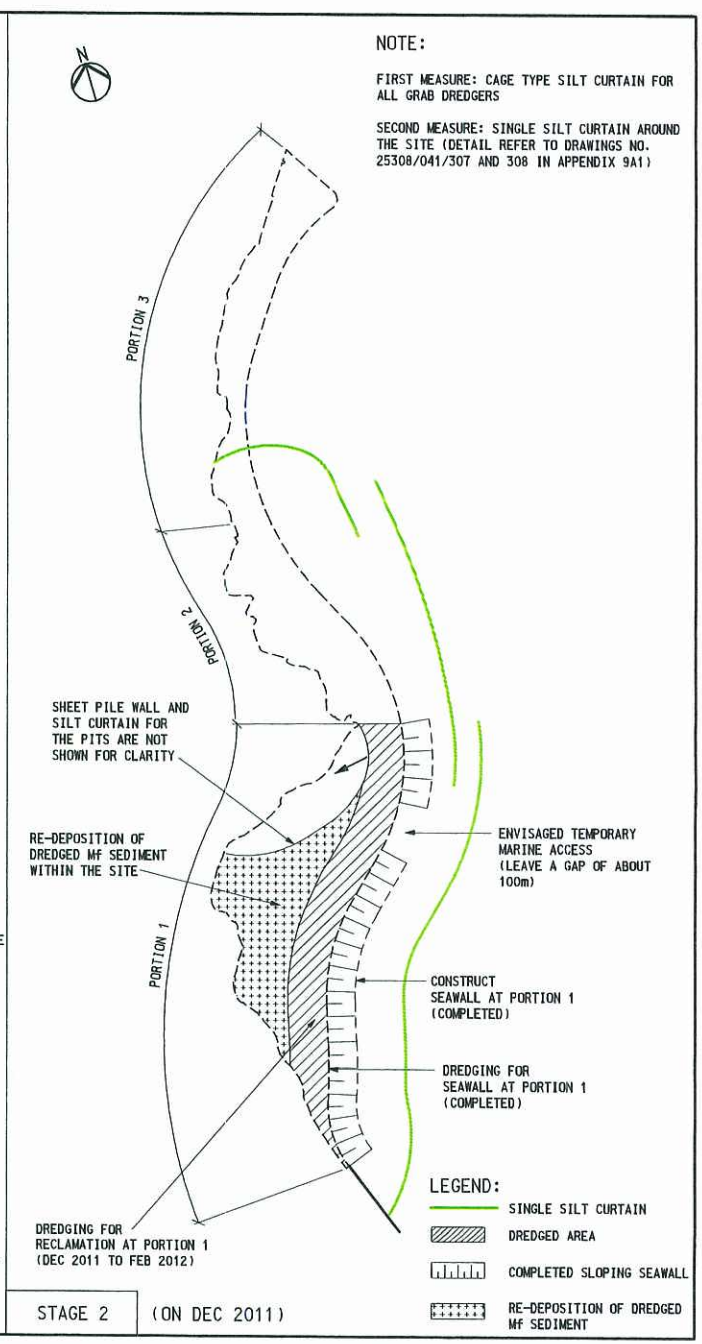
Envisaged Program for HKLR Reclamation and Foundation Work of Viaducts

Drawing No.

Figure 9C-3







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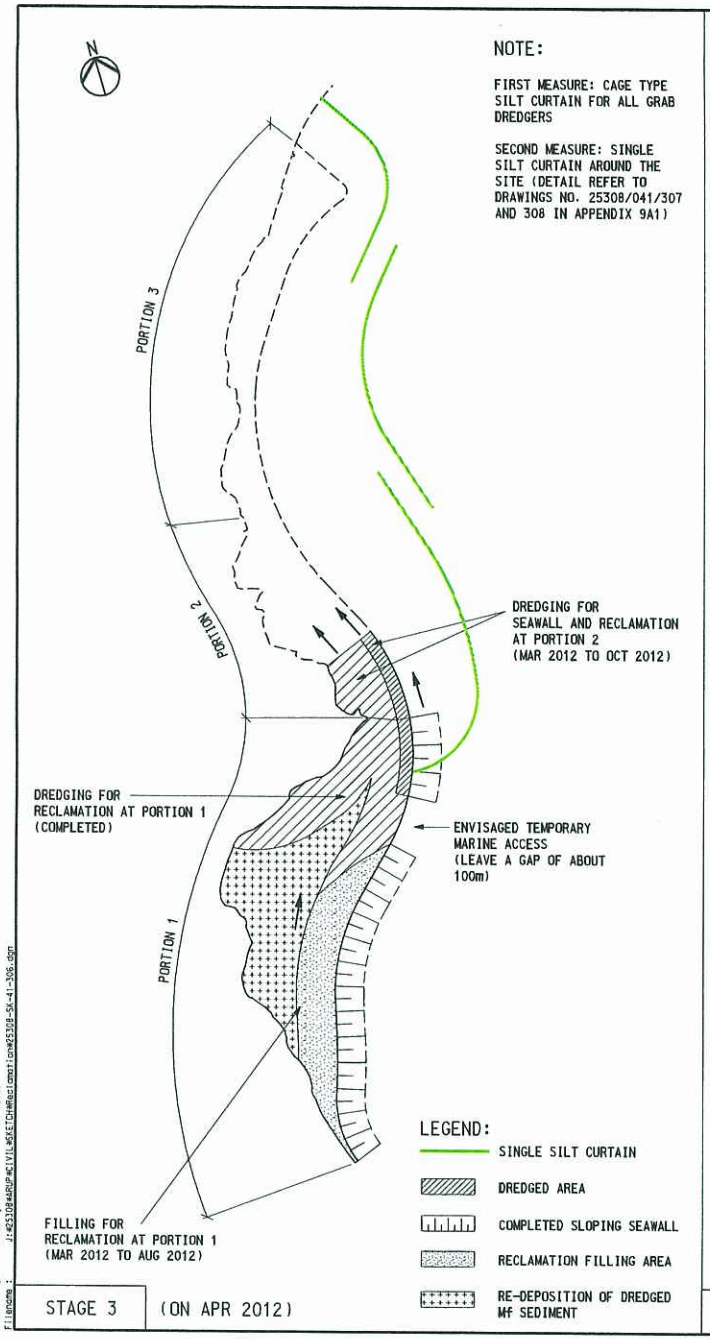
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Agreement No. CE 14/2008 (CE)
Hong Kong-Zhuhai-Macao Bridge Hong Kong
Boundary Crossing Facilities – Investigation

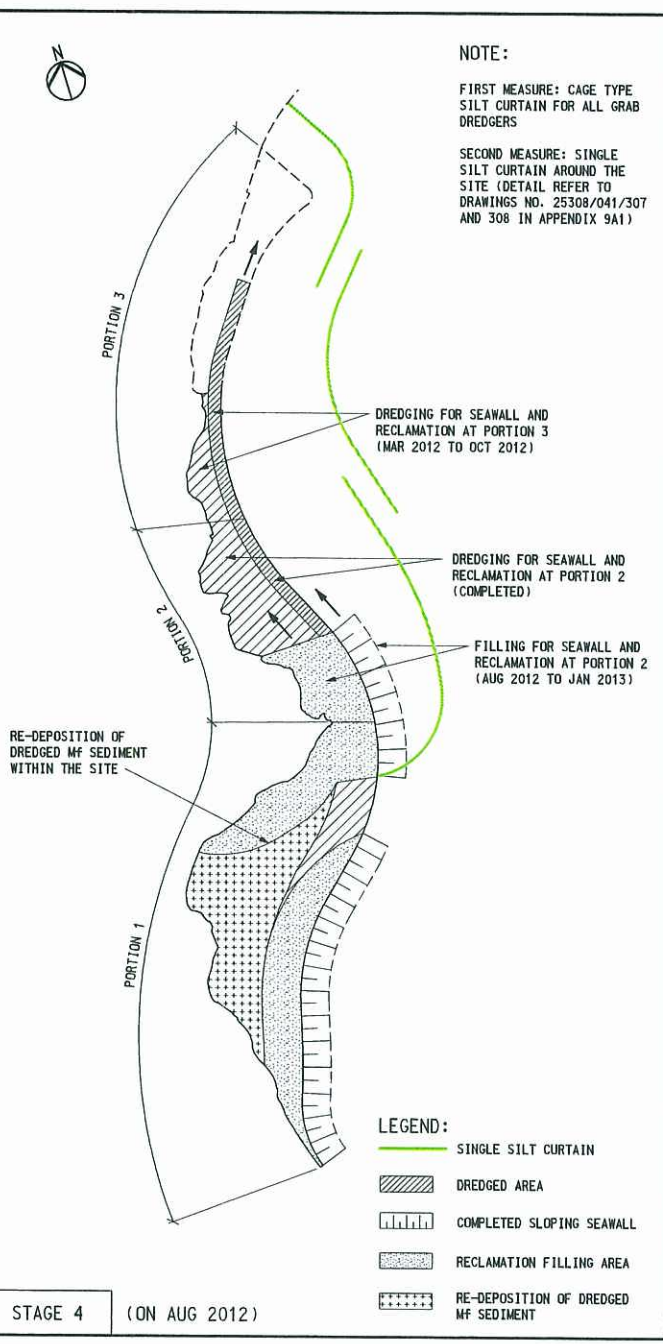
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ANTICIPATED CONSTRUCTION SEQUENCE OF HKLR

Rev.	Description	Date
A	FIRST ISSUE	02/09

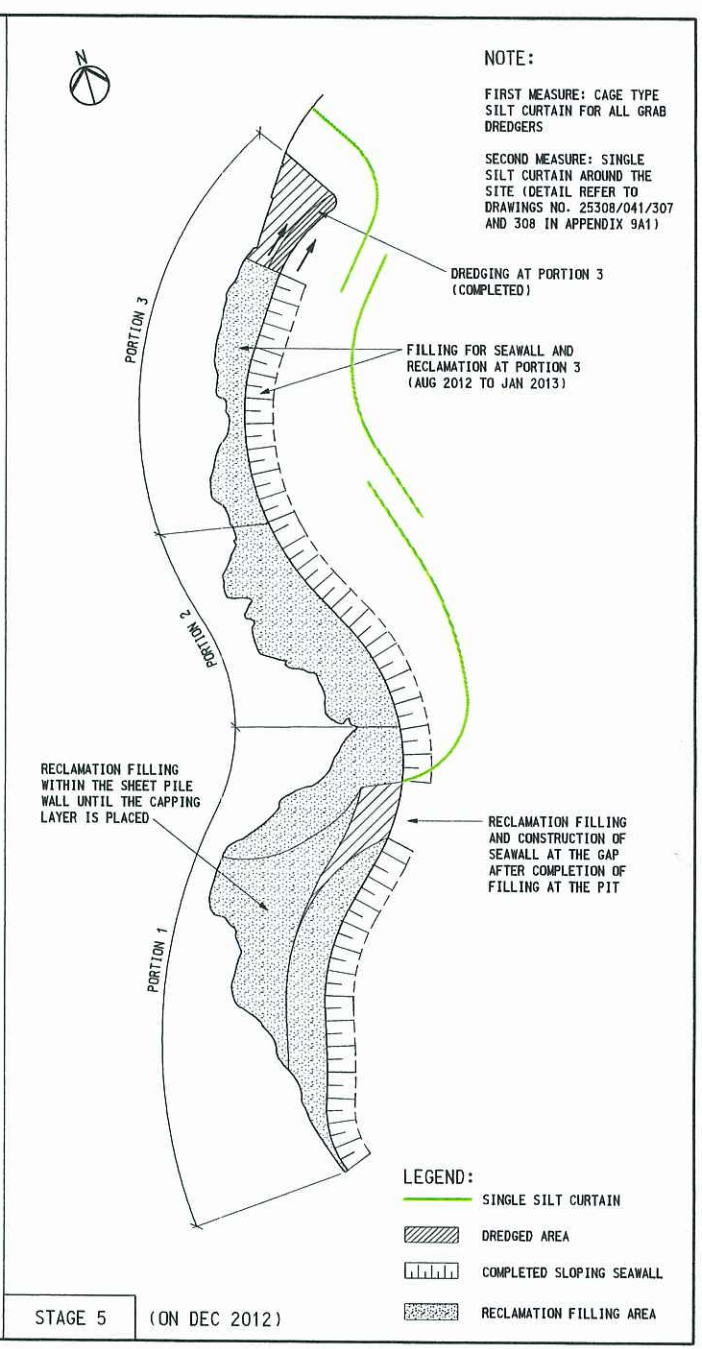
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Checked	SK	Approved	AK
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Status	PRELIMINARY	Rev.	A



STAGE 3 (ON APR 2012)



STAGE 4 (ON AUG 2012)



STAGE 5 (ON DEC 2012)

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Filename : J:\#25308#ARUP#civil\#9#ETD#Reclamation#25308-SK-41-306.dgn

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Drawing Title
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Rev.	Description	Date
A	FIRST ISSUE	02/09

Drawn	AL	Date	02/09
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Scale	1:10000 on A3	Drawing No.	25308/041/306
Status	PRELIMINARY	Rev.	A

APPENDIX 9D1

Sediment Testing Results for TM-CLKL

APPENDIX D1

SEDIMENT TESTING RESULTS

FOR TM-CLKL

D1-1 METHODOLOGY AND SCOPE

D1-1.1 The survey vessel was equipped with dGPS to ensure accurate positioning. At the sampling stations, sediment samples were collected using both vibrocore and/or surface grab. Vibrocores with internal diameter of 100mm with plastic lining were used to collect the sediment samples. Each vibrcore was pushed to penetrate the entire length of soft marine deposits (i.e., marine mud) of the specified location. The sediment depth was checked by visual observation of vibrocores and strata-logging was conducted on-site by geologists. Vibrocore sub-sampling was conducted according to **Table D1.1**. A reference sediment (surface grab) of ~30L was collected at Port Shelter (PS6, E850234, N820057).

Table D1.1 Vibrocore Sub-sampling and Laboratory Testing

Laboratory Testing	Depth of Sub-sample
Chemical and/or biological testing (ETWB 34/2002) – Sediment and Elutriate	0-1m below seabed Mid depths of vibrocore (1m) Bottom level of vibrocore (1m)
Inorganic Chemical testing – Sediment and Elutriate	Seabed Level 1m below mid-depths of vibrocore 1m above bottom level of vibrocore

D1-1.2 Once a vibrocore sample was retrieved from the site, the core with the plastic lining intact was cut into 1m sections with both end sealed with tin foil and plastic cap. For surface grab samples, food-grade plastic bags were used to contain the samples. For ambient marine water samples, a niskin sampler (or equivalent) was used to collect adequate amount of marine water for testing and running of elutriate procedure. The testing laboratory provided pre-cleaned containers for the marine water samples. The vibrocore tubes, grab sampler and niskin sampler were washed with adequate amount of ambient marine water before each deployment to minimise possible cross-contamination.

D1-1.3 The sectioned cores, grab and water samples were immediately stored in a refrigerator or ice chest on board with adequate amount of ice to keep the sample cool to 0°C (without freezing) to 4°C in dark. The samples were also kept at 0°C (without freezing) to 4°C in dark during shipment to the testing laboratory. To avoid undue temperature fluctuation and possible contamination, the duration of on-site storage were minimised and daily delivery of the collected samples to be testing laboratory was arranged. All the samples were appropriately labelled with unique code to indicate the date, station, sampling method, and sampling depth of each sample.

Chemical and Biological Screening

D1-1.4 At each station, marine sediment and ambient water were collected and tested for a suit of chemical parameters as summarised in Table D1.2. The reference sediment was also tested for comparison. Chemical screening parameters included:

- 9 metals/metalloid: cadmium, chromium, copper, mercury, nickel, lead, silver, zinc and arsenic for all vibrocore sub-samples.

- 3 organic micro-pollutants: polyaromatic hydrocarbons (PAHs) (low and high molecular weights), polychlorinated biphenyls (PCBs) (total), tributyltin (TBT) (in pore water) for all vibrocore sub-samples; and
- Chlorinated pesticides only for all grab samples.

D1-1.5 Biological screening parameters included:

- 10-day burrowing amphipod toxicity test;
- 20-day burrowing polychaete toxicity test; and
- 48-96 hours larvae (bivalve or echinoderm) toxicity test.

D1-1.6 Based on the chemical test results, the necessity and arrangement of biological tests were concluded, with a proposal of testing schedule. All analytical methods were based on the U.S. Environmental Protection Agency (U.S. EPA) or equivalent. Ancillary testing parameters including moisture content, grain size (<63 µm), total organic carbon, ammonia (as mg N/L), and salinity in porewater were analysed for those samples (composited) undergoing biological testing.

Table D1.2: Summary of Laboratory Testing

Contaminant of Concern	Reporting Limit	Unit
Sediment:		
Metals		
Cadmium (Cd)	0.2	mg/kg dry weight
Chromium (Cr)	8	mg/kg dry weight
Copper (Cu)	7	mg/kg dry weight
Mercury (Hg)	0.05	mg/kg dry weight
Nickel (Ni)	4	mg/kg dry weight
Lead (Pb)	8	mg/kg dry weight
Silver (Ag)	0.1	mg/kg dry weight
Zinc (Zn)	20	mg/kg dry weight
Metalloid		
Arsenic (As)	1	mg/kg dry weight
Micro-organics		
Low Molecular Weight PAHs	55	mg/kg dry weight
High Molecular Weight PAHs	170	mg/kg dry weight
Total PCBs	3	mg/kg dry weight
Tributyltin (in porewater)	0.015	µg/l
Chlorinated Pesticides	0.5	mg/kg dry weight
Nutrient		
Ammonia Nitrogen (NH_4-N)	0.1	mg N/kg dry weight
Total Kjeldahl Nitrogen (TKN)	50	mg N/kg dry weight
Nitrate Nitrogen (NO_3-N)	1	mg N/kg dry weight
Nitrite Nitrogen (NO_2-N)	1	mg N/kg dry weight
Total Phosphorus (TP)	10	mg P/kg dry weight
Marine Water, Elutriate and Porewater:		
Metals		
Cadmium (Cd)	0.2	µg/l
Chromium (Cr)	1	µg/l
Copper (Cu)	1	µg/l
Mercury (Hg)	0.1	µg/l
Nickel (Ni)	1	µg/l
Lead (Pb)	1	µg/l

Contaminant of Concern	Reporting Limit	Unit
Silver (Ag)	1	µg/l
Zinc (Zn)	4	µg/l
Metalloid		
Arsenic (As)	2	µg/l
Micro-organics		
Low Molecular Weight PAHs	0.2	µg/l
High Molecular Weight PAHs	0.2	µg/l
Total PCBs	0.01	µg/l
Tributyltin	0.015	µg/l
Chlorinated Pesticides	0.1	µg/l
Nutrient		
Ammonia Nitrogen (NH_4-N)	0.025	mg N/l
Total Kjeldahl Nitrogen (TKN)	1	mg N/l
Nitrate Nitrogen (NO_3-N)	0.025	mg N/l
Nitrite Nitrogen (NO_2-N)	0.025	mg N/l
Total Phosphorus (TP)	0.1	mg N/l
Orthophosphate (OP)	0.1	mg P/l
Biological Testing:		
10 Day amphipod toxicity	-	-
20-day polychaete (*Neanthes arenaceodentata*) toxicity	-	-
48-96 hour bivalve (or echinoderm) larvae toxicity	-	-

Elutriate and Porewater Tests

D1-1.7 The elutriate test (USACE, 1976) is a procedure developed to simulate the release of dissolved contaminants from a dredged disposal operation in open waters, and may be considered a laboratory simulation of release of dissolved contaminants from a mechanical dredged disposal operation (USEPA and USACE, 1998). Ambient marine water was collected at mid-depth of each monitoring station and used for elutriate test. The ambient marine water and sediment samples of the same station were mixed in a ratio of 1:4 sediment:water. The mixture was mechanically shaken vigorously for 30 minutes and allowed to settle undisturbed for 1 hour. The liquid phase was centrifuged or filtered through a 45 µm filter to remove all suspended particulate matter. The extracted liquid filtrate was the elutriate to be used for further test.

D1-1.8 While contaminants may be released from the sediment during the elutriate process, it is also possible that contaminants in the water column be absorbed into the sediment during the process. To allow for evaluation of this possibility, the ambient marine water was tested for the same suit of metallic, metalloid, micro-organic and nutrient parameters as listed in Table D1.2.

D1-1.9 Preparation of pore water for sediment samples was conducted in accordance with the "Method for Collection, Storage and Manipulation of Sediments for Chemical and Toxicological Analyses: Technical Manual, USEPA 2001". Porewater samples were prepared by sub-sampling sufficient amount of grab sediment in a pre-cleaned container in the laboratory and centrifuged at a rotation speed at 3,000 rpm for approximately 10 minutes. After that, the supernatant was decanted without disturbing the sediment material. The porewater testing parameters and assessment were the same as those for elutriate samples as shown in Table D1.2.

QA/QC Requirements

D1-1.10 All the tests were commenced within 2 weeks of sample collection and/or within the allowable holding time for the relevant referenced standard methods. Field logs and site diary were maintained for all on-site sampling works with date, equipment used, site activities and observations undertaken as far as possible. Any deviation from the standard procedures and the reasons were recorded in the logs. Laboratory QA/QC requirements, including analyses by HOKLAS accredited laboratory, certified reference materials, spike recovery, blank samples, duplicate samples (for every 20 samples), negative/positive control for biological test, proper documentation (e.g. completion of chain-of-custody forms, analysis request forms), etc. were strictly followed.

D1-2 SEDIMENT QUALITY TESTING RESULTS

Chemical Screening

D1-2.1 The results of chemical screening of sediment samples are summarised in Table D1.3. There were 23 sediment sub-samples at the 10 vibrocore locations near the proposed route alignment and reclamation landings of the TM-CLKL. With reference to the chemical tests under the ETWB TC(W) No.34/2002, 18 samples exhibited compliance with the LCEL, but 5 samples showed exceedance of LCEL, which required biological tests to confirm their disposal options. The chemical exceedance included metal (Pb), metalloid (As) and micro-organic pollutants (high molecular weight PAHs) concentrations. The levels of all chemical parameters in the other sub-samples were determined to range:

- <0.20-0.40 mg/kg for cadmium;
- 25-50 mg/kg for chromium;
- 10-52 mg/kg for copper;
- 12-25 mg/kg for nickel;
- 25-54 mg/kg for lead;
- 36-120 mg/kg for zinc;
- <0.05-0.22 mg/kg for mercury;
- 6.0-20 mg/kg for arsenic;
- <0.1-0.5 mg/kg for silver.
- <0.015 µg/l in interstitial water for tributyltin;
- <55-190 µg/kg for low molecular weight PAHs (total);
- <170-3,000 µg/kg for high molecular weight PAHs (total); and
- <3 µg/kg for total PCBs.

Table D1.3: Chemical Screening Results of Sediment

Sample Reference		Heavy Metals[1] (mg/kg)								Metalloid[1] (mg/kg)	Organo-metallics (µg/L in porewater)	Organic PAHs (µg/kg)		Organic non-PAHs (µg/kg)	Classification Under ETWB TC(W) 34/2002
Drillhole No.	Depth (m) From-To	Cd	Cr	Cu	Pb	Hg	Ni	Zn	Ag	As	TBT	Total LMW PAH	Total HMW PAH	Total PCB	
AN01	0.0-0.9m	0.22	41	48	54	0.18	24	120	0.50	11	<0.015	<55	<170	<3.0	Category L
AN01	0.9-1.9m	0.22	43	41	50	0.22	25	110	0.48	11	<0.015	<55	<170	<3.0	Category L
AN02	0.0-0.9m	<0.20	25	10	29	0.11	15	61	<0.10	8.2	<0.015	190	630	<3.0	Category L
AN02	1.9-2.9m	<0.20	25	11	31	0.07	15	62	<0.10	7.9	<0.015	<55	<170	<3.0	Category L
AN03	0.0-0.9m	0.22	42	52	52	0.23	24	110	0.36	12	<0.015	<55	<170	<3.0	Category L
AS01	0.1-0.9m	0.26	35	30	45	0.10	22	96	0.25	12	<0.015	<55	<170	<3.0	Category L
AS01	12.0-12.9m	0.40	31	16	51	0.07	19	84	0.10	***16***	<0.015	<55	<170	<3.0	Category M
AS02	0.2-0.9m	<0.20	42	27	48	0.21	27	86	0.12	***14***	<0.015	<55	<170	<3.0	Category M
AS02	6.0-6.9m	<0.20	33	11	31	<0.05	22	67	<0.10	7.5	<0.015	<55	<170	<3.0	Category L
AS02	8.9-9.4m	<0.20	41	12	24	0.06	12	71	<0.10	7.3	--[2]	<55	<170	<3.0	Category L
LS01	0.2-0.9m	<0.20	32	13	32	0.05	23	83	<0.10	9.0	<0.015	220	1100	<3.0	Category L
LS01	8.9-9.9m	<0.20	35	12	32	<0.05	23	72	<0.10	7.0	--[2]	<55	<170	<3.0	Category L
LS01	12.0-12.9m	<0.20	35	12	32	<0.05	23	71	<0.10	6.3	--[2]	<55	<170	<3.0	Category L
LS02	0.0-0.9m	<0.20	31	12	31	0.08	21	76	<0.10	8.0	<0.015	<55	<170	<3.0	Category L
LS02	8.9-9.9m	<0.20	32	12	31	0.07	21	66	<0.10	6.4	<0.015	<55	<170	<3.0	Category L
LS02	12.0-12.9m	<0.20	30	13	34	0.06	19	66	<0.10	11	<0.015	<55	<170	<3.0	Category L
LS03	0.0-0.9m	0.20	38	25	46	0.11	22	91	0.15	***13***	<0.015	230	<170	<3.0	Category M
LS03	6.0-6.9m	<0.20	30	12	32	0.06	20	70	<0.10	6.0	<0.015	400	***3,000***	<3.0	Category M
LS03	10.9-11.8m	<0.20	50	13	52	0.06	12	36	<0.10	***20***	<0.015	<55	<170	<3.0	Category M
LS04	0.2-0.9m	<0.20	32	13	34	0.08	23	78	<0.10	10	<0.015	<55	<170	<3.0	Category L
LS04	6.0-6.9m	<0.20	34	13	33	0.05	22	75	<0.10	7.4	<0.015	<55	<170	<3.0	Category L
LS04	8.9-9.9m	<0.20	34	12	32	<0.05	23	66	<0.10	8.6	<0.015	<55	<170	<3.0	Category L
LS05	0.2-0.9m	<0.20	31	12	31	0.07	21	78	<0.10	6.0	<0.015	<55	<170	<3.0	Category L
R01G	-	<0.20	28	13	36	0.06	20	72	0.12	6.4	<0.015	<55	<170	<3.0	Category L

[1] Values exceeding the LCELs are shown in bolded, italic and underlined with grey highlight; and
[2] Insufficient porewater was collected for the sample.

Biological Screening

D1-2.2 Biological screening was conducted for 5 sub-samples showing exceedance of LCEL (Category M) to determine the subsequent disposal options according to the schedule summarised in **Table D1.4**. The results of 10-day burrowing amphipod toxicity test, 20-day burrowing polychaete toxicity test, and 48-96 hours larvae (bivalve or echinoderm) toxicity test are summiarised in Tables **D1.4 to D1.8** respectively, whereas the results of ancillary parameters including grain size, moisture content, total organic carbon (TOC), ammonia, and salinity are summarised in **Table D1.8**. All of the 5 samples with exceedance of LCEL passed the biological test. In summary, two classifications of sediment material where identified, comprising Category L and Category M, that passes the biological testing (Mp). The material is suitable for disposal in Type 1 open sea and Type 1 Open Sea (Dedicated) disposal.

Table D1.4: Schedule of Biological Screening

Sample ID	Details of Sub-samples
AS01	Vibrocore AS01 at depth 0.1-0.9m
AS02	Vibrocore AS02 at depth 0.2-0.9m
LS03a	Vibrocore LS03 at depth 0.0-0.9m
LS03b	Vibrocore LS03 at depth 6.0-6.9m
LS03c	Vibrocore LS03 at depth 10.9-11.8m

Table D1.5: Amphipod Survival in Relation to Reference Sediment

Sample ID	Survival in Relation to Reference Site (%)	Statistical Difference from Reference Sediment (t-test)	Conclusion
AS01	101.0	N/A	Pass
AS02	97.9	N/A	Pass
LS03a	96.9	N/A	Pass
LS03b	101.0	N/A	Pass
LS03c	99.0	N/A	Pass

Note: N/A – As the average survival rate of amphipods for test sediment was over 80% to that of reference sediment, statistical analysis was not required.

Table D1.6: Total Dry Weight of Polychaete in Relation to Reference Sediment

Sample ID	Total Dry Weight in Relation to Reference Site (%)	Statistical Difference from Reference Sediment (t-test)	Conclusion
AS01	89.9	P=0.278 Assuming equal variance	Pass
AS02	90.9	N/A	Pass
LS03a	93.1	N/A	Pass
LS03b	76.7	P=0.115 Assuming equal variance	Pass
LS03c	86.5	P=0.234 Assuming equal variance	Pass

Note: N/A – As the average total dry weight for the test sediment was greater than 90% of that of the reference sediment, statistical analysis was not required.

Table D1.7: Normality Survival of Bivalve Larvae in Relation to Reference Sediment

Sample ID	Normality Survival in Relation to Reference Site (%)	Statistical Difference from Reference Sediment (t-test)	Conclusion
AS01	102.2	N/A	Pass
AS02	98.0	N/A	Pass
LS03a	98.1	N/A	Pass
LS03b	99.9	N/A	Pass
LS03c	95.5	N/A	Pass

Note: N/A – As the average survival rate of bivalve larvae for the test sediment was greater than 80% of that of the reference sediment, statistical analysis was not required.

Table D1.8: Test Results of Ancillary Parameters

Sample ID	Interstitial Ammonia (mgNH3/L)	Interstitial Salinity (ppt)	Grain Size <63m (%)	Moisture Content (%)	TOC (% Wet Weight)	TOC (% Dry Weight)
AS01	2.8	32	59	94	0.11	0.21
AS02	1.6	29	99	94	0.37	0.72
LS03a	0.9	29	97	98	0.42	0.83
LS03b	1.8	24	97	96	0.45	0.88
LS03c	5.5	26	76	39	0.07	0.10

Moisture content was calculated as (Sample Wet Weight – Sample Dry Weight) x 100%.
N/A - Insufficient porewater could be obtained for analysis, so interstitial ammonia not measured.

Elutriate

D1-2.3 Elutriate tests of grab samples were carried out for the purpose of water quality assessment of the extent of contaminant release when dredging activities take place. The testing parameters included heavy metals (cadmium, chromium, copper, mercury, nickel, lead, zinc and silver), metalloid (arsenic) and organic micro-pollutants (PCB, PAHs and TBT), chlorinated pesticides and nutrients including TKN, NO_3-N, NO_2-N, NH_4-N, PO_4-P and total phosphorus. The results are summarised in Tables D1.9 and D1.10. In general, the levels of cadmium, silver, TBT, PAHs, PCBs and Pesticides were all below the reporting limits, whereas other metals and metalloid including chromium, copper, mercury, nickel, lead, zinc and cadmium, nutrients including NH_3-N, NO_2-N, NO_3-N, TKN, PO_4-P and total phosphorus in elutriates varied among sediment samples from different locations.

Table D1.9: Elutriate Test Results for Metals, Metalloid and PAHs

Sample ID	Metals (µg/L)								Metalloid (µg/L)	Organic-PAHs (µg/L)	
	Cd	Cr	Cu	Ni	Pb	Zn	Hg	Ag	As	LMW PAH	HMW PAH
AN01	<0.2	<1	<1	<1	<1	<4	<0.1	<1	8	<0.20	<0.20
AN01	<0.2	<1	<1	<1	<1	<4	<0.1	<1	11	<0.20	<0.20
AN02	<0.2	3	2	<1	2	6	<0.1	<1	26.0	<0.20	<0.20
AN02	<0.2	3	2	2	2	<4	<0.1	<1	18.0	<0.20	<0.20
AN03	<0.2	<1	2	<1	<1	<4	<0.1	<1	6	<0.20	<0.20
AS01	<0.2	<1	<1	3	<1	<4	0.34	<1	2	<0.20	<0.20
AS01	<0.2	<1	<1	<1	<1	<4	<0.1	<1	3	<0.20	<0.20
AS02	<0.2	<1	<1	1	<1	<4	<0.1	<1	7	<0.20	<0.20
AS02	<0.2	<1	<1	2	<1	7	<0.1	<1	5.1	<0.20	<0.20
AS02	<0.2	<1	2	9	1	5	<0.1	<1	<2	<0.20	<0.20
LS01	<0.2	<1	<1	2	<1	<4	<0.1	<1	20.0	<0.20	<0.20
LS01	<0.2	<1	<1	2	<1	<4	<0.1	<1	6.3	<0.20	<0.20
LS01	<0.2	<1	<1	2	<1	<4	<0.1	<1	12.0	<0.20	<0.20
LS02	<0.2	<1	<1	<1	<1	<4	<0.1	<1	70.0	<0.20	<0.20
LS02	<0.2	<1	<1	2	<1	<4	<0.1	<1	19.0	<0.20	<0.20
LS02	<0.2	<1	<1	<1	<1	<4	<0.1	<1	7	<0.20	<0.20
LS03	<0.2	<1	1	3	<1	4	<0.1	<1	3	<0.20	<0.20
LS03	<0.2	<1	2	3	<1	<4	<0.1	<1	15.0	<0.20	<0.20
LS03	<0.2	<1	<1	3	<1	<4	<0.1	<1	2	<0.20	<0.20
LS04	<0.2	<1	<1	1	<1	<4	<0.1	<1	14	<0.20	<0.20
LS04	<0.2	<1	<1	2	<1	<4	<0.1	<1	22.0	<0.20	<0.20
LS04	<0.2	<1	3	3	<1	5	<0.1	<1	3.7	<0.20	<0.20
LS05	<0.2	<1	<1	2	<1	<4	<0.1	<1	17.0	<0.20	<0.20

Table 1.10: Elutriate Test Results for PCBs, TBT, Chlorinated Pesticides and Nutrients

Sample ID	Organic-non-PAHs (µg/L)	Organo-metallics (µg/L)	Chlorin-ated Pesticides (µg/L)	NH_3-N (mg/L)	NO_2-N (mg/L)	NO_3-N (mg/L)	TKN (mg/L)	Total P (mg/L)	Ortho-P (mg/L)
	Total PCBs	TBT							
AN01	<0.01	<0.015	<0.1	<0.025	<0.025	<0.025	<1.0	0.62	0.67
AN01	<0.01	<0.015	<0.1	<0.025	0.03	1.8	<1.0	0.11	<0.10
AN02	<0.01	<0.015	<0.1	<0.025	<0.025	<0.025	<1.0	0.23	0.16
AN02	<0.01	<0.015	<0.1	<0.025	<0.025	0.34	<1.0	<0.10	<0.10
AN03	<0.01	<0.015	<0.1	<0.025	<0.025	<0.025	<1.0	0.11	<0.10
AS01	<0.01	<0.015	<0.1	0.034	0.065	0.26	<1.0	0.1	<0.10
AS01	<0.01	<0.015	<0.1	0.95	0.081	0.33	1.2	<0.10	<0.10
AS02	<0.01	<0.015	<0.1	<0.025	<0.025	0.15	<1.0	<0.10	<0.10
AS02	<0.01	<0.015	<0.1	0.055	0.23	0.22	<1.0	<0.10	<0.10
AS02	<0.01	<0.015	<0.1	0.084	0.38	0.29	<1.0	<0.10	<0.10
LS01	<0.01	<0.015	<0.1	<0.025	<0.025	0.34	<1.0	<0.10	<0.10
LS01	<0.01	<0.015	<0.1	5.1	0.12	0.36	5.3	<0.10	<0.10

Sample ID	Organic-non-PAHs (µg/L)	Organo-metallics (µg/L)	Chlorin-ated Pesticides (µg/L)	NH_3-N (mg/L)	NO_2-N (mg/L)	NO_3-N (mg/L)	TKN (mg/L)	Total P (mg/L)	Ortho-P (mg/L)
	Total PCBs	TBT							
LS01	<0.01	<0.015	<0.1	6.1	0.094	0.39	6.5	<0.10	<0.10
LS02	<0.01	<0.015	<0.1	<0.025	<0.025	<0.025	<1.0	<0.10	<0.10
LS02	<0.01	<0.015	<0.1	2.5	4.6	<0.025	2.5	<0.10	<0.10
LS02	<0.01	<0.015	<0.1	<0.025	5.4	<0.025	<1.0	<0.10	<0.10
LS03	<0.01	<0.015	<0.1	<0.025	<0.025	0.066	<1.0	0.12	<0.10
LS03	<0.01	<0.015	<0.1	3.5	0.51	0.17	4.1	<0.10	0.14
LS03	<0.01	<0.015	<0.1	4.3	0.058	0.41	4.3	<0.10	<0.10
LS04	<0.01	<0.015	<0.1	<0.025	<0.025	0.2	<1.0	<0.10	<0.10
LS04	<0.01	<0.015	<0.1	3.5	0.12	0.33	3.6	<0.10	<0.10
LS04	<0.01	<0.015	<0.1	4.3	0.099	0.31	5.1	<0.10	<0.10
LS05	<0.01	<0.015	<0.1	<0.025	<0.025	0.12	<1.0	<0.10	<0.10

Porewater

D1-2.4 Porewater tests were conducted also for the purpose of water quality assessment of the potential of contaminant release when dredging and filling activities take place. The testing parameters included heavy metals (cadmium, chromium, copper, mercury, nickel, lead, zinc and silver), metalloid (arsenic) and organic micro-pollutants (PCB, PAHs and TBT), chlorinated pesticides and nutrients including NH_4-N, PO_4-P, and total phosphorus.

D1-2.5 The porewater test results of this investigation are summarised in Tables D1.11 and D1.12. In general, the levels of cadmium, lead, mercury, silver, PAHs, PCBs and TBT were all below the reporting limits, whereas other metals and metalloid including chromium, copper, nickel, zinc and arsenic, nutrients including NH_3-N, NO_2-N, NO_3-N, TKN, PO_4-P and total phosphorus in porewater samples varied among sediment samples from different locations.

Table D1.11: Porewater Test Results for Metals, Metalloid and PAHs

Sample ID	Metals (mg/kg)								Metalloid (mg/kg)	Organic-PAHs (µg/kg)	
	Cd	Cr	Cu	Ni	Pb	Zn	Hg	Ag	As	LMW PAH	HMW PAH
AN01	<0.2	<1	2	<1	<1	<4	<0.1	<1	13	<0.20	<0.20
AN02	<0.2	<1	2.9	30	<1	6.3	<0.1	<1	26	<0.20	<0.20
AN03	<0.2	<1	3.1	1.6	<1	4.4	<0.1	<1	3.3	<0.20	<0.20
AS01	<0.2	<1	2.6	1	<1	<4	<0.1	<1	4.4	<0.20	<0.20
AS02	<0.2	<1	2	1.4	<1	5.2	<0.1	<1	6	<0.20	<0.20

Table D1.12: Porewater Test Results for PCBs, TBT, Chlorinated Pesticides and Nutrients

Sample ID	Organic-non-PAHs (µg/L)	Organo-metallics (µg/L)	Chlorin-ated Pesticides (µg/L)	NH_3-N (mg/L)	NO_2-N (mg/L)	NO_3-N (mg/L)	TKN (mg/L)	Total P (mg/L)	Ortho-P (mg/L)
	Total PCBs	TBT							
AN01	<0.01	<0.015	<0.1	0.06	1.2	7.6	<1.0	2.4	2.3
AN02	<0.01	<0.015	<0.1	0.053	3.4	18	<1.0	1.3	1.8
AN03	<0.01	<0.015	<0.1	<0.025	0.059	0.16	<1.0	0.18	0.11
AS01	<0.01	<0.015	<0.1	0.73	0.17	0.09	<1.0	0.27	0.19
AS02	<0.01	<0.015	<0.1	1.6	0.14	0.086	1.9	0.23	0.14

APPENDIX 9D2

Summary of Proposed Simulations for Water Quality Modelling for the HKBCF, HKLR and TMCLKL

Scenario No.	Year	Description	Purpose	Model Output	Concurrent Projects Included
Simulations of Tidal Flows (Wet and Dry Season Simulations)					
V1	Verification (2010)	Simulation of the Baseline (2010) Scenario using the original model grid before any grid refinement	To verify that the grid refinement has not changed the simulation of the large scale tidal flows	The model results (tidal levels, water velocities and salinity at selected locations and discharges across selected sections) will be compared with the Baseline Simulation (No. 1 below) to verify that the grid refinement has not modified large scale tidal flows	see No 1. below
V2	Verification (2010)	Repeat the Baseline (2010) Scenario using the refined model grid for successive 15 days simulaiton period.	To verify that the spin up and simulation periods are sufficient and results stabilised	The model results (tidal levels, water velocities and salinity at selected locations and discharges across selected sections) will be compared with the Baseline Simulation (No. 1 below) to verify that the model has stabilised	see No 1. below
1	2010	Baseline Scenario using the refined model grid	Baseline Scenario before construction of the TM-CLKL+HKBCF+HKLR	The model results will be compared with the Verification simulations	Tonggu Channel changed bathymetry, CMPs 2010, Cooling water discharges from Black Point, Castle Peak and Lamma Power Stations
2	Feb 2011	Simulation of the coastline and exrtent of seawall construction in February 2011	To provide the tidal flows for the simulation of the initial worst case dredging and filling scenario	The model results will be compared with the Verification simulation and will provide tidal flow fields for the sediment plume simulations for the TM-CLKL+HKBCF+HKLR plus all concurrent projects expected to begin construction or be underway in 2011	Tonggu Channel changed bathymetry, CMPs 2011, Kwai Tsing Basin changed bathymetry, Cooling water discharges from Black Point, Castle Peak and Lamma Power Stations, part seawall for Portion A of HKBCF, HZMB artificial islands
3	Apr 2012	Intermediate construction phase on bulk completion of the HKBCF Phase I in April 2012	Tidal flow fields required for assessment of the construciton impact of the intermediate phase of TM-CLKL+HKBCF+HKLR and all concurrent works in 2012.	Model results will provide tidal flow fields for the sediment plume simulations for the TM-CLKL+HKBCF+HKLR plus all concurrent projects expected to be under construction in this year at the time the Phase I works are finishing	Tonggu Channel changed bathymetry, CMPs at interim year, Kwai Tsing Basin changed bathymetry at 2012, Cooling water discharges from Black Point, Castle Peak and Lamma Power Stations, portion A, B and C and part phase II seawall for HKBCF, part TM-CLKL southern viaduct piers, seawall for southern nib and northern nib of northern and southern TM-CLKL reclamations respectively, Portion 1 and part of piers for HKLR, HZMB artifical islands, seawall for LLP 72ha.
4	Apr 2013	Simulation of the substantially completed TM-CLKL+ HKBCF+HKLR and concurrent works in April 2013 when works are nearing completion but potential sediment losses are still significant	Tidal flow fields required for assessment of the construciton impact of the nearly completed TM-CLKL+HKBCF+HKLR and all concurrent works in 2013.	Model results will provide tidal flow fields for the sediment plume simulations for the TM-CLKL+HKBCF+HKLR plus all concurrent projects expected to be under construction in this year at the time the Phase II works are finishing	Tonggu Channel changed bathymetry, CMPs at 2013, complete Kwai Tsing Basin changed bathymetry, Cooling water discharges from Black Point, Castle Peak and Lamma Power Stations, complete Phase I HKBCF, part complete Phase II reclamation and Portion D for HKBCF, complete northern reclamation for TM-CLKL, complete southern viaduct for TM-CLKL, complete reclamation for HKLR, part complete piers for HKLR, HZMB artificial islands, complete LLP 72ha
5	end 2026	Simulation of the completed TM-CLKL+HKBCF+HKLR and concurrent works including Road P1 in 2026	Tidal flow fields required for the assessment of the impact the completed TM-CLKL+HKBCF+HKLR compared to other concurrent works in completed 2026 has on tidal flows	Model results will provide the tidal flow fields required for the simulation of water quality on completion of the TM-CLKL+HKBCF+HKLR and all concurrent works in 2026	Tonggu Channel changed bathymetry, CMPs at 2016, complete Kwai Tsing Basin changed bathymetry, Cooling water discharges from Black Point, Castle Peak and Lamma Power Stations, complete HKBCF, complete TM-CLKL, complete HKLR, complete HZMB, LLP 72ha, LLP 40ha, Tung Chung East and West developments, Road P1 eastern section
6	end 2026	Simulation of the completed concurrent works including Road P1but without the TM-CLKL+HKBCF+HKLR	Tidal flow fields required for the assessment of the impact the completed concurrent works in 2026 has on tidal flows without the TM-CLKL+HKBCF+HKLR.	Model results will provide the tidal flow fields required for the simulation of water quality on completion of all concurrent works in 2026 without the TM-CLKL+HKBCF+HKLR	Tonggu Channel changed bathymetry, CMPs at 2016, complete Kwai Tsing Basin changed bathymetry, Cooling water discharges from Black Point, Castle Peak and Lamma Power Stations, complete HZMB, LLP 72ha, LLP 40ha, Tung Chung East and West developments, Road P1 eastern section
Simulations of Sediment Plumes (Wet and Dry Season Simulations) - Construction Impacts					**Notes**
P1	2011	Simulation of the start of construction of the TM-CLKL+HKBCF+HKLR together with all concurrent projects underway or beginning in 2011	To assess cumulative impacts on suspended solids concentrations arising from losses of fine sediment to suspension during the construction of the TM-CLKL+ HKBCF+HKLR and all other concurrent works in 2011	The model results (in terms of elevations in suspended solids concentrations and deposition rates) will be assessed with respect to the Water Quality Objectives and other water quality standards set for, for example, seawater intakes, marine life and deposition rates on coral sites. If the sediment to be dredged is contaminated, the model results will be interpreted in terms of the maximum contaminant concentrations in the water column and at the sensitive receivers.	These simulations will use the tidal flow model results from the Flow simulation No. 2 above and including sediment losses from concurrent projects listed above.
P2	2012	Simulation of the interim stages of construction of the TM-CLKL+HKBCF+HKLR Phase I together with all concurrent projects underway in 2012	To assess cumulative impacts on suspended solids concentrations arising from losses of fine sediment to suspension during the interim stages of construction of the TM-CLKL+ HKBCF+HKLR Phase I and all other concurrent works in 2012	same as P1	These simulations will use the tidal flow model results from the Flow simulation No. 3 above and including sediment losses from concurrent projects listed above.
P3	2013	Simulation of the interim stages of construction of the TM-CLKL+HKBCF+HKLR Phase II together with all concurrent projects underway in 2013	To assess cumulative impacts on suspended solids concentrations arising from losses of fine sediment to suspension during the interim stages of construction of the TM-CLKL+ HKBCF+HKLR Phase II and all other concurrent works in 2013	Same as P1	These simulations will use the tidal flow model results from the Flow simulation No. 4 above and including sediment losses from concurrent projects listed above.
P4	2011	Simulation of the start of construction of the TM-CLKL+HKBCF+HKLR in 2011	To assess impacts on suspended solids concentrations arising from losses of fine sediment to suspension during the construction of the TM-CLKL+ HKBCF+HKLR in 2011	Same as P1	Similar to Simulation P1, but the sediment losses from concurrent projects excluded.
P5	2012	Simulation of the interim stages of construction of the TM-CLKL+HKBCF+HKLR Phase I	To assess impacts on suspended solids concentrations arising from losses of fine sediment to suspension during the interim stages of construction of the TM-CLKL+ HKBCF+HKLR Phase I in 2012	same as P1	Similar to Simulation P2, but the sediment losses from concurrent projects excluded.
P6	2013	Simulation of the interim stages of construction of the TM-CLKL+HKBCF+HKLR Phase II	To assess impacts on suspended solids concentrations arising from losses of fine sediment to suspension during the interim stages of construction of the TM-CLKL+ HKBCF+HKLR Phase II in 2013	Same as P1	Similar to Simulation P3, but the sediment losses from concurrent projects excluded.
P7	2011	Simulation of the start of construction of the TM-CLKL+HKBCF+HKLR in 2011	Similar to P4, but with specific mitigation measures applied to lower the sediment losses.	Same as P1	Similar to Simulation P4, but the sediment losses from the project mitigated.
P8	2012	Simulation of the interim stages of construction of the TM-CLKL+HKBCF+HKLR Phase I	Similar to P5, but with specific mitigation measures applied to lower the sediment losses.	same as P1	Similar to Simulation P5, but the sediment losses from the project mitigated.
P9	2013	Simulation of the interim stages of construction of the TM-CLKL+HKBCF+HKLR Phase II	Similar to P6, but with specific mitigation measures applied to lower the sediment losses.	Same as P1	Similar to Simulation P6, but the sediment losses from the project mitigated.
Simulations of Marine Water Quality (Annual Simulations) - Operational Impacts					
WQ1	2026	Simulation of the completed TM-CLKL+HKBCF+ HKLR and all other concurrent projects in 2026	This simulation is required to determine future water quality patterns following completion of the TM-CLKL+ HKBCF+ HKLR and all expected concurrent works	The results from this simulation will be compared with the relevant Water Quality Objectives and other water quality standards which might apply. The results will also be compared with those from WQ2 below in order to assess the potential impacts from the completed TM-CLKL+HKBCF+HKLR on marine water quality.	
WQ2	2026	Simulation of the completed concurrent projects in 2026 but without the TM-CLKL+HKBCF+HKLR	This simulation is required to determine future water quality patterns assuming the TM-CLKL+HKBCF+ HKLR is not constructed	The results from this simulation will be compared with the relevant Water Quality Objectives and other water quality standards which might apply. The results will also be compared with those from WQ1 above in order to assess the potential impacts from the completed TM-CLKL+HKBCF+HKLR on marine water quality.	

MAUNSELL AECOM
Maunsell Consultants Asia Ltd

AGREEMENT No. CE 52/2007 (HY)
TUEN MUN – CHECK LAP KOK LINK - INVESTIGATION

Summary of Proposed Simulations for Water Quality Modelling for the HKBCF, HKLR and TM-CLKL

SCALE	NTS	DATE	MAY. 2009
CHECK		DRAWN	
JOB No.	60044963	DRAWING No.	Appendix D2
		REV	

FILE:

APPENDIX 9D3

Calculation of Loss Coefficients for Bridge Piers

APPENDIX D3

CALCULATION OF LOSS COEFFICIENTS FOR BRIDGE PIERS

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D3-1 INTRODUCTION

D3-1.1 Background

D3-1.1.1 The Mainland section of Hong Kong-Zhuhai-Macao-Bridge (HZMB), the Hong Kong Link Road (HKLR) and the southern marine viaduct for the Tuen Mun Chek Lap Kok Link (TM-CLKL) will be supported on piles which could impact on tidal flows to some extent as a result of the reduction in flow area and additional friction losses.

D3-1.1.2 The typical dimensions associated with the bridge piers and piles are of the order of 1m-2m and much smaller than the resolution of the model grid (~50m-100m). In order to allow for the effects of the bridge piers on tidal flows, therefore, the Delft3D-Flow model allows for the addition of a quadratic friction term in the momentum equations which is applied in each model grid cell containing bridge piers (Reference 1).

D3-1.1.3 This approach to simulating the impact of bridge piers on tidal flows has now been employed in several studies in Hong Kong including the feasibility study for additional cross border links (Reference 1) and the loss term takes the form:

$$\text{Loss term},_u = \{ C_{loss,u}\, U\, |\langle U\rangle| \} / \{ \Delta x \}\ [m/s^2]$$
$$\text{Loss term},_v = \{ C_{loss,v}\, V\, |\langle U\rangle| \} / \{ \Delta y \}\ [m/s^2] \qquad \text{(Eq 1)}$$

Where:

$\langle U\rangle$ = Velocity vector (u,v) [m/s]
$|\langle U\rangle|$ = Magnitude of the velocity vector $\sqrt{(u^2+v^2)}$ [m/s]
$\Delta x\ \Delta y$ = Grid distances in the u and v coordinate directions [m]
$C_{loss,u}$ = Loss coefficients in the u coordinate direction
$C_{loss,v}$ = Loss coefficients in the v coordinate direction

D3-1.1.4 This additional friction term influences the horizontal flow distribution in each model layer according to the water speeds in each model layer and so indirectly affects the vertical turbulent exchange as well.

D3-1.1.5 The piles also reduce the flow area which will result in local accelerations in the water speeds. This effect is taken into account by calculating the effective flow area, A_{eff}, given by the original total flow area , A_{tot}, minus the area blocked by the piles and using the ratio of the original total flow area to the effective area to obtain the increased approach velocity $\langle U_{eff}\rangle$:

A_{eff} = A_{tot} – area blocked by piles as seen by the flow
a = A_{tot}/A_{eff}
$\langle U_{eff}\rangle$ = $a \times \langle U\rangle$

D3-1.1.6 The forces due to the flow on a vertical section Δz of one pile are described by:

$$F_u = \tfrac{1}{2}\, C_d\, \rho\, D\, u_{eff}\, |\langle U_{eff}\rangle|\, \Delta z$$
$$F_v = \tfrac{1}{2}\, C_d\, \rho\, D\, v_{eff}\, |\langle U_{eff}\rangle|\, \Delta z$$

Where:

F_u the drag force in u-co-ordinate direction on a pile [N];
F_v the drag force in v-co-ordinate direction on a pile [N];
C_d the drag coefficient (≈1 in the case of a cylinder in a tidal regime);
ρ the density of water [kg/m^3];
$<U_{eff}>$ the effective approach velocity vector (u_{eff},v_{eff}) [m/s];
$|<U_{eff}>|$ magnitude of the effective approach velocity $\sqrt{(u_{eff}^2 + v_{eff}^2)}$ [m/s];
D the diameter of a pile [m]; and
Δz the length of the vertical section [m].

D3-1.1.7 For several piles in the same model grid cell, assuming the worst case where the piles under consideration are not in the shadow of each other, results in a total force on the flow equal to:

$$F_{tot,u} = ½\ n \times C_d\ \rho\ D\ u_{eff}\ |<U_{eff}>|\ \Delta z$$
$$F_{tot,v} = ½\ n \times C_d\ \rho\ D\ v_{eff}\ |<U_{eff}>|\ \Delta z.$$

Where:

n = The number of piles in the control grid cell;
$F_{tot,u}$, $F_{tot,v}$ = The total force in the (u,v) coordinate directions [N]

D3-1.1.8 Division of the forces by the mass in the control volume (=$\rho\ \Delta x\ \Delta y\ \Delta z$) yields the following term in the u-momentum equation and the v-momentum equation respectively:

$$\text{Loss term}_{,u} = \{½\ n \times C_d\ D\ u_{eff}\ |<U_{eff}>|\ \} / \{\ \Delta x \times \Delta y\ \}$$
$$\text{Loss term}_{,v} = \{½\ n \times C_d\ D\ v_{eff}\ |<U_{eff}>|\ \} / \{\ \Delta x \times \Delta y\ \} \qquad \text{(Eq 2)}$$

D3-1.1.9 Comparing equations (1) and (2) allows the loss coefficients to be calculated in terms of the pile dimensions and the model grid size as:

$$C_{loss,u} = \{½\ n \times C_d\ D \times a^2\ \} / \{\ \Delta y\ \}$$
$$C_{loss,v} = \{½\ n \times C_d\ D \times a^2\ \} / \{\ \Delta x\ \}$$

D3-1.1.10 Where piles of different dimensions are contained within a model cell, the loss coefficients are calculated using the sum of all the pile diameters and the loss coefficients can be written as:

$$C_{loss,u} = \frac{1}{2}\left(\sum n * D\right) * C_d * a^2 / \Delta y$$
$$C_{loss,v} = \frac{1}{2}\left(\sum n * D\right) * C_d * a^2 / \Delta x$$

D3-1.1.11 Using these expressions, the loss coefficients, for each type of bridge pier have been calculated and are presented below.

D3-2 TUEN MUN CHEK LAP KOK LINK BRIDGE PIERS

D3-2.1 Bridge Pier Layout

D3-2.1.1 The bridge pier (**Figure 1**) consists of six piles 1.8m in diameter with a further eight piles 0.6m in diameter to support the ship protection dolphins.

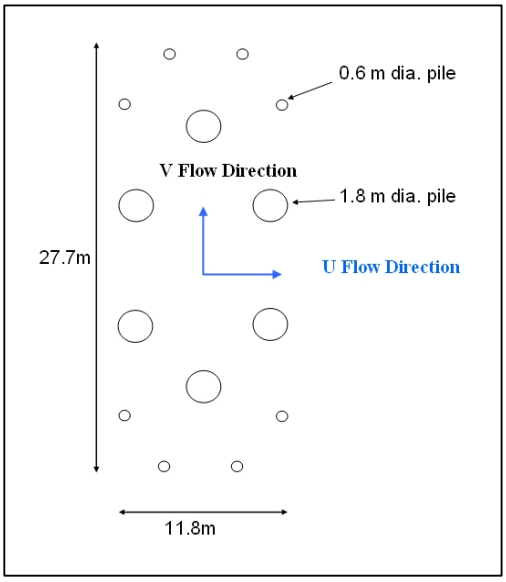


Figure 1 TM-CLKL Bridge Pier Arrangement

D3-2.1.2 The loss coefficients depend on the model grid size and, to the east of Chek Lap Kok, two representative grid sizes of 70m and 100m have been considered.

D3-2.2 70m Model Grid

D3-2.2.1 For a 70m model grid and a 60m pier spacing, some grid cells may contain a single pier or almost two piers (two piers less 1.8m width of ship protection island). However, if the grid cell contains the major part of a second pier, it will be assumed that both piers lie in the same cell and no part of the pier lies in the adjacent grid cell. The calculations of the loss coefficients for the cases of a single pier and two piers in a single cell are detailed below.

Single Pier : V Flow Direction

D3-2.2.2 As 'seen' by the flow, there will be a reduction in cross-sectional width due to 3 piles of 1.8m diameter and 2 piles of 0.6m diameter, and the ratio of the total area to the effective area, a, will be:

a = 70/(70-3*1.8-2*0.6)
= 1.10

D3-2.2.3 Each pier will consist of 6 piles 1.8m diameter exposed to the flow and eight piles of 0.6m diameter. The loss coefficient, $C_{loss,v}$ for this pier will be:

$$C_{loss,v} = \frac{1}{2}\left(\sum n * D\right) * C_d * a^2 / \Delta x$$
$$= \frac{1}{2}\left(6 * 1.8 + 8 * 0.6\right) * 1 * 1.10^2 / 70$$
$$= 0.14$$

Single Pier : U Flow Direction

D3-2.2.4 For flows perpendicular to the main axis of the pier, the flow area will be reduced by 4 piles of 1.8m diameter and 4 piles 0.6m diameter. The ratio of the total area to the effective area, a, will be:

a = 70/(70-4*1.8-4*0.6)
= 1.16

D3-2.2.5 Each pier will consist of 6 piles 1.8m diameter exposed to the flow and eight piles 0f 0.6m diameter. The loss coefficient for this pier will be:

$$C_{loss,u} = \frac{1}{2}\left(\sum n * D\right) * C_d * a^2 / \Delta y$$
$$= \frac{1}{2}\left(6 * 1.8 + 8 * 0.6\right) * 1 * 1.16^2 / 70$$
$$= 0.15$$

Two Piers: V Flow Direction

D3-2.2.6 The ratio of the total flow area to the effective flow area is used to allow for the local acceleration in water speed due to local reduction in flow area caused by the bridge pier. However, if two bridge piers are separated by 60m or more and are aligned along the flow direction, the reduction in flow area would be overestimated if the width of both piers is used to calculate this area ratio. However, if the piers are not aligned with the main flow direction, the magnitude of the overestimate should reduce. In order to ensure that the loss coefficients are not underestimated, therefore, it will be assumed the flow width is reduced by the maximum width of two bridge piers.

D3-2.2.7 If the grid cell contains 2 piers, the area ratio calculation gives:

a = 70/(70-2*(3*1.8-2*0.6))
= 1.23

D3-2.2.8 Two piers will consist of 12 piles 1.8m diameter exposed to the flow and sixteen piles 0.6m diameter. The loss coefficient for this pier will be:

$$C_{loss,v} = \frac{1}{2}\left(\sum n * D\right) * C_d * a^2 / \Delta x$$
$$= \frac{1}{2}\left(12 * 1.8 + 16 * 0.6\right) * 1 * 1.23^2 / 70$$
$$= 0.34$$

Two Piers: U Flow Direction

D3-2.2.9 If the grid cell contains 2 piers, the area ratio calculation gives:

a = 70/(70-2*(4*1.8 – 4*0.6))
= 1.38

D3-2.2.10 Each pier will consist of 4 piles 1.8m diameter exposed to the flow and one pile with an effective diameter of 20m. The loss coefficient for this pier will be:

$$C_{loss,u} = \frac{1}{2}\left(\sum n*D\right)*C_d*a^2/\Delta y$$
$$= \frac{1}{2}\left(2*6*1.8+2*8*0.6\right)*1*1.38^2/70$$
$$= 0.42$$

D3-2.3 100m Grid

V Flow Direction

D3-2.3.1 For a grid size of 100m, each cell will have 2 piers and the ratio of the total area to the effective area will be:

a = 100/(100-2*(3*1.8 – 2*0.6)))
= 1.15

D3-2.3.2 The loss coefficient will then be:

$$C_{loss,v} = \frac{1}{2}\left(\sum n*D\right)*C_d*a^2/\Delta x$$
$$= \frac{1}{2}\left(2*6*1.8+2*8*0.6\right)*1*1.15^2/100$$
$$= 0.21$$

U Flow Direction

D3-2.3.3 Similarly, in the U flow direction the ratio of the total area to the effective area will be:

a = 100/(100-2*(4*1.8 – 4*0.6))
= 1.24

D3-2.3.4 The loss coefficient will then be:

$$C_{loss,u} = \frac{1}{2}\left(\sum n*D\right)*C_d*a^2/\Delta y$$
$$= \frac{1}{2}\left(2*6*1.8+2*8*0.6\right)*1*1.24^2/100$$
$$= 0.24$$

D3-3 HONG KONG LINK ROAD

D3-3.1 Section A-A

D3-3.1.1 The HKLR will include bridge piers in the sea immediately to the west of the Sea Channel, as shown as Section A-A **Figure 2** and detailed in **Figure 3** below.

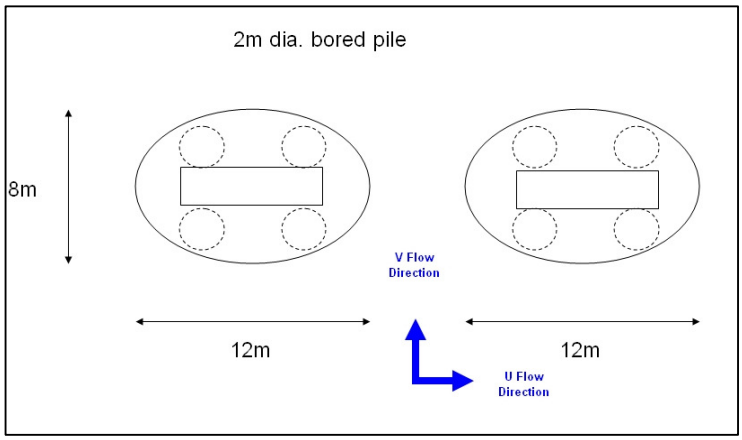


Figure 3 Hong Kong Link Road Marine Bridge Piers Outside the Sea Channel

D3-3.1.2 It is assumed that the flow directions are as indicated in **Figure 3**. At high water, the pile caps may be partially submerged by up to ~1m which would result in a small reduction in the flow area in the model's surface layer and introduce some additional drag in the surface layer. The pile caps may also be clear of the water at other times during the tidal cycle.

D3-3.1.3 In order to model this situation, the drag coefficients for the surface layer would need to be time dependent and linked to the tidal water levels. However, by ignoring the fact that some of the piles lie within the shadow of the leading piles with respect to the flow direction, the calculated loss coefficients should not underestimate the drag which will be generated by the piers. For the purposes of calculating the loss coefficients, therefore, it will be assumed that the pile caps remain above the sea surface level.

D3-3.1.4 Below the sea surface level, a total of eight 2m diameter piles will reduce the effective flow area and result in additional drag. It is also assumed that the grid size in the area containing these bridge piles is 70m.

V Flow Direction

D3-3.1.5 Based on these assumptions, the ratio of the total flow area to the effective flow area, a, is given by:

a = 70/(70-4*2)
= 1.13

D3-3.1.6 Each pier will consist of 8 piles 2m in diameter exposed to the flow. The loss coefficient for this pier will be:

$$C_{loss,v} = \frac{1}{2}\left(\sum n * D\right) * C_d * a^2 / \Delta x$$
$$= \frac{1}{2}(8*2)*1*1.13^2/70$$
$$= 0.15$$

U Flow Direction

D3-3.1.7 Similarly, in the U flow direction, the ratio of the total flow area to the effective flow area, a, is given by:

a = 70/(70-2*2)
= 1.06

D3-3.1.8 Each pier will consist of 8 piles 2m in diameter exposed to the flow. The loss coefficient for this pier will be:

$$C_{loss,u} = \frac{1}{2}\left(\sum n * D\right) * C_d * a^2 / \Delta y$$
$$= \frac{1}{2}(8*2)*1*1.06^2/70$$
$$= 0.13$$

D3-3.2 Section B-B : In The Airport Sea Channel

D3-3.2.1 The HKLR will include rectangular piles in the Sea Channel, as shown as Section B-B in **Figure 2** and detailed in **Figure 4** below.

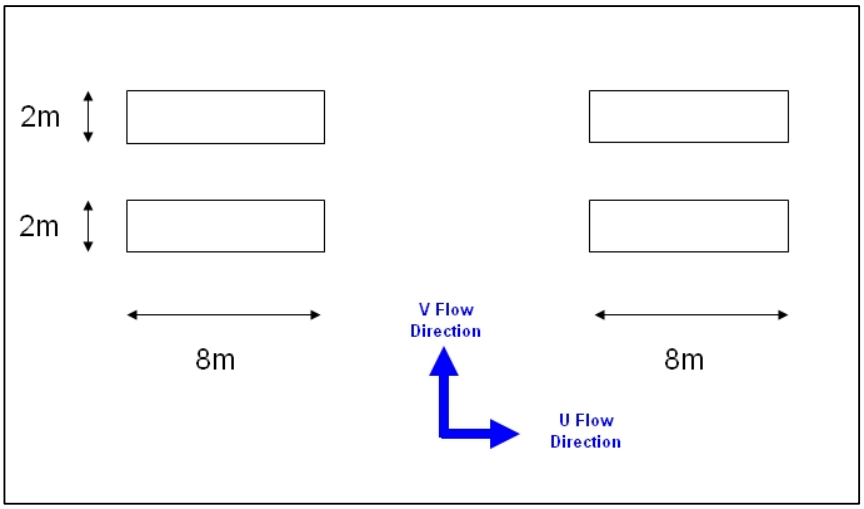


Figure 4 Hong Kong Link Road Marine Bridge Piers Inside the Sea Channel

D3-3.2.2 It is assumed that the flow directions are as indicated in **Figure 4** and that the pile caps are buried below seabed level.

V Flow Direction

D3-3.2.3 A total of two 8m wide piles will reduce the effective flow area and all 4 8m wide piles will result in additional drag. It is also assumed that the grid size in the area containing these bridge piles is 70m.

D3-3.2.4 Based on these assumptions, the ratio of the total flow area to the effective flow area, a, is given by:

a = 70/(70-2*8)
= 1.3

D3-3.2.5 Each pier will consist of 4 piles with an effective diameter of 4.5m exposed to the flow. The loss coefficient for this pier will be:

$$C_{loss,v} = \frac{1}{2}\left(\sum n * D\right) * C_d * a^2 / \Delta x$$
$$= \frac{1}{2}(4 * 4.5) * 1 * 1.3^2 / 70$$
$$= 0.22$$

U Flow Direction

D3-3.2.6 For flows in this direction, 2 piles 2m wide will reduce the effective flow area and all 4 piles with an effective diameter of 4.5m will again introduce some additional drag. The ratio of the total area to the effective flow area and the loss coefficients will be given by:

a = 70/(70-2*2)
= 1.06

$$C_{loss,u} = \frac{1}{2}\left(\sum n * D\right) * C_d * a^2 / \Delta y$$
$$= \frac{1}{2}(4 * 4.5) * 1 * 1.06^2 / 70$$
$$= 0.14$$

D3-3.3 Section D-D – Navigation Span

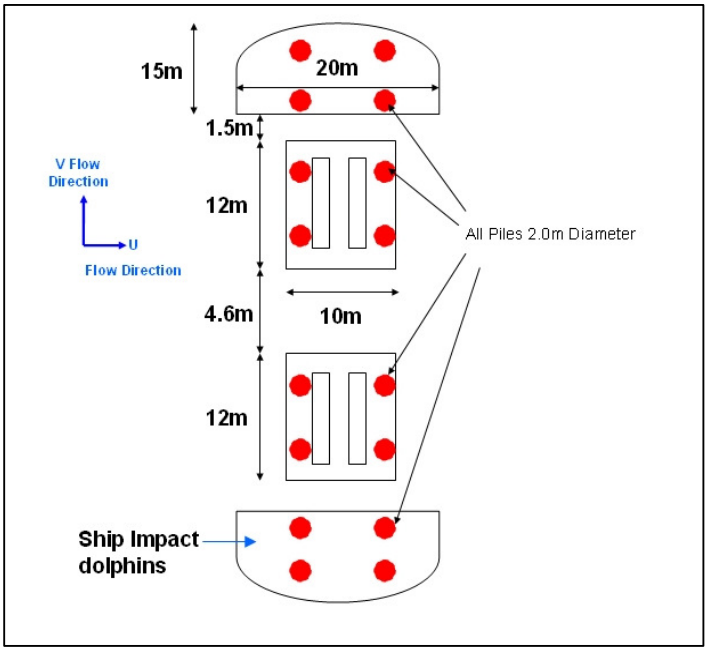


Figure 5 Hong Kong Link Road – Bridge Piers at the Navigation Channel

D3-3.3.1 In the vicinity of the navigation channel (Section D-D, **Figure 2**), a bridge span of 150m will be used with ship protection for the bridge piers as show in **Figure 5**. In this area, it will be assumed that the model grid size is 100m and that no more than one bridge pier lies in any one grid cell. The bridge pier consists of 8 piles 2m in diameter and 8 piles 2m in diameter to support the ship protection dolphins.

V Flow Direction

D3-3.3.2 The ratio of the total area to the effective flow area will be given by:

a = 100/(100-2*2)
= 1.04

D3-3.3.3 Each pier will consist of 16 piles each with a diameter of 2m exposed to the flow. The loss coefficient for this pier will be:

$$C_{loss,v} = \frac{1}{2}\left(\sum n * D\right) * C_d * a^2 / \Delta x$$
$$= \frac{1}{2}(16 * 2) * 1 * 1.04^2 / 100$$
$$= 0.17$$

U Flow Direction

D3-3.3.4 The ratio of the total area to the effective flow area will be given by:

a = 100/(100-8*2)
= 1.19

D3-3.3.5 Each pier will consist of 16 piles each with a diameter of 2m exposed to the flow. The loss coefficient for this pier will be:

$$C_{loss,u} = \frac{1}{2}\left(\sum n * D\right) * C_d * a^2 / \Delta y$$
$$= \frac{1}{2}(16 * 2) * 1 * 1.19^2 / 100$$
$$= 0.23$$

D3-4 HONG KONG ZHUHAI MACAU BRIDGE (HZMB)

D3-4.1 Introduction

D3-4.1.1 The whole length of the HZMB will be included in the Delft3D model and it is assumed that the main bridge sections across the Pearl Estuary have similar bridge piers along its length as shown in **Figure 6**. It will also be assumed that the bridge will have a span of 70m although it is appreciated that the span length could vary in different sections.

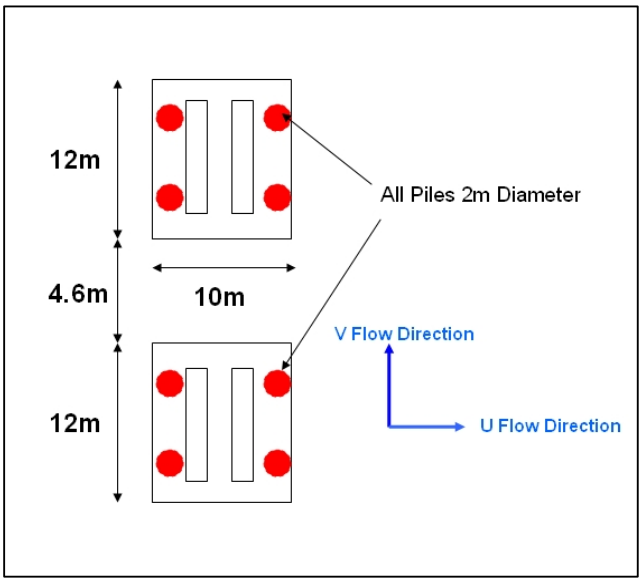


Figure 6 Mainland Section of Hong Kong Zhuhai Macau Bridge Piers

D3-4.1.2 The model grid size in the southern part of the Pearl Estuary will varies from the order of a few hundred metres to over 1,000m and could contain up to 15 bridge piers. The loss coefficients relevant to each grid cell will be calculated and following sample calculations of the loss coefficients are for a grid size of 1,000m and a bridge span of 70m.

D3-4.2 V Flow Direction

D3-4.2.1 In the V flow direction, the flow area will be reduced by 2 pile diameters for each of 15 piers and the ratio of the total area to the effective area will be given by:

$$a = 1000/(1000-15*2*2)$$
$$= 1.06$$

D3-4.2.2 Each of the 15 piers will consist of 8 piles each with a diameter of 2m exposed to the flow. The loss coefficient for these pier will be:

$$C_{loss,v} = \frac{1}{2}\left(\sum n * D\right) * C_d * a^2 / \Delta x$$
$$= \frac{1}{2}(15 * 8 * 2) * 1 * 1.06^2 / 1000$$
$$= 0.13$$

D3-4.3 U Flow Direction

D3-4.3.1 In the U flow direction the total area will be reduced by 4 piles of 2m diameter and the ratio of the total area to the effective area will be given by:

a = 1000/(1000-4*2)
= 1.008

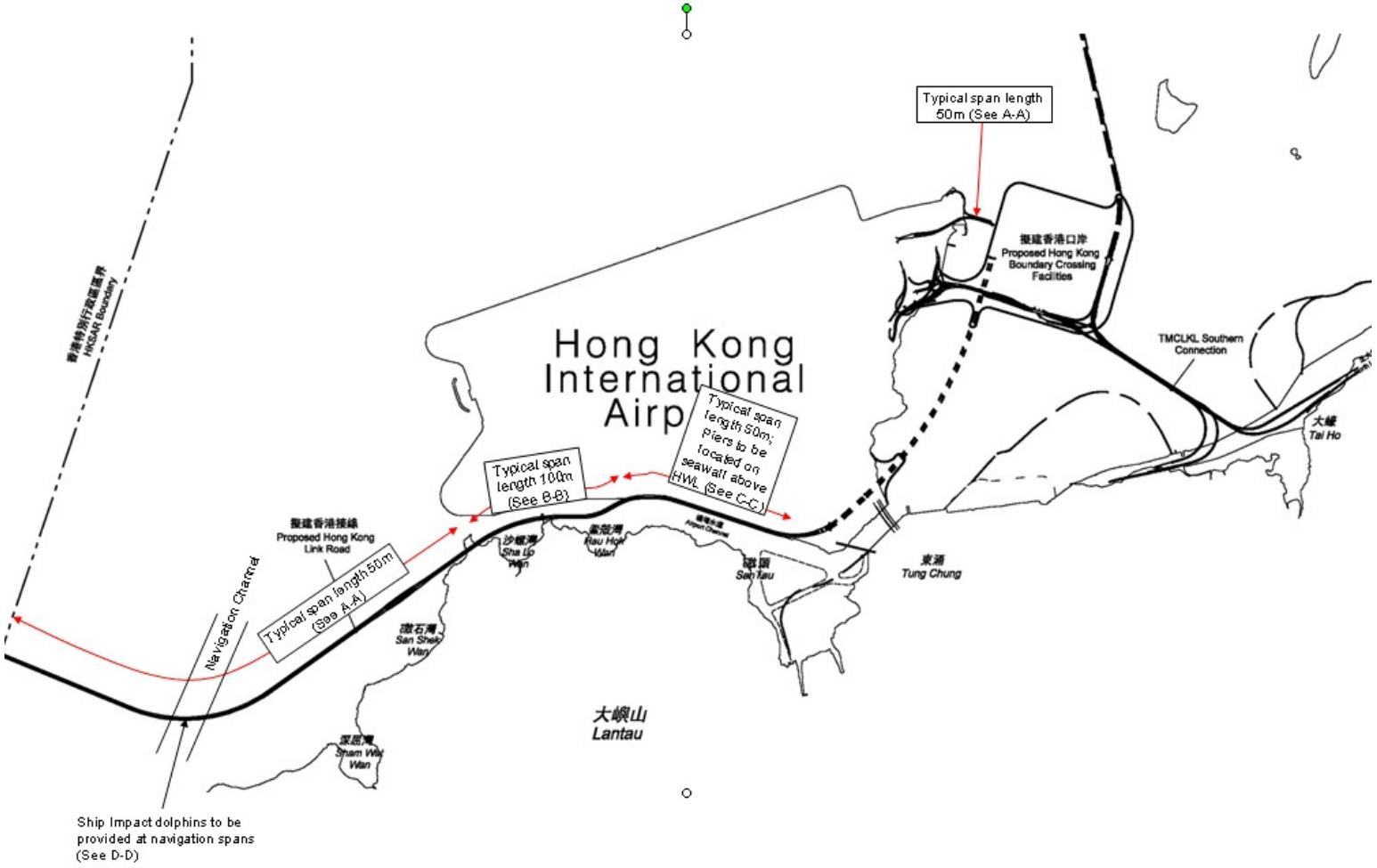
D3-4.3.2 Each of the 15 piers will consist of 8 piles each with a diameter of 2m exposed to the flow. The loss coefficient for these piers will be:

$$C_{loss,u} = \frac{1}{2}\left(\sum n * D\right) * C_d * a^2 / \Delta y$$
$$= \frac{1}{2}(15 * 8 * 2) * 1 * 1.008^2 / 1000$$
$$= 0.12$$

D3-5 REFERENCES

1 Feasibility Study for Additional Cross Border Links, Stage 2 Water Quality Impact Assessment Working Paper WP2. Mouchel Asia 1999.

Figure 2 Hong Kong Link Road



APPENDIX 9D4

Pollution Loading Inventory

Table 1 Updated Stormwater Loads (forecast up to 2026)

ID	Easting	Northing	Layer	Period	Description	FLOW (For discharges with no flows, the unit should be g/s.)	adsorbed ortho phosphate	Detritus Carbon (DetC)	Detritus Nitrogen (DetN)	Detritus Phosphorus (DetP)	Detritus Silica (DetSi)	Diatoms	Algae (non-Diatoms)	Ammonium (NH4)	Nitrate (NO3)	Ortho-Phosphate (PO4)	dissolved Silica (Si)	Water Temperature	Salinity	carbonaceous BOD (first pool) at 5 days	Dissolved Oxygen	Copper (Cu)	E. Coli bacteria	inorganic matter (IM1)
						(m3/s)	(gP/m3)	(gC/m3)	(gN/m3)	(gP/m3)	(gSi/m3)	(gC/m3)	(gC/m3)	(gN/m3)	(gN/m3)	(gP/m3)	(gSi/m3)	(oC)	(g/kg)	(gO2/m3)	(g/m3)	(g/m3)	(MPN/m3)	(gDM/m3)
							'AAP'	'DetC'	'DetN'	'DetP'	'DetSi'	'DIAT'	'GREEN'	'NH4'	'NO3'	'PO4'	'Si'	'ModTemp'	'Salinity'	'CBOD5'	'OXY'	'Cu'	'EColi'	'IM1'
SW1	811395	832157	1	Dry Season	SWNT - Tin Shui Wai Storm Outfall	0	0.04000	0	0.29000	0.04000	0	0	0	0.36000	0.00000	0.05000	0.14000	0	0	3.160	0	0.000	4.86E+05	3.960
SW1	811395	832157	1	Wet Season	SWNT - Tin Shui Wai Storm Outfall	0	0.06000	0	0.52000	0.06000	0	0	0	0.36000	0.08000	0.06000	0.78000	0	0	7.530	0	0.000	4.86E+05	12.400
YL2	820475	837746	1	Dry Season	Yuen Long Storm Outfall	0	0.28000	0	2.21000	0.28000	0	0	0	2.59000	0.01000	0.34000	1.09000	0	0	24.270	0	0.000	3.44E+06	29.310
YL2	820475	837746	1	Wet Season	Yuen Long Storm Outfall	0	0.40000	0	4.00000	0.40000	0	0	0	2.62000	0.61000	0.41000	6.01000	0	0	57.970	0	0.020	3.44E+06	94.180
TM5	809465	827699	1	Dry Season	Tuen Mun Storm Outfall	0	0.05500	0	0.73586	0.05500	0	0	0	0.97860	0.00320	0.16056	0.42227	0	0	10.431	0	0.002	8.21E+05	9.192
TM5	809465	827699	1	Wet Season	Tuen Mun Storm Outfall	0	0.08232	0	1.15213	0.08232	0	0	0	1.04945	0.14159	0.17451	1.55543	0	0	18.203	0	0.007	8.21E+05	24.274
TM1	815173	825847	1	Dry Season	Tuen Mun Storm Outfall	0	0.05500	0	0.73586	0.05500	0	0	0	0.97860	0.00320	0.16056	0.42227	0	0	10.431	0	0.002	8.21E+05	9.192
TM1	815173	825847	1	Wet Season	Tuen Mun Storm Outfall	0	0.08232	0	1.15213	0.08232	0	0	0	1.04945	0.14159	0.17451	1.55543	0	0	18.203	0	0.007	8.21E+05	24.274
TM2	815654	826160	1	Dry Season	Tuen Mun Storm Outfall	0	0.05500	0	0.73586	0.05500	0	0	0	0.97860	0.00320	0.16056	0.42227	0	0	10.431	0	0.002	8.21E+05	9.192
TM2	815654	826160	1	Wet Season	Tuen Mun Storm Outfall	0	0.08232	0	1.15213	0.08232	0	0	0	1.04945	0.14159	0.17451	1.55543	0	0	18.203	0	0.007	8.21E+05	24.274
TM3	817332	825557	1	Dry Season	Tuen Mun Storm Outfall	0	0.05500	0	0.73586	0.05500	0	0	0	0.97860	0.00320	0.16056	0.42227	0	0	10.431	0	0.002	8.21E+05	9.192
TM3	817332	825557	1	Wet Season	Tuen Mun Storm Outfall	0	0.08232	0	1.15213	0.08232	0	0	0	1.04945	0.14159	0.17451	1.55543	0	0	18.203	0	0.007	8.21E+05	24.274
TM4	819823	824674	1	Dry Season	Tuen Mun Storm Outfall	0	0.05500	0	0.73586	0.05500	0	0	0	0.97860	0.00320	0.16056	0.42227	0	0	10.431	0	0.002	8.21E+05	9.192
TM4	819823	824674	1	Wet Season	Tuen Mun Storm Outfall	0	0.08232	0	1.15213	0.08232	0	0	0	1.04945	0.14159	0.17451	1.55543	0	0	18.203	0	0.007	8.21E+05	24.274
WT7	822319	824520	1	Dry Season	Western Tsuen Wan and Rural Areas Storm Outfall	0	0.00132	0	0.01334	0.00132	0	0	0	0.02100	0.00023	0.00865	0.04014	0	0	0.142	0	0.000	4.45E+03	0.100
WT7	822319	824520	1	Wet Season	Western Tsuen Wan and Rural Areas Storm Outfall	0	0.00331	0	0.04350	0.00331	0	0	0	0.02610	0.01024	0.00972	0.12300	0	0	0.706	0	0.000	4.45E+03	1.195
WT9	823761	824942	1	Dry Season	Western Tsuen Wan and Rural Areas Storm Outfall	0	0.00132	0	0.01334	0.00132	0	0	0	0.02100	0.00023	0.00865	0.04014	0	0	0.142	0	0.000	4.45E+03	0.100
WT9	823761	824942	1	Wet Season	Western Tsuen Wan and Rural Areas Storm Outfall	0	0.00331	0	0.04350	0.00331	0	0	0	0.02610	0.01024	0.00972	0.12300	0	0	0.706	0	0.000	4.45E+03	1.195
WT8	824421	825014	1	Dry Season	Western Tsuen Wan and Rural Areas Storm Outfall	0	0.00132	0	0.01334	0.00132	0	0	0	0.02100	0.00023	0.00865	0.04014	0	0	0.142	0	0.000	4.45E+03	0.100
WT8	824421	825014	1	Wet Season	Western Tsuen Wan and Rural Areas Storm Outfall	0	0.00331	0	0.04350	0.00331	0	0	0	0.02610	0.01024	0.00972	0.12300	0	0	0.706	0	0.000	4.45E+03	1.195
WT3	825961	825344	1	Dry Season	Western Tsuen Wan and Rural Areas Storm Outfall	0	0.00132	0	0.01334	0.00132	0	0	0	0.02100	0.00023	0.00865	0.04014	0	0	0.142	0	0.000	4.45E+03	0.100
WT3	825961	825344	1	Wet Season	Western Tsuen Wan and Rural Areas Storm Outfall	0	0.00331	0	0.04350	0.00331	0	0	0	0.02610	0.01024	0.00972	0.12300	0	0	0.706	0	0.000	4.45E+03	1.195
WT2	826210	825251	1	Dry Season	Western Tsuen Wan and Rural Areas Storm Outfall	0	0.00132	0	0.01334	0.00132	0	0	0	0.02100	0.00023	0.00865	0.04014	0	0	0.142	0	0.000	4.45E+03	0.100
WT2	826210	825251	1	Wet Season	Western Tsuen Wan and Rural Areas Storm Outfall	0	0.00331	0	0.04350	0.00331	0	0	0	0.02610	0.01024	0.00972	0.12300	0	0	0.706	0	0.000	4.45E+03	1.195
WT1	827504	825347	1	Dry Season	Western Tsuen Wan and Rural Areas Storm Outfall	0	0.00132	0	0.01334	0.00132	0	0	0	0.02100	0.00023	0.00865	0.04014	0	0	0.142	0	0.000	4.45E+03	0.100
WT1	827504	825347	1	Wet Season	Western Tsuen Wan and Rural Areas Storm Outfall	0	0.00331	0	0.04350	0.00331	0	0	0	0.02610	0.01024	0.00972	0.12300	0	0	0.706	0	0.000	4.45E+03	1.195
TW5	829445	825235	1	Dry Season	Tsuen Wan and Kwai Chung Storm Outfall	0	0.05162	0	0.70880	0.05162	0	0	0	0.90130	0.00184	0.15080	0.41760	0	0	11.260	0	0.003	7.37E+05	9.199
TW5	829445	825235	1	Wet Season	Tsuen Wan and Kwai Chung Storm Outfall	0	0.06740	0	0.94770	0.06740	0	0	0	0.94080	0.08120	0.16010	1.07200	0	0	15.780	0	0.006	7.37E+05	17.860
TW6	829529	825096	1	Dry Season	Tsuen Wan and Kwai Chung Storm Outfall	0	0.05162	0	0.70880	0.05162	0	0	0	0.90130	0.00184	0.15080	0.41760	0	0	11.260	0	0.003	7.37E+05	9.199
TW6	829529	825096	1	Wet Season	Tsuen Wan and Kwai Chung Storm Outfall	0	0.06740	0	0.94770	0.06740	0	0	0	0.94080	0.08120	0.16010	1.07200	0	0	15.780	0	0.006	7.37E+05	17.860
TW7	829537	824895	1	Dry Season	Tsuen Wan and Kwai Chung Storm Outfall	0	0.05162	0	0.70880	0.05162	0	0	0	0.90130	0.00184	0.15080	0.41760	0	0	11.260	0	0.003	7.37E+05	9.199
TW7	829537	824895	1	Wet Season	Tsuen Wan and Kwai Chung Storm Outfall	0	0.06740	0	0.94770	0.06740	0	0	0	0.94080	0.08120	0.16010	1.07200	0	0	15.780	0	0.006	7.37E+05	17.860
TW9	829755	823556	1	Dry Season	Tsuen Wan and Kwai Chung Storm Outfall	0	0.05162	0	0.70880	0.05162	0	0	0	0.90130	0.00184	0.15080	0.41760	0	0	11.260	0	0.003	7.37E+05	9.199
TW9	829755	823556	1	Wet Season	Tsuen Wan and Kwai Chung Storm Outfall	0	0.06740	0	0.94770	0.06740	0	0	0	0.94080	0.08120	0.16010	1.07200	0	0	15.780	0	0.006	7.37E+05	17.860
TW8	829915	823808	1	Dry Season	Tsuen Wan and Kwai Chung Storm Outfall	0	0.05162	0	0.70880	0.05162	0	0	0	0.90130	0.00184	0.15080	0.41760	0	0	11.260	0	0.003	7.37E+05	9.199
TW8	829915	823808	1	Wet Season	Tsuen Wan and Kwai Chung Storm Outfall	0	0.06740	0	0.94770	0.06740	0	0	0	0.94080	0.08120	0.16010	1.07200	0	0	15.780	0	0.006	7.37E+05	17.860
TW10	830420	822849	1	Dry Season	Tsuen Wan and Kwai Chung Storm Outfall	0	0.05162	0	0.70880	0.05162	0	0	0	0.90130	0.00184	0.15080	0.41760	0	0	11.260	0	0.003	7.37E+05	9.199
TW10	830420	822849	1	Wet Season	Tsuen Wan and Kwai Chung Storm Outfall	0	0.06740	0	0.94770	0.06740	0	0	0	0.94080	0.08120	0.16010	1.07200	0	0	15.780	0	0.006	7.37E+05	17.860
TY1	829396	824170	1	Dry Season	Tsing Yi Storm Outfall	0	0.01694	0	0.22850	0.01694	0	0	0	0.29930	0.00144	0.04895	0.13220	0	0	3.457	0	0.001	2.51E+05	2.981
TY1	829396	824170	1	Wet Season	Tsing Yi Storm Outfall	0	0.02923	0	0.41530	0.02923	0	0	0	0.33180	0.06345	0.05556	0.64380	0	0	6.960	0	0.003	2.51E+05	9.732
TY2	829445	823952	1	Dry Season	Tsing Yi Storm Outfall	0	0.01694	0	0.22850	0.01694	0	0	0	0.29930	0.00144	0.04895	0.13220	0	0	3.457	0	0.001	2.51E+05	2.981
TY2	829445	823952	1	Wet Season	Tsing Yi Storm Outfall	0	0.02923	0	0.41530	0.02923	0	0	0	0.33180	0.06345	0.05556	0.64380	0	0	6.960	0	0.003	2.51E+05	9.732
TY3	829507	823744	1	Dry Season	Tsing Yi Storm Outfall	0	0.01694	0	0.22850	0.01694	0	0	0	0.29930	0.00144	0.04895	0.13220	0	0	3.457	0	0.001	2.51E+05	2.981
TY3	829507	823744	1	Wet Season	Tsing Yi Storm Outfall	0	0.02923	0	0.41530	0.02923	0	0	0	0.33180	0.06345	0.05556	0.64380	0	0	6.960	0	0.003	2.51E+05	9.732
TY4	829587	823512	1	Dry Season	Tsing Yi Storm Outfall	0	0.01694	0	0.22850	0.01694	0	0	0	0.29930	0.00144	0.04895	0.13220	0	0	3.457	0	0.001	2.51E+05	2.981
TY4	829587	823512	1	Wet Season	Tsing Yi Storm Outfall	0	0.02923	0	0.41530	0.02923	0	0	0	0.33180	0.06345	0.05556	0.64380	0	0	6.960	0	0.003	2.51E+05	9.732
NW23	832956	821051	1	Dry Season	Lai Chi Kok Storm Outfall	0	0.05076	0	0.70877	0.05076	0	0	0	0.86263	0.00170	0.14894	0.46417	0	0	11.963	0	0.003	6.94E+05	9.396
NW23	832956	821051	1	Wet Season	Lai Chi Kok Storm Outfall	0	0.06529	0	0.92844	0.06529	0	0	0	0.89987	0.07496	0.15643	1.06872	0	0	16.136	0	0.006	6.94E+05	17.377
NW22	833051	820990	1	Dry Season	Lai Chi Kok Storm Outfall	0	0.05076	0	0.70877	0.05076	0	0	0	0.86263	0.00170	0.14894	0.46417	0	0	11.963	0	0.003	6.94E+05	9.396
NW22	833051	820990	1	Wet Season	Lai Chi Kok Storm Outfall	0	0.06529	0	0.92844	0.06529	0	0	0	0.89987	0.07496	0.15643	1.06872	0	0	16.136	0	0.006	6.94E+05	17.377
NW21	833051	820990	1	Dry Season	Sham Shui Po Storm Outfall	0	0.09657	0	1.29042	0.09657	0	0	0	1.68846	0.00179	0.28302	0.76205	0	0	19.110	0	0.003	1.39E+06	16.007
NW21	833051	820990	1	Wet Season	Sham Shui Po Storm Outfall	0	0.11192	0	1.52689	0.11192	0	0	0	1.72484	0.07906	0.29168	1.40277	0	0	23.454	0	0.006	1.39E+06	24.450
NW20	833825	820261	1	Dry Season	Sham Shui Po Storm Outfall	0	0.09657	0	1.29042	0.09657	0	0	0	1.68846	0.00179	0.28302	0.76205	0	0	19.110	0	0.003	1.39E+06	16.007
NW20	833825	820261	1	Wet Season	Sham Shui Po Storm Outfall	0	0.11192	0	1.52689	0.11192	0	0	0	1.72484	0.07906	0.29168	1.40277	0	0	23.454	0	0.006	1.39E+06	24.450
NW19	833899	820107	1	Dry Season	Yau Ma Tei Storm Outfall	0	0.06690	0	0.88874	0.06690	0	0	0	1.13848	0.00172	0.19613	0.56849	0	0	13.782	0	0.002	9.26E+05	11.160
NW19	833899	820107	1	Wet Season	Yau Ma Tei Storm Outfall	0	0.08167	0	1.11387	0.08167	0	0	0	1.17700	0.07609	0.20351	1.18128	0	0	17.869	0	0.004	9.26E+05	19.239
NW18	834415	819708	1	Dry Season	Yau Ma Tei Storm Outfall	0	0.06690	0	0.88874	0.06690	0	0	0	1.13848	0.00172	0.19613	0.56849	0	0	13.782	0	0.002	9.26E+05	11.160
NW18	834415	819708	1	Wet Season	Yau Ma Tei Storm Outfall	0	0.08167	0	1.11387	0.08167	0	0	0	1.17700	0.07609	0.20351	1.18128	0	0	17.869	0	0.004	9.26E+05	19.239
NW17	834514	818766	1	Dry Season	Yau Ma Tei Storm Outfall	0	0.06690	0	0.88874	0.06690	0	0	0	1.13848	0.00172	0.19613	0.56849	0	0	13.782	0	0.002	9.26E+05	11.160
NW17	834514	818766	1	Wet Season	Yau Ma Tei Storm Outfall	0	0.08167	0	1.11387	0.08167	0	0	0	1.17700	0.07609	0.20351	1.18128	0	0	17.869	0	0.004	9.26E+05	19.239
NS3	835360	817252	1	Dry Season	South Kowloon Storm Outfall	0	0.01777	0	0.23687	0.01777	0	0	0	0.28716	0.00003	0.05215	0.15584	0	0	4.069	0	0.000	2.25E+05	3.039
NS3	835360	817252	1	Wet Season	South Kowloon Storm Outfall	0	0.01803	0	0.24076	0.01803	0	0	0	0.28716	0.00134	0.05228	0.16606	0	0	4.146	0	0.000	2.25E+05	3.180
NS4	835565	817006	1	Dry Season	South Kowloon Storm Outfall	0	0.01777	0	0.23687	0.01777	0	0	0	0.28716	0.00003	0.05215	0.15584	0	0	4.069	0	0.000	2.25E+05	3.039
NS4	835565	817006	1	Wet Season	South Kowloon Storm Outfall	0	0.01803	0	0.24076	0.01803	0	0	0	0.28716	0.00134	0.05228	0.16606	0	0	4.146	0	0.000	2.25E+05	3.180
NS5	835565	817006	1	Dry Season	South Kowloon Storm Outfall	0	0.01777	0	0.23687	0.01777	0	0	0	0.28716	0.00003	0.05215	0.15584	0	0	4.069	0	0.000	2.25E+05	3.039
NS5	835565	817006	1	Wet Season	South Kowloon Storm Outfall	0	0.01803	0	0.24076	0.01803	0	0	0	0.28716	0.00134	0.05228	0.16606	0	0	4.146	0	0.000	2.25E+05	3.180
NS6	836031	817063	1	Dry Season	South Kowloon Storm Outfall	0	0.01777	0	0.23687	0.01777	0	0	0	0.28716	0.00003	0.05215	0.15584	0	0	4.069	0	0.000	2.25E+05	3.039
NS6	836031	817063	1	Wet Season	South Kowloon Storm Outfall	0	0.01803	0	0.24076	0.01803	0	0	0	0.28716	0.00134	0.05228	0.16606	0	0	4.146	0	0.000	2.25E+05	3.180
NS7	836628	817375	1	Dry Season	South Kowloon Storm Outfall	0	0.01777	0	0.23687	0.01777	0	0	0	0.28716	0.00003	0.05215	0.15584	0	0	4.069	0	0.000	2.25E+05	3.039
NS7	836628	817375	1	Wet Season	South Kowloon Storm Outfall	0	0.01803	0	0.24076	0.01803	0	0	0	0.28716	0.00134	0.05228	0.16606	0	0	4.146	0	0.000	2.25E+05	3.180
NS8	836535	817573	1	Dry Season	South Kowloon Storm Outfall	0	0.01777	0	0.23687	0.01777	0	0	0	0.28716	0.00003	0.05215	0.15584	0	0	4.069	0	0.000	2.25E+05	3.039
NS8	836535	817573	1	Wet Season	South Kowloon Storm Outfall	0	0.01803	0	0.24076	0.01803	0	0	0	0.28716	0.00134	0.05228	0.16606	0	0	4.146	0	0.000	2.25E+05	3.180
NS23	837743	817923	1	Dry Season	South Kowloon Storm Outfall	0	0.01777	0	0.23687	0.01777	0	0	0	0.28716	0.00003	0.05215	0.15584	0	0	4.069	0	0.000	2.25E+05	3.039
NS23	837743	817923	1	Wet Season	South Kowloon Storm Outfall	0	0.01803	0	0.24076	0.01803	0	0	0	0.28716	0.00134	0.05228	0.16606	0	0	4.146	0	0.000	2.25E+05	3.180
A1	815074	820348	1	Dry Season	Airport Storm Outfall	0	0.00215	0	0.03224	0.00215	0	0	0	0.00537	0.01075	0.00107	0.08813	0	0	0.604	0	0.005	0.00E+00	1.162
A1	815074	820348	1	Wet Season	Airport Storm Outfall	0	0.01104	0	0.16560	0.01104	0	0	0	0.02759	0.05519	0.00552	0.45250	0	0	3.101	0	0.028	0.00E+00	5.967

Table 1 Updated Stormwater Loads (forecast up to 2026)

ID	Easting	Northing	Layer	Period	Description	FLOW (For discharges with no flows, the unit should be g/s.)	adsorbed ortho phosphate	Detritus Carbon (DetC)	Detritus Nitrogen (DetN)	Detritus Phosphorus (DetP)	Detritus Silica (DetSi)	Diatoms	Algae (non-Diatoms)	Ammonium (NH4)	Nitrate (NO3)	Ortho-Phosphate (PO4)	dissolved Silica (Si)	Water Temperature	Salinity	carbonaceous BOD (first pool) at 5 days	Dissolved Oxygen	Copper (Cu)	E. Coli bacteria	inorganic matter (IM1)
						(m3/s)	(gP/m3)	(gC/m3)	(gN/m3)	(gP/m3)	(gSi/m3)	(gC/m3)	(gC/m3)	(gN/m3)	(gN/m3)	(gP/m3)	(gSi/m3)	(oC)	(g/kg)	(gO2/m3)	(g/m3)	(g/m3)	(MPN/m3)	(gDM/m3)
							'AAP'	'DetC'	'DetN'	'DetP'	'DetSi'	'DIAT'	'GREEN'	'NH4'	'NO3'	'PO4'	'Si'	'ModTemp'	'Salinity'	'CBOD5'	'OXY'	'Cu'	'EColi'	'IM1'
A2	808925	819867	1	Dry Season	Airport Storm Outfall	0	0.00144	0	0.02158	0.00144	0	0	0	0.00360	0.00719	0.00072	0.05898	0	0	0.404	0	0.004	0.00E+00	0.778
A2	808925	819867	1	Wet Season	Airport Storm Outfall	0	0.00739	0	0.11080	0.00739	0	0	0	0.00185	0.03693	0.00369	0.30290	0	0	2.076	0	0.018	0.00E+00	3.993
A3	807316	819390	1	Dry Season	Airport Storm Outfall	0	0.00144	0	0.02153	0.00144	0	0	0	0.00359	0.00718	0.00072	0.05884	0	0	0.403	0	0.004	0.00E+00	0.776
A3	807316	819390	1	Wet Season	Airport Storm Outfall	0	0.00737	0	0.11054	0.00737	0	0	0	0.01842	0.03685	0.00368	0.30220	0	0	2.071	0	0.018	0.00E+00	3.984
A4	807233	817825	1	Dry Season	Airport Storm Outfall	0	0.00237	0	0.03551	0.00237	0	0	0	0.00592	0.01184	0.00118	0.09705	0	0	0.665	0	0.006	0.00E+00	1.280
A4	807233	817825	1	Wet Season	Airport Storm Outfall	0	0.01216	0	0.18230	0.01216	0	0	0	0.03039	0.06078	0.00608	0.49836	0	0	3.416	0	0.030	0.00E+00	6.571
A5	809506	817334	1	Dry Season	Airport Storm Outfall	0	0.00108	0	0.01621	0.00108	0	0	0	0.00270	0.00540	0.00054	0.04431	0	0	0.304	0	0.003	0.00E+00	0.584
A5	809506	817334	1	Wet Season	Airport Storm Outfall	0	0.00555	0	0.08325	0.00555	0	0	0	0.00139	0.02775	0.00277	0.22755	0	0	1.560	0	0.014	0.00E+00	3.001
A6	811652	818051	1	Dry Season	Airport Storm Outfall	0	0.00168	0	0.02518	0.00168	0	0	0	0.00420	0.00839	0.00084	0.06882	0	0	0.472	0	0.004	0.00E+00	0.907
A6	811652	818051	1	Wet Season	Airport Storm Outfall	0	0.00862	0	0.12928	0.00862	0	0	0	0.00216	0.04309	0.00431	0.35337	0	0	2.422	0	0.022	0.00E+00	4.660
A7	812139	819312	1	Dry Season	Airport Storm Outfall	0	0.00242	0	0.03635	0.00242	0	0	0	0.00606	0.01212	0.00121	0.09936	0	0	0.681	0	0.006	0.00E+00	1.310
A7	812139	819312	1	Wet Season	Airport Storm Outfall	0	0.01346	0	0.20196	0.01346	0	0	0	0.03367	0.06732	0.00673	0.55203	0	0	3.783	0	0.029	0.00E+00	7.279
TC1	806267	815086	1	Dry Season	North Lantau Storm Outfall	0	0.00180	0	0.02610	0.00180	0	0	0	0.02056	0.00005	0.00375	0.00165	0	0	0.219	0	0.000	2.37E+04	0.221
TC1	806267	815086	1	Wet Season	North Lantau Storm Outfall	0	0.00185	0	0.02674	0.00185	0	0	0	0.02066	0.00027	0.00376	0.00342	0	0	0.231	0	0.000	2.37E+04	0.245
TC2	806743	815725	1	Dry Season	North Lantau Storm Outfall	0	0.00320	0	0.04638	0.00320	0	0	0	0.03634	0.00019	0.00662	0.00375	0	0	0.392	0	0.001	4.18E+04	0.402
TC2	806743	815725	1	Wet Season	North Lantau Storm Outfall	0	0.00336	0	0.04879	0.00336	0	0	0	0.03675	0.00099	0.00671	0.01033	0	0	0.437	0	0.001	4.18E+04	0.489
TC6	810746	816461	1	Dry Season	Tung Chung West Development	0	0.00412	0	0.06012	0.00412	0	0	0	0.03862	0.00477	0.00707	0.04131	0	0	0.649	0	0.003	4.18E+04	0.890
TC6	810746	816461	1	Wet Season	Tung Chung West Development	0	0.00807	0	0.11933	0.00807	0	0	0	0.04850	0.02452	0.00906	0.20315	0	0	1.759	0	0.013	4.18E+04	3.031
TC7	811215	816707	1	Dry Season	Tung Chung West Development	0	0.00471	0	0.06891	0.00471	0	0	0	0.04009	0.00770	0.00737	0.06534	0	0	0.814	0	0.004	4.18E+04	1.214
TC7	811215	816707	1	Wet Season	Tung Chung West Development	0	0.01108	0	0.16448	0.01108	0	0	0	0.05603	0.03957	0.01055	0.32659	0	0	2.604	0	0.020	4.18E+04	4.659
NL3	817196	819491	1	Dry Season	North Lantau Storm Outfall	0	0.00306	0	0.04442	0.00306	0	0	0	0.03308	0.00110	0.00605	0.01094	0	0	0.404	0	0.001	3.75E+04	0.461
NL3	817196	819491	1	Wet Season	North Lantau Storm Outfall	0	0.00397	0	0.05802	0.00397	0	0	0	0.03535	0.00564	0.00649	0.04814	0	0	0.659	0	0.003	3.75E+04	0.951
NL4	817517	819861	1	Dry Season	North Lantau Storm Outfall	0	0.00354	0	0.05152	0.00354	0	0	0	0.03524	0.00294	0.00645	0.02616	0	0	0.520	0	0.002	3.89E+04	0.673
NL4	817517	819861	1	Wet Season	North Lantau Storm Outfall	0	0.00597	0	0.08805	0.00597	0	0	0	0.04135	0.01512	0.00767	0.12602	0	0	1.205	0	0.008	3.89E+04	1.990
NL5	817842	820216	1	Dry Season	North Lantau Storm Outfall	0	0.00330	0	0.04778	0.00330	0	0	0	0.03657	0.00066	0.00667	0.00755	0	0	0.418	0	0.001	4.18E+04	0.452
NL5	817842	820216	1	Wet Season	North Lantau Storm Outfall	0	0.00384	0	0.05594	0.00384	0	0	0	0.03792	0.00337	0.00694	0.02988	0	0	0.571	0	0.002	4.18E+04	0.746
NL6	818051	820253	1	Dry Season	North Lantau Storm Outfall	0	0.00359	0	0.05221	0.00359	0	0	0	0.03731	0.00214	0.00683	0.01968	0	0	0.501	0	0.002	4.18E+04	0.612
NL6	818051	820253	1	Wet Season	North Lantau Storm Outfall	0	0.00536	0	0.07874	0.00536	0	0	0	0.04172	0.01098	0.00771	0.09219	0	0	0.998	0	0.006	4.18E+04	1.568
NL7	818260	820296	1	Dry Season	North Lantau Storm Outfall	0	0.00334	0	0.04841	0.00334	0	0	0	0.03668	0.00087	0.00669	0.00929	0	0	0.430	0	0.001	4.18E+04	0.475
NL7	818260	820296	1	Wet Season	North Lantau Storm Outfall	0	0.00406	0	0.05917	0.00406	0	0	0	0.03847	0.00445	0.00705	0.03874	0	0	0.632	0	0.003	4.18E+04	0.863
NL8	818482	820482	1	Dry Season	North Lantau Storm Outfall	0	0.00363	0	0.05273	0.00363	0	0	0	0.03740	0.00231	0.00685	0.02113	0	0	0.511	0	0.002	4.18E+04	0.631
NL8	818482	820482	1	Wet Season	North Lantau Storm Outfall	0	0.00554	0	0.08145	0.00554	0	0	0	0.04217	0.01189	0.00780	0.09960	0	0	1.049	0	0.007	4.18E+04	1.666
NL9	818724	820541	1	Dry Season	North Lantau Storm Outfall	0	0.00343	0	0.04981	0.00343	0	0	0	0.03691	0.00134	0.00673	0.01313	0	0	0.456	0	0.001	4.18E+04	0.526
NL9	818724	820541	1	Wet Season	North Lantau Storm Outfall	0	0.00454	0	0.06640	0.00454	0	0	0	0.03969	0.00687	0.00730	0.05849	0	0	0.767	0	0.004	4.18E+04	1.123
NL10	819963	821483	1	Dry Season	North Lantau Storm Outfall	0	0.00375	0	0.05453	0.00375	0	0	0	0.03770	0.00291	0.00689	0.02604	0	0	0.545	0	0.002	4.18E+04	0.696
NL10	819963	821483	1	Wet Season	North Lantau Storm Outfall	0	0.00615	0	0.09067	0.00615	0	0	0	0.04371	0.01496	0.00811	0.12482	0	0	1.222	0	0.008	4.18E+04	1.998
NL11	819963	821483	1	Dry Season	North Lantau Storm Outfall	0	0.00366	0	0.05318	0.00366	0	0	0	0.03747	0.00246	0.00685	0.02235	0	0	0.519	0	0.002	4.18E+04	0.647
NL11	819963	821483	1	Wet Season	North Lantau Storm Outfall	0	0.00569	0	0.08373	0.00569	0	0	0	0.04256	0.01266	0.00786	0.10588	0	0	1.092	0	0.007	4.18E+04	1.749
NL12	820549	821538	1	Dry Season	North Lantau Storm Outfall	0	0.00412	0	0.06014	0.00412	0	0	0	0.03862	0.00478	0.00707	0.04138	0	0	0.650	0	0.003	4.18E+04	0.898
NL12	820549	821538	1	Wet Season	North Lantau Storm Outfall	0	0.00808	0	0.11949	0.00808	0	0	0	0.04852	0.02457	0.00906	0.20358	0	0	1.761	0	0.013	4.18E+04	3.037
NL13	820504	821750	1	Dry Season	North Lantau Storm Outfall	0	0.00350	0	0.05077	0.00350	0	0	0	0.03707	0.00166	0.00678	0.15752	0	0	0.474	0	0.001	4.18E+04	0.560
NL13	820504	821750	1	Wet Season	North Lantau Storm Outfall	0	0.00487	0	0.07133	0.00487	0	0	0	0.04050	0.08520	0.00746	0.07198	0	0	0.859	0	0.005	4.18E+04	1.301
NL14	821073	822257	1	Dry Season	North Lantau Storm Outfall	0	0.00404	0	0.05890	0.00404	0	0	0	0.03842	0.00437	0.00705	0.03797	0	0	0.626	0	0.003	4.18E+04	0.853
NL14	821073	822257	1	Wet Season	North Lantau Storm Outfall	0	0.00765	0	0.11309	0.00765	0	0	0	0.04746	0.02242	0.00886	0.18609	0	0	1.641	0	0.012	4.18E+04	2.806
NL15	821672	822585	1	Dry Season	North Lantau Storm Outfall	0	0.00388	0	0.05653	0.00388	0	0	0	0.03803	0.00358	0.00696	0.03150	0	0	0.582	0	0.002	4.18E+04	0.768
NL15	821672	822585	1	Wet Season	North Lantau Storm Outfall	0	0.00684	0	0.10093	0.00684	0	0	0	0.04543	0.01837	0.00845	0.15284	0	0	1.414	0	0.010	4.18E+04	2.368
NL16	821983	822658	1	Dry Season	North Lantau Storm Outfall	0	0.00355	0	0.05159	0.00355	0	0	0	0.03721	0.00193	0.00680	0.01801	0	0	0.490	0	0.002	4.18E+04	0.590
NL16	821983	822658	1	Wet Season	North Lantau Storm Outfall	0	0.00515	0	0.07557	0.00515	0	0	0	0.04120	0.00992	0.00759	0.08355	0	0	0.939	0	0.006	4.18E+04	1.454
NL17	822268	822721	1	Dry Season	North Lantau Storm Outfall	0	0.00327	0	0.04737	0.00327	0	0	0	0.03650	0.00052	0.00667	0.00646	0	0	0.410	0	0.001	4.18E+04	0.438
NL17	822268	822721	1	Wet Season	North Lantau Storm Outfall	0	0.00370	0	0.05386	0.00370	0	0	0	0.03758	0.00269	0.00687	0.02420	0	0	0.532	0	0.002	4.18E+04	0.672
NL18	822516	822985	1	Dry Season	North Lantau Storm Outfall	0	0.00327	0	0.04732	0.00327	0	0	0	0.03649	0.00051	0.00667	0.06351	0	0	0.410	0	0.001	4.18E+04	0.436
NL18	822516	822985	1	Wet Season	North Lantau Storm Outfall	0	0.00369	0	0.05365	0.00369	0	0	0	0.03754	0.00262	0.00687	0.02362	0	0	0.505	0	0.002	4.18E+04	0.664
NL19	824009	821687	1	Dry Season	North Lantau Storm Outfall	0	0.00346	0	0.05024	0.00346	0	0	0	0.03698	0.00148	0.00676	0.01431	0	0	0.464	0	0.001	4.18E+04	0.541
NL19	824009	821687	1	Wet Season	North Lantau Storm Outfall	0	0.00469	0	0.06864	0.00469	0	0	0	0.04005	0.00762	0.00737	0.06457	0	0	0.809	0	0.004	4.18E+04	1.204
NL20	823940	821055	1	Dry Season	North Lantau Storm Outfall	0	0.00386	0	0.05631	0.00386	0	0	0	0.03800	0.00351	0.00696	0.03092	0	0	0.578	0	0.002	4.18E+04	0.760
NL20	823940	821055	1	Wet Season	North Lantau Storm Outfall	0	0.00676	0	0.09982	0.00676	0	0	0	0.04525	0.01801	0.00841	0.14982	0	0	1.393	0	0.010	4.18E+04	2.328
NL21	823902	820661	1	Dry Season	North Lantau Storm Outfall	0	0.00391	0	0.05695	0.00391	0	0	0	0.03810	0.00372	0.00698	0.03266	0	0	0.590	0	0.002	4.18E+04	0.783
NL21	823902	820661	1	Wet Season	North Lantau Storm Outfall	0	0.00698	0	0.10310	0.00698	0	0	0	0.04579	0.01910	0.00852	0.15881	0	0	1.454	0	0.010	4.18E+04	2.446
NL22	824119	819601	1	Dry Season	North Lantau Storm Outfall	0	0.00374	0	0.05447	0.00374	0	0	0	0.03769	0.00289	0.00689	0.02588	0	0	0.543	0	0.002	4.18E+04	0.694
NL22	824119	819601	1	Wet Season	North Lantau Storm Outfall	0	0.00613	0	0.09035	0.00613	0	0	0	0.04366	0.01485	0.00809	0.12394	0	0	1.216	0	0.008	4.18E+04	1.987
TO1	803904	813456	1	Dry Season	Tai O Storm Outfall	0	0.00206	0	0.03409	0.00206	0	0	0	0.03946	0.00090	0.00753	0.00754	0	0	0.455	0	0.001	3.39E+04	0.452
TO1	803904	813456	1	Wet Season	Tai O Storm Outfall	0	0.00280	0	0.04529	0.00280	0	0	0	0.04133	0.00463	0.00791	0.03816	0	0	0.665	0	0.003	3.39E+04	0.855
TO2	803656	812779	1	Dry Season	Tai O Storm Outfall	0	0.00206	0	0.03409	0.00206	0	0	0	0.03946	0.00090	0.00753	0.00754	0	0	0.455	0	0.001	3.39E+04	0.452
TO2	803656	812779	1	Wet Season	Tai O Storm Outfall	0	0.00280	0	0.04529	0.00280	0	0	0	0.04133	0.00463	0.00791	0.03816	0	0	0.665	0	0.003	3.39E+04	0.855
AN1	803598	812432	1	Dry Season	Tai O Storm Outfall	0	0.00000	0	0.00000	0.00000	0	0	0	0.00001	0.00000	0.00000	0.00000	0	0	0.000	0	0.000	0.00E+00	0.000
AN1	803598	812432	1	Wet Season	Tai O Storm Outfall	0	0.00000	0	0.00000	0.00000	0	0	0	0.00001	0.00000	0.00000	0.00000	0	0	0.000	0	0.000	0.00E+00	0.000
SP1	806151	809058	1	Dry Season	Shek Pik Storm Outfall	0	0.00178	0	0.02435	0.00178	0	0	0	0.03089	0.00031	0.00511	0.01467	0	0	0.340	0	0.000	2.58E+04	0.313
SP1	806151	809058	1	Wet Season	Shek Pik Storm Outfall	0	0.00445	0	0.06504	0.00445	0	0	0	0.03786	0.01377	0.00655	0.12562	0	0	1.102	0	0.001	2.58E+04	1.782
SL1	815856	811127	1	Dry Season	South Lantau Island Storm Outfall	0	0.00104	0	0.02203	0.00104	0	0	0	0.02392	0.00011	0.00525	0.00128	0	0	0.279	0	0.000	2.14E+04	0.243
SL1	815856	811127	1	Wet Season	South Lantau Island Storm Outfall	0	0.00201	0	0.03683	0.00201	0	0	0	0.02642	0.00503	0.00577	0.04175	0	0	0.557	0	0.001	2.14E+04	0.778
SL2	814589	810857	1	Dry Season	South Lantau Island Storm Outfall	0	0.00104	0	0.02203	0.00104	0	0	0	0.02392	0.00011	0.00525	0.00128	0	0	0.279	0	0.000	2.14E+04	0.243
SL2	814589	810857	1	Wet Season	South Lantau Island Storm Outfall	0	0.00201	0	0.03683	0.00201	0	0	0	0.02642	0.00503	0.00577	0.04175	0	0	0.557	0	0.001	2.14E+04	0.778
SL3	813498	810546	1	Dry Season	South Lantau Island Storm Outfall	0	0.00104	0	0.02203	0.00104	0	0	0	0.02392	0.00011	0.00525	0.00128	0	0	0.279	0	0.000	2.14E+04	0.243
SL3	813498	810546	1	Wet Season	South Lantau Island Storm Outfall	0	0.00201	0	0.03683	0.00201	0	0	0	0.02642	0.00503	0.00577	0.04175	0	0	0.557	0	0.001	2.14E+04	0.778
SL4	812678	810485	1	Dry Season	South Lantau Island Storm Outfall	0	0.00104	0	0.02203	0.00104	0	0	0	0.02392	0.00011	0.00525	0.00128	0	0	0.279	0	0.000	2.14E+04	0.243
SL4	812678	810485	1	Wet Season	South Lantau Island Storm Outfall	0	0.00201	0	0.03683	0.00201	0	0	0	0.02642	0.00503	0.00577	0.04175	0	0	0.557	0	0.001	2.14E+04	0.778
SL5	811049	809617	1	Dry Season	South Lantau Island Storm Outfall	0	0.00104	0	0.02203	0.00104	0	0	0	0.02392	0.00011	0.00525	0.00128	0	0	0.279	0	0.000	2.14E+04	0.243

Table 1 Updated Stormwater Loads (forecast up to 2026)

ID	Easting	Northing	Layer	Period	Description	Flow (For discharges with no flows, the unit should be g/s.)	adsorbed ortho phosphate	Detritus Carbon (DetC)	Detritus Nitrogen (DetN)	Detritus Phosphorus (DetP)	Detritus Silica (DetSi)	Diatoms	Algae (non-Diatoms)	Ammonium (NH4)	Nitrate (NO3)	Ortho-Phosphate (PO4)	dissolved Silica (Si)	Water Temperature	Salinity	carbonaceous BOD (first pool) at 5 days	Dissolved Oxygen	Copper (Cu)	E. Coli bacteria	inorganic matter (IM1)
						(m3/s)	(gP/m3)	(gC/m3)	(gN/m3)	(gP/m3)	(gSi/m3)	(gC/m3)	(gC/m3)	(gN/m3)	(gN/m3)	(gP/m3)	(gSi/m3)	(oC)	(g/kg)	(gO2/m3)	(g/m3)	(g/m3)	(MPN/m3)	(gDM/m3)
							'AAP'	'DetC'	'DetN'	'DetP'	'DetSi'	'DIAT'	'GREEN'	'NH4'	'NO3'	'PO4'	'Si'	'ModTemp'	'Salinity'	'CBOD5'	'OXY'	'Cu'	'EColi'	'IM1'
SL5	811049	809617	1	Wet Season	South Lantau Island Storm Outfall	0	0.00201	0	0.03683	0.00201	0	0	0	0.02642	0.00503	0.00577	0.04175	0	0	0.557	0	0.001	2.14E+04	0.778
SL6	810342	809651	1	Dry Season	South Lantau Island Storm Outfall	0	0.00104	0	0.02203	0.00104	0	0	0	0.02392	0.00011	0.00525	0.00128	0	0	0.279	0	0.000	2.14E+04	0.243
SL6	810342	809651	1	Wet Season	South Lantau Island Storm Outfall	0	0.00201	0	0.03683	0.00201	0	0	0	0.02642	0.00503	0.00577	0.04175	0	0	0.557	0	0.001	2.14E+04	0.778
SL7	809685	808919	1	Dry Season	South Lantau Island Storm Outfall	0	0.00104	0	0.02203	0.00104	0	0	0	0.02392	0.00011	0.00525	0.00128	0	0	0.279	0	0.000	2.14E+04	0.243
SL7	809685	808919	1	Wet Season	South Lantau Island Storm Outfall	0	0.00201	0	0.03683	0.00201	0	0	0	0.02642	0.00503	0.00577	0.04175	0	0	0.557	0	0.001	2.14E+04	0.778
SH1	817296	806462	1	Dry Season	Shek Kwu Chau Storm Outfall	0	0.00137	0	0.01811	0.00137	0	0	0	0.02435	0.00004	0.00401	0.00975	0	0	0.249	0	0.000	2.05E+04	0.218
SH1	817296	806462	1	Wet Season	Shek Kwu Chau Storm Outfall	0	0.00168	0	0.02286	0.00168	0	0	0	0.02524	0.00162	0.00417	0.02272	0	0	0.339	0	0.000	2.05E+04	0.389
CC1	820684	807608	1	Dry Season	Cheung Chau Storm Outfall	0	0.00234	0	0.03051	0.00234	0	0	0	0.04211	0.00006	0.00687	0.01154	0	0	0.410	0	0.000	3.57E+04	0.372
CC1	820684	807608	1	Wet Season	Cheung Chau Storm Outfall	0	0.00284	0	0.03816	0.00284	0	0	0	0.04338	0.00259	0.00713	0.03236	0	0	0.552	0	0.000	3.57E+04	0.647
CC2	820684	807608	1	Dry Season	Cheung Chau Storm Outfall	0	0.00234	0	0.03051	0.00234	0	0	0	0.04211	0.00006	0.00687	0.01154	0	0	0.410	0	0.000	3.57E+04	0.372
CC2	820684	807608	1	Wet Season	Cheung Chau Storm Outfall	0	0.00284	0	0.03816	0.00284	0	0	0	0.04338	0.00259	0.00713	0.03236	0	0	0.552	0	0.000	3.57E+04	0.647
CC3	820684	807608	1	Dry Season	Cheung Chau Storm Outfall	0	0.00234	0	0.03051	0.00234	0	0	0	0.04211	0.00006	0.00687	0.01154	0	0	0.410	0	0.000	3.57E+04	0.372
CC3	820684	807608	1	Wet Season	Cheung Chau Storm Outfall	0	0.00284	0	0.03816	0.00284	0	0	0	0.04338	0.00259	0.00713	0.03236	0	0	0.552	0	0.000	3.57E+04	0.647
CC4	820684	807608	1	Dry Season	Cheung Chau Storm Outfall	0	0.00234	0	0.03051	0.00234	0	0	0	0.04211	0.00006	0.00687	0.01154	0	0	0.410	0	0.000	3.57E+04	0.372
CC4	820684	807608	1	Wet Season	Cheung Chau Storm Outfall	0	0.00284	0	0.03816	0.00284	0	0	0	0.04338	0.00259	0.00713	0.03236	0	0	0.552	0	0.000	3.57E+04	0.647
CC5	820684	807608	1	Dry Season	Cheung Chau Storm Outfall	0	0.00234	0	0.03051	0.00234	0	0	0	0.04211	0.00006	0.00687	0.01154	0	0	0.410	0	0.000	3.57E+04	0.372
CC5	820684	807608	1	Wet Season	Cheung Chau Storm Outfall	0	0.00284	0	0.03816	0.00284	0	0	0	0.04338	0.00259	0.00713	0.03236	0	0	0.552	0	0.000	3.57E+04	0.647
CC6	820606	807857	1	Dry Season	Cheung Chau Storm Outfall	0	0.00234	0	0.03051	0.00234	0	0	0	0.04211	0.00006	0.00687	0.01154	0	0	0.410	0	0.000	3.57E+04	0.372
CC6	820606	807857	1	Wet Season	Cheung Chau Storm Outfall	0	0.00284	0	0.03816	0.00284	0	0	0	0.04338	0.00259	0.00713	0.03236	0	0	0.552	0	0.000	3.57E+04	0.647
CC7	820606	807857	1	Dry Season	Cheung Chau Storm Outfall	0	0.00234	0	0.03051	0.00234	0	0	0	0.04211	0.00006	0.00687	0.01154	0	0	0.410	0	0.000	3.57E+04	0.372
CC7	820606	807857	1	Wet Season	Cheung Chau Storm Outfall	0	0.00284	0	0.03816	0.00284	0	0	0	0.04338	0.00259	0.00713	0.03236	0	0	0.552	0	0.000	3.57E+04	0.647
CC8	820540	808046	1	Dry Season	Cheung Chau Storm Outfall	0	0.00234	0	0.03051	0.00234	0	0	0	0.04211	0.00006	0.00687	0.01154	0	0	0.410	0	0.000	3.57E+04	0.372
CC8	820540	808046	1	Wet Season	Cheung Chau Storm Outfall	0	0.00284	0	0.03816	0.00284	0	0	0	0.04338	0.00259	0.00713	0.03236	0	0	0.552	0	0.000	3.57E+04	0.647
CC9	820540	808046	1	Dry Season	Cheung Chau Storm Outfall	0	0.00234	0	0.03051	0.00234	0	0	0	0.04211	0.00006	0.00687	0.01154	0	0	0.410	0	0.000	3.57E+04	0.372
CC9	820540	808046	1	Wet Season	Cheung Chau Storm Outfall	0	0.00284	0	0.03816	0.00284	0	0	0	0.04338	0.00259	0.00713	0.03236	0	0	0.552	0	0.000	3.57E+04	0.647
CC10	820540	808046	1	Dry Season	Cheung Chau Storm Outfall	0	0.00234	0	0.03051	0.00234	0	0	0	0.04211	0.00006	0.00687	0.01154	0	0	0.410	0	0.000	3.57E+04	0.372
CC10	820540	808046	1	Wet Season	Cheung Chau Storm Outfall	0	0.00284	0	0.03816	0.00284	0	0	0	0.04338	0.00259	0.00713	0.03236	0	0	0.552	0	0.000	3.57E+04	0.647
CC11	820099	807118	1	Dry Season	Cheung Chau Storm Outfall	0	0.00234	0	0.03051	0.00234	0	0	0	0.04211	0.00006	0.00687	0.01154	0	0	0.410	0	0.000	3.57E+04	0.372
CC11	820099	807118	1	Wet Season	Cheung Chau Storm Outfall	0	0.00284	0	0.03816	0.00284	0	0	0	0.04338	0.00259	0.00713	0.03236	0	0	0.552	0	0.000	3.57E+04	0.647
CC12	821693	807923	1	Dry Season	Cheung Chau Storm Outfall	0	0.00234	0	0.03051	0.00234	0	0	0	0.04211	0.00006	0.00687	0.01154	0	0	0.410	0	0.000	3.57E+04	0.372
CC12	821693	807923	1	Wet Season	Cheung Chau Storm Outfall	0	0.00284	0	0.03816	0.00284	0	0	0	0.04338	0.00259	0.00713	0.03236	0	0	0.552	0	0.000	3.57E+04	0.647
MW3	817475	811337	1	Dry Season	Mui Wo Storm Outfall	0	0.00130	0	0.02144	0.00130	0	0	0	0.02569	0.00034	0.00485	0.00299	0	0	0.274	0	0.000	2.24E+04	0.265
MW3	817475	811337	1	Wet Season	Mui Wo Storm Outfall	0	0.00421	0	0.06575	0.00421	0	0	0	0.03319	0.01505	0.00643	0.12418	0	0	1.105	0	0.001	2.24E+04	1.865
MW4	818544	810690	1	Dry Season	Mui Wo Storm Outfall	0	0.00130	0	0.02144	0.00130	0	0	0	0.02569	0.00034	0.00485	0.00299	0	0	0.274	0	0.000	2.24E+04	0.265
MW4	818544	810690	1	Wet Season	Mui Wo Storm Outfall	0	0.00421	0	0.06575	0.00421	0	0	0	0.03319	0.01505	0.00643	0.12418	0	0	1.105	0	0.001	2.24E+04	1.865
MW1	818054	814741	1	Dry Season	Mui Wo Storm Outfall	0	0.00130	0	0.02144	0.00130	0	0	0	0.02569	0.00034	0.00485	0.00299	0	0	0.274	0	0.000	2.24E+04	0.265
MW1	818054	814741	1	Wet Season	Mui Wo Storm Outfall	0	0.00421	0	0.06575	0.00421	0	0	0	0.03319	0.01505	0.00643	0.12418	0	0	1.105	0	0.001	2.24E+04	1.865
MW2	817947	814591	1	Dry Season	Mui Wo Storm Outfall	0	0.00130	0	0.02144	0.00130	0	0	0	0.02569	0.00034	0.00485	0.00299	0	0	0.274	0	0.000	2.24E+04	0.265
MW2	817947	814591	1	Wet Season	Mui Wo Storm Outfall	0	0.00421	0	0.06575	0.00421	0	0	0	0.03319	0.01505	0.00643	0.12418	0	0	1.105	0	0.001	2.24E+04	1.865
PC1	821687	816587	1	Dry Season	Peng Chau Storm Outfall	0	0.00191	0	0.02468	0.00191	0	0	0	0.03429	0.00012	0.00556	0.00808	0	0	0.330	0	0.000	2.92E+04	0.310
PC1	821687	816587	1	Wet Season	Peng Chau Storm Outfall	0	0.00294	0	0.04014	0.00294	0	0	0	0.03689	0.00528	0.00612	0.05053	0	0	0.621	0	0.000	2.92E+04	0.872
PC2	821720	816240	1	Dry Season	Peng Chau Storm Outfall	0	0.00191	0	0.02468	0.00191	0	0	0	0.03429	0.00012	0.00556	0.00808	0	0	0.330	0	0.000	2.92E+04	0.310
PC2	821720	816240	1	Wet Season	Peng Chau Storm Outfall	0	0.00294	0	0.04014	0.00294	0	0	0	0.03689	0.00528	0.00612	0.05053	0	0	0.621	0	0.000	2.92E+04	0.872
PC3	821737	816105	1	Dry Season	Peng Chau Storm Outfall	0	0.00191	0	0.02468	0.00191	0	0	0	0.03429	0.00012	0.00556	0.00808	0	0	0.330	0	0.000	2.92E+04	0.310
PC3	821737	816105	1	Wet Season	Peng Chau Storm Outfall	0	0.00294	0	0.04014	0.00294	0	0	0	0.03689	0.00528	0.00612	0.05053	0	0	0.621	0	0.000	2.92E+04	0.872
PS8	844758	817839	1	Dry Season	Port Shelter Storm Outfall	0	0.00280	0	0.03486	0.00280	0	0	0	0.05778	0.00026	0.01665	0.05224	0	0	0.357	0	0.000	1.82E+04	0.235
PS8	844758	817839	1	Wet Season	Port Shelter Storm Outfall	0	0.00504	0	0.06900	0.00504	0	0	0	0.06346	0.01159	0.01786	0.14602	0	0	0.998	0	0.001	1.82E+04	1.472
TK3	844758	817839	1	Dry Season	Tseung Kwan O Storm Outfall	0	0.09905	0	1.31456	0.09905	0	0	0	1.76176	0.00662	0.28829	0.78541	0	0	18.938	0	0.005	1.48E+06	16.765
TK3	844758	817839	1	Wet Season	Tseung Kwan O Storm Outfall	0	0.15558	0	2.18400	0.15558	0	0	0	1.90632	0.29318	0.31845	3.14912	0	0	35.110	0	0.015	1.48E+06	47.892
TU1	849016	812889	1	Dry Season	Tung Lung Chau Storm Outfall	0	0.00362	0	0.04981	0.00362	0	0	0	0.06562	0.00000	0.01062	0.02958	0	0	0.708	0	0.000	5.48E+04	0.604
TU1	849016	812889	1	Wet Season	Tung Lung Chau Storm Outfall	0	0.00364	0	0.05019	0.00364	0	0	0	0.06562	0.00013	0.01063	0.03073	0	0	0.714	0	0.000	5.48E+04	0.618
PT1	844200	802291	1	Dry Season	Po Toi Storm Outfall	0	0.00085	0	0.01115	0.00085	0	0	0	0.01557	0.00001	0.00251	0.00447	0	0	0.142	0	0.000	1.33E+04	0.130
PT1	844200	802291	1	Wet Season	Po Toi Storm Outfall	0	0.00094	0	0.01245	0.00094	0	0	0	0.01579	0.00044	0.00255	0.00806	0	0	0.166	0	0.000	1.33E+04	0.178
GL1	830264	816357	1	Dry Season	Green Island Storm Outfall	0	0.01554	0	0.00006	0.01554	0	0	0	0.28190	0.00002	0.04559	0.11720	0	0	2.610	0	0.000	2.40E+05	2.390
GL1	830264	816357	1	Wet Season	Green Island Storm Outfall	0	0.01566	0	0.00258	0.01566	0	0	0	0.28190	0.00085	0.04559	0.12410	0	0	2.668	0	0.000	2.40E+05	2.482
CE1	833591	816708	1	Dry Season	Central, Western Storm Outfall	0	0.06496	0	0.86540	0.06496	0	0	0	1.07100	0.00067	0.19020	0.55680	0	0	14.270	0	0.001	8.53E+05	11.020
CE1	833591	816708	1	Wet Season	Central, Western Storm Outfall	0	0.07064	0	0.95120	0.07064	0	0	0	1.08600	0.02946	0.19370	0.79340	0	0	15.890	0	0.002	8.53E+05	14.150
CE2	833165	816854	1	Dry Season	Central, Western Storm Outfall	0	0.06496	0	0.86540	0.06496	0	0	0	1.07100	0.00067	0.19020	0.55680	0	0	14.270	0	0.001	8.53E+05	11.020
CE2	833165	816854	1	Wet Season	Central, Western Storm Outfall	0	0.07064	0	0.95120	0.07064	0	0	0	1.08600	0.02946	0.19370	0.79340	0	0	15.890	0	0.002	8.53E+05	14.150
CE3	832569	816900	1	Dry Season	Central, Western Storm Outfall	0	0.06496	0	0.86540	0.06496	0	0	0	1.07100	0.00067	0.19020	0.55680	0	0	14.270	0	0.001	8.53E+05	11.020
CE3	832569	816900	1	Wet Season	Central, Western Storm Outfall	0	0.07064	0	0.95120	0.07064	0	0	0	1.08600	0.02946	0.19370	0.79340	0	0	15.890	0	0.002	8.53E+05	14.150
WC7	834590	816203	1	Dry Season	Wan Chai West Storm Outfall	0	0.04501	0	0.60320	0.04501	0	0	0	0.72040	0.00052	0.13220	0.38280	0	0	10.570	0	0.001	5.61E+05	7.853
WC7	834590	816203	1	Wet Season	Wan Chai West Storm Outfall	0	0.04953	0	0.67050	0.04953	0	0	0	0.73200	0.02297	0.13460	0.56720	0	0	11.830	0	0.002	5.61E+05	10.290
WC8	834852	816091	1	Dry Season	Wan Chai West Storm Outfall	0	0.04501	0	0.60320	0.04501	0	0	0	0.72040	0.00052	0.13220	0.38280	0	0	10.570	0	0.001	5.61E+05	7.853
WC8	834852	816091	1	Wet Season	Wan Chai West Storm Outfall	0	0.04953	0	0.67050	0.04953	0	0	0	0.73200	0.02297	0.13460	0.56720	0	0	11.830	0	0.002	5.61E+05	10.290
WC9	835531	815972	1	Dry Season	Wan Chai West Storm Outfall	0	0.04501	0	0.60320	0.04501	0	0	0	0.72040	0.00052	0.13220	0.38280	0	0	10.570	0	0.001	5.61E+05	7.853
WC9	835531	815972	1	Wet Season	Wan Chai West Storm Outfall	0	0.04953	0	0.67050	0.04953	0	0	0	0.73200	0.02297	0.13460	0.56720	0	0	11.830	0	0.002	5.61E+05	10.290
WE1	836662	816222	1	Dry Season	Wan Chai East Storm Outfall	0	0.01636	0	0.21690	0.01636	0	0	0	0.26800	0.00043	0.04779	0.14040	0	0	3.608	0	0.000	2.13E+05	2.796
WE1	836662	816222	1	Wet Season	Wan Chai East Storm Outfall	0	0.02007	0	0.27380	0.02007	0	0	0	0.27720	0.01902	0.04976	0.29350	0	0	4.652	0	0.001	2.13E+05	4.826
WE2	836662	816222	1	Dry Season	Wan Chai East Storm Outfall	0	0.01636	0	0.21690	0.01636	0	0	0	0.26800	0.00043	0.04779	0.14040	0	0	3.608	0	0.000	2.13E+05	2.796
WE2	836662	816222	1	Wet Season	Wan Chai East Storm Outfall	0	0.02007	0	0.27380	0.02007	0	0	0	0.27720	0.01902	0.04976	0.29350	0	0	4.652	0	0.001	2.13E+05	4.826
WE8	837698	816806	1	Dry Season	Wan Chai East Storm Outfall	0	0.01636	0	0.21690	0.01636	0	0	0	0.26800	0.00043	0.04779	0.14040	0	0	3.608	0	0.000	2.13E+05	2.796
WE8	837698	816806	1	Wet Season	Wan Chai East Storm Outfall	0	0.02007	0	0.27380	0.02007	0	0	0	0.27720	0.01902	0.04976	0.29350	0	0	4.652	0	0.001	2.13E+05	4.826
WE9	838083	817048	1	Dry Season	Wan Chai East Storm Outfall	0	0.01636	0	0.21690	0.01636	0	0	0	0.26800	0.00043	0.04779	0.14040	0	0	3.608	0	0.000	2.13E+05	2.796
WE9	838083	817048	1	Wet Season	Wan Chai East Storm Outfall	0	0.02007	0	0.27380	0.02007	0	0	0	0.27720	0.01902	0.04976	0.29350	0	0	4.652	0	0.001	2.13E+05	4.826
NP2	838472	817180	1	Dry Season	North Point Storm Outfall	0	0.02668	0	0.35380	0.02668	0	0	0	0.45360	0.00037	0.07830	0.23430	0	0	5.475	0	0.001	3.69E+05	4.420
NP2	838472	817180	1	Wet Season	North Point Storm Outfall	0	0.02981	0	0.40250	0.02981	0	0	0	0.46170	0.01636	0.08004	0.36660	0	0	6.380	0	0.001	3.69E+05	6.171

Table 1 Updated Stormwater Loads (forecast up to 2026)

ID	Easting	Northing	Layer	Period	Description	FLOW (For discharges with no flows, the unit should be g/s.)	adsorbed ortho phosphate	Detritus Carbon (DetC)	Detritus Nitrogen (DetN)	Detritus Phosphorus (DetP)	Detritus Silica (DetSi)	Diatoms	Algae (non-Diatoms)	Ammonium (NH4)	Nitrate (NO3)	Ortho-Phosphate (PO4)	dissolved Silica (Si)	Water Temperature	Salinity	carbonaceous BOD (first pool) at 5 days	Dissolved Oxygen	Copper (Cu)	E. Coli bacteria	inorganic matter (IM1)
						(m3/s)	(gP/m3)	(gC/m3)	(gN/m3)	(gP/m3)	(gSi/m3)	(gC/m3)	(gC/m3)	(gN/m3)	(gN/m3)	(gP/m3)	(gSi/m3)	(oC)	(g/kg)	(gO2/m3)	(g/m3)	(g/m3)	(MPN/m3)	(gDM/m3)
							'AAP'	'DetC'	'DetN'	'DetP'	'DetSi'	'DIAT'	'GREEN'	'NH4'	'NO3'	'PO4'	'Si'	'ModTemp'	'Salinity'	'CBOD5'	'OXY'	'Cu'	'EColi'	'IM1'
NP3	838905	817231	1	Dry Season	North Point Storm Outfall	0	0.02668	0	0.35380	0.02668	0	0	0	0.45360	0.00037	0.07830	0.23430	0	0	5.475	0	0.001	3.69E+05	4.420
NP3	838905	817231	1	Wet Season	North Point Storm Outfall	0	0.02981	0	0.40250	0.02981	0	0	0	0.46170	0.01636	0.08004	0.36660	0	0	6.380	0	0.001	3.69E+05	6.171
NP4	838905	817231	1	Dry Season	North Point Storm Outfall	0	0.02668	0	0.35380	0.02668	0	0	0	0.45360	0.00037	0.07830	0.23430	0	0	5.475	0	0.001	3.69E+05	4.420
NP4	838905	817231	1	Wet Season	North Point Storm Outfall	0	0.02981	0	0.40250	0.02981	0	0	0	0.46170	0.01636	0.08004	0.36660	0	0	6.380	0	0.001	3.69E+05	6.171
NP5	839781	817060	1	Dry Season	North Point Storm Outfall	0	0.02668	0	0.35380	0.02668	0	0	0	0.45360	0.00037	0.07830	0.23430	0	0	5.475	0	0.001	3.69E+05	4.420
NP5	839781	817060	1	Wet Season	North Point Storm Outfall	0	0.02981	0	0.40250	0.02981	0	0	0	0.46170	0.01636	0.08004	0.36660	0	0	6.380	0	0.001	3.69E+05	6.171
NP6	840677	816726	1	Dry Season	North Point Storm Outfall	0	0.02668	0	0.35380	0.02668	0	0	0	0.45360	0.00037	0.07830	0.23430	0	0	5.475	0	0.001	3.69E+05	4.420
NP6	840677	816726	1	Wet Season	North Point Storm Outfall	0	0.02981	0	0.40250	0.02981	0	0	0	0.46170	0.01636	0.08004	0.36660	0	0	6.380	0	0.001	3.69E+05	6.171
CS1	840235	816892	1	Dry Season	Shau Kei Wan Storm Outfall	0	0.00832	0	0.10900	0.00832	0	0	0	0.14730	0.00019	0.02436	0.06519	0	0	1.508	0	0.000	1.24E+05	1.322
CS1	840235	816892	1	Wet Season	Shau Kei Wan Storm Outfall	0	0.00991	0	0.13340	0.00991	0	0	0	0.15200	0.00818	0.02529	0.13110	0	0	1.960	0	0.000	1.24E+05	2.192
CS2	840677	816726	1	Dry Season	Shau Kei Wan Storm Outfall	0	0.00832	0	0.10900	0.00832	0	0	0	0.14730	0.00019	0.02436	0.06519	0	0	1.508	0	0.000	1.24E+05	1.322
CS2	840677	816726	1	Wet Season	Shau Kei Wan Storm Outfall	0	0.00991	0	0.13340	0.00991	0	0	0	0.15200	0.00818	0.02529	0.13110	0	0	1.960	0	0.000	1.24E+05	2.192
CS5	841364	816100	1	Dry Season	Shau Kei Wan Storm Outfall	0	0.00832	0	0.10900	0.00832	0	0	0	0.14730	0.00019	0.02436	0.06519	0	0	1.508	0	0.000	1.24E+05	1.322
CS5	841364	816100	1	Wet Season	Shau Kei Wan Storm Outfall	0	0.00991	0	0.13340	0.00991	0	0	0	0.15200	0.00818	0.02529	0.13110	0	0	1.960	0	0.000	1.24E+05	2.192
CS23	841364	816100	1	Dry Season	Shau Kei Wan Storm Outfall	0	0.00832	0	0.10900	0.00832	0	0	0	0.14730	0.00019	0.02436	0.06519	0	0	1.508	0	0.000	1.24E+05	1.322
CS23	841364	816100	1	Wet Season	Shau Kei Wan Storm Outfall	0	0.00991	0	0.13340	0.00991	0	0	0	0.15200	0.00818	0.02529	0.13110	0	0	1.960	0	0.000	1.24E+05	2.192
CS24	841364	816100	1	Dry Season	Shau Kei Wan Storm Outfall	0	0.00832	0	0.10900	0.00832	0	0	0	0.14730	0.00019	0.02436	0.06519	0	0	1.508	0	0.000	1.24E+05	1.322
CS24	841364	816100	1	Wet Season	Shau Kei Wan Storm Outfall	0	0.00991	0	0.13340	0.00991	0	0	0	0.15200	0.00818	0.02529	0.13110	0	0	1.960	0	0.000	1.24E+05	2.192
CS12	841629	816225	1	Dry Season	Shau Kei Wan Storm Outfall	0	0.00832	0	0.10900	0.00832	0	0	0	0.14730	0.00019	0.02436	0.06519	0	0	1.508	0	0.000	1.24E+05	1.322
CS12	841629	816225	1	Wet Season	Shau Kei Wan Storm Outfall	0	0.00991	0	0.13340	0.00991	0	0	0	0.15200	0.00818	0.02529	0.13110	0	0	1.960	0	0.000	1.24E+05	2.192
CS13	842637	815867	1	Dry Season	Shau Kei Wan Storm Outfall	0	0.00832	0	0.10900	0.00832	0	0	0	0.14730	0.00019	0.02436	0.06519	0	0	1.508	0	0.000	1.24E+05	1.322
CS13	842637	815867	1	Wet Season	Shau Kei Wan Storm Outfall	0	0.00991	0	0.13340	0.00991	0	0	0	0.15200	0.00818	0.02529	0.13110	0	0	1.960	0	0.000	1.24E+05	2.192
CS14	843275	815077	1	Dry Season	Chai Wan Storm Outfall	0	0.00972	0	0.12990	0.00972	0	0	0	0.17280	0.00032	0.02842	0.07621	0	0	1.879	0	0.000	1.44E+05	1.647
CS14	843275	815077	1	Wet Season	Chai Wan Storm Outfall	0	0.01241	0	0.17170	0.01241	0	0	0	0.17980	0.01404	0.02993	0.18910	0	0	2.656	0	0.001	1.44E+05	3.144
CS20	843882	814435	1	Dry Season	Chai Wan Storm Outfall	0	0.00972	0	0.12990	0.00972	0	0	0	0.17280	0.00032	0.02842	0.07621	0	0	1.879	0	0.000	1.44E+05	1.647
CS20	843882	814435	1	Wet Season	Chai Wan Storm Outfall	0	0.01241	0	0.17170	0.01241	0	0	0	0.17980	0.01404	0.02993	0.18910	0	0	2.656	0	0.001	1.44E+05	3.144
CS21	844267	813883	1	Dry Season	Chai Wan Storm Outfall	0	0.00972	0	0.12990	0.00972	0	0	0	0.17280	0.00032	0.02842	0.07621	0	0	1.879	0	0.000	1.44E+05	1.647
CS21	844267	813883	1	Wet Season	Chai Wan Storm Outfall	0	0.01241	0	0.17170	0.01241	0	0	0	0.17980	0.01404	0.02993	0.18910	0	0	2.656	0	0.001	1.44E+05	3.144
CS22	844267	813883	1	Dry Season	Chai Wan Storm Outfall	0	0.00972	0	0.12990	0.00972	0	0	0	0.17280	0.00032	0.02842	0.07621	0	0	1.879	0	0.000	1.44E+05	1.647
CS22	844267	813883	1	Wet Season	Chai Wan Storm Outfall	0	0.01241	0	0.17170	0.01241	0	0	0	0.17980	0.01404	0.02993	0.18910	0	0	2.656	0	0.001	1.44E+05	3.144
HS21	844612	809142	1	Dry Season	Shek O Storm Outfall	0	0.00025	0	0.00328	0.00025	0	0	0	0.00434	0.00006	0.00070	0.00173	0	0	0.044	0	0.000	3.67E+03	0.043
HS21	844612	809142	1	Wet Season	Shek O Storm Outfall	0	0.00076	0	0.01102	0.00076	0	0	0	0.00566	0.00263	0.00098	0.02295	0	0	0.189	0	0.000	3.67E+03	0.323
HS22	844612	809142	1	Dry Season	Shek O Storm Outfall	0	0.00025	0	0.00328	0.00025	0	0	0	0.00434	0.00006	0.00070	0.00173	0	0	0.044	0	0.000	3.67E+03	0.043
HS22	844612	809142	1	Wet Season	Shek O Storm Outfall	0	0.00076	0	0.01102	0.00076	0	0	0	0.00566	0.00263	0.00098	0.02295	0	0	0.189	0	0.000	3.67E+03	0.323
HS23	844612	809142	1	Dry Season	Shek O Storm Outfall	0	0.00025	0	0.00328	0.00025	0	0	0	0.00434	0.00006	0.00070	0.00173	0	0	0.044	0	0.000	3.67E+03	0.043
HS23	844612	809142	1	Wet Season	Shek O Storm Outfall	0	0.00076	0	0.01102	0.00076	0	0	0	0.00566	0.00263	0.00098	0.02295	0	0	0.189	0	0.000	3.67E+03	0.323
HS24	844612	809142	1	Dry Season	Shek O Storm Outfall	0	0.00025	0	0.00328	0.00025	0	0	0	0.00434	0.00006	0.00070	0.00173	0	0	0.044	0	0.000	3.67E+03	0.043
HS24	844612	809142	1	Wet Season	Shek O Storm Outfall	0	0.00076	0	0.01102	0.00076	0	0	0	0.00566	0.00263	0.00098	0.02295	0	0	0.189	0	0.000	3.67E+03	0.323
HS25	844612	809142	1	Dry Season	Shek O Storm Outfall	0	0.00025	0	0.00328	0.00025	0	0	0	0.00434	0.00006	0.00070	0.00173	0	0	0.044	0	0.000	3.67E+03	0.043
HS25	844612	809142	1	Wet Season	Shek O Storm Outfall	0	0.00076	0	0.01102	0.00076	0	0	0	0.00566	0.00263	0.00098	0.02295	0	0	0.189	0	0.000	3.67E+03	0.323
HS26	844612	809142	1	Dry Season	Shek O Storm Outfall	0	0.00025	0	0.00328	0.00025	0	0	0	0.00434	0.00006	0.00070	0.00173	0	0	0.044	0	0.000	3.67E+03	0.043
HS26	844612	809142	1	Wet Season	Shek O Storm Outfall	0	0.00076	0	0.01102	0.00076	0	0	0	0.00566	0.00263	0.00098	0.02295	0	0	0.189	0	0.000	3.67E+03	0.323
HS1	836758	811617	1	Dry Season	Shouson Hill and Repulse Bay Storm Outfall	0	0.00055	0	0.00722	0.00055	0	0	0	0.00957	0.00009	0.00157	0.00487	0	0	0.099	0	0.000	8.02E+03	0.092
HS1	836758	811617	1	Wet Season	Shouson Hill and Repulse Bay Storm Outfall	0	0.00131	0	0.01881	0.00131	0	0	0	0.01153	0.00393	0.00199	0.03656	0	0	0.316	0	0.000	8.02E+03	0.510
HS2	836758	811617	1	Dry Season	Shouson Hill and Repulse Bay Storm Outfall	0	0.00055	0	0.00722	0.00055	0	0	0	0.00957	0.00009	0.00157	0.00487	0	0	0.099	0	0.000	8.02E+03	0.092
HS2	836758	811617	1	Wet Season	Shouson Hill and Repulse Bay Storm Outfall	0	0.00131	0	0.01881	0.00131	0	0	0	0.01153	0.00393	0.00199	0.03656	0	0	0.316	0	0.000	8.02E+03	0.510
HS4	837094	810999	1	Dry Season	Shouson Hill and Repulse Bay Storm Outfall	0	0.00055	0	0.00722	0.00055	0	0	0	0.00957	0.00009	0.00157	0.00487	0	0	0.099	0	0.000	8.02E+03	0.092
HS4	837094	810999	1	Wet Season	Shouson Hill and Repulse Bay Storm Outfall	0	0.00131	0	0.01881	0.00131	0	0	0	0.01153	0.00393	0.00199	0.03656	0	0	0.316	0	0.000	8.02E+03	0.510
HS8	837761	810787	1	Dry Season	Shouson Hill and Repulse Bay Storm Outfall	0	0.00055	0	0.00722	0.00055	0	0	0	0.00957	0.00009	0.00157	0.00487	0	0	0.099	0	0.000	8.02E+03	0.092
HS8	837761	810787	1	Wet Season	Shouson Hill and Repulse Bay Storm Outfall	0	0.00131	0	0.01881	0.00131	0	0	0	0.01153	0.00393	0.00199	0.03656	0	0	0.316	0	0.000	8.02E+03	0.510
HS9	837761	810787	1	Dry Season	Shouson Hill and Repulse Bay Storm Outfall	0	0.00055	0	0.00722	0.00055	0	0	0	0.00957	0.00009	0.00157	0.00487	0	0	0.099	0	0.000	8.02E+03	0.092
HS9	837761	810787	1	Wet Season	Shouson Hill and Repulse Bay Storm Outfall	0	0.00131	0	0.01881	0.00131	0	0	0	0.01153	0.00393	0.00199	0.03656	0	0	0.316	0	0.000	8.02E+03	0.510
HS10	837761	810787	1	Dry Season	Shouson Hill and Repulse Bay Storm Outfall	0	0.00055	0	0.00722	0.00055	0	0	0	0.00957	0.00009	0.00157	0.00487	0	0	0.099	0	0.000	8.02E+03	0.092
HS10	837761	810787	1	Wet Season	Shouson Hill and Repulse Bay Storm Outfall	0	0.00131	0	0.01881	0.00131	0	0	0	0.01153	0.00393	0.00199	0.03656	0	0	0.316	0	0.000	8.02E+03	0.510
HS11	837951	809403	1	Dry Season	South Bay Storm Outfall	0	0.00025	0	0.00333	0.00025	0	0	0	0.00442	0.00002	0.00073	0.00233	0	0	0.046	0	0.000	3.70E+03	0.041
HS11	837951	809403	1	Wet Season	South Bay Storm Outfall	0	0.00046	0	0.00645	0.00046	0	0	0	0.00496	0.00106	0.00084	0.01087	0	0	0.104	0	0.000	3.70E+03	0.154
HS12	837951	809403	1	Dry Season	South Bay Storm Outfall	0	0.00025	0	0.00333	0.00025	0	0	0	0.00442	0.00002	0.00073	0.00233	0	0	0.046	0	0.000	3.70E+03	0.041
HS12	837951	809403	1	Wet Season	South Bay Storm Outfall	0	0.00046	0	0.00645	0.00046	0	0	0	0.00496	0.00106	0.00084	0.01087	0	0	0.104	0	0.000	3.70E+03	0.154
HS14	839381	808377	1	Dry Season	Chung Hom Kok Storm Outfall	0	0.00073	0	0.00967	0.00073	0	0	0	0.01278	0.00008	0.00212	0.00572	0	0	0.135	0	0.000	1.07E+04	0.121
HS14	839381	808377	1	Wet Season	Chung Hom Kok Storm Outfall	0	0.00140	0	0.01965	0.00140	0	0	0	0.01443	0.00341	0.00247	0.03313	0	0	0.323	0	0.000	1.07E+04	0.483
HS15	838789	807668	1	Dry Season	Stanley Storm Outfall	0	0.00144	0	0.01893	0.00144	0	0	0	0.02508	0.00024	0.00413	0.01105	0	0	0.262	0	0.000	2.11E+04	0.245
HS15	838789	807668	1	Wet Season	Stanley Storm Outfall	0	0.00351	0	0.05041	0.00351	0	0	0	0.03041	0.01071	0.00524	0.09726	0	0	0.853	0	0.000	2.11E+04	1.384
HS16	839381	808377	1	Dry Season	Stanley Storm Outfall	0	0.00144	0	0.01893	0.00144	0	0	0	0.02508	0.00024	0.00413	0.01105	0	0	0.262	0	0.000	2.11E+04	0.245
HS16	839381	808377	1	Wet Season	Stanley Storm Outfall	0	0.00351	0	0.05041	0.00351	0	0	0	0.03041	0.01071	0.00524	0.09726	0	0	0.853	0	0.000	2.11E+04	1.384
HS17	839381	808377	1	Dry Season	Stanley Storm Outfall	0	0.00144	0	0.01893	0.00144	0	0	0	0.02508	0.00024	0.00413	0.01105	0	0	0.262	0	0.000	2.11E+04	0.245
HS17	839381	808377	1	Wet Season	Stanley Storm Outfall	0	0.00351	0	0.05041	0.00351	0	0	0	0.03041	0.01071	0.00524	0.09726	0	0	0.853	0	0.000	2.11E+04	1.384
HS18	839381	808377	1	Dry Season	Stanley Storm Outfall	0	0.00144	0	0.01893	0.00144	0	0	0	0.02508	0.00024	0.00413	0.01105	0	0	0.262	0	0.000	2.11E+04	0.245
HS18	839381	808377	1	Wet Season	Stanley Storm Outfall	0	0.00351	0	0.05041	0.00351	0	0	0	0.03041	0.01071	0.00524	0.09726	0	0	0.853	0	0.000	2.11E+04	1.384
HS19	839381	808377	1	Dry Season	Stanley Storm Outfall	0	0.00144	0	0.01893	0.00144	0	0	0	0.02508	0.00024	0.00413	0.01105	0	0	0.262	0	0.000	2.11E+04	0.245
HS19	839381	808377	1	Wet Season	Stanley Storm Outfall	0	0.00351	0	0.05041	0.00351	0	0	0	0.03041	0.01071	0.00524	0.09726	0	0	0.853	0	0.000	2.11E+04	1.384
HS20	840319	809196	1	Dry Season	Tai Tam Storm Outfall	0	0.00430	0	0.05620	0.00430	0	0	0	0.07632	0.00052	0.01242	0.03408	0	0	0.738	0	0.000	6.45E+04	0.698
HS20	840319	809196	1	Wet Season	Tai Tam Storm Outfall	0	0.00874	0	0.12424	0.00874	0	0	0	0.08768	0.02295	0.01479	0.21889	0	0	2.011	0	0.001	6.45E+04	3.148
PF1	830265	814855	1	Dry Season	Pokfulam Storm Outfall	0	0.01134	0	0.14790	0.01134	0	0	0	0.20114	0.00060	0.03313	0.08602	0	0	2.035	0	0.000	1.69E+05	1.822
PF1	830265	814855	1	Wet Season	Pokfulam Storm Outfall	0	0.01656	0	0.22715	0.01656	0	0	0	0.21420	0.02662	0.03585	0.30049	0	0	3.503	0	0.001	1.69E+05	4.661
PF2	831602	812883	1	Dry Season	Pokfulam Storm Outfall	0	0.01134	0	0.14790	0.01134	0	0	0	0.20114	0.00060	0.03313	0.08602	0	0	2.035	0	0.000	1.69E+05	1.822
PF2	831602	812883	1	Wet Season	Pokfulam Storm Outfall	0	0.01656	0	0.22715	0.01656	0	0	0	0.21420	0.02662	0.03585	0.30049	0	0	3.503	0	0.001	1.69E+05	4.661
PF3	831669	812514	1	Dry Season	Pokfulam Storm Outfall	0	0.01134	0	0.14790	0.01134	0	0	0	0.20114	0.00060	0.03313	0.08602	0	0	2.035	0	0.000	1.69E+05	1.822

Table 1 Updated Stormwater Loads (forecast up to 2026)

ID	Easting	Northing	Layer	Period	Description	FLOW (For discharges with no flows, the unit should be g/s.)	adsorbed ortho phosphate	Detritus Carbon (DetC)	Detritus Nitrogen (DetN)	Detritus Phosphorus (DetP)	Detritus Silica (DetSi)	Diatoms	Algae (non-Diatoms)	Ammonium (NH4)	Nitrate (NO3)	Ortho-Phosphate (PO4)	dissolved Silica (Si)	Water Temperature	Salinity	carbonaceous BOD (first pool) at 5 days	Dissolved Oxygen	Copper (Cu)	E. Coli bacteria	inorganic matter (IM1)
						(m3/s)	(gP/m3)	(gC/m3)	(gN/m3)	(gP/m3)	(gSi/m3)	(gC/m3)	(gC/m3)	(gN/m3)	(gN/m3)	(gP/m3)	(gSi/m3)	(oC)	(g/kg)	(gO2/m3)	(g/m3)	(g/m3)	(MPN/m3)	(gDM/m3)
							'AAP'	'DetC'	'DetN'	'DetP'	'DetSi'	'DIAT'	'GREEN'	'NH4'	'NO3'	'PO4'	'Si'	'ModTemp'	'Salinity'	'CBOD5'	'OXY'	'Cu'	'EColi'	'IM1'
PF3	831669	812514	1	Wet Season	Pokfulam Storm Outfall	0	0.01656	0	0.22715	0.01656	0	0	0	0.21420	0.02662	0.03585	0.30049	0	0	3.503	0	0.001	1.69E+05	4.661
AB1	832657	812039	1	Dry Season	Aberdeen Storm Outfall	0	0.00705	0	0.09584	0.00705	0	0	0	0.12424	0.00033	0.02058	0.05656	0	0	1.420	0	0.000	1.03E+05	1.219
AB1	832657	812039	1	Wet Season	Aberdeen Storm Outfall	0	0.00992	0	0.13964	0.00992	0	0	0	0.13138	0.01479	0.02212	0.17513	0	0	2.236	0	0.001	1.03E+05	2.793
AB2	833083	812073	1	Dry Season	Aberdeen Storm Outfall	0	0.00705	0	0.09584	0.00705	0	0	0	0.12424	0.00033	0.02058	0.05656	0	0	1.420	0	0.000	1.03E+05	1.219
AB2	833083	812073	1	Wet Season	Aberdeen Storm Outfall	0	0.00992	0	0.13964	0.00992	0	0	0	0.13138	0.01479	0.02212	0.17513	0	0	2.236	0	0.001	1.03E+05	2.793
AB3	833083	812073	1	Dry Season	Aberdeen Storm Outfall	0	0.00705	0	0.09584	0.00705	0	0	0	0.12424	0.00033	0.02058	0.05656	0	0	1.420	0	0.000	1.03E+05	1.219
AB3	833083	812073	1	Wet Season	Aberdeen Storm Outfall	0	0.00992	0	0.13964	0.00992	0	0	0	0.13138	0.01479	0.02212	0.17513	0	0	2.236	0	0.001	1.03E+05	2.793
AB4	833576	811967	1	Dry Season	Aberdeen Storm Outfall	0	0.00705	0	0.09584	0.00705	0	0	0	0.12424	0.00033	0.02058	0.05656	0	0	1.420	0	0.000	1.03E+05	1.219
AB4	833576	811967	1	Wet Season	Aberdeen Storm Outfall	0	0.00992	0	0.13964	0.00992	0	0	0	0.13138	0.01479	0.02212	0.17513	0	0	2.236	0	0.001	1.03E+05	2.793
AB5	833083	812073	1	Dry Season	Aberdeen Storm Outfall	0	0.00705	0	0.09584	0.00705	0	0	0	0.12424	0.00033	0.02058	0.05656	0	0	1.420	0	0.000	1.03E+05	1.219
AB5	833083	812073	1	Wet Season	Aberdeen Storm Outfall	0	0.00992	0	0.13964	0.00992	0	0	0	0.13138	0.01479	0.02212	0.17513	0	0	2.236	0	0.001	1.03E+05	2.793
AB6	833576	811967	1	Dry Season	Aberdeen Storm Outfall	0	0.00705	0	0.09584	0.00705	0	0	0	0.12424	0.00033	0.02058	0.05656	0	0	1.420	0	0.000	1.03E+05	1.219
AB6	833576	811967	1	Wet Season	Aberdeen Storm Outfall	0	0.00992	0	0.13964	0.00992	0	0	0	0.13138	0.01479	0.02212	0.17513	0	0	2.236	0	0.001	1.03E+05	2.793
AB8	834741	811740	1	Dry Season	Aberdeen Storm Outfall	0	0.00705	0	0.09584	0.00705	0	0	0	0.12424	0.00033	0.02058	0.05656	0	0	1.420	0	0.000	1.03E+05	1.219
AB8	834741	811740	1	Wet Season	Aberdeen Storm Outfall	0	0.00992	0	0.13964	0.00992	0	0	0	0.13138	0.01479	0.02212	0.17513	0	0	2.236	0	0.001	1.03E+05	2.793
AL1	834780	811135	1	Dry Season	Ap Lei Chau Storm Outfall	0	0.00537	0	0.07572	0.00537	0	0	0	0.09738	0.00010	0.01574	0.04437	0	0	1.132	0	0.000	8.19E+04	0.951
AL1	834780	811135	1	Wet Season	Ap Lei Chau Storm Outfall	0	0.00621	0	0.08851	0.00621	0	0	0	0.09951	0.00434	0.01621	0.07927	0	0	1.373	0	0.001	8.19E+04	1.408
AL2	834600	811486	1	Dry Season	Ap Lei Chau Storm Outfall	0	0.00537	0	0.07572	0.00537	0	0	0	0.09738	0.00010	0.01574	0.04437	0	0	1.132	0	0.000	8.19E+04	0.951
AL2	834600	811486	1	Wet Season	Ap Lei Chau Storm Outfall	0	0.00621	0	0.08851	0.00621	0	0	0	0.09951	0.00434	0.01621	0.07927	0	0	1.373	0	0.001	8.19E+04	1.408
AL3	834220	811879	1	Dry Season	Ap Lei Chau Storm Outfall	0	0.00537	0	0.07572	0.00537	0	0	0	0.09738	0.00010	0.01574	0.04437	0	0	1.132	0	0.000	8.19E+04	0.951
AL3	834220	811879	1	Wet Season	Ap Lei Chau Storm Outfall	0	0.00621	0	0.08851	0.00621	0	0	0	0.09951	0.00434	0.01621	0.07927	0	0	1.373	0	0.001	8.19E+04	1.408
AL4	834220	811879	1	Dry Season	Ap Lei Chau Storm Outfall	0	0.00537	0	0.07572	0.00537	0	0	0	0.09738	0.00010	0.01574	0.04437	0	0	1.132	0	0.000	8.19E+04	0.951
AL4	834220	811879	1	Wet Season	Ap Lei Chau Storm Outfall	0	0.00621	0	0.08851	0.00621	0	0	0	0.09951	0.00434	0.01621	0.07927	0	0	1.373	0	0.001	8.19E+04	1.408
AL6	833910	810761	1	Dry Season	Ap Lei Chau Storm Outfall	0	0.00537	0	0.07572	0.00537	0	0	0	0.09738	0.00010	0.01574	0.04437	0	0	1.132	0	0.000	8.19E+04	0.951
AL6	833910	810761	1	Wet Season	Ap Lei Chau Storm Outfall	0	0.00621	0	0.08851	0.00621	0	0	0	0.09951	0.00434	0.01621	0.07927	0	0	1.373	0	0.001	8.19E+04	1.408
AL9	834980	811369	1	Dry Season	Ap Lei Chau Storm Outfall	0	0.00969	0	0.13250	0.00969	0	0	0	0.17279	0.00033	0.02840	0.07277	0	0	1.940	0	0.001	1.44E+05	1.680
AL9	834980	811369	1	Wet Season	Ap Lei Chau Storm Outfall	0	0.01255	0	0.17513	0.01255	0	0	0	0.17983	0.01479	0.02994	0.19166	0	0	2.757	0	0.002	1.44E+05	3.254
AL10	834980	811369	1	Dry Season	Ap Lei Chau Storm Outfall	0	0.00969	0	0.13250	0.00969	0	0	0	0.17279	0.00033	0.02840	0.07277	0	0	1.940	0	0.001	1.44E+05	1.680
AL10	834980	811369	1	Wet Season	Ap Lei Chau Storm Outfall	0	0.01255	0	0.17513	0.01255	0	0	0	0.17983	0.01479	0.02994	0.19166	0	0	2.757	0	0.002	1.44E+05	3.254
LI1	829313	809765	1	Dry Season	Lamma Island Storm Outfall	0	0.00874	0	0.11748	0.00874	0	0	0	0.15732	0.00040	0.02548	0.05693	0	0	1.670	0	0.000	1.33E+05	1.476
LI1	829313	809765	1	Wet Season	Lamma Island Storm Outfall	0	0.01216	0	0.16980	0.01216	0	0	0	0.16560	0.01754	0.02742	0.19908	0	0	2.645	0	0.001	1.33E+05	3.341
LI2	829313	809765	1	Dry Season	Lamma Island Storm Outfall	0	0.00874	0	0.11748	0.00874	0	0	0	0.15732	0.00040	0.02548	0.05693	0	0	1.670	0	0.000	1.33E+05	1.476
LI2	829313	809765	1	Wet Season	Lamma Island Storm Outfall	0	0.01216	0	0.16980	0.01216	0	0	0	0.16560	0.01754	0.02742	0.19908	0	0	2.645	0	0.001	1.33E+05	3.341
LI3	830229	805997	1	Dry Season	Lamma Island Storm Outfall	0	0.00874	0	0.11748	0.00874	0	0	0	0.15732	0.00040	0.02548	0.05693	0	0	1.670	0	0.000	1.33E+05	1.476
LI3	830229	805997	1	Wet Season	Lamma Island Storm Outfall	0	0.01216	0	0.16980	0.01216	0	0	0	0.16560	0.01754	0.02742	0.19908	0	0	2.645	0	0.001	1.33E+05	3.341
BCF1	813273	820479	1	Dry Season	HKBCF / TM-CLKL	0	0.00031	0	0.00460	0.00031	0	0	0	0.00077	0.00153	0.00015	0.01258	0	0	0.086	0	0.000	0.00E+00	0.166
BCF1	813273	820479	1	Wet Season	HKBCF / TM-CLKL	0	0.00332	0	0.04983	0.00332	0	0	0	0.00831	0.01661	0.00166	0.13621	0	0	0.934	0	0.000	0.00E+00	1.796
BCF2	813749	820331	1	Dry Season	HKBCF / TM-CLKL	0	0.00031	0	0.00460	0.00031	0	0	0	0.00077	0.00153	0.00015	0.01258	0	0	0.086	0	0.000	0.00E+00	0.166
BCF2	813749	820331	1	Wet Season	HKBCF / TM-CLKL	0	0.00332	0	0.04983	0.00332	0	0	0	0.00831	0.01661	0.00166	0.13621	0	0	0.934	0	0.000	0.00E+00	1.796
BCF3	813536	819094	1	Dry Season	HKBCF / TM-CLKL	0	0.00031	0	0.00460	0.00031	0	0	0	0.00077	0.00153	0.00015	0.01258	0	0	0.086	0	0.000	0.00E+00	0.166
BCF3	813536	819094	1	Wet Season	HKBCF / TM-CLKL	0	0.00332	0	0.04983	0.00332	0	0	0	0.00831	0.01661	0.00166	0.13621	0	0	0.934	0	0.000	0.00E+00	1.796
BCF4	812743	819325	1	Dry Season	HKBCF / TM-CLKL	0	0.00031	0	0.00460	0.00031	0	0	0	0.00077	0.00153	0.00015	0.01258	0	0	0.086	0	0.000	0.00E+00	0.166
BCF4	812743	819325	1	Wet Season	HKBCF / TM-CLKL	0	0.00332	0	0.04983	0.00332	0	0	0	0.00831	0.01661	0.00166	0.13621	0	0	0.934	0	0.000	0.00E+00	1.796
LLP1	815500	818900	1	Dry Season	Lantau Logistic Park	0	0.00026	0	0.00388	0.00026	0	0	0	0.00065	0.00129	0.00013	0.01060	0	0	0.073	0	0.000	0.00E+00	0.140
LLP1	815500	818900	1	Wet Season	Lantau Logistic Park	0	0.00280	0	0.04199	0.00280	0	0	0	0.00700	0.01400	0.00140	0.11476	0	0	0.787	0	0.000	0.00E+00	1.513
LLP2	816030	819405	1	Dry Season	Lantau Logistic Park	0	0.00026	0	0.00388	0.00026	0	0	0	0.00065	0.00129	0.00013	0.01060	0	0	0.073	0	0.000	0.00E+00	0.140
LLP2	816030	819405	1	Wet Season	Lantau Logistic Park	0	0.00280	0	0.04199	0.00280	0	0	0	0.00700	0.01400	0.00140	0.11476	0	0	0.787	0	0.000	0.00E+00	1.513
LLP3	816345	819488	1	Dry Season	Lantau Logistic Park	0	0.00026	0	0.00388	0.00026	0	0	0	0.00065	0.00129	0.00013	0.01060	0	0	0.073	0	0.000	0.00E+00	0.140
LLP3	816345	819488	1	Wet Season	Lantau Logistic Park	0	0.00280	0	0.04199	0.00280	0	0	0	0.00700	0.01400	0.00140	0.11476	0	0	0.787	0	0.000	0.00E+00	1.513
LLP4	816688	819595	1	Dry Season	Lantau Logistic Park	0	0.00026	0	0.00388	0.00026	0	0	0	0.00065	0.00129	0.00013	0.01060	0	0	0.073	0	0.000	0.00E+00	0.140
LLP4	816688	819595	1	Wet Season	Lantau Logistic Park	0	0.00280	0	0.04199	0.00280	0	0	0	0.00700	0.01400	0.00140	0.11476	0	0	0.787	0	0.000	0.00E+00	1.513
LLP5	817045	819295	1	Dry Season	Lantau Logistic Park	0	0.00026	0	0.00388	0.00026	0	0	0	0.00065	0.00129	0.00013	0.01060	0	0	0.073	0	0.000	0.00E+00	0.140
LLP5	817045	819295	1	Wet Season	Lantau Logistic Park	0	0.00280	0	0.04199	0.00280	0	0	0	0.00700	0.01400	0.00140	0.11476	0	0	0.787	0	0.000	0.00E+00	1.513
LLP6	817345	819565	1	Dry Season	Lantau Logistic Park	0	0.00026	0	0.00388	0.00026	0	0	0	0.00065	0.00129	0.00013	0.01060	0	0	0.073	0	0.000	0.00E+00	0.140
LLP6	817345	819565	1	Wet Season	Lantau Logistic Park	0	0.00280	0	0.04199	0.00280	0	0	0	0.00700	0.01400	0.00140	0.11476	0	0	0.787	0	0.000	0.00E+00	1.513
LLP7	817625	820000	1	Dry Season	Lantau Logistic Park	0	0.00026	0	0.00388	0.00026	0	0	0	0.00065	0.00129	0.00013	0.01060	0	0	0.073	0	0.000	0.00E+00	0.140
LLP7	817625	820000	1	Wet Season	Lantau Logistic Park	0	0.00280	0	0.04199	0.00280	0	0	0	0.00700	0.01400	0.00140	0.11476	0	0	0.787	0	0.000	0.00E+00	1.513
TC8	813113	818137	1	Dry Season	Tung Chung East Development	0	0.00052	0	0.00773	0.00052	0	0	0	0.00129	0.00258	0.00026	0.02112	0	0	0.145	0	0.000	0.00E+00	0.279
TC8	813113	818137	1	Wet Season	Tung Chung East Development	0	0.00558	0	0.08364	0.00558	0	0	0	0.01394	0.02788	0.00279	0.22861	0	0	1.567	0	0.001	0.00E+00	3.014
TC9	813696	818498	1	Dry Season	Tung Chung East Development	0	0.00052	0	0.00773	0.00052	0	0	0	0.00129	0.00258	0.00026	0.02112	0	0	0.145	0	0.000	0.00E+00	0.279
TC9	813696	818498	1	Wet Season	Tung Chung East Development	0	0.00558	0	0.08364	0.00558	0	0	0	0.01394	0.02788	0.00279	0.22861	0	0	1.567	0	0.001	0.00E+00	3.014
TMN1	812737	825081	1	Dry Season	TMCLKL Northern Reclamation	0	0.00002	0	0.00035	0.00002	0	0	0	0.00006	0.00012	0.00001	0.00096	0	0	0.007	0	0.000	0.00E+00	0.013
TMN1	812737	825081	1	Wet Season	TMCLKL Northern Reclamation	0	0.00025	0	0.00379	0.00025	0	0	0	0.00063	0.00126	0.00013	0.01036	0	0	0.071	0	0.000	0.00E+00	0.137
TMN2	812801	824936	1	Dry Season	TMCLKL Northern Reclamation	0	0.00002	0	0.00035	0.00002	0	0	0	0.00006	0.00012	0.00001	0.00096	0	0	0.007	0	0.000	0.00E+00	0.013
TMN2	812801	824936	1	Wet Season	TMCLKL Northern Reclamation	0	0.00025	0	0.00379	0.00025	0	0	0	0.00063	0.00126	0.00013	0.01036	0	0	0.071	0	0.000	0.00E+00	0.137
TMN3	812873	824829	1	Dry Season	TMCLKL Northern Reclamation	0	0.00002	0	0.00035	0.00002	0	0	0	0.00006	0.00012	0.00001	0.00096	0	0	0.007	0	0.000	0.00E+00	0.013
TMN3	812873	824829	1	Wet Season	TMCLKL Northern Reclamation	0	0.00025	0	0.00379	0.00025	0	0	0	0.00063	0.00126	0.00013	0.01036	0	0	0.071	0	0.000	0.00E+00	0.137
TMN4	812974	824679	1	Dry Season	TMCLKL Northern Reclamation	0	0.00002	0	0.00035	0.00002	0	0	0	0.00006	0.00012	0.00001	0.00096	0	0	0.007	0	0.000	0.00E+00	0.013
TMN4	812974	824679	1	Wet Season	TMCLKL Northern Reclamation	0	0.00025	0	0.00379	0.00025	0	0	0	0.00063	0.00126	0.00013	0.01036	0	0	0.071	0	0.000	0.00E+00	0.137
TMN5	813066	824530	1	Dry Season	TMCLKL Northern Reclamation	0	0.00002	0	0.00035	0.00002	0	0	0	0.00006	0.00012	0.00001	0.00096	0	0	0.007	0	0.000	0.00E+00	0.013
TMN5	813066	824530	1	Wet Season	TMCLKL Northern Reclamation	0	0.00025	0	0.00379	0.00025	0	0	0	0.00063	0.00126	0.00013	0.01036	0	0	0.071	0	0.000	0.00E+00	0.137
TMN6	813139	824400	1	Dry Season	TMCLKL Northern Reclamation	0	0.00002	0	0.00035	0.00002	0	0	0	0.00006	0.00012	0.00001	0.00096	0	0	0.007	0	0.000	0.00E+00	0.013
TMN6	813139	824400	1	Wet Season	TMCLKL Northern Reclamation	0	0.00025	0	0.00379	0.00025	0	0	0	0.00063	0.00126	0.00013	0.01036	0	0	0.071	0	0.000	0.00E+00	0.137
TMN7	813217	824241	1	Dry Season	TMCLKL Northern Reclamation	0	0.00002	0	0.00035	0.00002	0	0	0	0.00006	0.00012	0.00001	0.00096	0	0	0.007	0	0.000	0.00E+00	0.013
TMN7	813217	824241	1	Wet Season	TMCLKL Northern Reclamation	0	0.00025	0	0.00379	0.00025	0	0	0	0.00063	0.00126	0.00013	0.01036	0	0	0.071	0	0.000	0.00E+00	0.137
TMS1	813980	820373	1	Dry Season	TMCLKL Southern Reclamation	0	0.00003	0	0.00040	0.00003	0	0	0	0.00007	0.00013	0.00001	0.00111	0	0	0.008	0	0.000	0.00E+00	0.015
TMS1	813980	820373	1	Wet Season	TMCLKL Southern Reclamation	0	0.00029	0	0.00438	0.00029	0	0	0	0.00073	0.00146	0.00015	0.01197	0	0	0.082	0	0.000	0.00E+00	0.158

Table 1 Updated Stormwater Loads (forecast up to 2026)

ID	Easting	Northing	Layer	Period	Description	FLOW (For discharges with flows, the unit should be g/s.)	adsorbed ortho phosphate	Detritus Carbon (DetC)	Detritus Nitrogen (DetN)	Detritus Phosphorus (DetP)	Detritus Silica (DetSi)	Diatoms	Algae (non-Diatoms)	Ammonium (NH4)	Nitrate (NO3)	Ortho-Phosphate (PO4)	dissolved Silica (Si)	Water Temperature	Salinity	carbonaceous BOD (first pool) at 5 days	Dissolved Oxygen	Copper (Cu)	E. Coli bacteria	inorganic matter (IM1)
						(m3/s)	(gP/m3)	(gC/m3)	(gN/m3)	(gP/m3)	(gSi/m3)	(gC/m3)	(gC/m3)	(gN/m3)	(gN/m3)	(gP/m3)	(gSi/m3)	(oC)	(g/kg)	(gO2/m3)	(g/m3)	(g/m3)	(MPN/m3)	(gDM/m3)
							'AAP'	'DetC'	'DetN'	'DetP'	'DetSi'	'DIAT'	'GREEN'	'NH4'	'NO3'	'PO4'	'Si'	'ModTemp'	'Salinity'	'CBOD5'	'OXY'	'Cu'	'EColi'	'IM1'
TMS2	814140	820371	1	Dry Season	TMCLKL Southern Reclamation	0	0.00003	0	0.00040	0.00003	0	0	0	0.00007	0.00013	0.00001	0.00111	0	0	0.008	0	0.000	0.00E+00	0.015
TMS2	814140	820371	1	Wet Season	TMCLKL Southern Reclamation	0	0.00029	0	0.00438	0.00029	0	0	0	0.00073	0.00146	0.00015	0.01197	0	0	0.082	0	0.000	0.00E+00	0.158
TMS3	814128	820181	1	Dry Season	TMCLKL Southern Reclamation	0	0.00003	0	0.00040	0.00003	0	0	0	0.00007	0.00013	0.00001	0.00111	0	0	0.008	0	0.000	0.00E+00	0.015
TMS3	814128	820181	1	Wet Season	TMCLKL Southern Reclamation	0	0.00029	0	0.00438	0.00029	0	0	0	0.00073	0.00146	0.00015	0.01197	0	0	0.082	0	0.000	0.00E+00	0.158
TMS4	814079	819970	1	Dry Season	TMCLKL Southern Reclamation	0	0.00003	0	0.00040	0.00003	0	0	0	0.00007	0.00013	0.00001	0.00111	0	0	0.008	0	0.000	0.00E+00	0.015
TMS4	814079	819970	1	Wet Season	TMCLKL Southern Reclamation	0	0.00029	0	0.00438	0.00029	0	0	0	0.00073	0.00146	0.00015	0.01197	0	0	0.082	0	0.000	0.00E+00	0.158
TMS5	814020	819751	1	Dry Season	TMCLKL Southern Reclamation	0	0.00003	0	0.00040	0.00003	0	0	0	0.00007	0.00013	0.00001	0.00111	0	0	0.008	0	0.000	0.00E+00	0.015
TMS5	814020	819751	1	Wet Season	TMCLKL Southern Reclamation	0	0.00029	0	0.00438	0.00029	0	0	0	0.00073	0.00146	0.00015	0.01197	0	0	0.082	0	0.000	0.00E+00	0.158
TMS6	813953	819533	1	Dry Season	TMCLKL Southern Reclamation	0	0.00003	0	0.00040	0.00003	0	0	0	0.00007	0.00013	0.00001	0.00111	0	0	0.008	0	0.000	0.00E+00	0.015
TMS6	813953	819533	1	Wet Season	TMCLKL Southern Reclamation	0	0.00029	0	0.00438	0.00029	0	0	0	0.00073	0.00146	0.00015	0.01197	0	0	0.082	0	0.000	0.00E+00	0.158
TMS7	813885	819314	1	Dry Season	TMCLKL Southern Reclamation	0	0.00003	0	0.00040	0.00003	0	0	0	0.00007	0.00013	0.00001	0.00111	0	0	0.008	0	0.000	0.00E+00	0.015
TMS7	813885	819314	1	Wet Season	TMCLKL Southern Reclamation	0	0.00029	0	0.00438	0.00029	0	0	0	0.00073	0.00146	0.00015	0.01197	0	0	0.082	0	0.000	0.00E+00	0.158

Table 2 Updated Sewage Outfall Loads (forecast up to 2026)

ID	Easting	Northing	Layer	Period	Description	FLOW (For discharges with 0 flows, the unit should be g/s.)	adsorbed ortho phosphate	Detritus Carbon (DetC)	Detritus Nitrogen (DetN)	Detritus Phosphorus (DetP)	Detritus Silica (DetSi)	Diatoms	Algae (non-Diatoms)	Ammonium (NH4)	Nitrate (NO3)	Ortho-Phosphate (PO4)	dissolved Silica (Si)	Water Temperature	Salinity	carbonaceous BOD (first pool) at 5 days	Dissolved Oxygen	Copper (Cu)	E. Coli bacteria	inorganic matter (IM1)
						(m3/s)	(gP/m3)	(gC/m3)	(gN/m3)	(gP/m3)	(gSi/m3)	(gC/m3)	(gC/m3)	(gN/m3)	(gN/m3)	(gP/m3)	(gSi/m3)	(oC)	(g/kg)	(gO2/m3)	(g/m3)	(g/m3)	(MPN/m3)	(gDM/m3)
							'AAP'	'DetC'	'DetN'	'DetP'	'DetSi'	'DIAT'	'GREEN'	'NH4'	'NO3'	'PO4'	'Si'	'ModTemp'	'Salinity'	'CBOD5'	'OXY'	'Cu'	'EColi'	'IM1'
CCB	819710	808326	1	Dry Season	Cheung Chau STW	0.00	0.041	0	0.723	0.041	0	0	0	1.183	0.013	0.193	0.310	0	0	7.69	0	0.001	5.0E+05	4.62
CCB	819710	808326	1	Wet Season	Cheung Chau STW	0.00	0.042	0	0.729	0.042	0	0	0	1.195	0.013	0.195	0.310	0	0	7.69	0	0.001	5.1E+05	4.62
HLA	822805	812825	1	Dry Season	Hei Ling Chau STW	0.00	0.007	0	0.070	0.007	0	0	0	0.119	0.247	0.051	0.220	0	0	0.72	0	0.000	1.2E+02	0.43
HLA	822805	812825	1	Wet Season	Hei Ling Chau STW	0.00	0.008	0	0.079	0.008	0	0	0	0.120	0.249	0.051	0.244	0	0	0.89	0	0.000	1.2E+02	0.74
HLB	820641	813086	1	Dry Season	Hei Ling Chau STW	0.00	0.000	0	0.005	0.000	0	0	0	0.008	0.016	0.003	0.015	0	0	0.05	0	0.000	7.6E+00	0.03
HLB	820641	813086	1	Wet Season	Hei Ling Chau STW	0.00	0.001	0	0.013	0.001	0	0	0	0.009	0.019	0.004	0.038	0	0	0.21	0	0.000	7.6E+00	0.35
MWA	818794	813632	1	Dry Season	Mui Wo STW	0.00	0.003	0	0.207	0.003	0	0	0	0.214	0.000	0.173	0.104	0	0	0.86	0	0.005	4.3E+05	1.28
MWA	818794	813632	1	Wet Season	Mui Wo STW	0.00	0.003	0	0.207	0.003	0	0	0	0.214	0.000	0.173	0.104	0	0	0.86	0	0.005	4.3E+05	1.28
NPA	807464	808764	1	Dry Season	Ngong Ping STW	0.00	0.000	0	0.589	0.000	0	0	0	0.125	0.876	0.218	0.077	0	0	1.25	0	0.014	1.3E+05	1.88
NPA	807464	808764	1	Wet Season	Ngong Ping STW	0.00	0.000	0	0.589	0.000	0	0	0	0.125	0.876	0.218	0.077	0	0	1.25	0	0.014	1.3E+05	1.88
PCA	821314	816627	1	Dry Season	Peng Chau STW	0.00	0.004	0	0.018	0.004	0	0	0	0.037	0.037	0.025	0.050	0	0	0.37	0	0.000	1.8E+05	0.55
PCA	821314	816627	1	Wet Season	Peng Chau STW	0.00	0.004	0	0.018	0.004	0	0	0	0.037	0.037	0.025	0.050	0	0	0.37	0	0.000	1.8E+05	0.55
TMC	811271	823289	1	Dry Season	Pillar Point STW	2.66	0.455	0	24.000	0.455	0	0	0	24.000	0.137	1.330	9.000	0	0	180.00	0.1	0.080	3.0E+09	120.00
TMC	811271	823289	1	Wet Season	Pillar Point STW	2.66	0.455	0	24.000	0.455	0	0	0	24.000	0.137	1.330	9.000	0	0	180.00	0.1	0.080	3.0E+09	120.00
TMA	807286	828377	1	Dry Season	San Wai STW	0.00	1.041	0	32.226	1.041	0	0	0	77.387	24.840	4.710	32.917	0	0	300.93	0.68981	0.248	6.9E+08	180.90
TMA	807286	828377	1	Wet Season	San Wai STW	0.00	1.041	0	32.226	1.041	0	0	0	77.387	24.840	4.710	32.917	0	0	300.93	0.68981	0.248	6.9E+08	180.90
WTA	824680	824702	1	Dry Season	Sham Tseng STW	0.20	0.485	0	10.210	0.485	0	0	0	30.320	0.137	1.430	9.000	0	0	180.00	0.1	0.080	6.0E+08	100.00
WTA	824680	824702	1	Wet Season	Sham Tseng STW	0.20	0.485	0	10.210	0.485	0	0	0	30.320	0.137	1.430	9.000	0	0	180.00	0.1	0.080	6.0E+08	100.00
TLAB	838963	820011	1	Dry Season	THEES	5.44	0.115	0	1.500	0.115	0	0	0	1.150	11.480	1.700	9.000	0	0	5.00	5.2	0.064	1.0E+07	8.00
TLAB	838963	820011	1	Wet Season	THEES	5.44	0.115	0	1.500	0.115	0	0	0	1.150	11.480	1.700	9.000	0	0	5.00	5.2	0.064	1.0E+07	8.00
HSG	845046	809445	1	Dry Season	Shek O STW	0.00	0.013	0	0.167	0.013	0	0	0	0.233	0.000	0.038	0.067	0	0	2.17	0	0.000	2.0E+05	1.98
HSG	845046	809445	1	Wet Season	Shek O STW	0.00	0.017	0	0.205	0.017	0	0	0	0.317	0.000	0.049	0.069	0	0	2.24	0	0.000	2.9E+05	2.03
SPA	807041	809248	1	Dry Season	Shek Pik STW	0.00	0.004	0	0.042	0.004	0	0	0	0.069	0.048	0.030	0.109	0	0	0.44	0	0.000	7.0E+01	0.25
SPA	807041	809248	1	Wet Season	Shek Pik STW	0.00	0.004	0	0.042	0.004	0	0	0	0.069	0.048	0.030	0.109	0	0	0.44	0	0.000	7.0E+01	0.25
NLA	816800	820625	1	Dry Season	Siu Ho Wan STW	1.96	0.485	0	10.210	0.485	0	0	0	30.320	0.137	1.430	9.000	0	0	180.00	0.1	0.080	3.0E+09	120.00
NLA	816800	820625	1	Wet Season	Siu Ho Wan STW	1.96	0.485	0	10.210	0.485	0	0	0	30.320	0.137	1.430	9.000	0	0	180.00	0.1	0.080	3.0E+09	120.00
LIC	833047	808438	1	Dry Season	Sok Kwu Wan STW	0.02	0.000	0	0.000	0.000	0	0	0	2.550	10.380	0.000	0.000	0	0	20.00	0	0.000	1.5E+07	30.00
LIC	833047	808438	1	Wet Season	Sok Kwu Wan STW	0.02	0.000	0	0.000	0.000	0	0	0	2.550	10.380	0.000	0.000	0	0	20.00	0	0.000	1.5E+07	30.00
HSF	842956	807310	1	Dry Season	Stanley STW	0.00	0.030	0	0.279	0.030	0	0	0	0.480	0.621	0.205	0.722	0	0	2.80	0	0.001	4.9E+02	1.66
HSF	842956	807310	1	Wet Season	Stanley STW	0.00	0.031	0	0.283	0.031	0	0	0	0.492	0.622	0.208	0.723	0	0	2.80	0	0.001	5.0E+02	1.67
NWE	830523	819376	1	Dry Season	Stonecutters Island STW	28.32	0.350	0	3.500	0.350	0	0	0	7.000	23.000	1.300	8.600	0	0	24.00	0	0.012	2.0E+08	16.00
NWE	830523	819376	1	Wet Season	Stonecutters Island STW	28.32	0.350	0	3.500	0.350	0	0	0	7.000	23.000	1.300	8.600	0	0	24.00	0	0.012	2.0E+08	16.00
TOA	803325	813579	1	Dry Season	Tai O STW	0.00	0.014	0	0.307	0.014	0	0	0	0.627	0.000	0.051	0.051	0	0	3.28	0	0.002	3.0E+02	1.91
TOA	803325	813579	1	Wet Season	Tai O STW	0.00	0.014	0	0.307	0.014	0	0	0	0.627	0.000	0.051	0.051	0	0	3.28	0	0.002	3.0E+02	1.91
LIB	828782	809792	1	Dry Season	Yuen Shue Wan STW	0.03	0.000	0	0.000	0.000	0	0	0	2.550	10.380	0.000	0.000	0	0	20.00	0	0.000	0.0E+00	30.00
LIB	828782	809792	1	Wet Season	Yuen Shue Wan STW	0.03	0.000	0	0.000	0.000	0	0	0	2.550	10.380	0.000	0.000	0	0	20.00	0	0.000	0.0E+00	30.00
LIA	828457	808727	1	Dry Season	HKE's Outfall	0.00	0.000	0	82.710	0.000	0	0	0	0.000	0.000	0.000	0.000	0	0	54.17	0	0.285	1.2E+00	81.66
LIA	828457	808727	1	Wet Season	HKE's Outfall	0.00	0.000	0	82.710	0.000	0	0	0	0.000	0.000	0.000	0.000	0	0	54.17	0	0.285	1.2E+00	81.66
BCF	813894	819245	1	Dry Season	BCF STW	0.02	2.500	0	10.000	2.500	0	0	0	40.000	0.000	2.000	9.000	0	0	20.00	1.5	0.030	1.0E+07	30.00
BCF	813894	819245	1	Wet Season	BCF STW	0.02	2.500	0	10.000	2.500	0	0	0	40.000	0.000	2.000	9.000	0	0	20.00	1.5	0.030	1.0E+07	30.00
SSW	814555	810762	1	Dry Season	San Shek Wan STW	0.04	0.000	0	0.000	0.000	0	0	0	0.000	0.000	0.000	0.000	0	0	20.00	0	0.000	1.0E+07	30.00
SSW	814555	810762	1	Wet Season	San Shek Wan STW	0.04	0.000	0	0.000	0.000	0	0	0	0.000	0.000	0.000	0.000	0	0	20.00	0	0.000	1.0E+07	30.00

Table 3 Other Loads from Typhoon Shelters and Marine Culture Zones

ID	Easting	Northing	Layer	Period	Description	FLOW (For discharges with 0 flows, the unit should be g/s.)	adsorbed ortho phosphate	Detritus Carbon (DetC)	Detritus Nitrogen (DetN)	Detritus Phosphonus (DetP)	Detritus Silica (DetSi)	Diatoms	Algae (non-Diatoms)	Ammonium (NH4)	Nitrate (NO3)	Ortho-Phosphate (PO4)	dissolved Silica (Si)	Water Temperature	Salinity	carbonaceous BOD (first pool) at 5 days	Dissolved Oxygen	Copper (Cu)	E. Coli bacteria	inorganic matter (IM1)
						(m3/s)	(gP/m3)	(gC/m3)	(gN/m3)	(gP/m3)	(gSi/m3)	(gC/m3)	(gC/m3)	(gN/m3)	(gN/m3)	(gP/m3)	(gSi/m3)	(oC)	(g/kg)	(gO2/m3)	(g/m3)	(g/m3)	(MPN/m3)	(gDM/m3)
							'AAP'	'DetC'	'DetN'	'DetP'	'DetSi'	'DIAT'	'GREEN'	'NH4'	'NO3'	'PO4'	'Si'	'ModTemp'	'Salinity'	'CBOD5'	'OXY'	'Cu'	'EColi'	'IM1'
TS1	841364	816100	1	Dry Season	Shau Kei Wan Typhoon Shelter	0	0.003	0	0.040	0.003	0	0	0	0.058	0	0.009	0.015	0	0	0.48	0	0.000075	4.95E+04	0.461
TS1	841364	816100	1	Wet Season	Shau Kei Wan Typhoon Shelter	0	0.003	0	0.040	0.003	0	0	0	0.058	0	0.009	0.015	0	0	0.48	0	0.000075	4.95E+04	0.461
TS2	842821	816263	1	Dry Season	Sam Ka Tsuen Typhoon Shelter	0	0.001	0	0.010	0.001	0	0	0	0.015	0	0.002	0.004	0	0	0.13	0	0.000019	1.29E+04	0.120
TS2	842821	816263	1	Wet Season	Sam Ka Tsuen Typhoon Shelter	0	0.001	0	0.010	0.001	0	0	0	0.015	0	0.002	0.004	0	0	0.13	0	0.000019	1.29E+04	0.120
TS4	837384	816359	1	Dry Season	Causeway Bay Typhoon Shelter	0	0.004	0	0.048	0.004	0	0	0	0.069	0	0.011	0.018	0	0	0.58	0	0.000090	5.95E+04	0.553
TS4	837384	816359	1	Wet Season	Causeway Bay Typhoon Shelter	0	0.004	0	0.048	0.004	0	0	0	0.069	0	0.011	0.018	0	0	0.58	0	0.000090	5.95E+04	0.553
TS5	815148	826611	1	Dry Season	Yau Ma Tei Typhoon Shelter	0	0.004	0	0.050	0.004	0	0	0	0.071	0	0.011	0.018	0	0	0.60	0	0.000093	6.14E+04	0.571
TS5	815148	826611	1	Wet Season	Yau Ma Tei Typhoon Shelter	0	0.004	0	0.050	0.004	0	0	0	0.071	0	0.011	0.018	0	0	0.60	0	0.000093	6.14E+04	0.571
TS6	829261	824755	1	Dry Season	Rambler Channel Typhoon Shelter	0	0.001	0	0.010	0.001	0	0	0	0.014	0	0.002	0.004	0	0	0.12	0	0.000018	1.20E+04	0.111
TS6	829261	824755	1	Wet Season	Rambler Channel Typhoon Shelter	0	0.001	0	0.010	0.001	0	0	0	0.014	0	0.002	0.004	0	0	0.12	0	0.000018	1.20E+04	0.111
TS7	829261	824755	1	Dry Season	Aberdeen Typhoon Shelter	0	0.008	0	0.105	0.008	0	0	0	0.150	0	0.024	0.039	0	0	1.26	0	0.000195	1.29E+05	1.206
TS7	829261	824755	1	Wet Season	Aberdeen Typhoon Shelter	0	0.008	0	0.105	0.008	0	0	0	0.150	0	0.024	0.039	0	0	1.26	0	0.000195	1.29E+05	1.206
TS12	843882	814435	1	Dry Season	Chai Wan Typhoon Shelter	0	0.001	0	0.012	0.001	0	0	0	0.017	0	0.003	0.004	0	0	0.14	0	0.000022	1.46E+04	0.137
TS12	843882	814435	1	Wet Season	Chai Wan Typhoon Shelter	0	0.001	0	0.012	0.001	0	0	0	0.017	0	0.003	0.004	0	0	0.14	0	0.000022	1.46E+04	0.137
M18	848452	813918	1	Dry Season	Po Toi O Marine Culture Zone	0	0.001	0	0.026	0.001	0	0	0	0.094	0	0.004	0.000	0	0	0.11	0	0.000000	0.00E+00	0.307
M18	848452	813918	1	Wet Season	Po Toi O Marine Culture Zone	0	0.001	0	0.026	0.001	0	0	0	0.094	0	0.004	0.000	0	0	0.11	0	0.000000	0.00E+00	0.307
M20	844200	802291	1	Dry Season	Po Toi Marine Culture Zone	0	0.002	0	0.096	0.002	0	0	0	0.347	0	0.015	0.000	0	0	0.39	0	0.000000	0.00E+00	1.137
M20	844200	802291	1	Wet Season	Po Toi Marine Culture Zone	0	0.002	0	0.096	0.002	0	0	0	0.347	0	0.015	0.000	0	0	0.39	0	0.000000	0.00E+00	1.137
M21	831384	807554	1	Dry Season	Sok Kwu Wan Marine Culture Zone	0	0.002	0	0.074	0.002	0	0	0	0.268	0	0.011	0.000	0	0	0.30	0	0.000000	0.00E+00	0.879
M21	831384	807554	1	Wet Season	Sok Kwu Wan Marine Culture Zone	0	0.002	0	0.074	0.002	0	0	0	0.268	0	0.011	0.000	0	0	0.30	0	0.000000	0.00E+00	0.879
M22	831357	809068	1	Dry Season	Lo Tik Wan Marine Culture Zone	0	0.001	0	0.032	0.001	0	0	0	0.114	0	0.005	0.000	0	0	0.13	0	0.000000	0.00E+00	0.372
M22	831357	809068	1	Wet Season	Lo Tik Wan Marine Culture Zone	0	0.001	0	0.032	0.001	0	0	0	0.114	0	0.005	0.000	0	0	0.13	0	0.000000	0.00E+00	0.372
M24	823843	823645	1	Dry Season	Ma Wan Marine Culture Zone	0	0.003	0	0.146	0.003	0	0	0	0.526	0	0.022	0.000	0	0	0.59	0	0.000000	0.00E+00	1.728
M24	823843	823645	1	Wet Season	Ma Wan Marine Culture Zone	0	0.003	0	0.146	0.003	0	0	0	0.526	0	0.022	0.000	0	0	0.59	0	0.000000	0.00E+00	1.728
M26	818686	810697	1	Dry Season	Cheung Sha Wan Marine Culture Zone	0	0.001	0	0.055	0.001	0	0	0	0.196	0	0.008	0.000	0	0	0.22	0	0.000000	0.00E+00	0.644
M26	818686	810697	1	Wet Season	Cheung Sha Wan Marine Culture Zone	0	0.001	0	0.055	0.001	0	0	0	0.196	0	0.008	0.000	0	0	0.22	0	0.000000	0.00E+00	0.644

Table 4 Pearl River Delta Loads

ID	Easting	Northing	Layer	Period	FLOW (For discharges with 0 flows, the unit should be g/s.)	adsorbed ortho phosphate	Detritus Carbon (DetC)	Detritus Nitrogen (DetN)	Detritus Phosphorus (DetP)	Detritus Silica (DetSi)	Diatoms	Algae (non-Diatoms)	Ammonium (NH4)	Nitrate (NO3)	Ortho-Phosphate (PO4)	dissolved Silica (Si)	Water Temperature	Salinity	carbonaceous BOD (first pool) at 5 days	Dissolved Oxygen	Copper (Cu)	E. Coli bacteria	inorganic matter (IM1)
					(m3/s)	(gP/m3)	(gC/m3)	(gN/m3)	(gP/m3)	(gSi/m3)	(gC/m3)	(gC/m3)	(gN/m3)	(gN/m3)	(gP/m3)	(gSi/m3)	(oC)	(g/kg)	(gO2/m3)	(g/m3)	(g/m3)	(MPN/m3)	(gDM/m3)
						'AAP'	'DetC'	'DetN'	'DetP'	'DetSi'	'DIAT'	'GREEN'	'NH4'	'NO3'	'PO4'	'Si'	'ModTemp'	'Salinity'	'CBOD5'	'OXY'	'Cu'	'EColi'	'IM1'
Humen Layer 1	767999	903233	1	1996/12/01-00:00:00	158.9	0.0508	4.424	0.2228	0.0282	0.1165	0	0.3	0.4466	1.399	0.0515	5.361	17.6	0	0	5	0.00449	11.31	30
Humen Layer 1	767999	903233	1	1997/01/01-00:00:00	158.9	0.0452	4.424	0.2228	0.0282	0.1165	0	0.3	0.4466	1.399	0.0457	5.361	15.8	0	0	5	0.00449	11.31	30
Humen Layer 1	767999	903233	1	1997/01/31-00:00:00	158.9	0.0452	4.424	0.2228	0.0282	0.1165	0	0.3	0.335	1.399	0.0457	5.361	15.9	0	0	5	0.00449	11.31	30
Humen Layer 1	767999	903233	1	1997/03/02-00:00:00	158.9	0.0452	4.424	0.2228	0.0282	0.1165	0	0.3	0.2233	1.399	0.0457	5.361	18.5	0	0	5	0.00449	11.31	30
Humen Layer 1	767999	903233	1	1997/04/01-00:00:00	158.9	0.0282	4.424	0.2228	0.0282	0.1165	0	0.3	0.1117	1.399	0.0457	5.361	22.2	0	0	5	0.00449	11.31	30
Humen Layer 1	767999	903233	1	1997/05/01-14:24:00	335	0.0282	1.659	0.1671	0.0282	0.1165	0	0.15	0.1117	1.399	0.0457	5.361	25.9	0	0	5	0.00449	11.31	30
Humen Layer 1	767999	903233	1	1997/05/16-16:48:00	511.1	0.0168	1.106	0.0557	0.0168	0.1165	0	0.15	0.0447	1.224	0.0457	5.011	25.9	0	0	5	0.00449	226.2	10
Humen Layer 1	767999	903233	1	1997/05/31-16:48:00	687.2	0.0168	1.106	0.0557	0.0168	0.1165	0	0.15	0.0223	1.224	0.0457	5.011	27.8	0	0	5	0.00449	226.2	10
Humen Layer 1	767999	903233	1	1997/07/01-00:00:00	687.2	0.0168	1.106	0.0557	0.0168	0.1165	0	0.15	0.0335	1.166	0.0572	5.011	30.3	0	0	5	0.00449	226.2	10
Humen Layer 1	767999	903233	1	1997/07/30-21:36:00	511.1	0.0168	1.106	0.0557	0.0168	0.1165	0	1	0.0223	1.166	0.0457	5.011	31	0	0	5	0.00449	226.2	10
Humen Layer 1	767999	903233	1	1997/08/14-21:36:00	335	0.0168	1.659	0.0557	0.0168	0.1165	0	1	0.0223	1.748	0.0457	5.011	31	0	0	5	0.00449	226.2	10
Humen Layer 1	767999	903233	1	1997/08/30-00:00:00	158.9	0.0282	4.424	0.1114	0.0282	0.1165	0	0.3	0.1117	2.331	0.0457	5.361	29.5	0	0	5	0.00449	11.31	30
Humen Layer 1	767999	903233	1	1997/09/14-00:00:00	158.9	0.0282	4.424	0.1114	0.0282	0.1165	0	0.3	0.1117	2.331	0.0457	5.361	29.5	0	0	5	0.00449	11.31	30
Humen Layer 1	767999	903233	1	1997/10/09-00:00:00	158.9	0.0677	4.424	0.1671	0.0282	0.1165	0	0.3	0.2233	2.098	0.0686	5.361	25.2	0	0	5	0.00449	11.31	30
Humen Layer 1	767999	903233	1	1997/10/29-00:00:00	158.9	0.0564	4.424	0.2228	0.0282	0.1165	0	0.3	0.335	1.632	0.0572	5.361	21.4	0	0	5	0.00449	11.31	30
Humen Layer 1	767999	903233	1	1997/11/28-00:00:00	158.9	0.0508	4.424	0.2228	0.0282	0.1165	0	0.3	0.4466	1.399	0.0515	5.361	17.6	0	0	5	0.00449	11.31	30
Humen Layer 1	767999	903233	1	1998/01/01-00:00:00	158.9	0.0508	4.424	0.2228	0.0282	0.1165	0	0.3	0.4466	1.399	0.0515	5.361	15.8	0	0	5	0.00449	11.31	30
Humen Layer 2	767999	903233	2	1996/12/01-00:00:00	158.9	0.0508	4.424	0.2228	0.0282	0.1165	0	0.3	0.4466	1.399	0.0515	5.361	17.6	0	0	5	0.00449	11.31	30
Humen Layer 2	767999	903233	2	1997/01/01-00:00:00	158.9	0.0452	4.424	0.2228	0.0282	0.1165	0	0.3	0.4466	1.399	0.0457	5.361	15.8	0	0	5	0.00449	11.31	30
Humen Layer 2	767999	903233	2	1997/01/31-00:00:00	158.9	0.0452	4.424	0.2228	0.0282	0.1165	0	0.3	0.335	1.399	0.0457	5.361	15.9	0	0	5	0.00449	11.31	30
Humen Layer 2	767999	903233	2	1997/03/02-00:00:00	158.9	0.0452	4.424	0.2228	0.0282	0.1165	0	0.3	0.2233	1.399	0.0457	5.361	18.5	0	0	5	0.00449	11.31	30
Humen Layer 2	767999	903233	2	1997/04/01-00:00:00	158.9	0.0282	4.424	0.2228	0.0282	0.1165	0	0.3	0.1117	1.399	0.0457	5.361	22.2	0	0	5	0.00449	11.31	30
Humen Layer 2	767999	903233	2	1997/05/01-14:24:00	335	0.0282	1.659	0.1671	0.0282	0.1165	0	0.15	0.1117	1.399	0.0457	5.361	25.9	0	0	5	0.00449	11.31	30
Humen Layer 2	767999	903233	2	1997/05/16-16:48:00	511.1	0.0168	1.106	0.0557	0.0168	0.1165	0	0.15	0.0447	1.224	0.0457	5.011	25.9	0	0	5	0.00449	226.2	10
Humen Layer 2	767999	903233	2	1997/05/31-16:48:00	687.2	0.0168	1.106	0.0557	0.0168	0.1165	0	0.15	0.0223	1.224	0.0457	5.011	27.8	0	0	5	0.00449	226.2	10
Humen Layer 2	767999	903233	2	1997/07/01-00:00:00	687.2	0.0168	1.106	0.0557	0.0168	0.1165	0	0.15	0.0335	1.166	0.0572	5.011	30.3	0	0	5	0.00449	226.2	10
Humen Layer 2	767999	903233	2	1997/07/30-21:36:00	511.1	0.0168	1.106	0.0557	0.0168	0.1165	0	1	0.0223	1.166	0.0457	5.011	31	0	0	5	0.00449	226.2	10
Humen Layer 2	767999	903233	2	1997/08/14-21:36:00	335	0.0168	1.659	0.0557	0.0168	0.1165	0	1	0.0223	1.748	0.0457	5.011	31	0	0	5	0.00449	226.2	10
Humen Layer 2	767999	903233	2	1997/08/30-00:00:00	158.9	0.0282	4.424	0.1114	0.0282	0.1165	0	0.3	0.1117	2.331	0.0457	5.361	29.5	0	0	5	0.00449	11.31	30
Humen Layer 2	767999	903233	2	1997/09/14-00:00:00	158.9	0.0282	4.424	0.1114	0.0282	0.1165	0	0.3	0.1117	2.331	0.0457	5.361	29.5	0	0	5	0.00449	11.31	30
Humen Layer 2	767999	903233	2	1997/10/09-00:00:00	158.9	0.0677	4.424	0.1671	0.0282	0.1165	0	0.3	0.2233	2.098	0.0686	5.361	25.2	0	0	5	0.00449	11.31	30
Humen Layer 2	767999	903233	2	1997/10/29-00:00:00	158.9	0.0564	4.424	0.2228	0.0282	0.1165	0	0.3	0.335	1.632	0.0572	5.361	21.4	0	0	5	0.00449	11.31	30
Humen Layer 2	767999	903233	2	1997/11/28-00:00:00	158.9	0.0508	4.424	0.2228	0.0282	0.1165	0	0.3	0.4466	1.399	0.0515	5.361	17.6	0	0	5	0.00449	11.31	30
Humen Layer 2	767999	903233	2	1998/01/01-00:00:00	158.9	0.0508	4.424	0.2228	0.0282	0.1165	0	0.3	0.4466	1.399	0.0515	5.361	15.8	0	0	5	0.00449	11.31	30
Humen Layer 3	767999	903233	2	1996/12/01-00:00:00	158.9	0.0508	4.424	0.2228	0.0282	0.1165	0	0.3	0.4466	1.399	0.0515	5.361	17.6	0	0	5	0.00449	11.31	30
Humen Layer 3	767999	903233	2	1997/01/01-00:00:00	158.9	0.0452	4.424	0.2228	0.0282	0.1165	0	0.3	0.4466	1.399	0.0457	5.361	15.8	0	0	5	0.00449	11.31	30
Humen Layer 3	767999	903233	2	1997/01/31-00:00:00	158.9	0.0452	4.424	0.2228	0.0282	0.1165	0	0.3	0.335	1.399	0.0457	5.361	15.9	0	0	5	0.00449	11.31	30
Humen Layer 3	767999	903233	2	1997/03/02-00:00:00	158.9	0.0452	4.424	0.2228	0.0282	0.1165	0	0.3	0.2233	1.399	0.0457	5.361	18.5	0	0	5	0.00449	11.31	30
Humen Layer 3	767999	903233	2	1997/04/01-00:00:00	158.9	0.0282	4.424	0.2228	0.0282	0.1165	0	0.3	0.1117	1.399	0.0457	5.361	22.2	0	0	5	0.00449	11.31	30
Humen Layer 3	767999	903233	2	1997/05/01-14:24:00	335	0.0282	1.659	0.1671	0.0282	0.1165	0	0.15	0.1117	1.399	0.0457	5.361	25.9	0	0	5	0.00449	11.31	30
Humen Layer 3	767999	903233	2	1997/05/16-16:48:00	511.1	0.0168	1.106	0.0557	0.0168	0.1165	0	0.15	0.0447	1.224	0.0457	5.011	25.9	0	0	5	0.00449	226.2	10
Humen Layer 3	767999	903233	2	1997/05/31-16:48:00	687.2	0.0168	1.106	0.0557	0.0168	0.1165	0	0.15	0.0223	1.224	0.0457	5.011	27.8	0	0	5	0.00449	226.2	10
Humen Layer 3	767999	903233	2	1997/07/01-00:00:00	687.2	0.0168	1.106	0.0557	0.0168	0.1165	0	0.15	0.0335	1.166	0.0572	5.011	30.3	0	0	5	0.00449	226.2	10
Humen Layer 3	767999	903233	2	1997/07/30-21:36:00	511.1	0.0168	1.106	0.0557	0.0168	0.1165	0	1	0.0223	1.166	0.0457	5.011	31	0	0	5	0.00449	226.2	10
Humen Layer 3	767999	903233	2	1997/08/14-21:36:00	335	0.0168	1.659	0.0557	0.0168	0.1165	0	1	0.0223	1.748	0.0457	5.011	31	0	0	5	0.00449	226.2	10
Humen Layer 3	767999	903233	2	1997/08/30-00:00:00	158.9	0.0282	4.424	0.1114	0.0282	0.1165	0	0.3	0.1117	2.331	0.0457	5.361	29.5	0	0	5	0.00449	11.31	30
Humen Layer 3	767999	903233	2	1997/09/14-00:00:00	158.9	0.0282	4.424	0.1114	0.0282	0.1165	0	0.3	0.1117	2.331	0.0457	5.361	29.5	0	0	5	0.00449	11.31	30
Humen Layer 3	767999	903233	2	1997/10/09-00:00:00	158.9	0.0677	4.424	0.1671	0.0282	0.1165	0	0.3	0.2233	2.098	0.0686	5.361	25.2	0	0	5	0.00449	11.31	30
Humen Layer 3	767999	903233	2	1997/10/29-00:00:00	158.9	0.0564	4.424	0.2228	0.0282	0.1165	0	0.3	0.335	1.632	0.0572	5.361	21.4	0	0	5	0.00449	11.31	30
Humen Layer 3	767999	903233	2	1997/11/28-00:00:00	158.9	0.0508	4.424	0.2228	0.0282	0.1165	0	0.3	0.4466	1.399	0.0515	5.361	17.6	0	0	5	0.00449	11.31	30
Humen Layer 3	767999	903233	2	1998/01/01-00:00:00	158.9	0.0508	4.424	0.2228	0.0282	0.1165	0	0.3	0.4466	1.399	0.0515	5.361	15.8	0	0	5	0.00449	11.31	30
Humen Layer 4	767999	903233	3	1996/12/01-00:00:00	158.9	0.0508	4.424	0.2228	0.0282	0.1165	0	0.3	0.4466	1.399	0.0515	5.361	17.6	0	0	5	0.00449	11.31	30
Humen Layer 4	767999	903233	3	1997/01/01-00:00:00	158.9	0.0452	4.424	0.2228	0.0282	0.1165	0	0.3	0.4466	1.399	0.0457	5.361	15.8	0	0	5	0.00449	11.31	30
Humen Layer 4	767999	903233	3	1997/01/31-00:00:00	158.9	0.0452	4.424	0.2228	0.0282	0.1165	0	0.3	0.335	1.399	0.0457	5.361	15.9	0	0	5	0.00449	11.31	30
Humen Layer 4	767999	903233	3	1997/03/02-00:00:00	158.9	0.0452	4.424	0.2228	0.0282	0.1165	0	0.3	0.2233	1.399	0.0457	5.361	18.5	0	0	5	0.00449	11.31	30
Humen Layer 4	767999	903233	3	1997/04/01-00:00:00	158.9	0.0282	4.424	0.2228	0.0282	0.1165	0	0.3	0.1117	1.399	0.0457	5.361	22.2	0	0	5	0.00449	11.31	30
Humen Layer 4	767999	903233	3	1997/05/01-14:24:00	335	0.0282	1.659	0.1671	0.0282	0.1165	0	0.15	0.1117	1.399	0.0457	5.361	25.9	0	0	5	0.00449	11.31	30

Table 4 Pearl River Delta Loads

ID	Easting	Northing	Layer	Period	Flow (for discharges with 0 flows, the unit should be g/s.)	adsorbed ortho phosphate	Detritus Carbon (DetC)	Detritus Nitrogen (DetN)	Detritus Phosphorus (DetP)	Detritus Silica (DetSi)	Diatoms	Algae (non-Diatoms)	Ammonium (NH4)	Nitrate (NO3)	Ortho-Phosphate (PO4)	dissolved Silica (Si)	Water Temperature	Salinity	carbonaceous BOD (first pool) at 5 days	Dissolved Oxygen	Copper (Cu)	E. Coli bacteria	inorganic matter (IM1)
					(m3/s)	(gP/m3)	(gC/m3)	(gN/m3)	(gP/m3)	(gSi/m3)	(gC/m3)	(gC/m3)	(gN/m3)	(gN/m3)	(gP/m3)	(gSi/m3)	(oC)	(g/kg)	(gO2/m3)	(g/m3)	(g/m3)	(MPN/m3)	(gDM/m3)
						'AAP'	'DetC'	'DetN'	'DetP'	'DetSi'	'DIAT'	'GREEN'	'NH4'	'NO3'	'PO4'	'Si'	'ModTemp'	'Salinity'	'CBOD5'	'OXY'	'Cu'	'EColi'	'IM1'
Humen Layer 4	767999	903233	3	1997/05/16-16:48:00	511.1	0.0168	1.106	0.0557	0.0168	0.1165	0	0.15	0.0447	1.224	0.0457	5.011	25.9	0	0	5	0.00449	226.2	10
Humen Layer 4	767999	903233	3	1997/05/31-16:48:00	687.2	0.0168	1.106	0.0557	0.0168	0.1165	0	0.15	0.0223	1.224	0.0457	5.011	27.8	0	0	5	0.00449	226.2	10
Humen Layer 4	767999	903233	3	1997/07/01-00:00:00	687.2	0.0168	1.106	0.0557	0.0168	0.1165	0	0.15	0.0335	1.166	0.0572	5.011	30.3	0	0	5	0.00449	226.2	10
Humen Layer 4	767999	903233	3	1997/07/30-21:36:00	511.1	0.0168	1.106	0.0557	0.0168	0.1165	0	1	0.0223	1.166	0.0457	5.011	31	0	0	5	0.00449	226.2	10
Humen Layer 4	767999	903233	3	1997/08/14-21:36:00	335	0.0168	1.659	0.0557	0.0168	0.1165	0	1	0.0223	1.748	0.0457	5.011	31	0	0	5	0.00449	226.2	10
Humen Layer 4	767999	903233	3	1997/08/30-00:00:00	158.9	0.0282	4.424	0.1114	0.0282	0.1165	0	0.3	0.1117	2.331	0.0457	5.361	29.5	0	0	5	0.00449	11.31	30
Humen Layer 4	767999	903233	3	1997/09/14-00:00:00	158.9	0.0282	4.424	0.1114	0.0282	0.1165	0	0.3	0.1117	2.331	0.0457	5.361	29.5	0	0	5	0.00449	11.31	30
Humen Layer 4	767999	903233	3	1997/10/09-00:00:00	158.9	0.0677	4.424	0.1671	0.0282	0.1165	0	0.3	0.2233	2.098	0.0686	5.361	25.2	0	0	5	0.00449	11.31	30
Humen Layer 4	767999	903233	3	1997/10/29-00:00:00	158.9	0.0564	4.424	0.2228	0.0282	0.1165	0	0.3	0.335	1.632	0.0572	5.361	21.4	0	0	5	0.00449	11.31	30
Humen Layer 4	767999	903233	3	1997/11/28-00:00:00	158.9	0.0508	4.424	0.2228	0.0282	0.1165	0	0.3	0.4466	1.399	0.0515	5.361	17.6	0	0	5	0.00449	11.31	30
Humen Layer 4	767999	903233	3	1998/01/01-00:00:00	158.9	0.0508	4.424	0.2228	0.0282	0.1165	0	0.3	0.4466	1.399	0.0515	5.361	15.8	0	0	5	0.00449	11.31	30
Humen Layer 5	767999	903233	3	1996/12/01-00:00:00	158.9	0.0508	4.424	0.2228	0.0282	0.1165	0	0.3	0.4466	1.399	0.0515	5.361	17.6	0	0	5	0.00449	11.31	30
Humen Layer 5	767999	903233	3	1997/01/01-00:00:00	158.9	0.0452	4.424	0.2228	0.0282	0.1165	0	0.3	0.4466	1.399	0.0457	5.361	15.8	0	0	5	0.00449	11.31	30
Humen Layer 5	767999	903233	3	1997/01/31-00:00:00	158.9	0.0452	4.424	0.2228	0.0282	0.1165	0	0.3	0.335	1.399	0.0457	5.361	15.9	0	0	5	0.00449	11.31	30
Humen Layer 5	767999	903233	3	1997/03/02-00:00:00	158.9	0.0452	4.424	0.2228	0.0282	0.1165	0	0.3	0.2233	1.399	0.0457	5.361	18.5	0	0	5	0.00449	11.31	30
Humen Layer 5	767999	903233	3	1997/04/01-00:00:00	158.9	0.0282	4.424	0.2228	0.0282	0.1165	0	0.3	0.1117	1.399	0.0457	5.361	22.2	0	0	5	0.00449	11.31	30
Humen Layer 5	767999	903233	3	1997/05/01-14:24:00	335	0.0282	1.659	0.1671	0.0282	0.1165	0	0.15	0.1117	1.399	0.0457	5.361	25.9	0	0	5	0.00449	11.31	30
Humen Layer 5	767999	903233	3	1997/05/16-16:48:00	511.1	0.0168	1.106	0.0557	0.0168	0.1165	0	0.15	0.0447	1.224	0.0457	5.011	25.9	0	0	5	0.00449	226.2	10
Humen Layer 5	767999	903233	3	1997/05/31-16:48:00	687.2	0.0168	1.106	0.0557	0.0168	0.1165	0	0.15	0.0223	1.224	0.0457	5.011	27.8	0	0	5	0.00449	226.2	10
Humen Layer 5	767999	903233	3	1997/07/01-00:00:00	687.2	0.0168	1.106	0.0557	0.0168	0.1165	0	0.15	0.0335	1.166	0.0572	5.011	30.3	0	0	5	0.00449	226.2	10
Humen Layer 5	767999	903233	3	1997/07/30-21:36:00	511.1	0.0168	1.106	0.0557	0.0168	0.1165	0	1	0.0223	1.166	0.0457	5.011	31	0	0	5	0.00449	226.2	10
Humen Layer 5	767999	903233	3	1997/08/14-21:36:00	335	0.0168	1.659	0.0557	0.0168	0.1165	0	1	0.0223	1.748	0.0457	5.011	31	0	0	5	0.00449	226.2	10
Humen Layer 5	767999	903233	3	1997/08/30-00:00:00	158.9	0.0282	4.424	0.1114	0.0282	0.1165	0	0.3	0.1117	2.331	0.0457	5.361	29.5	0	0	5	0.00449	11.31	30
Humen Layer 5	767999	903233	3	1997/09/14-00:00:00	158.9	0.0282	4.424	0.1114	0.0282	0.1165	0	0.3	0.1117	2.331	0.0457	5.361	29.5	0	0	5	0.00449	11.31	30
Humen Layer 5	767999	903233	3	1997/10/09-00:00:00	158.9	0.0677	4.424	0.1671	0.0282	0.1165	0	0.3	0.2233	2.098	0.0686	5.361	25.2	0	0	5	0.00449	11.31	30
Humen Layer 5	767999	903233	3	1997/10/29-00:00:00	158.9	0.0564	4.424	0.2228	0.0282	0.1165	0	0.3	0.335	1.632	0.0572	5.361	21.4	0	0	5	0.00449	11.31	30
Humen Layer 5	767999	903233	3	1997/11/28-00:00:00	158.9	0.0508	4.424	0.2228	0.0282	0.1165	0	0.3	0.4466	1.399	0.0515	5.361	17.6	0	0	5	0.00449	11.31	30
Humen Layer 5	767999	903233	3	1998/01/01-00:00:00	158.9	0.0508	4.424	0.2228	0.0282	0.1165	0	0.3	0.4466	1.399	0.0515	5.361	15.8	0	0	5	0.00449	11.31	30
Jiaomen Layer 1	758268	876128	1	1996/12/01-00:00:00	139.9	0.0497	4.364	0.2188	0.0276	0.1134	0	0.3	0.4394	1.361	0.0504	5.216	17.6	0	0	5	0.0046	11.11	30
Jiaomen Layer 1	758268	876128	1	1997/01/01-00:00:00	139.9	0.0441	4.364	0.2188	0.0276	0.1134	0	0.3	0.4394	1.361	0.0448	5.216	15.8	0	0	5	0.0046	11.11	30
Jiaomen Layer 1	758268	876128	1	1997/01/31-00:00:00	139.9	0.0441	4.364	0.2188	0.0276	0.1134	0	0.3	0.3295	1.361	0.0448	5.216	15.9	0	0	5	0.0046	11.11	30
Jiaomen Layer 1	758268	876128	1	1997/03/02-00:00:00	139.9	0.0441	4.364	0.2188	0.0276	0.1134	0	0.3	0.2197	1.361	0.0448	5.216	18.5	0	0	5	0.0046	11.11	30
Jiaomen Layer 1	758268	876128	1	1997/04/01-00:00:00	139.9	0.0275	4.364	0.2188	0.0275	0.1134	0	0.3	0.1098	1.361	0.0448	5.216	22.2	0	0	5	0.0046	11.11	30
Jiaomen Layer 1	758268	876128	1	1997/05/01-14:24:00	313.5	0.0275	1.637	0.1641	0.0275	0.1134	0	0.15	0.1098	1.361	0.0448	5.216	25.9	0	0	5	0.0046	11.11	30
Jiaomen Layer 1	758268	876128	1	1997/05/16-16:48:00	487.1	0.0164	1.091	0.0547	0.0164	0.1134	0	0.15	0.0439	1.191	0.0448	4.876	25.9	0	0	5	0.0046	222.3	10
Jiaomen Layer 1	758268	876128	1	1997/05/31-16:48:00	660.7	0.0164	1.091	0.0547	0.0164	0.1134	0	0.15	0.022	1.191	0.0448	4.876	27.8	0	0	5	0.0046	222.3	10
Jiaomen Layer 1	758268	876128	1	1997/07/01-00:00:00	660.7	0.0164	1.091	0.0547	0.0164	0.1134	0	0.15	0.033	1.134	0.056	4.876	30.3	0	0	5	0.0046	222.3	10
Jiaomen Layer 1	758268	876128	1	1997/07/30-21:36:00	487.1	0.0164	1.091	0.0547	0.0164	0.1134	0	1	0.022	1.134	0.0448	4.876	31	0	0	5	0.0046	222.3	10
Jiaomen Layer 1	758268	876128	1	1997/08/14-21:36:00	313.5	0.0164	1.637	0.0547	0.0164	0.1134	0	1	0.022	1.701	0.0448	4.876	31	0	0	5	0.0046	222.3	10
Jiaomen Layer 1	758268	876128	1	1997/08/30-00:00:00	139.9	0.0275	4.364	0.1094	0.0275	0.1134	0	0.3	0.1098	2.268	0.0448	5.216	29.5	0	0	5	0.0046	11.11	30
Jiaomen Layer 1	758268	876128	1	1997/09/14-00:00:00	139.9	0.0275	4.364	0.1094	0.0275	0.1134	0	0.3	0.1098	2.268	0.0448	5.216	29.5	0	0	5	0.0046	11.11	30
Jiaomen Layer 1	758268	876128	1	1997/10/09-00:00:00	139.9	0.0662	4.364	0.1641	0.0276	0.1134	0	0.3	0.2197	2.041	0.0672	5.216	25.2	0	0	5	0.0046	11.11	30
Jiaomen Layer 1	758268	876128	1	1997/10/29-00:00:00	139.9	0.0552	4.364	0.2188	0.0276	0.1134	0	0.3	0.3295	1.587	0.056	5.216	21.4	0	0	5	0.0046	11.11	30
Jiaomen Layer 1	758268	876128	1	1997/11/28-00:00:00	139.9	0.0497	4.364	0.2188	0.0276	0.1134	0	0.3	0.4394	1.361	0.0504	5.216	17.6	0	0	5	0.0046	11.11	30
Jiaomen Layer 1	758268	876128	1	1998/01/01-00:00:00	139.9	0.0497	4.364	0.2188	0.0276	0.1134	0	0.3	0.4394	1.361	0.0504	5.216	15.8	0	0	5	0.0046	11.11	30
Jiaomen Layer 2	758268	876128	2	1996/12/01-00:00:00	139.9	0.0497	4.364	0.2188	0.0276	0.1134	0	0.3	0.4394	1.361	0.0504	5.216	17.6	0	0	5	0.0046	11.11	30
Jiaomen Layer 2	758268	876128	2	1997/01/01-00:00:00	139.9	0.0441	4.364	0.2188	0.0276	0.1134	0	0.3	0.4394	1.361	0.0448	5.216	15.8	0	0	5	0.0046	11.11	30
Jiaomen Layer 2	758268	876128	2	1997/01/31-00:00:00	139.9	0.0441	4.364	0.2188	0.0276	0.1134	0	0.3	0.3295	1.361	0.0448	5.216	15.9	0	0	5	0.0046	11.11	30
Jiaomen Layer 2	758268	876128	2	1997/03/02-00:00:00	139.9	0.0441	4.364	0.2188	0.0276	0.1134	0	0.3	0.2197	1.361	0.0448	5.216	18.5	0	0	5	0.0046	11.11	30
Jiaomen Layer 2	758268	876128	2	1997/04/01-00:00:00	139.9	0.0275	4.364	0.2188	0.0275	0.1134	0	0.3	0.1098	1.361	0.0448	5.216	22.2	0	0	5	0.0046	11.11	30
Jiaomen Layer 2	758268	876128	2	1997/05/01-14:24:00	313.5	0.0275	1.637	0.1641	0.0275	0.1134	0	0.15	0.1098	1.361	0.0448	5.216	25.9	0	0	5	0.0046	11.11	30
Jiaomen Layer 2	758268	876128	2	1997/05/16-16:48:00	487.1	0.0164	1.091	0.0547	0.0164	0.1134	0	0.15	0.0439	1.191	0.0448	4.876	25.9	0	0	5	0.0046	222.3	10
Jiaomen Layer 2	758268	876128	2	1997/05/31-16:48:00	660.7	0.0164	1.091	0.0547	0.0164	0.1134	0	0.15	0.022	1.191	0.0448	4.876	27.8	0	0	5	0.0046	222.3	10
Jiaomen Layer 2	758268	876128	2	1997/07/01-00:00:00	660.7	0.0164	1.091	0.0547	0.0164	0.1134	0	0.15	0.033	1.134	0.056	4.876	30.3	0	0	5	0.0046	222.3	10
Jiaomen Layer 2	758268	876128	2	1997/07/30-21:36:00	487.1	0.0164	1.091	0.0547	0.0164	0.1134	0	1	0.022	1.134	0.0448	4.876	31	0	0	5	0.0046	222.3	10
Jiaomen Layer 2	758268	876128	2	1997/08/14-21:36:00	313.5	0.0164	1.637	0.0547	0.0164	0.1134	0	1	0.022	1.701	0.0448	4.876	31	0	0	5	0.0046	222.3	10
Jiaomen Layer 2	758268	876128	2	1997/08/30-00:00:00	139.9	0.0275	4.364	0.1094	0.0275	0.1134	0	0.3	0.1098	2.268	0.0448	5.216	29.5	0	0	5	0.0046	11.11	30
Jiaomen Layer 2	758268	876128	2	1997/09/14-00:00:00	139.9	0.0275	4.364	0.1094	0.0275	0.1134	0	0.3	0.1098	2.268	0.0448	5.216	29.5	0	0	5	0.0046	11.11	30

Table 4 Pearl River Delta Loads

ID	Easting	Northing	Layer	Period	Flow (for discharges with 0 flows, the unit should be g/s.)	adsorbed ortho phosphate	Detritus Carbon (DetC)	Detritus Nitrogen (DetN)	Detritus Phosphorus (DetP)	Detritus Silica (DetSi)	Diatoms	Algae (non-Diatoms)	Ammonium (NH4)	Nitrate (NO3)	Ortho-Phosphate (PO4)	dissolved Silica (Si)	Water Temperature	Salinity	carbonaceous BOD (first pool) at 5 days	Dissolved Oxygen	Copper (Cu)	E. Coli bacteria	inorganic matter (IM1)
					(m3/s)	(gP/m3)	(gC/m3)	(gN/m3)	(gP/m3)	(gSi/m3)	(gC/m3)	(gC/m3)	(gN/m3)	(gN/m3)	(gP/m3)	(gSi/m3)	(oC)	(g/kg)	(gO2/m3)	(g/m3)	(g/m3)	(MPN/m3)	(gDM/m3)
						'AAP'	'DetC'	'DetN'	'DetP'	'DetSi'	'DIAT'	'GREEN'	'NH4'	'NO3'	'PO4'	'Si'	'ModTemp'	'Salinity'	'CBOD5'	'OXY'	'Cu'	'EColi'	'IM1'
Jiaomen Layer 2	758268	876128	2	1997/10/09-00:00:00	139.9	0.0662	4.364	0.1641	0.0276	0.1134	0	0.3	0.2197	2.041	0.0672	5.216	25.2	0	0	5	0.0046	11.11	30
Jiaomen Layer 2	758268	876128	2	1997/10/29-00:00:00	139.9	0.0552	4.364	0.2188	0.0276	0.1134	0	0.3	0.3295	1.587	0.056	5.216	21.4	0	0	5	0.0046	11.11	30
Jiaomen Layer 2	758268	876128	2	1997/11/28-00:00:00	139.9	0.0497	4.364	0.2188	0.0276	0.1134	0	0.3	0.4394	1.361	0.0504	5.216	17.6	0	0	5	0.0046	11.11	30
Jiaomen Layer 2	758268	876128	2	1998/01/01-00:00:00	139.9	0.0497	4.364	0.2188	0.0276	0.1134	0	0.3	0.4394	1.361	0.0504	5.216	15.8	0	0	5	0.0046	11.11	30
Jiaomen Layer 3	758268	876128	2	1996/12/01-00:00:00	139.9	0.0497	4.364	0.2188	0.0276	0.1134	0	0.3	0.4394	1.361	0.0504	5.216	17.6	0	0	5	0.0046	11.11	30
Jiaomen Layer 3	758268	876128	2	1997/01/01-00:00:00	139.9	0.0441	4.364	0.2188	0.0276	0.1134	0	0.3	0.4394	1.361	0.0448	5.216	15.8	0	0	5	0.0046	11.11	30
Jiaomen Layer 3	758268	876128	2	1997/01/31-00:00:00	139.9	0.0441	4.364	0.2188	0.0276	0.1134	0	0.3	0.3295	1.361	0.0448	5.216	15.9	0	0	5	0.0046	11.11	30
Jiaomen Layer 3	758268	876128	2	1997/03/02-00:00:00	139.9	0.0441	4.364	0.2188	0.0276	0.1134	0	0.3	0.2197	1.361	0.0448	5.216	18.5	0	0	5	0.0046	11.11	30
Jiaomen Layer 3	758268	876128	2	1997/04/01-00:00:00	139.9	0.0275	4.364	0.2188	0.0275	0.1134	0	0.3	0.1098	1.361	0.0448	5.216	22.2	0	0	5	0.0046	11.11	30
Jiaomen Layer 3	758268	876128	2	1997/05/01-14:24:00	313.5	0.0275	1.637	0.1641	0.0275	0.1134	0	0.15	0.1098	1.361	0.0448	5.216	25.9	0	0	5	0.0046	11.11	30
Jiaomen Layer 3	758268	876128	2	1997/05/16-16:48:00	487.1	0.0164	1.091	0.0547	0.0164	0.1134	0	0.15	0.0439	1.191	0.0448	4.876	25.9	0	0	5	0.0046	222.3	10
Jiaomen Layer 3	758268	876128	2	1997/05/31-16:48:00	660.7	0.0164	1.091	0.0547	0.0164	0.1134	0	0.15	0.022	1.191	0.0448	4.876	27.8	0	0	5	0.0046	222.3	10
Jiaomen Layer 3	758268	876128	2	1997/07/01-00:00:00	660.7	0.0164	1.091	0.0547	0.0164	0.1134	0	0.15	0.033	1.134	0.056	4.876	30.3	0	0	5	0.0046	222.3	10
Jiaomen Layer 3	758268	876128	2	1997/07/30-21:36:00	487.1	0.0164	1.091	0.0547	0.0164	0.1134	0	1	0.022	1.134	0.0448	4.876	31	0	0	5	0.0046	222.3	10
Jiaomen Layer 3	758268	876128	2	1997/08/14-21:36:00	313.5	0.0164	1.637	0.0547	0.0164	0.1134	0	1	0.022	1.701	0.0448	4.876	31	0	0	5	0.0046	222.3	10
Jiaomen Layer 3	758268	876128	2	1997/08/30-00:00:00	139.9	0.0275	4.364	0.1094	0.0275	0.1134	0	0.3	0.1098	2.268	0.0448	5.216	29.5	0	0	5	0.0046	11.11	30
Jiaomen Layer 3	758268	876128	2	1997/09/14-00:00:00	139.9	0.0275	4.364	0.1094	0.0275	0.1134	0	0.3	0.1098	2.268	0.0448	5.216	29.5	0	0	5	0.0046	11.11	30
Jiaomen Layer 3	758268	876128	2	1997/10/09-00:00:00	139.9	0.0662	4.364	0.1641	0.0276	0.1134	0	0.3	0.2197	2.041	0.0672	5.216	25.2	0	0	5	0.0046	11.11	30
Jiaomen Layer 3	758268	876128	2	1997/10/29-00:00:00	139.9	0.0552	4.364	0.2188	0.0276	0.1134	0	0.3	0.3295	1.587	0.056	5.216	21.4	0	0	5	0.0046	11.11	30
Jiaomen Layer 3	758268	876128	2	1997/11/28-00:00:00	139.9	0.0497	4.364	0.2188	0.0276	0.1134	0	0.3	0.4394	1.361	0.0504	5.216	17.6	0	0	5	0.0046	11.11	30
Jiaomen Layer 3	758268	876128	2	1998/01/01-00:00:00	139.9	0.0497	4.364	0.2188	0.0276	0.1134	0	0.3	0.4394	1.361	0.0504	5.216	15.8	0	0	5	0.0046	11.11	30
Jiaomen Layer 4	758268	876128	3	1996/12/01-00:00:00	139.9	0.0497	4.364	0.2188	0.0276	0.1134	0	0.3	0.4394	1.361	0.0504	5.216	17.6	0	0	5	0.0046	11.11	30
Jiaomen Layer 4	758268	876128	3	1997/01/01-00:00:00	139.9	0.0441	4.364	0.2188	0.0276	0.1134	0	0.3	0.4394	1.361	0.0448	5.216	15.8	0	0	5	0.0046	11.11	30
Jiaomen Layer 4	758268	876128	3	1997/01/31-00:00:00	139.9	0.0441	4.364	0.2188	0.0276	0.1134	0	0.3	0.3295	1.361	0.0448	5.216	15.9	0	0	5	0.0046	11.11	30
Jiaomen Layer 4	758268	876128	3	1997/03/02-00:00:00	139.9	0.0441	4.364	0.2188	0.0276	0.1134	0	0.3	0.2197	1.361	0.0448	5.216	18.5	0	0	5	0.0046	11.11	30
Jiaomen Layer 4	758268	876128	3	1997/04/01-00:00:00	139.9	0.0275	4.364	0.2188	0.0275	0.1134	0	0.3	0.1098	1.361	0.0448	5.216	22.2	0	0	5	0.0046	11.11	30
Jiaomen Layer 4	758268	876128	3	1997/05/01-14:24:00	313.5	0.0275	1.637	0.1641	0.0275	0.1134	0	0.15	0.1098	1.361	0.0448	5.216	25.9	0	0	5	0.0046	11.11	30
Jiaomen Layer 4	758268	876128	3	1997/05/16-16:48:00	487.1	0.0164	1.091	0.0547	0.0164	0.1134	0	0.15	0.0439	1.191	0.0448	4.876	25.9	0	0	5	0.0046	222.3	10
Jiaomen Layer 4	758268	876128	3	1997/05/31-16:48:00	660.7	0.0164	1.091	0.0547	0.0164	0.1134	0	0.15	0.022	1.191	0.0448	4.876	27.8	0	0	5	0.0046	222.3	10
Jiaomen Layer 4	758268	876128	3	1997/07/01-00:00:00	660.7	0.0164	1.091	0.0547	0.0164	0.1134	0	0.15	0.033	1.134	0.056	4.876	30.3	0	0	5	0.0046	222.3	10
Jiaomen Layer 4	758268	876128	3	1997/07/30-21:36:00	487.1	0.0164	1.091	0.0547	0.0164	0.1134	0	1	0.022	1.134	0.0448	4.876	31	0	0	5	0.0046	222.3	10
Jiaomen Layer 4	758268	876128	3	1997/08/14-21:36:00	313.5	0.0164	1.637	0.0547	0.0164	0.1134	0	1	0.022	1.701	0.0448	4.876	31	0	0	5	0.0046	222.3	10
Jiaomen Layer 4	758268	876128	3	1997/08/30-00:00:00	139.9	0.0275	4.364	0.1094	0.0275	0.1134	0	0.3	0.1098	2.268	0.0448	5.216	29.5	0	0	5	0.0046	11.11	30
Jiaomen Layer 4	758268	876128	3	1997/09/14-00:00:00	139.9	0.0275	4.364	0.1094	0.0275	0.1134	0	0.3	0.1098	2.268	0.0448	5.216	29.5	0	0	5	0.0046	11.11	30
Jiaomen Layer 4	758268	876128	3	1997/10/09-00:00:00	139.9	0.0662	4.364	0.1641	0.0276	0.1134	0	0.3	0.2197	2.041	0.0672	5.216	25.2	0	0	5	0.0046	11.11	30
Jiaomen Layer 4	758268	876128	3	1997/10/29-00:00:00	139.9	0.0552	4.364	0.2188	0.0276	0.1134	0	0.3	0.3295	1.587	0.056	5.216	21.4	0	0	5	0.0046	11.11	30
Jiaomen Layer 4	758268	876128	3	1997/11/28-00:00:00	139.9	0.0497	4.364	0.2188	0.0276	0.1134	0	0.3	0.4394	1.361	0.0504	5.216	17.6	0	0	5	0.0046	11.11	30
Jiaomen Layer 4	758268	876128	3	1998/01/01-00:00:00	139.9	0.0497	4.364	0.2188	0.0276	0.1134	0	0.3	0.4394	1.361	0.0504	5.216	15.8	0	0	5	0.0046	11.11	30
Jiaomen Layer 5	758268	876128	3	1996/12/01-00:00:00	139.9	0.0497	4.364	0.2188	0.0276	0.1134	0	0.3	0.4394	1.361	0.0504	5.216	17.6	0	0	5	0.0046	11.11	30
Jiaomen Layer 5	758268	876128	3	1997/01/01-00:00:00	139.9	0.0441	4.364	0.2188	0.0276	0.1134	0	0.3	0.4394	1.361	0.0448	5.216	15.8	0	0	5	0.0046	11.11	30
Jiaomen Layer 5	758268	876128	3	1997/01/31-00:00:00	139.9	0.0441	4.364	0.2188	0.0276	0.1134	0	0.3	0.3295	1.361	0.0448	5.216	15.9	0	0	5	0.0046	11.11	30
Jiaomen Layer 5	758268	876128	3	1997/03/02-00:00:00	139.9	0.0441	4.364	0.2188	0.0276	0.1134	0	0.3	0.2197	1.361	0.0448	5.216	18.5	0	0	5	0.0046	11.11	30
Jiaomen Layer 5	758268	876128	3	1997/04/01-00:00:00	139.9	0.0275	4.364	0.2188	0.0275	0.1134	0	0.3	0.1098	1.361	0.0448	5.216	22.2	0	0	5	0.0046	11.11	30
Jiaomen Layer 5	758268	876128	3	1997/05/01-14:24:00	313.5	0.0275	1.637	0.1641	0.0275	0.1134	0	0.15	0.1098	1.361	0.0448	5.216	25.9	0	0	5	0.0046	11.11	30
Jiaomen Layer 5	758268	876128	3	1997/05/16-16:48:00	487.1	0.0164	1.091	0.0547	0.0164	0.1134	0	0.15	0.0439	1.191	0.0448	4.876	25.9	0	0	5	0.0046	222.3	10
Jiaomen Layer 5	758268	876128	3	1997/05/31-16:48:00	660.7	0.0164	1.091	0.0547	0.0164	0.1134	0	0.15	0.022	1.191	0.0448	4.876	27.8	0	0	5	0.0046	222.3	10
Jiaomen Layer 5	758268	876128	3	1997/07/01-00:00:00	660.7	0.0164	1.091	0.0547	0.0164	0.1134	0	0.15	0.033	1.134	0.056	4.876	30.3	0	0	5	0.0046	222.3	10
Jiaomen Layer 5	758268	876128	3	1997/07/30-21:36:00	487.1	0.0164	1.091	0.0547	0.0164	0.1134	0	1	0.022	1.134	0.0448	4.876	31	0	0	5	0.0046	222.3	10
Jiaomen Layer 5	758268	876128	3	1997/08/14-21:36:00	313.5	0.0164	1.637	0.0547	0.0164	0.1134	0	1	0.022	1.701	0.0448	4.876	31	0	0	5	0.0046	222.3	10
Jiaomen Layer 5	758268	876128	3	1997/08/30-00:00:00	139.9	0.0275	4.364	0.1094	0.0275	0.1134	0	0.3	0.1098	2.268	0.0448	5.216	29.5	0	0	5	0.0046	11.11	30
Jiaomen Layer 5	758268	876128	3	1997/09/14-00:00:00	139.9	0.0275	4.364	0.1094	0.0275	0.1134	0	0.3	0.1098	2.268	0.0448	5.216	29.5	0	0	5	0.0046	11.11	30
Jiaomen Layer 5	758268	876128	3	1997/10/09-00:00:00	139.9	0.0662	4.364	0.1641	0.0276	0.1134	0	0.3	0.2197	2.041	0.0672	5.216	25.2	0	0	5	0.0046	11.11	30
Jiaomen Layer 5	758268	876128	3	1997/10/29-00:00:00	139.9	0.0552	4.364	0.2188	0.0276	0.1134	0	0.3	0.3295	1.587	0.056	5.216	21.4	0	0	5	0.0046	11.11	30
Jiaomen Layer 5	758268	876128	3	1997/11/28-00:00:00	139.9	0.0497	4.364	0.2188	0.0276	0.1134	0	0.3	0.4394	1.361	0.0504	5.216	17.6	0	0	5	0.0046	11.11	30
Jiaomen Layer 5	758268	876128	3	1998/01/01-00:00:00	139.9	0.0497	4.364	0.2188	0.0276	0.1134	0	0.3	0.4394	1.361	0.0504	5.216	15.8	0	0	5	0.0046	11.11	30
Hongqili Layer 1	759538	866774	1	1996/12/01-00:00:00	44.9	0.0489	4.369	0.2191	0.0272	0.1129	0	0.3	0.4395	1.355	0.0505	5.196	17.6	0	0	5	0.00455	11.07	30
Hongqili Layer 1	759538	866774	1	1997/01/01-00:00:00	44.9	0.0435	4.369	0.2191	0.0272	0.1129	0	0.3	0.4395	1.355	0.0449	5.196	15.8	0	0	5	0.00455	11.07	30
Hongqili Layer 1	759538	866774	1	1997/01/31-00:00:00	44.9	0.0435	4.369	0.2191	0.0272	0.1129	0	0.3	0.3296	1.355	0.0449	5.196	15.9	0	0	5	0.00455	11.07	30

Table 4 Pearl River Delta Loads

ID	Easting	Northing	Layer	Period	FLOW (for discharges with 0 flows, the unit should be g/s.)	adsorbed ortho phosphate	Detritus Carbon (DetC)	Detritus Nitrogen (DetN)	Detritus Phosphorus (DetP)	Detritus Silica (DetSi)	Diatoms	Algae (non-Diatoms)	Ammonium (NH4)	Nitrate (NO3)	Ortho-Phosphate (PO4)	dissolved Silica (Si)	Water Temperature	Salinity	carbonaceous BOD (first pool) at 5 days	Dissolved Oxygen	Copper (Cu)	E. Coli bacteria	inorganic matter (IM1)
					(m3/s)	(gP/m3)	(gC/m3)	(gN/m3)	(gP/m3)	(gSi/m3)	(gC/m3)	(gC/m3)	(gN/m3)	(gN/m3)	(gP/m3)	(gSi/m3)	(oC)	(g/kg)	(gO2/m3)	(g/m3)	(g/m3)	(MPN/m3)	(gDM/m3)
						'AAP'	'DetC'	'DetN'	'DetP'	'DetSi'	'DIAT'	'GREEN'	'NH4'	'NO3'	'PO4'	'Si'	'ModTemp'	'Salinity'	'CBOD5'	'OXY'	'Cu'	'EColi'	'IM1'
Hongqili Layer 1	759538	866774	1	1997/03/02-00:00:00	44.9	0.0435	4.369	0.2191	0.0272	0.1129	0	0.3	0.2197	1.355	0.0449	5.196	18.5	0	0	5	0.00455	11.07	30
Hongqili Layer 1	759538	866774	1	1997/04/01-00:00:00	44.9	0.0271	4.369	0.2191	0.0271	0.1129	0	0.3	0.1099	1.355	0.0449	5.196	22.2	0	0	5	0.00455	11.07	30
Hongqili Layer 1	759538	866774	1	1997/05/01-14:24:00	114.6	0.0271	1.638	0.1643	0.0271	0.1129	0	0.15	0.1099	1.355	0.0449	5.196	25.9	0	0	5	0.00455	11.07	30
Hongqili Layer 1	759538	866774	1	1997/05/16-16:48:00	184.3	0.0161	1.092	0.0548	0.0161	0.1129	0	0.15	0.0439	1.186	0.0449	4.857	25.9	0	0	5	0.00455	221.5	10
Hongqili Layer 1	759538	866774	1	1997/05/31-16:48:00	254	0.0161	1.092	0.0548	0.0161	0.1129	0	0.15	0.022	1.186	0.0449	4.857	27.8	0	0	5	0.00455	221.5	10
Hongqili Layer 1	759538	866774	1	1997/07/01-00:00:00	254	0.016	1.092	0.0548	0.016	0.1129	0	0.15	0.033	1.129	0.0561	4.857	30.3	0	0	5	0.00455	221.5	10
Hongqili Layer 1	759538	866774	1	1997/07/30-21:36:00	184.3	0.0161	1.092	0.0548	0.0161	0.1129	0	1	0.022	1.129	0.0449	4.857	31	0	0	5	0.00455	221.5	10
Hongqili Layer 1	759538	866774	1	1997/08/14-21:36:00	114.6	0.0161	1.638	0.0548	0.0161	0.1129	0	1	0.022	1.694	0.0449	4.857	31	0	0	5	0.00455	221.5	10
Hongqili Layer 1	759538	866774	1	1997/08/30-00:00:00	44.9	0.0271	4.369	0.1096	0.0271	0.1129	0	0.3	0.1099	2.259	0.0449	5.196	29.5	0	0	5	0.00455	11.07	30
Hongqili Layer 1	759538	866774	1	1997/09/14-00:00:00	44.9	0.0271	4.369	0.1096	0.0271	0.1129	0	0.3	0.1099	2.259	0.0449	5.196	29.5	0	0	5	0.00455	11.07	30
Hongqili Layer 1	759538	866774	1	1997/10/09-00:00:00	44.9	0.0652	4.369	0.1643	0.0272	0.1129	0	0.3	0.2197	2.033	0.0673	5.196	25.2	0	0	5	0.00455	11.07	30
Hongqili Layer 1	759538	866774	1	1997/10/29-00:00:00	44.9	0.0543	4.369	0.2191	0.0272	0.1129	0	0.3	0.3296	1.581	0.0561	5.196	21.4	0	0	5	0.00455	11.07	30
Hongqili Layer 1	759538	866774	1	1997/11/28-00:00:00	44.9	0.0489	4.369	0.2191	0.0272	0.1129	0	0.3	0.4395	1.355	0.0505	5.196	17.6	0	0	5	0.00455	11.07	30
Hongqili Layer 1	759538	866774	1	1998/01/01-00:00:00	44.9	0.0489	4.369	0.2191	0.0272	0.1129	0	0.3	0.4395	1.355	0.0505	5.196	15.8	0	0	5	0.00455	11.07	30
Hongqili Layer 2	759538	866774	2	1996/12/01-00:00:00	44.9	0.0489	4.369	0.2191	0.0272	0.1129	0	0.3	0.4395	1.355	0.0505	5.196	17.6	0	0	5	0.00455	11.07	30
Hongqili Layer 2	759538	866774	2	1997/01/01-00:00:00	44.9	0.0435	4.369	0.2191	0.0272	0.1129	0	0.3	0.4395	1.355	0.0449	5.196	15.8	0	0	5	0.00455	11.07	30
Hongqili Layer 2	759538	866774	2	1997/01/31-00:00:00	44.9	0.0435	4.369	0.2191	0.0272	0.1129	0	0.3	0.3296	1.355	0.0449	5.196	15.9	0	0	5	0.00455	11.07	30
Hongqili Layer 2	759538	866774	2	1997/03/02-00:00:00	44.9	0.0435	4.369	0.2191	0.0272	0.1129	0	0.3	0.2197	1.355	0.0449	5.196	18.5	0	0	5	0.00455	11.07	30
Hongqili Layer 2	759538	866774	2	1997/04/01-00:00:00	44.9	0.0271	4.369	0.2191	0.0271	0.1129	0	0.3	0.1099	1.355	0.0449	5.196	22.2	0	0	5	0.00455	11.07	30
Hongqili Layer 2	759538	866774	2	1997/05/01-14:24:00	114.6	0.0271	1.638	0.1643	0.0271	0.1129	0	0.15	0.1099	1.355	0.0449	5.196	25.9	0	0	5	0.00455	11.07	30
Hongqili Layer 2	759538	866774	2	1997/05/16-16:48:00	184.3	0.0161	1.092	0.0548	0.0161	0.1129	0	0.15	0.0439	1.186	0.0449	4.857	25.9	0	0	5	0.00455	221.5	10
Hongqili Layer 2	759538	866774	2	1997/05/31-16:48:00	254	0.0161	1.092	0.0548	0.0161	0.1129	0	0.15	0.022	1.186	0.0449	4.857	27.8	0	0	5	0.00455	221.5	10
Hongqili Layer 2	759538	866774	2	1997/07/01-00:00:00	254	0.016	1.092	0.0548	0.016	0.1129	0	0.15	0.033	1.129	0.0561	4.857	30.3	0	0	5	0.00455	221.5	10
Hongqili Layer 2	759538	866774	2	1997/07/30-21:36:00	184.3	0.0161	1.092	0.0548	0.0161	0.1129	0	1	0.022	1.129	0.0449	4.857	31	0	0	5	0.00455	221.5	10
Hongqili Layer 2	759538	866774	2	1997/08/14-21:36:00	114.6	0.0161	1.638	0.0548	0.0161	0.1129	0	1	0.022	1.694	0.0449	4.857	31	0	0	5	0.00455	221.5	10
Hongqili Layer 2	759538	866774	2	1997/08/30-00:00:00	44.9	0.0271	4.369	0.1096	0.0271	0.1129	0	0.3	0.1099	2.259	0.0449	5.196	29.5	0	0	5	0.00455	11.07	30
Hongqili Layer 2	759538	866774	2	1997/09/14-00:00:00	44.9	0.0271	4.369	0.1096	0.0271	0.1129	0	0.3	0.1099	2.259	0.0449	5.196	29.5	0	0	5	0.00455	11.07	30
Hongqili Layer 2	759538	866774	2	1997/10/09-00:00:00	44.9	0.0652	4.369	0.1643	0.0272	0.1129	0	0.3	0.2197	2.033	0.0673	5.196	25.2	0	0	5	0.00455	11.07	30
Hongqili Layer 2	759538	866774	2	1997/10/29-00:00:00	44.9	0.0543	4.369	0.2191	0.0272	0.1129	0	0.3	0.3296	1.581	0.0561	5.196	21.4	0	0	5	0.00455	11.07	30
Hongqili Layer 2	759538	866774	2	1997/11/28-00:00:00	44.9	0.0489	4.369	0.2191	0.0272	0.1129	0	0.3	0.4395	1.355	0.0505	5.196	17.6	0	0	5	0.00455	11.07	30
Hongqili Layer 2	759538	866774	2	1998/01/01-00:00:00	44.9	0.0489	4.369	0.2191	0.0272	0.1129	0	0.3	0.4395	1.355	0.0505	5.196	15.8	0	0	5	0.00455	11.07	30
Hongqili Layer 3	759538	866774	2	1996/12/01-00:00:00	44.9	0.0489	4.369	0.2191	0.0272	0.1129	0	0.3	0.4395	1.355	0.0505	5.196	17.6	0	0	5	0.00455	11.07	30
Hongqili Layer 3	759538	866774	2	1997/01/01-00:00:00	44.9	0.0435	4.369	0.2191	0.0272	0.1129	0	0.3	0.4395	1.355	0.0449	5.196	15.8	0	0	5	0.00455	11.07	30
Hongqili Layer 3	759538	866774	2	1997/01/31-00:00:00	44.9	0.0435	4.369	0.2191	0.0272	0.1129	0	0.3	0.3296	1.355	0.0449	5.196	15.9	0	0	5	0.00455	11.07	30
Hongqili Layer 3	759538	866774	2	1997/03/02-00:00:00	44.9	0.0435	4.369	0.2191	0.0272	0.1129	0	0.3	0.2197	1.355	0.0449	5.196	18.5	0	0	5	0.00455	11.07	30
Hongqili Layer 3	759538	866774	2	1997/04/01-00:00:00	44.9	0.0271	4.369	0.2191	0.0271	0.1129	0	0.3	0.1099	1.355	0.0449	5.196	22.2	0	0	5	0.00455	11.07	30
Hongqili Layer 3	759538	866774	2	1997/05/01-14:24:00	114.6	0.0271	1.638	0.1643	0.0271	0.1129	0	0.15	0.1099	1.355	0.0449	5.196	25.9	0	0	5	0.00455	11.07	30
Hongqili Layer 3	759538	866774	2	1997/05/16-16:48:00	184.3	0.0161	1.092	0.0548	0.0161	0.1129	0	0.15	0.0439	1.186	0.0449	4.857	25.9	0	0	5	0.00455	221.5	10
Hongqili Layer 3	759538	866774	2	1997/05/31-16:48:00	254	0.0161	1.092	0.0548	0.0161	0.1129	0	0.15	0.022	1.186	0.0449	4.857	27.8	0	0	5	0.00455	221.5	10
Hongqili Layer 3	759538	866774	2	1997/07/01-00:00:00	254	0.016	1.092	0.0548	0.016	0.1129	0	0.15	0.033	1.129	0.0561	4.857	30.3	0	0	5	0.00455	221.5	10
Hongqili Layer 3	759538	866774	2	1997/07/30-21:36:00	184.3	0.0161	1.092	0.0548	0.0161	0.1129	0	1	0.022	1.129	0.0449	4.857	31	0	0	5	0.00455	221.5	10
Hongqili Layer 3	759538	866774	2	1997/08/14-21:36:00	114.6	0.0161	1.638	0.0548	0.0161	0.1129	0	1	0.022	1.694	0.0449	4.857	31	0	0	5	0.00455	221.5	10
Hongqili Layer 3	759538	866774	2	1997/08/30-00:00:00	44.9	0.0271	4.369	0.1096	0.0271	0.1129	0	0.3	0.1099	2.259	0.0449	5.196	29.5	0	0	5	0.00455	11.07	30
Hongqili Layer 3	759538	866774	2	1997/09/14-00:00:00	44.9	0.0271	4.369	0.1096	0.0271	0.1129	0	0.3	0.1099	2.259	0.0449	5.196	29.5	0	0	5	0.00455	11.07	30
Hongqili Layer 3	759538	866774	2	1997/10/09-00:00:00	44.9	0.0652	4.369	0.1643	0.0272	0.1129	0	0.3	0.2197	2.033	0.0673	5.196	25.2	0	0	5	0.00455	11.07	30
Hongqili Layer 3	759538	866774	2	1997/10/29-00:00:00	44.9	0.0543	4.369	0.2191	0.0272	0.1129	0	0.3	0.3296	1.581	0.0561	5.196	21.4	0	0	5	0.00455	11.07	30
Hongqili Layer 3	759538	866774	2	1997/11/28-00:00:00	44.9	0.0489	4.369	0.2191	0.0272	0.1129	0	0.3	0.4395	1.355	0.0505	5.196	17.6	0	0	5	0.00455	11.07	30
Hongqili Layer 3	759538	866774	2	1998/01/01-00:00:00	44.9	0.0489	4.369	0.2191	0.0272	0.1129	0	0.3	0.4395	1.355	0.0505	5.196	15.8	0	0	5	0.00455	11.07	30
Hongqili Layer 4	759538	866774	3	1996/12/01-00:00:00	44.9	0.0489	4.369	0.2191	0.0272	0.1129	0	0.3	0.4395	1.355	0.0505	5.196	17.6	0	0	5	0.00455	11.07	30
Hongqili Layer 4	759538	866774	3	1997/01/01-00:00:00	44.9	0.0435	4.369	0.2191	0.0272	0.1129	0	0.3	0.4395	1.355	0.0449	5.196	15.8	0	0	5	0.00455	11.07	30
Hongqili Layer 4	759538	866774	3	1997/01/31-00:00:00	44.9	0.0435	4.369	0.2191	0.0272	0.1129	0	0.3	0.3296	1.355	0.0449	5.196	15.9	0	0	5	0.00455	11.07	30
Hongqili Layer 4	759538	866774	3	1997/03/02-00:00:00	44.9	0.0435	4.369	0.2191	0.0272	0.1129	0	0.3	0.2197	1.355	0.0449	5.196	18.5	0	0	5	0.00455	11.07	30
Hongqili Layer 4	759538	866774	3	1997/04/01-00:00:00	44.9	0.0271	4.369	0.2191	0.0271	0.1129	0	0.3	0.1099	1.355	0.0449	5.196	22.2	0	0	5	0.00455	11.07	30
Hongqili Layer 4	759538	866774	3	1997/05/01-14:24:00	114.6	0.0271	1.638	0.1643	0.0271	0.1129	0	0.15	0.1099	1.355	0.0449	5.196	25.9	0	0	5	0.00455	11.07	30
Hongqili Layer 4	759538	866774	3	1997/05/16-16:48:00	184.3	0.0161	1.092	0.0548	0.0161	0.1129	0	0.15	0.0439	1.186	0.0449	4.857	25.9	0	0	5	0.00455	221.5	10
Hongqili Layer 4	759538	866774	3	1997/05/31-16:48:00	254	0.0161	1.092	0.0548	0.0161	0.1129	0	0.15	0.022	1.186	0.0449	4.857	27.8	0	0	5	0.00455	221.5	10
Hongqili Layer 4	759538	866774	3	1997/07/01-00:00:00	254	0.016	1.092	0.0548	0.016	0.1129	0	0.15	0.033	1.129	0.0561	4.857	30.3	0	0	5	0.00455	221.5	10
Hongqili Layer 4	759538	866774	3	1997/07/30-21:36:00	184.3	0.0161	1.092	0.0548	0.0161	0.1129	0	1	0.022	1.129	0.0449	4.857	31	0	0	5	0.00455	221.5	10

Table 4 Pearl River Delta Loads

ID	Easting	Northing	Layer	Period	FLOW (For discharges with 0 flows, the unit should be g/s.)	adsorbed ortho phosphate	Detritus Carbon (DetC)	Detritus Nitrogen (DetN)	Detritus Phosphorus (DetP)	Detritus Silica (DetSi)	Diatoms	Algae (non-Diatoms)	Ammonium (NH4)	Nitrate (NO3)	Ortho-Phosphate (PO4)	dissolved Silica (Si)	Water Temperature	Salinity	carbonaceous BOD (first pool) at 5 days	Dissolved Oxygen	Copper (Cu)	E. Coli bacteria	inorganic matter (IM1)
					(m3/s)	(gP/m3)	(gC/m3)	(gN/m3)	(gP/m3)	(gSi/m3)	(gC/m3)	(gC/m3)	(gN/m3)	(gN/m3)	(gP/m3)	(gSi/m3)	(oC)	(g/kg)	(gO2/m3)	(g/m3)	(g/m3)	(MPN/m3)	(gDM/m3)
						'AAP'	'DetC'	'DetN'	'DetP'	'DetSi'	'DIAT'	'GREEN'	'NH4'	'NO3'	'PO4'	'Si'	'ModTemp'	'Salinity'	'CBOD5'	'OXY'	'Cu'	'EColi'	'IM1'
Hongqili Layer 4	759538	866774	3	1997/08/14-21:36:00	114.6	0.0161	1.638	0.0548	0.0161	0.1129	0	1	0.022	1.694	0.0449	4.857	31	0	0	5	0.00455	221.5	10
Hongqili Layer 4	759538	866774	3	1997/08/30-00:00:00	44.9	0.0271	4.369	0.1096	0.0271	0.1129	0	0.3	0.1099	2.259	0.0449	5.196	29.5	0	0	5	0.00455	11.07	30
Hongqili Layer 4	759538	866774	3	1997/09/14-00:00:00	44.9	0.0271	4.369	0.1096	0.0271	0.1129	0	0.3	0.1099	2.259	0.0449	5.196	29.5	0	0	5	0.00455	11.07	30
Hongqili Layer 4	759538	866774	3	1997/10/09-00:00:00	44.9	0.0652	4.369	0.1643	0.0272	0.1129	0	0.3	0.2197	2.033	0.0673	5.196	25.2	0	0	5	0.00455	11.07	30
Hongqili Layer 4	759538	866774	3	1997/10/29-00:00:00	44.9	0.0543	4.369	0.2191	0.0272	0.1129	0	0.3	0.3296	1.581	0.0561	5.196	21.4	0	0	5	0.00455	11.07	30
Hongqili Layer 4	759538	866774	3	1997/11/28-00:00:00	44.9	0.0489	4.369	0.2191	0.0272	0.1129	0	0.3	0.4395	1.355	0.0505	5.196	17.6	0	0	5	0.00455	11.07	30
Hongqili Layer 4	759538	866774	3	1998/01/01-00:00:00	44.9	0.0489	4.369	0.2191	0.0272	0.1129	0	0.3	0.4395	1.355	0.0505	5.196	15.8	0	0	5	0.00455	11.07	30
Hongqili Layer 5	759538	866774	3	1996/12/01-00:00:00	44.9	0.0489	4.369	0.2191	0.0272	0.1129	0	0.3	0.4395	1.355	0.0505	5.196	17.6	0	0	5	0.00455	11.07	30
Hongqili Layer 5	759538	866774	3	1997/01/01-00:00:00	44.9	0.0435	4.369	0.2191	0.0272	0.1129	0	0.3	0.4395	1.355	0.0449	5.196	15.8	0	0	5	0.00455	11.07	30
Hongqili Layer 5	759538	866774	3	1997/01/31-00:00:00	44.9	0.0435	4.369	0.2191	0.0272	0.1129	0	0.3	0.3296	1.355	0.0449	5.196	15.9	0	0	5	0.00455	11.07	30
Hongqili Layer 5	759538	866774	3	1997/03/02-00:00:00	44.9	0.0435	4.369	0.2191	0.0272	0.1129	0	0.3	0.2197	1.355	0.0449	5.196	18.5	0	0	5	0.00455	11.07	30
Hongqili Layer 5	759538	866774	3	1997/04/01-00:00:00	44.9	0.0271	4.369	0.2191	0.0271	0.1129	0	0.3	0.1099	1.355	0.0449	5.196	22.2	0	0	5	0.00455	11.07	30
Hongqili Layer 5	759538	866774	3	1997/05/01-14:24:00	114.6	0.0271	1.638	0.1643	0.0271	0.1129	0	0.15	0.1099	1.355	0.0449	5.196	25.9	0	0	5	0.00455	11.07	30
Hongqili Layer 5	759538	866774	3	1997/05/16-16:48:00	184.3	0.0161	1.092	0.0548	0.0161	0.1129	0	0.15	0.0439	1.186	0.0449	4.857	25.9	0	0	5	0.00455	221.5	10
Hongqili Layer 5	759538	866774	3	1997/05/31-16:48:00	254	0.0161	1.092	0.0548	0.0161	0.1129	0	0.15	0.022	1.186	0.0449	4.857	27.8	0	0	5	0.00455	221.5	10
Hongqili Layer 5	759538	866774	3	1997/07/01-00:00:00	254	0.016	1.092	0.0548	0.016	0.1129	0	0.15	0.033	1.129	0.0561	4.857	30.3	0	0	5	0.00455	221.5	10
Hongqili Layer 5	759538	866774	3	1997/07/30-21:36:00	184.3	0.0161	1.092	0.0548	0.0161	0.1129	0	1	0.022	1.129	0.0449	4.857	31	0	0	5	0.00455	221.5	10
Hongqili Layer 5	759538	866774	3	1997/08/14-21:36:00	114.6	0.0161	1.638	0.0548	0.0161	0.1129	0	1	0.022	1.694	0.0449	4.857	31	0	0	5	0.00455	221.5	10
Hongqili Layer 5	759538	866774	3	1997/08/30-00:00:00	44.9	0.0271	4.369	0.1096	0.0271	0.1129	0	0.3	0.1099	2.259	0.0449	5.196	29.5	0	0	5	0.00455	11.07	30
Hongqili Layer 5	759538	866774	3	1997/09/14-00:00:00	44.9	0.0271	4.369	0.1096	0.0271	0.1129	0	0.3	0.1099	2.259	0.0449	5.196	29.5	0	0	5	0.00455	11.07	30
Hongqili Layer 5	759538	866774	3	1997/10/09-00:00:00	44.9	0.0652	4.369	0.1643	0.0272	0.1129	0	0.3	0.2197	2.033	0.0673	5.196	25.2	0	0	5	0.00455	11.07	30
Hongqili Layer 5	759538	866774	3	1997/10/29-00:00:00	44.9	0.0543	4.369	0.2191	0.0272	0.1129	0	0.3	0.3296	1.581	0.0561	5.196	21.4	0	0	5	0.00455	11.07	30
Hongqili Layer 5	759538	866774	3	1997/11/28-00:00:00	44.9	0.0489	4.369	0.2191	0.0272	0.1129	0	0.3	0.4395	1.355	0.0505	5.196	17.6	0	0	5	0.00455	11.07	30
Hongqili Layer 5	759538	866774	3	1998/01/01-00:00:00	44.9	0.0489	4.369	0.2191	0.0272	0.1129	0	0.3	0.4395	1.355	0.0505	5.196	15.8	0	0	5	0.00455	11.07	30
Hengmen Layer 1	755610	852782	1	1996/12/01-00:00:00	88.1	0.0498	4.369	0.2189	0.0276	0.1117	0	0.3	0.4384	1.34	0.0498	5.136	17.6	0	0	5	0.00451	11.03	30
Hengmen Layer 1	755610	852782	1	1997/01/01-00:00:00	88.1	0.0442	4.369	0.2189	0.0276	0.1117	0	0.3	0.4384	1.34	0.0443	5.136	15.8	0	0	5	0.00451	11.03	30
Hengmen Layer 1	755610	852782	1	1997/01/31-00:00:00	88.1	0.0442	4.369	0.2189	0.0276	0.1117	0	0.3	0.3288	1.34	0.0443	5.136	15.9	0	0	5	0.00451	11.03	30
Hengmen Layer 1	755610	852782	1	1997/03/02-00:00:00	88.1	0.0442	4.369	0.2189	0.0276	0.1117	0	0.3	0.2192	1.34	0.0443	5.136	18.5	0	0	5	0.00451	11.03	30
Hengmen Layer 1	755610	852782	1	1997/04/01-00:00:00	88.1	0.0276	4.369	0.2189	0.0276	0.1117	0	0.3	0.1096	1.34	0.0443	5.136	22.2	0	0	5	0.00451	11.03	30
Hengmen Layer 1	755610	852782	1	1997/05/01-14:24:00	202.3	0.0276	1.638	0.1642	0.0276	0.1117	0	0.15	0.1096	1.34	0.0443	5.136	25.9	0	0	5	0.00451	11.03	30
Hengmen Layer 1	755610	852782	1	1997/05/16-16:48:00	316.6	0.0166	1.092	0.0547	0.0166	0.1117	0	0.15	0.0438	1.172	0.0443	4.801	25.9	0	0	5	0.00451	220.6	10
Hengmen Layer 1	755610	852782	1	1997/05/31-16:48:00	430.8	0.0166	1.092	0.0547	0.0166	0.1117	0	0.15	0.0219	1.172	0.0443	4.801	27.8	0	0	5	0.00451	220.6	10
Hengmen Layer 1	755610	852782	1	1997/07/01-00:00:00	430.8	0.0166	1.092	0.0547	0.0166	0.1117	0	0.15	0.0329	1.117	0.0553	4.801	30.3	0	0	5	0.00451	220.6	10
Hengmen Layer 1	755610	852782	1	1997/07/30-21:36:00	316.6	0.0166	1.092	0.0547	0.0166	0.1117	0	1	0.0219	1.117	0.0443	4.801	31	0	0	5	0.00451	220.6	10
Hengmen Layer 1	755610	852782	1	1997/08/14-21:36:00	202.3	0.0166	1.638	0.0547	0.0166	0.1117	0	1	0.0219	1.675	0.0443	4.801	31	0	0	5	0.00451	220.6	10
Hengmen Layer 1	755610	852782	1	1997/08/30-00:00:00	88.1	0.0276	4.369	0.1095	0.0276	0.1117	0	0.3	0.1096	2.233	0.0443	5.136	29.5	0	0	5	0.00451	11.03	30
Hengmen Layer 1	755610	852782	1	1997/09/14-00:00:00	88.1	0.0276	4.369	0.1095	0.0276	0.1117	0	0.3	0.1096	2.233	0.0443	5.136	29.5	0	0	5	0.00451	11.03	30
Hengmen Layer 1	755610	852782	1	1997/10/09-00:00:00	88.1	0.0664	4.369	0.1642	0.0276	0.1117	0	0.3	0.2192	2.01	0.0664	5.136	25.2	0	0	5	0.00451	11.03	30
Hengmen Layer 1	755610	852782	1	1997/10/29-00:00:00	88.1	0.0553	4.369	0.2189	0.0276	0.1117	0	0.3	0.3288	1.563	0.0553	5.136	21.4	0	0	5	0.00451	11.03	30
Hengmen Layer 1	755610	852782	1	1997/11/28-00:00:00	88.1	0.0498	4.369	0.2189	0.0276	0.1117	0	0.3	0.4384	1.34	0.0498	5.136	17.6	0	0	5	0.00451	11.03	30
Hengmen Layer 1	755610	852782	1	1998/01/01-00:00:00	88.1	0.0498	4.369	0.2189	0.0276	0.1117	0	0.3	0.4384	1.34	0.0498	5.136	15.8	0	0	5	0.00451	11.03	30
Hengmen Layer 2	755610	852782	2	1996/12/01-00:00:00	88.1	0.0498	4.369	0.2189	0.0276	0.1117	0	0.3	0.4384	1.34	0.0498	5.136	17.6	0	0	5	0.00451	11.03	30
Hengmen Layer 2	755610	852782	2	1997/01/01-00:00:00	88.1	0.0442	4.369	0.2189	0.0276	0.1117	0	0.3	0.4384	1.34	0.0443	5.136	15.8	0	0	5	0.00451	11.03	30
Hengmen Layer 2	755610	852782	2	1997/01/31-00:00:00	88.1	0.0442	4.369	0.2189	0.0276	0.1117	0	0.3	0.3288	1.34	0.0443	5.136	15.9	0	0	5	0.00451	11.03	30
Hengmen Layer 2	755610	852782	2	1997/03/02-00:00:00	88.1	0.0442	4.369	0.2189	0.0276	0.1117	0	0.3	0.2192	1.34	0.0443	5.136	18.5	0	0	5	0.00451	11.03	30
Hengmen Layer 2	755610	852782	2	1997/04/01-00:00:00	88.1	0.0276	4.369	0.2189	0.0276	0.1117	0	0.3	0.1096	1.34	0.0443	5.136	22.2	0	0	5	0.00451	11.03	30
Hengmen Layer 2	755610	852782	2	1997/05/01-14:24:00	202.3	0.0276	1.638	0.1642	0.0276	0.1117	0	0.15	0.1096	1.34	0.0443	5.136	25.9	0	0	5	0.00451	11.03	30
Hengmen Layer 2	755610	852782	2	1997/05/16-16:48:00	316.6	0.0166	1.092	0.0547	0.0166	0.1117	0	0.15	0.0438	1.172	0.0443	4.801	25.9	0	0	5	0.00451	220.6	10
Hengmen Layer 2	755610	852782	2	1997/05/31-16:48:00	430.8	0.0166	1.092	0.0547	0.0166	0.1117	0	0.15	0.0219	1.172	0.0443	4.801	27.8	0	0	5	0.00451	220.6	10
Hengmen Layer 2	755610	852782	2	1997/07/01-00:00:00	430.8	0.0166	1.092	0.0547	0.0166	0.1117	0	0.15	0.0329	1.117	0.0553	4.801	30.3	0	0	5	0.00451	220.6	10
Hengmen Layer 2	755610	852782	2	1997/07/30-21:36:00	316.6	0.0166	1.092	0.0547	0.0166	0.1117	0	1	0.0219	1.117	0.0443	4.801	31	0	0	5	0.00451	220.6	10
Hengmen Layer 2	755610	852782	2	1997/08/14-21:36:00	202.3	0.0166	1.638	0.0547	0.0166	0.1117	0	1	0.0219	1.675	0.0443	4.801	31	0	0	5	0.00451	220.6	10
Hengmen Layer 2	755610	852782	2	1997/08/30-00:00:00	88.1	0.0276	4.369	0.1095	0.0276	0.1117	0	0.3	0.1096	2.233	0.0443	5.136	29.5	0	0	5	0.00451	11.03	30
Hengmen Layer 2	755610	852782	2	1997/09/14-00:00:00	88.1	0.0276	4.369	0.1095	0.0276	0.1117	0	0.3	0.1096	2.233	0.0443	5.136	29.5	0	0	5	0.00451	11.03	30
Hengmen Layer 2	755610	852782	2	1997/10/09-00:00:00	88.1	0.0664	4.369	0.1642	0.0276	0.1117	0	0.3	0.2192	2.01	0.0664	5.136	25.2	0	0	5	0.00451	11.03	30
Hengmen Layer 2	755610	852782	2	1997/10/29-00:00:00	88.1	0.0553	4.369	0.2189	0.0276	0.1117	0	0.3	0.3288	1.563	0.0553	5.136	21.4	0	0	5	0.00451	11.03	30
Hengmen Layer 2	755610	852782	2	1997/11/28-00:00:00	88.1	0.0498	4.369	0.2189	0.0276	0.1117	0	0.3	0.4384	1.34	0.0498	5.136	17.6	0	0	5	0.00451	11.03	30
Hengmen Layer 2	755610	852782	2	1998/01/01-00:00:00	88.1	0.0498	4.369	0.2189	0.0276	0.1117	0	0.3	0.4384	1.34	0.0498	5.136	15.8	0	0	5	0.00451	11.03	30

Table 4 Pearl River Delta Loads

ID	Easting	Northing	Layer	Period	Flow (for discharges with 0 flows, the unit should be g/s.)	adsorbed ortho phosphate	Detritus Carbon (DetC)	Detritus Nitrogen (DetN)	Detritus Phosphorus (DetP)	Detritus Silica (DetSi)	Diatoms	Algae (non-Diatoms)	Ammonium (NH4)	Nitrate (NO3)	Ortho-Phosphate (PO4)	dissolved Silica (Si)	Water Temperature	Salinity	carbonaceous BOD (first pool) at 5 days	Dissolved Oxygen	Copper (Cu)	E. Coli bacteria	inorganic matter (IM1)
					(m3/s)	(gP/m3)	(gC/m3)	(gN/m3)	(gP/m3)	(gSi/m3)	(gC/m3)	(gC/m3)	(gN/m3)	(gN/m3)	(gP/m3)	(gSi/m3)	(oC)	(g/kg)	(gO2/m3)	(g/m3)	(g/m3)	(MPN/m3)	(gDM/m3)
						'AAP'	'DetC'	'DetN'	'DetP'	'DetSi'	'DIAT'	'GREEN'	'NH4'	'NO3'	'PO4'	'Si'	'ModTemp'	'Salinity'	'CBOD5'	'OXY'	'Cu'	'EColi'	'IM1'
Hengmen Layer 3	755610	852782	2	1996/12/01-00:00:00	88.1	0.0498	4.369	0.2189	0.0276	0.1117	0	0.3	0.4384	1.34	0.0498	5.136	17.6	0	0	5	0.00451	11.03	30
Hengmen Layer 3	755610	852782	2	1997/01/01-00:00:00	88.1	0.0442	4.369	0.2189	0.0276	0.1117	0	0.3	0.4384	1.34	0.0443	5.136	15.8	0	0	5	0.00451	11.03	30
Hengmen Layer 3	755610	852782	2	1997/01/31-00:00:00	88.1	0.0442	4.369	0.2189	0.0276	0.1117	0	0.3	0.3288	1.34	0.0443	5.136	15.9	0	0	5	0.00451	11.03	30
Hengmen Layer 3	755610	852782	2	1997/03/02-00:00:00	88.1	0.0442	4.369	0.2189	0.0276	0.1117	0	0.3	0.2192	1.34	0.0443	5.136	18.5	0	0	5	0.00451	11.03	30
Hengmen Layer 3	755610	852782	2	1997/04/01-00:00:00	88.1	0.0276	4.369	0.2189	0.0276	0.1117	0	0.3	0.1096	1.34	0.0443	5.136	22.2	0	0	5	0.00451	11.03	30
Hengmen Layer 3	755610	852782	2	1997/05/01-14:24:00	202.3	0.0276	1.638	0.1642	0.0276	0.1117	0	0.15	0.1096	1.34	0.0443	5.136	25.9	0	0	5	0.00451	11.03	30
Hengmen Layer 3	755610	852782	2	1997/05/16-16:48:00	316.6	0.0166	1.092	0.0547	0.0166	0.1117	0	0.15	0.0438	1.172	0.0443	4.801	25.9	0	0	5	0.00451	220.6	10
Hengmen Layer 3	755610	852782	2	1997/05/31-16:48:00	430.8	0.0166	1.092	0.0547	0.0166	0.1117	0	0.15	0.0219	1.172	0.0443	4.801	27.8	0	0	5	0.00451	220.6	10
Hengmen Layer 3	755610	852782	2	1997/07/01-00:00:00	430.8	0.0166	1.092	0.0547	0.0166	0.1117	0	0.15	0.0329	1.117	0.0553	4.801	30.3	0	0	5	0.00451	220.6	10
Hengmen Layer 3	755610	852782	2	1997/07/30-21:36:00	316.6	0.0166	1.092	0.0547	0.0166	0.1117	0	1	0.0219	1.117	0.0443	4.801	31	0	0	5	0.00451	220.6	10
Hengmen Layer 3	755610	852782	2	1997/08/14-21:36:00	202.3	0.0166	1.638	0.0547	0.0166	0.1117	0	1	0.0219	1.675	0.0443	4.801	31	0	0	5	0.00451	220.6	10
Hengmen Layer 3	755610	852782	2	1997/08/30-00:00:00	88.1	0.0276	4.369	0.1095	0.0276	0.1117	0	0.3	0.1096	2.233	0.0443	5.136	29.5	0	0	5	0.00451	11.03	30
Hengmen Layer 3	755610	852782	2	1997/09/14-00:00:00	88.1	0.0276	4.369	0.1095	0.0276	0.1117	0	0.3	0.1096	2.233	0.0443	5.136	29.5	0	0	5	0.00451	11.03	30
Hengmen Layer 3	755610	852782	2	1997/10/09-00:00:00	88.1	0.0664	4.369	0.1642	0.0276	0.1117	0	0.3	0.2192	2.01	0.0664	5.136	25.2	0	0	5	0.00451	11.03	30
Hengmen Layer 3	755610	852782	2	1997/10/29-00:00:00	88.1	0.0553	4.369	0.2189	0.0276	0.1117	0	0.3	0.3288	1.563	0.0553	5.136	21.4	0	0	5	0.00451	11.03	30
Hengmen Layer 3	755610	852782	2	1997/11/28-00:00:00	88.1	0.0498	4.369	0.2189	0.0276	0.1117	0	0.3	0.4384	1.34	0.0498	5.136	17.6	0	0	5	0.00451	11.03	30
Hengmen Layer 3	755610	852782	2	1998/01/01-00:00:00	88.1	0.0498	4.369	0.2189	0.0276	0.1117	0	0.3	0.4384	1.34	0.0498	5.136	15.8	0	0	5	0.00451	11.03	30
Hengmen Layer 4	755610	852782	3	1996/12/01-00:00:00	88.1	0.0498	4.369	0.2189	0.0276	0.1117	0	0.3	0.4384	1.34	0.0498	5.136	17.6	0	0	5	0.00451	11.03	30
Hengmen Layer 4	755610	852782	3	1997/01/01-00:00:00	88.1	0.0442	4.369	0.2189	0.0276	0.1117	0	0.3	0.4384	1.34	0.0443	5.136	15.8	0	0	5	0.00451	11.03	30
Hengmen Layer 4	755610	852782	3	1997/01/31-00:00:00	88.1	0.0442	4.369	0.2189	0.0276	0.1117	0	0.3	0.3288	1.34	0.0443	5.136	15.9	0	0	5	0.00451	11.03	30
Hengmen Layer 4	755610	852782	3	1997/03/02-00:00:00	88.1	0.0442	4.369	0.2189	0.0276	0.1117	0	0.3	0.2192	1.34	0.0443	5.136	18.5	0	0	5	0.00451	11.03	30
Hengmen Layer 4	755610	852782	3	1997/04/01-00:00:00	88.1	0.0276	4.369	0.2189	0.0276	0.1117	0	0.3	0.1096	1.34	0.0443	5.136	22.2	0	0	5	0.00451	11.03	30
Hengmen Layer 4	755610	852782	3	1997/05/01-14:24:00	202.3	0.0276	1.638	0.1642	0.0276	0.1117	0	0.15	0.1096	1.34	0.0443	5.136	25.9	0	0	5	0.00451	11.03	30
Hengmen Layer 4	755610	852782	3	1997/05/16-16:48:00	316.6	0.0166	1.092	0.0547	0.0166	0.1117	0	0.15	0.0438	1.172	0.0443	4.801	25.9	0	0	5	0.00451	220.6	10
Hengmen Layer 4	755610	852782	3	1997/05/31-16:48:00	430.8	0.0166	1.092	0.0547	0.0166	0.1117	0	0.15	0.0219	1.172	0.0443	4.801	27.8	0	0	5	0.00451	220.6	10
Hengmen Layer 4	755610	852782	3	1997/07/01-00:00:00	430.8	0.0166	1.092	0.0547	0.0166	0.1117	0	0.15	0.0329	1.117	0.0553	4.801	30.3	0	0	5	0.00451	220.6	10
Hengmen Layer 4	755610	852782	3	1997/07/30-21:36:00	316.6	0.0166	1.092	0.0547	0.0166	0.1117	0	1	0.0219	1.117	0.0443	4.801	31	0	0	5	0.00451	220.6	10
Hengmen Layer 4	755610	852782	3	1997/08/14-21:36:00	202.3	0.0166	1.638	0.0547	0.0166	0.1117	0	1	0.0219	1.675	0.0443	4.801	31	0	0	5	0.00451	220.6	10
Hengmen Layer 4	755610	852782	3	1997/08/30-00:00:00	88.1	0.0276	4.369	0.1095	0.0276	0.1117	0	0.3	0.1096	2.233	0.0443	5.136	29.5	0	0	5	0.00451	11.03	30
Hengmen Layer 4	755610	852782	3	1997/09/14-00:00:00	88.1	0.0276	4.369	0.1095	0.0276	0.1117	0	0.3	0.1096	2.233	0.0443	5.136	29.5	0	0	5	0.00451	11.03	30
Hengmen Layer 4	755610	852782	3	1997/10/09-00:00:00	88.1	0.0664	4.369	0.1642	0.0276	0.1117	0	0.3	0.2192	2.01	0.0664	5.136	25.2	0	0	5	0.00451	11.03	30
Hengmen Layer 4	755610	852782	3	1997/10/29-00:00:00	88.1	0.0553	4.369	0.2189	0.0276	0.1117	0	0.3	0.3288	1.563	0.0553	5.136	21.4	0	0	5	0.00451	11.03	30
Hengmen Layer 4	755610	852782	3	1997/11/28-00:00:00	88.1	0.0498	4.369	0.2189	0.0276	0.1117	0	0.3	0.4384	1.34	0.0498	5.136	17.6	0	0	5	0.00451	11.03	30
Hengmen Layer 4	755610	852782	3	1998/01/01-00:00:00	88.1	0.0498	4.369	0.2189	0.0276	0.1117	0	0.3	0.4384	1.34	0.0498	5.136	15.8	0	0	5	0.00451	11.03	30
Hengmen Layer 5	755610	852782	3	1996/12/01-00:00:00	88.1	0.0498	4.369	0.2189	0.0276	0.1117	0	0.3	0.4384	1.34	0.0498	5.136	17.6	0	0	5	0.00451	11.03	30
Hengmen Layer 5	755610	852782	3	1997/01/01-00:00:00	88.1	0.0442	4.369	0.2189	0.0276	0.1117	0	0.3	0.4384	1.34	0.0443	5.136	15.8	0	0	5	0.00451	11.03	30
Hengmen Layer 5	755610	852782	3	1997/01/31-00:00:00	88.1	0.0442	4.369	0.2189	0.0276	0.1117	0	0.3	0.3288	1.34	0.0443	5.136	15.9	0	0	5	0.00451	11.03	30
Hengmen Layer 5	755610	852782	3	1997/03/02-00:00:00	88.1	0.0442	4.369	0.2189	0.0276	0.1117	0	0.3	0.2192	1.34	0.0443	5.136	18.5	0	0	5	0.00451	11.03	30
Hengmen Layer 5	755610	852782	3	1997/04/01-00:00:00	88.1	0.0276	4.369	0.2189	0.0276	0.1117	0	0.3	0.1096	1.34	0.0443	5.136	22.2	0	0	5	0.00451	11.03	30
Hengmen Layer 5	755610	852782	3	1997/05/01-14:24:00	202.3	0.0276	1.638	0.1642	0.0276	0.1117	0	0.15	0.1096	1.34	0.0443	5.136	25.9	0	0	5	0.00451	11.03	30
Hengmen Layer 5	755610	852782	3	1997/05/16-16:48:00	316.6	0.0166	1.092	0.0547	0.0166	0.1117	0	0.15	0.0438	1.172	0.0443	4.801	25.9	0	0	5	0.00451	220.6	10
Hengmen Layer 5	755610	852782	3	1997/05/31-16:48:00	430.8	0.0166	1.092	0.0547	0.0166	0.1117	0	0.15	0.0219	1.172	0.0443	4.801	27.8	0	0	5	0.00451	220.6	10
Hengmen Layer 5	755610	852782	3	1997/07/01-00:00:00	430.8	0.0166	1.092	0.0547	0.0166	0.1117	0	0.15	0.0329	1.117	0.0553	4.801	30.3	0	0	5	0.00451	220.6	10
Hengmen Layer 5	755610	852782	3	1997/07/30-21:36:00	316.6	0.0166	1.092	0.0547	0.0166	0.1117	0	1	0.0219	1.117	0.0443	4.801	31	0	0	5	0.00451	220.6	10
Hengmen Layer 5	755610	852782	3	1997/08/14-21:36:00	202.3	0.0166	1.638	0.0547	0.0166	0.1117	0	1	0.0219	1.675	0.0443	4.801	31	0	0	5	0.00451	220.6	10
Hengmen Layer 5	755610	852782	3	1997/08/30-00:00:00	88.1	0.0276	4.369	0.1095	0.0276	0.1117	0	0.3	0.1096	2.233	0.0443	5.136	29.5	0	0	5	0.00451	11.03	30
Hengmen Layer 5	755610	852782	3	1997/09/14-00:00:00	88.1	0.0276	4.369	0.1095	0.0276	0.1117	0	0.3	0.1096	2.233	0.0443	5.136	29.5	0	0	5	0.00451	11.03	30
Hengmen Layer 5	755610	852782	3	1997/10/09-00:00:00	88.1	0.0664	4.369	0.1642	0.0276	0.1117	0	0.3	0.2192	2.01	0.0664	5.136	25.2	0	0	5	0.00451	11.03	30
Hengmen Layer 5	755610	852782	3	1997/10/29-00:00:00	88.1	0.0553	4.369	0.2189	0.0276	0.1117	0	0.3	0.3288	1.563	0.0553	5.136	21.4	0	0	5	0.00451	11.03	30
Hengmen Layer 5	755610	852782	3	1997/11/28-00:00:00	88.1	0.0498	4.369	0.2189	0.0276	0.1117	0	0.3	0.4384	1.34	0.0498	5.136	17.6	0	0	5	0.00451	11.03	30
Hengmen Layer 5	755610	852782	3	1998/01/01-00:00:00	88.1	0.0498	4.369	0.2189	0.0276	0.1117	0	0.3	0.4384	1.34	0.0498	5.136	15.8	0	0	5	0.00451	11.03	30
Deep Bay Layer 1	826520	842053	1	1996/12/01-00:00:00	0.5	0.045	4	0.2	0.025	0.1	0	0.3	0.4	1.2	0.045	4.6	17.6	0	0	5	0.004	10	30
Deep Bay Layer 1	826520	842053	1	1997/01/01-00:00:00	0.5	0.04	4	0.2	0.025	0.1	0	0.3	0.4	1.2	0.04	4.6	15.8	0	0	5	0.004	10	30
Deep Bay Layer 1	826520	842053	1	1997/01/31-00:00:00	0.5	0.04	4	0.2	0.025	0.1	0	0.3	0.3	1.2	0.04	4.6	15.9	0	0	5	0.004	10	30
Deep Bay Layer 1	826520	842053	1	1997/03/02-00:00:00	0.5	0.04	4	0.2	0.025	0.1	0	0.3	0.2	1.2	0.04	4.6	18.5	0	0	5	0.004	10	30
Deep Bay Layer 1	826520	842053	1	1997/04/01-00:00:00	0.5	0.025	4	0.2	0.025	0.1	0	0.3	0.1	1.2	0.04	4.6	22.2	0	0	5	0.004	10	30
Deep Bay Layer 1	826520	842053	1	1997/05/01-14:24:00	1.37	0.025	1.5	0.15	0.025	0.1	0	0.15	0.1	1.2	0.04	4.6	25.9	0	0	5	0.004	10	30
Deep Bay Layer 1	826520	842053	1	1997/05/16-16:48:00	2.23	0.015	1	0.05	0.015	0.1	0	0.15	0.04	1.05	0.04	4.3	25.9	0	0	5	0.004	200	10

Table 4 Pearl River Delta Loads

ID	Easting	Northing	Layer	Period	FLOW (For discharges with 0 flows, the unit should be g/s.)	adsorbed ortho phosphate	Detritus Carbon (DetC)	Detritus Nitrogen (DetN)	Detritus Phosphorus (DetP)	Detritus Silica (DetSi)	Diatoms	Algae (non-Diatoms)	Ammonium (NH4)	Nitrate (NO3)	Ortho-Phosphate (PO4)	dissolved Silica (Si)	Water Temperature	Salinity	carbonaceous BOD (first pool) at 5 days	Dissolved Oxygen	Copper (Cu)	E. Coli bacteria	inorganic matter (IM1)
					(m3/s)	(gP/m3)	(gC/m3)	(gN/m3)	(gP/m3)	(gSi/m3)	(gC/m3)	(gC/m3)	(gN/m3)	(gN/m3)	(gP/m3)	(gSi/m3)	(oC)	(g/kg)	(gO2/m3)	(g/m3)	(g/m3)	(MPN/m3)	(gDM/m3)
						'AAP'	'DetC'	'DetN'	'DetP'	'DetSi'	'DIAT'	'GREEN'	'NH4'	'NO3'	'PO4'	'Si'	'ModTemp'	'Salinity'	'CBOD5'	'OXY'	'Cu'	'EColi'	'IM1'
Deep Bay Layer 1	826520	842053	1	1997/05/31-16:48:00	3.1	0.015	1	0.05	0.015	0.1	0	0.15	0.02	1.05	0.04	4.3	27.8	0	0	5	0.004	200	10
Deep Bay Layer 1	826520	842053	1	1997/07/01-00:00:00	3.1	0.015	1	0.05	0.015	0.1	0	0.15	0.03	1	0.05	4.3	30.3	0	0	5	0.004	200	10
Deep Bay Layer 1	826520	842053	1	1997/07/30-21:36:00	2.23	0.015	1	0.05	0.015	0.1	0	1	0.02	1	0.04	4.3	31	0	0	5	0.004	200	10
Deep Bay Layer 1	826520	842053	1	1997/08/14-21:36:00	1.37	0.015	1.5	0.05	0.015	0.1	0	1	0.02	1.5	0.04	4.3	31	0	0	5	0.004	200	10
Deep Bay Layer 1	826520	842053	1	1997/08/30-00:00:00	0.5	0.025	4	0.1	0.025	0.1	0	0.3	0.1	2	0.04	4.6	29.5	0	0	5	0.004	10	30
Deep Bay Layer 1	826520	842053	1	1997/09/14-00:00:00	0.5	0.025	4	0.1	0.025	0.1	0	0.3	0.1	2	0.04	4.6	29.5	0	0	5	0.004	10	30
Deep Bay Layer 1	826520	842053	1	1997/10/09-00:00:00	0.5	0.06	4	0.15	0.025	0.1	0	0.3	0.2	1.8	0.06	4.6	25.2	0	0	5	0.004	10	30
Deep Bay Layer 1	826520	842053	1	1997/10/29-00:00:00	0.5	0.05	4	0.2	0.025	0.1	0	0.3	0.3	1.4	0.05	4.6	21.4	0	0	5	0.004	10	30
Deep Bay Layer 1	826520	842053	1	1997/11/28-00:00:00	0.5	0.045	4	0.2	0.025	0.1	0	0.3	0.4	1.2	0.045	4.6	17.6	0	0	5	0.004	10	30
Deep Bay Layer 1	826520	842053	1	1998/01/01-00:00:00	0.5	0.045	4	0.2	0.025	0.1	0	0.3	0.4	1.2	0.045	4.6	15.8	0	0	5	0.004	10	30
Deep Bay Layer 2	826520	842053	2	1996/12/01-00:00:00	0.5	0.045	4	0.2	0.025	0.1	0	0.3	0.4	1.2	0.045	4.6	17.6	0	0	5	0.004	10	30
Deep Bay Layer 2	826520	842053	2	1997/01/01-00:00:00	0.5	0.04	4	0.2	0.025	0.1	0	0.3	0.4	1.2	0.04	4.6	15.8	0	0	5	0.004	10	30
Deep Bay Layer 2	826520	842053	2	1997/01/31-00:00:00	0.5	0.04	4	0.2	0.025	0.1	0	0.3	0.3	1.2	0.04	4.6	15.9	0	0	5	0.004	10	30
Deep Bay Layer 2	826520	842053	2	1997/03/02-00:00:00	0.5	0.04	4	0.2	0.025	0.1	0	0.3	0.2	1.2	0.04	4.6	18.5	0	0	5	0.004	10	30
Deep Bay Layer 2	826520	842053	2	1997/04/01-00:00:00	0.5	0.025	4	0.2	0.025	0.1	0	0.3	0.1	1.2	0.04	4.6	22.2	0	0	5	0.004	10	30
Deep Bay Layer 2	826520	842053	2	1997/05/01-14:24:00	1.37	0.025	1.5	0.15	0.025	0.1	0	0.15	0.1	1.2	0.04	4.6	25.9	0	0	5	0.004	10	30
Deep Bay Layer 2	826520	842053	2	1997/05/16-16:48:00	2.23	0.015	1	0.05	0.015	0.1	0	0.15	0.04	1.05	0.04	4.3	25.9	0	0	5	0.004	200	10
Deep Bay Layer 2	826520	842053	2	1997/05/31-16:48:00	3.1	0.015	1	0.05	0.015	0.1	0	0.15	0.02	1.05	0.04	4.3	27.8	0	0	5	0.004	200	10
Deep Bay Layer 2	826520	842053	2	1997/07/01-00:00:00	3.1	0.015	1	0.05	0.015	0.1	0	0.15	0.03	1	0.05	4.3	30.3	0	0	5	0.004	200	10
Deep Bay Layer 2	826520	842053	2	1997/07/30-21:36:00	2.23	0.015	1	0.05	0.015	0.1	0	1	0.02	1	0.04	4.3	31	0	0	5	0.004	200	10
Deep Bay Layer 2	826520	842053	2	1997/08/14-21:36:00	1.37	0.015	1.5	0.05	0.015	0.1	0	1	0.02	1.5	0.04	4.3	31	0	0	5	0.004	200	10
Deep Bay Layer 2	826520	842053	2	1997/08/30-00:00:00	0.5	0.025	4	0.1	0.025	0.1	0	0.3	0.1	2	0.04	4.6	29.5	0	0	5	0.004	10	30
Deep Bay Layer 2	826520	842053	2	1997/09/14-00:00:00	0.5	0.025	4	0.1	0.025	0.1	0	0.3	0.1	2	0.04	4.6	29.5	0	0	5	0.004	10	30
Deep Bay Layer 2	826520	842053	2	1997/10/09-00:00:00	0.5	0.06	4	0.15	0.025	0.1	0	0.3	0.2	1.8	0.06	4.6	25.2	0	0	5	0.004	10	30
Deep Bay Layer 2	826520	842053	2	1997/10/29-00:00:00	0.5	0.05	4	0.2	0.025	0.1	0	0.3	0.3	1.4	0.05	4.6	21.4	0	0	5	0.004	10	30
Deep Bay Layer 2	826520	842053	2	1997/11/28-00:00:00	0.5	0.045	4	0.2	0.025	0.1	0	0.3	0.4	1.2	0.045	4.6	17.6	0	0	5	0.004	10	30
Deep Bay Layer 2	826520	842053	2	1998/01/01-00:00:00	0.5	0.045	4	0.2	0.025	0.1	0	0.3	0.4	1.2	0.045	4.6	15.8	0	0	5	0.004	10	30
Deep Bay Layer 3	826520	842053	2	1996/12/01-00:00:00	0.5	0.045	4	0.2	0.025	0.1	0	0.3	0.4	1.2	0.045	4.6	17.6	0	0	5	0.004	10	30
Deep Bay Layer 3	826520	842053	2	1997/01/01-00:00:00	0.5	0.04	4	0.2	0.025	0.1	0	0.3	0.4	1.2	0.04	4.6	15.8	0	0	5	0.004	10	30
Deep Bay Layer 3	826520	842053	2	1997/01/31-00:00:00	0.5	0.04	4	0.2	0.025	0.1	0	0.3	0.3	1.2	0.04	4.6	15.9	0	0	5	0.004	10	30
Deep Bay Layer 3	826520	842053	2	1997/03/02-00:00:00	0.5	0.04	4	0.2	0.025	0.1	0	0.3	0.2	1.2	0.04	4.6	18.5	0	0	5	0.004	10	30
Deep Bay Layer 3	826520	842053	2	1997/04/01-00:00:00	0.5	0.025	4	0.2	0.025	0.1	0	0.3	0.1	1.2	0.04	4.6	22.2	0	0	5	0.004	10	30
Deep Bay Layer 3	826520	842053	2	1997/05/01-14:24:00	1.37	0.025	1.5	0.15	0.025	0.1	0	0.15	0.1	1.2	0.04	4.6	25.9	0	0	5	0.004	10	30
Deep Bay Layer 3	826520	842053	2	1997/05/16-16:48:00	2.23	0.015	1	0.05	0.015	0.1	0	0.15	0.04	1.05	0.04	4.3	25.9	0	0	5	0.004	200	10
Deep Bay Layer 3	826520	842053	2	1997/05/31-16:48:00	3.1	0.015	1	0.05	0.015	0.1	0	0.15	0.02	1.05	0.04	4.3	27.8	0	0	5	0.004	200	10
Deep Bay Layer 3	826520	842053	2	1997/07/01-00:00:00	3.1	0.015	1	0.05	0.015	0.1	0	0.15	0.03	1	0.05	4.3	30.3	0	0	5	0.004	200	10
Deep Bay Layer 3	826520	842053	2	1997/07/30-21:36:00	2.23	0.015	1	0.05	0.015	0.1	0	1	0.02	1	0.04	4.3	31	0	0	5	0.004	200	10
Deep Bay Layer 3	826520	842053	2	1997/08/14-21:36:00	1.37	0.015	1.5	0.05	0.015	0.1	0	1	0.02	1.5	0.04	4.3	31	0	0	5	0.004	200	10
Deep Bay Layer 3	826520	842053	2	1997/08/30-00:00:00	0.5	0.025	4	0.1	0.025	0.1	0	0.3	0.1	2	0.04	4.6	29.5	0	0	5	0.004	10	30
Deep Bay Layer 3	826520	842053	2	1997/09/14-00:00:00	0.5	0.025	4	0.1	0.025	0.1	0	0.3	0.1	2	0.04	4.6	29.5	0	0	5	0.004	10	30
Deep Bay Layer 3	826520	842053	2	1997/10/09-00:00:00	0.5	0.06	4	0.15	0.025	0.1	0	0.3	0.2	1.8	0.06	4.6	25.2	0	0	5	0.004	10	30
Deep Bay Layer 3	826520	842053	2	1997/10/29-00:00:00	0.5	0.05	4	0.2	0.025	0.1	0	0.3	0.3	1.4	0.05	4.6	21.4	0	0	5	0.004	10	30
Deep Bay Layer 3	826520	842053	2	1997/11/28-00:00:00	0.5	0.045	4	0.2	0.025	0.1	0	0.3	0.4	1.2	0.045	4.6	17.6	0	0	5	0.004	10	30
Deep Bay Layer 3	826520	842053	2	1998/01/01-00:00:00	0.5	0.045	4	0.2	0.025	0.1	0	0.3	0.4	1.2	0.045	4.6	15.8	0	0	5	0.004	10	30
Deep Bay Layer 4	826520	842053	3	1996/12/01-00:00:00	0.5	0.045	4	0.2	0.025	0.1	0	0.3	0.4	1.2	0.045	4.6	17.6	0	0	5	0.004	10	30
Deep Bay Layer 4	826520	842053	3	1997/01/01-00:00:00	0.5	0.04	4	0.2	0.025	0.1	0	0.3	0.4	1.2	0.04	4.6	15.8	0	0	5	0.004	10	30
Deep Bay Layer 4	826520	842053	3	1997/01/31-00:00:00	0.5	0.04	4	0.2	0.025	0.1	0	0.3	0.3	1.2	0.04	4.6	15.9	0	0	5	0.004	10	30
Deep Bay Layer 4	826520	842053	3	1997/03/02-00:00:00	0.5	0.04	4	0.2	0.025	0.1	0	0.3	0.2	1.2	0.04	4.6	18.5	0	0	5	0.004	10	30
Deep Bay Layer 4	826520	842053	3	1997/04/01-00:00:00	0.5	0.025	4	0.2	0.025	0.1	0	0.3	0.1	1.2	0.04	4.6	22.2	0	0	5	0.004	10	30
Deep Bay Layer 4	826520	842053	3	1997/05/01-14:24:00	1.37	0.025	1.5	0.15	0.025	0.1	0	0.15	0.1	1.2	0.04	4.6	25.9	0	0	5	0.004	10	30
Deep Bay Layer 4	826520	842053	3	1997/05/16-16:48:00	2.23	0.015	1	0.05	0.015	0.1	0	0.15	0.04	1.05	0.04	4.3	25.9	0	0	5	0.004	200	10
Deep Bay Layer 4	826520	842053	3	1997/05/31-16:48:00	3.1	0.015	1	0.05	0.015	0.1	0	0.15	0.02	1.05	0.04	4.3	27.8	0	0	5	0.004	200	10
Deep Bay Layer 4	826520	842053	3	1997/07/01-00:00:00	3.1	0.015	1	0.05	0.015	0.1	0	0.15	0.03	1	0.05	4.3	30.3	0	0	5	0.004	200	10
Deep Bay Layer 4	826520	842053	3	1997/07/30-21:36:00	2.23	0.015	1	0.05	0.015	0.1	0	1	0.02	1	0.04	4.3	31	0	0	5	0.004	200	10
Deep Bay Layer 4	826520	842053	3	1997/08/14-21:36:00	1.37	0.015	1.5	0.05	0.015	0.1	0	1	0.02	1.5	0.04	4.3	31	0	0	5	0.004	200	10
Deep Bay Layer 4	826520	842053	3	1997/08/30-00:00:00	0.5	0.025	4	0.1	0.025	0.1	0	0.3	0.1	2	0.04	4.6	29.5	0	0	5	0.004	10	30
Deep Bay Layer 4	826520	842053	3	1997/09/14-00:00:00	0.5	0.025	4	0.1	0.025	0.1	0	0.3	0.1	2	0.04	4.6	29.5	0	0	5	0.004	10	30
Deep Bay Layer 4	826520	842053	3	1997/10/09-00:00:00	0.5	0.06	4	0.15	0.025	0.1	0	0.3	0.2	1.8	0.06	4.6	25.2	0	0	5	0.004	10	30

Table 4 Pearl River Delta Loads

ID	Easting	Northing	Layer	Period	Flow (for discharges with 0 flows, the unit should be g/s.)	adsorbed ortho phosphate	Detritus Carbon (DetC)	Detritus Nitrogen (DetN)	Detritus Phosphorus (DetP)	Detritus Silica (DetSi)	Diatoms	Algae (non-Diatoms)	Ammonium (NH4)	Nitrate (NO3)	Ortho-Phosphate (PO4)	dissolved Silica (Si)	Water Temperature	Salinity	carbonaceous BOD (first pool) at 5 days	Dissolved Oxygen	Copper (Cu)	E. Coli bacteria	inorganic matter (IM1)
					(m3/s)	(gP/m3)	(gC/m3)	(gN/m3)	(gP/m3)	(gSi/m3)	(gC/m3)	(gC/m3)	(gN/m3)	(gN/m3)	(gP/m3)	(gSi/m3)	(oC)	(g/kg)	(gO2/m3)	(g/m3)	(g/m3)	(MPN/m3)	(gDM/m3)
						'AAP'	'DetC'	'DetN'	'DetP'	'DetSi'	'DIAT'	'GREEN'	'NH4'	'NO3'	'PO4'	'Si'	'ModTemp'	'Salinity'	'CBOD5'	'OXY'	'Cu'	'EColi'	'IM1'
Deep Bay Layer 4	826520	842053	3	1997/10/29-00:00:00	0.5	0.05	4	0.2	0.025	0.1	0	0.3	0.3	1.4	0.05	4.6	21.4	0	0	5	0.004	10	30
Deep Bay Layer 4	826520	842053	3	1997/11/28-00:00:00	0.5	0.045	4	0.2	0.025	0.1	0	0.3	0.4	1.2	0.045	4.6	17.6	0	0	5	0.004	10	30
Deep Bay Layer 4	826520	842053	3	1998/01/01-00:00:00	0.5	0.045	4	0.2	0.025	0.1	0	0.3	0.4	1.2	0.045	4.6	15.8	0	0	5	0.004	10	30
Deep Bay Layer 5	826520	842053	3	1996/12/01-00:00:00	0.5	0.045	4	0.2	0.025	0.1	0	0.3	0.4	1.2	0.045	4.6	17.6	0	0	5	0.004	10	30
Deep Bay Layer 5	826520	842053	3	1997/01/01-00:00:00	0.5	0.04	4	0.2	0.025	0.1	0	0.3	0.4	1.2	0.04	4.6	15.8	0	0	5	0.004	10	30
Deep Bay Layer 5	826520	842053	3	1997/01/31-00:00:00	0.5	0.04	4	0.2	0.025	0.1	0	0.3	0.3	1.2	0.04	4.6	15.9	0	0	5	0.004	10	30
Deep Bay Layer 5	826520	842053	3	1997/03/02-00:00:00	0.5	0.04	4	0.2	0.025	0.1	0	0.3	0.2	1.2	0.04	4.6	18.5	0	0	5	0.004	10	30
Deep Bay Layer 5	826520	842053	3	1997/04/01-00:00:00	0.5	0.025	4	0.2	0.025	0.1	0	0.3	0.1	1.2	0.04	4.6	22.2	0	0	5	0.004	10	30
Deep Bay Layer 5	826520	842053	3	1997/05/01-14:24:00	1.37	0.025	1.5	0.15	0.025	0.1	0	0.15	0.1	1.2	0.04	4.6	25.9	0	0	5	0.004	10	30
Deep Bay Layer 5	826520	842053	3	1997/05/16-16:48:00	2.23	0.015	1	0.05	0.015	0.1	0	0.15	0.04	1.05	0.04	4.3	25.9	0	0	5	0.004	200	10
Deep Bay Layer 5	826520	842053	3	1997/05/31-16:48:00	3.1	0.015	1	0.05	0.015	0.1	0	0.15	0.02	1.05	0.04	4.3	27.8	0	0	5	0.004	200	10
Deep Bay Layer 5	826520	842053	3	1997/07/01-00:00:00	3.1	0.015	1	0.05	0.015	0.1	0	0.15	0.03	1	0.05	4.3	30.3	0	0	5	0.004	200	10
Deep Bay Layer 5	826520	842053	3	1997/07/30-21:36:00	2.23	0.015	1	0.05	0.015	0.1	0	1	0.02	1	0.04	4.3	31	0	0	5	0.004	200	10
Deep Bay Layer 5	826520	842053	3	1997/08/14-21:36:00	1.37	0.015	1.5	0.05	0.015	0.1	0	1	0.02	1.5	0.04	4.3	31	0	0	5	0.004	200	10
Deep Bay Layer 5	826520	842053	3	1997/08/30-00:00:00	0.5	0.025	4	0.1	0.025	0.1	0	0.3	0.1	2	0.04	4.6	29.5	0	0	5	0.004	10	30
Deep Bay Layer 5	826520	842053	3	1997/09/14-00:00:00	0.5	0.025	4	0.1	0.025	0.1	0	0.3	0.1	2	0.04	4.6	29.5	0	0	5	0.004	10	30
Deep Bay Layer 5	826520	842053	3	1997/10/09-00:00:00	0.5	0.06	4	0.15	0.025	0.1	0	0.3	0.2	1.8	0.06	4.6	25.2	0	0	5	0.004	10	30
Deep Bay Layer 5	826520	842053	3	1997/10/29-00:00:00	0.5	0.05	4	0.2	0.025	0.1	0	0.3	0.3	1.4	0.05	4.6	21.4	0	0	5	0.004	10	30
Deep Bay Layer 5	826520	842053	3	1997/11/28-00:00:00	0.5	0.045	4	0.2	0.025	0.1	0	0.3	0.4	1.2	0.045	4.6	17.6	0	0	5	0.004	10	30
Deep Bay Layer 5	826520	842053	3	1998/01/01-00:00:00	0.5	0.045	4	0.2	0.025	0.1	0	0.3	0.4	1.2	0.045	4.6	15.8	0	0	5	0.004	10	30
Maogang	789486	867253	1	1996/11/21-00:00:00	0	0.21	0	2.587	0.21	0	0	0	11.41	0.9094	4.802	7.958	0	0	24.59	0	0.04849	196	537.1
Maogang	789486	867253	1	1997/05/16-16:48:00	0	0.21	0	2.587	0.21	0	0	0	11.41	0.9094	4.802	7.958	0	0	24.59	0	0.04849	196	537.1
Maogang	789486	867253	1	1997/08/14-21:36:00	0	0.21	0	2.587	0.21	0	0	0	11.41	0.9094	4.802	7.958	0	0	24.59	0	0.04849	196	537.1
Maogang	789486	867253	1	1998/04/05-00:00:00	0	0.21	0	2.587	0.21	0	0	0	11.41	0.9094	4.802	7.958	0	0	24.59	0	0.04849	196	537.1
Xixiang	801978	846562	1	1996/11/21-00:00:00	0	0.03828	0	2.1	0.03828	0	0	0	7.064	0.5429	0.667	3.932	0	0	11.16	0	0.03596	4.35	53.59
Xixiang	801978	846562	1	1997/05/16-16:48:00	0	0.03828	0	2.1	0.03828	0	0	0	7.064	0.5429	0.667	3.932	0	0	11.16	0	0.03596	4.35	53.59
Xixiang	801978	846562	1	1997/08/14-21:36:00	0	0.03828	0	2.1	0.03828	0	0	0	7.064	0.5429	0.667	3.932	0	0	11.16	0	0.03596	4.35	53.59
Xixiang	801978	846562	1	1998/04/05-00:00:00	0	0.03828	0	2.1	0.03828	0	0	0	7.064	0.5429	0.667	3.932	0	0	11.16	0	0.03596	4.35	53.59
Nanshan	806289	844192	1	1996/11/21-00:00:00	0	1.063	0	14.15	1.063	0	0	0	64.26	4.211	2.587	29.46	0	0	156.6	0	0.1427	211.1	845.6
Nanshan	806289	844192	1	1997/05/16-16:48:00	0	1.063	0	14.15	1.063	0	0	0	64.26	4.211	2.587	29.46	0	0	156.6	0	0.1427	211.1	845.6
Nanshan	806289	844192	1	1997/08/14-21:36:00	0	1.063	0	14.15	1.063	0	0	0	64.26	4.211	2.587	29.46	0	0	156.6	0	0.1427	211.1	845.6
Nanshan	806289	844192	1	1998/04/05-00:00:00	0	1.063	0	14.15	1.063	0	0	0	64.26	4.211	2.587	29.46	0	0	156.6	0	0.1427	211.1	845.6
Chi Wan	806524	835758	1	1996/11/21-00:00:00	0	1.55	0	21.08	1.55	0	0	0	26.64	63.97	9.03	10.81	0	0	326.37	0	0.34	9590000	187.48
Chi Wan	806524	835758	1	1997/05/16-16:48:00	0	1.7	0	23.39	1.7	0	0	0	27.04	64.75	9.11	17.15	0	0	369.79	0	0.35	9590000	271.04
Chi Wan	806524	835758	1	1997/08/14-21:36:00	0	1.55	0	21.08	1.55	0	0	0	26.64	63.97	9.03	10.81	0	0	326.37	0	0.34	9590000	187.48
Chi Wan	806524	835758	1	1998/04/05-00:00:00	0	1.55	0	21.08	1.55	0	0	0	26.64	63.97	9.03	10.81	0	0	326.37	0	0.34	9590000	187.48
Sekou	810020	838375	1	1996/11/21-00:00:00	0	0.38	0	4.92	0.38	0	0	0	7.07	2.01	1.12	0.28	0	0	61.72	0	0	6150000	62.66
Sekou	810020	838375	1	1997/05/16-16:48:00	0	0.54	0	7.23	0.54	0	0	0	7.47	2.79	1.19	6.62	0	0	105.2	0	0.02	6150000	146.2
Sekou	810020	838375	1	1997/08/14-21:36:00	0	0.38	0	4.92	0.38	0	0	0	7.07	2.01	1.12	0.28	0	0	61.72	0	0	6150000	62.66
Sekou	810020	838375	1	1998/04/05-00:00:00	0	0.38	0	4.92	0.38	0	0	0	7.07	2.01	1.12	0.28	0	0	61.72	0	0	6150000	62.66
Dasha	812722	841130	1	1996/11/21-00:00:00	0	0.38	0	4.92	0.38	0	0	0	7.07	2.01	1.12	0.28	0	0	61.72	0	0	6150000	62.66
Dasha	812722	841130	1	1997/05/16-16:48:00	0	0.54	0	7.23	0.54	0	0	0	7.47	2.79	1.19	6.62	0	0	105.2	0	0.02	6150000	146.2
Dasha	812722	841130	1	1997/08/14-21:36:00	0	0.38	0	4.92	0.38	0	0	0	7.07	2.01	1.12	0.28	0	0	61.72	0	0	6150000	62.66
Dasha	812722	841130	1	1998/04/05-00:00:00	0	0.38	0	4.92	0.38	0	0	0	7.07	2.01	1.12	0.28	0	0	61.72	0	0	6150000	62.66
Nan Shan	814975	840417	1	1996/11/21-00:00:00	0	0.38	0	4.92	0.38	0	0	0	7.07	2.01	1.12	0.28	0	0	61.72	0	0	6150000	62.66
Nan Shan	814975	840417	1	1997/05/16-16:48:00	0	0.54	0	7.23	0.54	0	0	0	7.47	2.79	1.19	6.62	0	0	105.15	0	0	6150000	146.23
Nan Shan	814975	840417	1	1997/08/14-21:36:00	0	0.38	0	4.92	0.38	0	0	0	7.07	2.01	1.12	0.28	0	0	61.72	0	0	6150000	62.66
Nan Shan	814975	840417	1	1998/04/05-00:00:00	0	0.38	0	4.92	0.38	0	0	0	7.07	2.01	1.12	0.28	0	0	61.72	0	0	6150000	62.66
Jinxiu Zhonghua	816229	841946	1	1996/11/21-00:00:00	0	3.23	0	42.58	3.23	0	0	0	58.97	53.45	12.22	7.64	0	0	576.8	0	0.24	42700000	482.6
Jinxiu Zhonghua	816229	841946	1	1997/05/16-16:48:00	0	3.66	0	48.99	3.66	0	0	0	60.05	55.59	12.44	25.17	0	0	697	0	0.3	42700000	713.9
Jinxiu Zhonghua	816229	841946	1	1997/08/14-21:36:00	0	3.23	0	42.58	3.23	0	0	0	58.97	53.45	12.22	7.64	0	0	576.8	0	0.24	42700000	482.6
Jinxiu Zhonghua	816229	841946	1	1998/04/05-00:00:00	0	3.23	0	42.58	3.23	0	0	0	58.97	53.45	12.22	7.64	0	0	576.8	0	0.24	42700000	482.6
Xin Zhou River	821284	841427	1	1996/11/21-00:00:00	0	1.26	0	16.05	1.26	0	0	0	23.34	6.54	3.69	0.38	0	0	200.24	0	0	20300000	200
Xin Zhou River	821284	841427	1	1997/05/16-16:48:00	0	1.48	0	19.26	1.48	0	0	0	23.89	7.6	3.8	9.16	0	0	260.4	0	0.02	20300000	315.7
Xin Zhou River	821284	841427	1	1997/08/14-21:36:00	0	1.26	0	16.05	1.26	0	0	0	23.34	6.54	3.69	0.38	0	0	200.2	0	0	20300000	200
Xin Zhou River	821284	841427	1	1998/04/05-00:00:00	0	1.26	0	16.05	1.26	0	0	0	23.34	6.54	3.69	0.38	0	0	200.2	0	0	20300000	200
Shenzhen	823887	840542	1	1996/11/21-00:00:00	0	4.88	0	67.62	4.88	0	0	0	79.17	179.1	25.05	45.1	0	0	1064	0	1.04	32400000	765.9
Shenzhen	823887	840542	1	1997/05/16-16:48:00	0	5.13	0	71.34	5.13	0	0	0	79.21	180.4	25.19	55.31	0	0	1134	0	1.09	32400000	900.7

Table 4 Pearl River Delta Loads

ID	Easting	Northing	Layer	Period	FLOW (For discharges with 0 flows, the unit should be g/s.)	adsorbed ortho phosphate	Detritus Carbon (DetC)	Detritus Nitrogen (DetN)	Detritus Phosphorus (DetP)	Detritus Silica (DetSi)	Diatoms	Algae (non-Diatoms)	Ammonium (NH4)	Nitrate (NO3)	Ortho-Phosphate (PO4)	dissolved Silica (Si)	Water Temperature	Salinity	carbonaceous BOD (first pool) at 5 days	Dissolved Oxygen	Copper (Cu)	E. Coli bacteria	inorganic matter (IM1)
					(m3/s)	(gP/m3)	(gC/m3)	(gN/m3)	(gP/m3)	(gSi/m3)	(gC/m3)	(gC/m3)	(gN/m3)	(gN/m3)	(gP/m3)	(gSi/m3)	(oC)	(g/kg)	(gO2/m3)	(g/m3)	(g/m3)	(MPN/m3)	(gDM/m3)
						'AAP'	'DetC'	'DetN'	'DetP'	'DetSi'	'DIAT'	'GREEN'	'NH4'	'NO3'	'PO4'	'Si'	'ModTemp'	'Salinity'	'CBOD5'	'OXY'	'Cu'	'EColi'	'IM1'
Shenzhen	823887	840542	1	1997/08/14-21:36:00	0	4.88	0	67.62	4.88	0	0	0	79.17	179.1	25.05	45.1	0	0	1064	0	1.04	32400000	765.9
Shenzhen	823887	840542	1	1998/04/05-00:00:00	0	4.88	0	67.62	4.88	0	0	0	79.17	179.1	25.05	45.1	0	0	1064	0	1.04	32400000	765.9
Xiangzhou	775181	817500	1	1996/11/21-00:00:00	0	0.312	0	7.888	0.312	0	0	0	26.68	5.278	3.167	15.54	0	0	50.81	0	0.01172	218.1	235.5
Xiangzhou	775181	817500	1	1997/05/16-16:48:00	0	0.312	0	7.888	0.312	0	0	0	26.68	5.278	3.167	15.54	0	0	50.81	0	0.01172	218.1	235.5
Xiangzhou	775181	817500	1	1997/08/14-21:36:00	0	0.312	0	7.888	0.312	0	0	0	26.68	5.278	3.167	15.54	0	0	50.81	0	0.01172	218.1	235.5
Xiangzhou	775181	817500	1	1998/04/05-00:00:00	0	0.312	0	7.888	0.312	0	0	0	26.68	5.278	3.167	15.54	0	0	50.81	0	0.01172	218.1	235.5
Jida	777011	815235	1	1996/11/21-00:00:00	0	0.003132	0	1.346	0.003132	0	0	0	5.359	0.1357	0.3144	1.67	0	0	1.694	0	0.001473	8.758	17.98
Jida	777011	815235	1	1997/05/16-16:48:00	0	0.003132	0	1.346	0.003132	0	0	0	5.359	0.1357	0.3144	1.67	0	0	1.694	0	0.001473	8.758	17.98
Jida	777011	815235	1	1997/08/14-21:36:00	0	0.003132	0	1.346	0.003132	0	0	0	5.359	0.1357	0.3144	1.67	0	0	1.694	0	0.001473	8.758	17.98
Jida	777011	815235	1	1998/04/05-00:00:00	0	0.003132	0	1.346	0.003132	0	0	0	5.359	0.1357	0.3144	1.67	0	0	1.694	0	0.001473	8.758	17.98
Gongbei	774541	810492	1	1996/11/21-00:00:00	0	0.01694	0	1.496	0.01694	0	0	0	6.206	0.3178	0.2366	2.587	0	0	3.213	0	0.001473	44.31	43.73
Gongbei	774541	810492	1	1997/05/16-16:48:00	0	0.01694	0	1.496	0.01694	0	0	0	6.206	0.3178	0.2366	2.587	0	0	3.213	0	0.001473	44.31	43.73
Gongbei	774541	810492	1	1997/08/14-21:36:00	0	0.01694	0	1.496	0.01694	0	0	0	6.206	0.3178	0.2366	2.587	0	0	3.213	0	0.001473	44.31	43.73
Gongbei	774541	810492	1	1998/04/05-00:00:00	0	0.01694	0	1.496	0.01694	0	0	0	6.206	0.3178	0.2366	2.587	0	0	3.213	0	0.001473	44.31	43.73
Macau	773968	810225	1	1996/11/21-00:00:00	0	1.299	0	15.78	1.299	0	0	0	22.27	0	5.324	15.31	0	0	208.8	0	0.4872	14620000	170.5
Macau	773968	810225	1	1997/05/16-16:48:00	0	1.299	0	15.78	1.299	0	0	0	22.27	0	5.324	15.31	0	0	208.8	0	0.4872	14620000	170.5
Macau	773968	810225	1	1997/08/14-21:36:00	0	1.299	0	15.78	1.299	0	0	0	22.27	0	5.324	15.31	0	0	208.8	0	0.4872	14620000	170.5
Macau	773968	810225	1	1998/04/05-00:00:00	0	1.299	0	15.78	1.299	0	0	0	22.27	0	5.324	15.31	0	0	208.8	0	0.4872	14620000	170.5

Appendix 9D5

Cumulative Dredging and Sediment Loss Rates

Appendix 9D5

Assumptions on Dredging and Sediment Loss Rates for the Cumulative Construction Impact Assessment on the Marine Environment (Sequence A)

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D5-1 INTRODUCTION

D5-1.1 Background

D5-1.1.1 During the construction of the proposed Tuen Mun Chek Lap Kok Link (TM-CLKL), the Hong Kong Boundary Crossing Facilities (HKBCF) and HZMB Hong Kong Link Road (HKLR) (TM-CLKL+HKBCF+HKLR), sediment losses to suspension as a result of dredging and filling activities are a significant concern with respect to impacts on marine water quality and the marine environment. In addition, dredging and filling operations at neighbouring work sites could result in cumulative impacts on the marine environment during the marine works for the TM-CLKL+HKBCF+HKLR.

D5-1.1.2 Projects which could be constructed concurrently with the TM-CLKL+HKBCF+HKLR and which could result in cumulative construction impacts are presented in Table 1. Table 1 also includes details of the type of impacts associated with each project to be considered under the current studies.

Table 1 Summary of Possible Concurrent Projects with the Potential to Result in Cumulative Construction Impacts with the TM-CLKL+HKBCF+HKLR

Proposed Development	Notes
Kwai Tsing Container Basin Dredging	Capital dredging to increase water depths
Lantau Logistics Park (LLP)	72ha development for construction impacts
Tonggu Channel	Annual maintenance dredging
Mainland Section of Hong Kong Zhuihao Macao Bridge (HZMB)	Construction
Tuen Mun Chek Lap Kok Link (TM-CLKL)	Subject of current study
Hong Kong Link Road (HKLR)	Subject of current study
HZMB Hong Kong Boundary Crossing Facilities (HKBCF)	Subject of current study
Existing and Proposed Contaminated Mud Disposal Facility at East of Sha Chau and South of Brothers	Construction dredging and backfilling operations
Mud Disposal Facility at North Brothers	Disposal operations

D5-1.1.3 Those projects which will be considered likely to have cumulative construction impacts with the TM-CLKL+HKBCF+HKLR are discussed in more detail below together with the best estimates on the volumes of marine sediment to be dredged, dredging rates and potential rates of loss of fine sediment to suspension during their construction.

D5-1.1.4 The rates of sediment lost to suspension during dredging, disposal and filling operations depends principally on the rates of dredging, filling and disposal and the type of equipment used (Trailer Suction Hopper Dredger (TSHD), grab dredger or Cutter Suction Dredgers (CSD)).

D5-1.1.5 In estimating the rates of loss of fine sediment to suspension during dredging for the TM-CLKL+HKBCF+HKLR works and all concurrent, standard loss rates which have been assumed in previous Environmental Impact Assessments (EIAs) in Hong Kong have been used and full References to these previous studies have been given.

D5-1.1.6 For the Mainland section of HZMB, an EIA (Reference 7) has been carried out by Mainland consultants. In the EIA, the consultants used different parameters for some aspects of the calculations of sediment losses to suspension. As a result, for the discussion of the potential sediment losses from the construction works for the HZMB, it will be necessary to confirm the parameters and standard to be adopted and some correspondences between the Mainland authority/consultants has been solicited (References 3, 8 and 9). These are further discussed in the subsequent section.

D5-1.1.7 When modelling the sediment losses to suspension, the water quality model will also use standard coefficients describing the physical properties of fine sediment which have been used in previous studies in Hong Kong. Principally, a settling velocity of 0.5mm/s will be used and it will be assumed that the critical shear stresses for erosion and deposition are $0.3N/m^2$ and $0.2N/m^2$ respectively and that, in water depths of 0.2m or less, deposition does not occur as a result of wave action (References 5 & 6).

D5-2 KWAI TSING CONTAINER BASIN DREDGING

D5-2.1 Background

D5-2.1.1 It is proposed to increase water depths in the Kwai Tsing Basin, Northern Fairway and Western Fairway from approximately 15.5m to 17m. Sediment losses during dredging in the Southern Rambler Channel are unlikely to travel far from the dredging site. However, when dredging at the western end of the Northern Fairway or in the Western Fairway, there is the potential for any sediment losses to be transported some distance from the dredging area. Cumulative impacts with the TM-CLKL+HKBCF+HKLR, while improbable, are most likely to occur when dredging is taking place at the Western extent of the Northern Fairway or in the Western Fairway but the impacts from dredging in the Rambler Channel will also be assessed. A Project Profile (PP) has been prepared for the Kwai Tsing Container Basin dredging but, in the PP, no concurrent works in North Lantau Waters were considered likely to have cumulative impacts with the Kwai Tsing Container Basin dredging.

D5-2.2 Estimated Dredging and Sediment Loss rates

D5-2.2.1 The Project Profile (PP) assumed the dredging works would begin in October 2010 and provides the following information on the dredging, as detailed in Table 2 below.

Table 2 Estimated Volumes of Material to be Dredged for Kwai Tsing Container Basin Dredging

Fiscal Year	In-situ Volume of Type 1 (Open Sea) Sediment Produced (m^3)	In-situ Volume of Type 2 (Confined Marine) Sediment Produced (m^3)
2010-11	200,000	800,000
2011-12	550,000	2,200,000
2012-13	350,000	1,400,000
Total	**1,100,000**	**4,400,000**

D5-2.2.2 In advance of the required site investigation but based on previous maintenance dredging records, the Type 1 material listed in Table 2 above corresponds to the material to be dredged from the Western Fairway while the Type 2 material will be dredged from the Western Fairway and Kwai Tsing Container Basin. However, the dredging programme has not yet been developed to:

1. Indicate when dredging in these different areas might take place; and
2. Indicate which of the grab dredgers and small TSHDs mentioned in the PP would be used in each area and how many dredgers would be working simultaneously.

D5-2.2.3 Normally, closed grabs would be used for Type 2 material but it may be unlikely that grab dredgers and barges would be allowed to moor in the middle of the main fairways. As a result, in the main shipping channel, it will be assumed that small TSHDs will be used. With respect to the rate of sediment lost to suspension, TSHDs would also represent the worst case with respect to sediment losses as has been assumed in many previous studies.

D5-2.2.4 Based on the annual dredging rates given in Table 2 above and that dredging in the fiscal year 2010-11 may only last 100 days, the equivalent daily production rates (assuming 350 working days per full year) are given in Table 3 below.

Table 3 Estimated Production Rates of Kwai Tsing Container Basin Dredging Based on Table 2

Fiscal Year	Type 1 Dredging Rate (m^3/day)	Type 2 Dredging Rate (m^3/day)
2010-11	2,000	8,000
2011-12	1,571	6,286
2012-13[1]	*1,000*	*4,000*
Average 2010-2012	**1,786**	**7,143**

Notes: 1 The duration of dredging in 2012-13 is not known but is expected to be shorter than 350 days. The data for 2012-2013 has not been used in calculating the average dredging rates.

D5-2.2.5 In recent correspondence of 10th November 2008 (Ref: PW WP/KTCB/02 Pt.01), CEDD indicated that dredging could begin on 20/12/2010 and finish on 20/12/2012. If this dredging programme is implemented, the maximum mean dredging rate for Type 2 material over the two year period (700 working days) would become 6,285m^3/day. In order to ensure that the worst case is assessed, it is proposed that a maximum daily production rate of 8,000m^3 is assumed.

D5-2.2.6 It is thought that the maximum estimated production rate for Type 2 material of 8,000m^3/day could be achieved easily by a small to medium TSHD or by two grab dredgers working 24 hours per day as has been assumed in the PP.

D5-2.2.7 Typical small to medium sized TSHDs which commonly operate in Hong Kong waters have capacities in the range 3,000m^3-5,500m^3 [1] and, for the purpose of the assessment of cumulative impacts with the construction of the TM-CLKL+HKBCF+HKLR, a nominal capacity of 4,500m^3 will be assumed[1]. Larger TSHDs could carry out the dredging but, for Type 2 material requiring disposal at the Contaminated Mud Pits, smaller TSHDs may be required to ensure safe access to the disposal area. It will be further assumed that the typical loading time for the TSHD will be 17 minutes[1] within which time the dredger would load 3,050m^3 of in-situ material (allowing for bulking and water in the hopper). Based on these assumptions, the maximum daily production rate (8,000m^3/day) could be achieved in 2.62 dredging cycles.

[1] Detailed Site Selection Study for a Proposed Contaminated Mud Disposal Facility within the Airport East/East of Sha Chau Area Agreement No. CE 12/2002(EP), ERM May 2005

D5-2.2.8 If the Type 2 material is to be placed in the ESC CMPs, it is thought that up to 8 dredging cycles each day should be possible without exceeding the approved maximum disposal rate at the CMPs but it may be that the apparently low production rate of 8,000m^3/day is the result of constraints imposed by the need to dredge in a very busy shipping channel and the expectation that other concurrent projects will require some of the maximum daily disposal capacity of 26,700m^3 at the CMPs.

D5-2.2.9 For the purposes of the assessment of cumulative impacts with the construction of the TM-CLKL+HKBCF+HKLR, it will be assumed that the worst case will be the operation of a single TSHD of 4,500m^3 nominal capacity carrying out 2.62 dredging cycles per day and taking 17 minutes to fill the hopper with 3,050m^3 of in-situ material. If it is assumed that the rate of sediment loss to suspension (principally caused by the dragheads bulldozing the seabed) is equivalent to 7kg/m^3 dredged, the rate of sediment lost to suspension will be equivalent to 20.9kg/s[1]. In the model studies, it will be assumed that the dredging is intermittent and takes place for 17 minutes every 11.63 hours, equivalent to 2.62 dredging cycles per day (Table 4). Furthermore, it will also be assumed the dredging works will be on-going on the selected scenario years for the modelling.

D5-2.2.10 It is thought that the worst case with respect to sediment losses and potential cumulative impacts with the TM-CLKL+HKBCF+HKLR works will occur during the initial removal of Type 2 material using TSHDs at the western extent of the Northern Fairway where tidal currents are strongest. Sediment losses when dredging in the Southern Rambler Channel area may not travel as far from the dredging site and so are less likely to result in cumulative impacts with the construction of the HKBCF. However, in order to ensure that the possible impacts from the different aspects of the dredging works are simulated, it will be assumed that one dredging cycle per day takes place at the western extent of the Northern Fairway while the second dredging cycle each day takes place in the Southern Rambler Channel.

Table 4 Summary of Worst Case Dredging Loss Scenario for Kwai Tsing Container Basin Dredging

Location	Dredging Period	Sediment Loss Rate (kg/s)	Duration of Dredging (minutes)	Interval between dredging cycles (hours)
Western end of the Northern Fairway	2010-2013	20.9	17	11.63
Southern Rambler Channel	2010-2013	20.9	17	11.63

D5-3 EXISTING & PLANNED MUD DISPOSAL FACILITIES AT EAST OF SHA CHAU AND SOUTH OF THE BROTHERS

D5-3.1 Background

D5-3.1.1 Information on the programme for the construction and operation of the existing and planned contaminated mud disposal facilities (Figure 1) was provided by CEDD (Ref FM DS/STU/56, 8TH September 2008) and is summarised in Table 5 below.

Table 5 Proposed Programme for Construction and Operation of the Contaminated Mud Pits

Location	Filling/Dredging Period	Disposal/Fill Rate (m^3/day)
North of Brothers	Possibly after 2009 (under review)	100,000 (Cat L) 26,700 (Cat M)
Existing East of Sha Chau	In use until mid 2010	26,700 (Cat M)
Proposed East of Sha Chau	Mid 2009 - 2010 Mid 2010 – 2012	Construction:100,000m^3/week Filling : 26,700m^3/day
Proposed South of Brothers	Mid 2011 – 2012 Mid 2012 - ongoing	Construction:100,000m^3/week Filling : 26,700m^3/day

D5-3.1.2 It is still uncertain whether or not the backfilling of the North Brothers Borrow Pit will begin within the construction period for the TM-CLKL+HKBCF+HKLR. It has also not yet been decided whether to use the pit for uncontaminated (Category L) material or moderately contaminated material (Category M).

D5-3.1.3 Under the current programme, the existing CMP (CMP IV) at East of Sha Chau will be backfilled while the construction of the proposed new CMPs (CMP V) at East of Sha Chau are being constructed. Once the new CMPs are in operation, the existing CMP will be capped during the same period. Similarly, when the new CMP at East of Sha Chau is being backfilled, the proposed South of the Brothers CMP could be under construction. Once the proposed South of the Brothers CMP is being backfilled, the new East of Sha Chau CMPs could be being capped with clean sand and marine mud.

D5-3.1.4 The combined works for the CMP are summarised in Table 6.

Table 6 Expected Construction and Operation Sequence for the Contaminated Mud Pits

Date	Backfilling Operations	Construction
2009-10	Backfilling the existing CMP IVc	Construction of the Proposed East of Sha Chau CMP
2010-11	Backfilling the Proposed East of Sha Chau CMP	Construction of the Proposed East of Sha Chau CMP
2011-12	Backfilling the Proposed East of Sha Chau CMP	Construction of the South of Brothers CMP
2012 -	Backfilling the South of Brothers CMP	Construction of the South of Brothers CMP

D5-3.2 Estimated Dredging and Sediment Loss rates

D5-3.2.1 Construction for the TM-CLKL+HKBCF+HKLR is planned to begin in September 2010 with dredging for the seawalls being carried out by grab dredgers. Once the soft marine deposits have been removed, sand fill will be placed in the dredged trench followed by construction of the seawalls. Once the seawalls have been constructed apart from an opening to allow access, the remainder of the dredging will be carried out within the almost completed seawalls with no significant loss of sediment to the surrounding waters. As a result, cumulative impacts from sediment lost to suspension at the contaminated mud pits and from the dredging and filling works for the seawalls will only persist during the period 2010-2011 when the proposed East of Sha Chau pits will be in operation. It is intended that this dredging/reclamation behind the seawall approach be adopted as much as possible although the applicability also depends on the specific portion of the reclamation area and the anticipated construction sequences of each area are further discussed in Sections D5-8 to 10.

D5-3.2.2 The Proposed East of Sha Chau facility consists of four separate pits while the proposed South of Brothers consists of three separate pits and the construction, backfilling and capping of each set of pits will proceed in parallel. Backfilling of each CMP in turn will proceed at a maximum rate of 26,700m^3/day while construction of each new pit will proceed at a maximum rate of 100,000m^3/week, equivalent to 14,285m^3/day. Capping of backfilled pits will proceed at a rate of no more than 26,700m^3/day. In practice, the programme for the construction of the pits, backfilling and capping will depend on the rate of supply of contaminated (Category M) dredged material and capping material. However, with respect to the assessment of the cumulative impacts during construction of the TMLKL+HKBCF+HKLR, it will be assumed that the programme detailed in Table 6 will be followed.

D5-3.2.3 It is also noted that capping of backfilled pits proceeds in an infrequent manner and the daily disposal rates are expected to be less than the maximum permitted rate of 26,700m^3/day. In addition, it is possible that some capping could, on occasion, be carried out using a small TSHD. However, in the current studies, following the methodology adopted in the EIA for the proposed new pits, it will

be assumed that capping is carried out at the maximum permitted rate using bottom dumping barges.

D5-3.2.4 The representative barge and TSHD hopper capacities, the dry densities of the material being placed in the pits and the loss rates for TSHD and barge material to be used in the current studies have been taken from the EIA for the proposed new pits and are summarised in Table 7.

Table 7 Hong Kong Standard Parameters for the Calculation of Loss Rates

Parameter	Value (Reference 1)
Barge capacity	800m^3
TSHD capacity	4,500m^3
Dry Density of dredged material within a barge	750kg/m^3
Dry Density of dredged material within a TSHD	556 kg/m^3
Loss rate to suspension from barge bottom dumping	3%
Loss rate to suspension from TSHD bottom dumping	5%

D5-3.2.5 In the EIA, loss rates for TSHD discharging down the suction arm and down floating hose to a down a pipe discharging near the bottom of the pit were also assessed. However, the loss rates for these disposal options are less than from bottom dumping and so, for the worst case scenario with respect to construction impacts, only bottom dumping TSHD will be considered in the model studies.

D5-3.2.6 It is noted that, in Reference 1, the total instantaneous loss of sediment to suspension during each disposal operation event by a bottom dumping TSHD was subsequently calculated to be 168,750kg using a dry density of 750kg/m^3 instead of 556kg/m^3. It may be that, in the model studies, a dry density of 556kg/m^3 was used and, in the current studies, it will be assumed that the instantaneous loss to suspension from a TSHD will be 125,100kg based on a hopper capacity of 4,500m^3, a dry density of 556kg/m^3 and a loss rate of 5%.

D5-3.2.7 In Reference 1, it was estimated that, in the relatively shallow water at East of Sha Chau, an 8m^3 grab could achieve a production rate of 475m^3/hour at the start of the dredging for a new pit compared to the average required rate of 298m^3/hour to achieve the maximum allowed dredging rate of 100,000m^3/week. In the current studies, as discussed below, it will be assumed that the worst case scenario arises when dredging for a new pit is nearing completion and so it is proposed that the average dredging rate of 298m^3/hour for a grab will be used.

D5-3.2.8 Based on the parameters in Table 7 and the dredging rates for construction of new pits assumed in Reference 1, the following worst case loss rates will be assumed in the model studies (Table 8).

Table 8 Assumed Sediment Loss Rates for Possible Works Activities at the Proposed Contaminated Mud Pits East of Sha Chau

Activity	Dredging/ Disposal Rates	Loss Rate	Duration (minutes)	Frequency	Total Loss (kg/day)
Barge disposal[1]	26,700 (m^3/day)	18,000 (kg/event)	0	33.3 events/day 43 mins	602,800
TSHD disposall[2] (bottom dumping)	26,700 (m^3/day)	125,100 (kg/event)	0	6 events/day 4 hours	750,600
Dredging[1] (Grab[3])	596 (m^3/hour)	2.8 kg/s	Continuous	Continuous	241,920
Dredging[4] (TSHD)	3,050 (m^3/cycle)	20.9 kg/s	17	4.7 cycles/day 5.5 hours	116,300

Notes: 1 For bottom dumping barges and grab dredging, it is assumed the sediment loss is distributed evenly over the water depth;

2 For TSHD disposal, allowing for the draught of the vessel, it is assumed that the sediment losses enter the bottom 60% of the water column (Reference 1);

3 Two grab dredgers are assumed to be required to complete the construction of a new pit within a year. The average dredging rate at east of Sha Chau to achieve 100,000m^3/week is equivalent to 298m^3/hr with a loss rate of 1.4kg/s for each of 2 grabs;

4 For TSHD dredging, it is assumed all sediment losses enter the bottom 1m of the water column.

D5-3.2.9 The barge disposal and loss rates and volumes in Table 8 apply to both the disposal of contaminated material and to capping using uncontaminated material. Trailer disposal by bottom dumping is only likely to be undertaken at the proposed new East of Sha Chau pits where water depths will allow access but it is thought that only barges or TSHD discharging through a floating hose could access the South of Brothers pits.

D5-3.2.10 Once dredging for a new pit is underway, some of the sediment lost to suspension will be confined within the pit and will not be dispersed by the tidal currents. Similarly, at the start of the disposal operations in a newly constructed pit, much of the sediment lost to suspension will also be confined within the depth of the pit. As a result, the worst case with respect to sediment losses being transported from the pit area by tidal currents will occur at the start of dredging a new pit and when the active pit is almost backfilled. However, for operational reasons, as the active pit approaches its maximum backfill level, the next pit to be used will be nearing completion. If a TSHD is used to excavate the new pit, all sediment losses would be confined in the bottom 1m of the pit and would be very unlikely to be transported away from the pit by the tidal currents. Based on the data presented in Table 8, therefore, it will be assumed that the worst case to be simulated will occur when completing the backfilling of the active pit using a bottom dumping trailer and completing the dredging of a new pit using two grab dredgers.

D5-3.2.11 When disposing of dredged material in the contaminated mud pits, the greatest potential for sediment losses arises when TSHDs are used. However, it is unlikely that the full daily capacity of the pits would be taken up by 6 TSHDs working every 4 hours. A more realistic worst case scenario which would also distribute the sediment losses throughout each day could involve three trips by a bottom dumping TSHD and 16.5 (rounded up to 17) trips by a barges in a 24-hour period which would give a total daily loss rate of 681,300m^3. Based on the above information and calculation and also some further clarification from CEDD on the tentative phasing of various the CMPs, the specific concurrent activities for the selected scenario years are proposed. Based on these assumptions, the sediment loss rates proposed to be employed in the model studies are detailed in Table 9.

Table 9 Summary of Sediment Loss Rates to be Modelled for CMPs

Scenario	CMPs	Activity	Rates	Loss Rate	Duration (minutes)	Frequency	Total Loss (kg/day)
2011	ESC IVc	TSHD (4,500m^3)	13,500	125,100	0	8 hours	375,300
	ESC IVc	Barges (800m^3)	13200 (m^3/day)	18000 (kg/event)	0	87 minutes	306,000
	ESC Va	TSHD (4,500m^3)	13,500	125,100	0	8 hours	375,300
	ESC Va	Barges (800m^3)	13200 (m^3/day)	18000 (kg/event)	0	87 minutes	306,000
2012	ESC Va	TSHD (4,500m^3)	13,500	125,100	0	8 hours	375,300
	ESC Va	Barges (800m^3)	13200 (m^3/day)	18000 (kg/event)	0	87 minutes	306,000
	ESC Vb	TSHD (4,500m^3)	13,500	125,100	0	8 hours	375,300
	ESC Vb	Barges (800m^3)	13200 (m^3/day)	18000 (kg/event)	0	87 minutes	306,000
	ESC Vc	Dredging (2 grabs)	596 (m^3/hour)	2.8 kg/s	Continuous	Continuous	241,920
2013	ESC Vc	TSHD (4,500m^3)	13,500	125,100	0	8 hours	375,300
	ESC Vc	Barges (800m^3)	13200 (m^3/day)	18000 (kg/event)	0	87 minutes	306,000
	ESC Vd	Dredging (2 grabs)	596 (m^3/hour)	2.8 kg/s	Continuous	Continuous	241,920
	SB Pit A	Dredging (2 grabs)	596 (m^3/hour)	2.8 kg/s	Continuous	Continuous	241,920
	SB Pit B	Dredging (2 grabs)	596 (m^3/hour)	2.8 kg/s	Continuous	Continuous	241,920

D5-4 BACKFILLING NORTH BROTHERS MARINE BORROW AREA

D5-4.1 Introduction

D5-4.1.1 Backfilling the North Brothers Marine Borrow Area (NBMBA) (Figure 2) could begin after 2009. At present, there is no firm programme to begin the backfilling operations at the NBMBA but, in order to assess the worst case scenario, it will be assumed that the NBMBA could be in operation in 2010 at the start of construction for the TM-CLKL+HKBCF+HKLR. It is also possible that backfilling operations might be underway in 2012 when the HKBCF Phase I works are finishing and in 2014 when the marine works for TM-CLKL+HKBCF+HKLR are nearing completion. As a result, when assessing cumulative construction impacts, the disposal operations at the NBMBA will be assumed to be on-going at all stages of the construction works for the TM-CLKL+HKBCF+HKLR.

D5-4.2 Sediment Loss rates

D5-4.2.1 In the previous EIA for the NBMBA (Reference 5), it was concluded that the disposal of moderately contaminated dredged material at the rate of 26,700m^3/day or uncontaminated material at the rate of 100,000m^3/day in the NBMBA would not result in unacceptable direct or cumulative impacts (with the East of Sha Chau disposal operations) on marine water quality. The more recent EIA for the proposed new Contaminated Mud Pits at East of Sha Chau and South of the Brothers (Reference 1) also assessed cumulative impacts with the NBMBA using these same disposal rates at the NBMBA and again concluded that no unacceptable impacts on the marine environment would arise.

D5-4.2.2 As a result, it is proposed that, for the purposes of assessing worst case potential cumulative impacts with construction of the TM-CLKL+HKBCF+HKLR, it is assumed that the NBMBA is being used to receive 100,000m^3/day of uncontaminated material.

D5-4.2.3 In both References 1 and 5, it was found that the worst case with respect to sediment losses to the receiving waters would arise when TSHDs were placing most of the material in the NBMBA. In Reference 5, a 24-hour worst case disposal programme was calculated to consist of bottom dumping from 12 TSHD of 8,000m^3 capacity and bottom dumping from 5 barges of 800m^3 capacity. The TSHD operations were assumed to be at 2 hour intervals throughout each day and that barge operations took place mid-way between two TSHD operations.

D5-4.2.4 In Reference 5, in order to minimise the potential for sediment to escape from the pit area, it was recommended that disposal operations should take place at the western end of the borrow area on the ebb tide and at the eastern end of the borrow area on the flood tide. However, for the purposes of assessing the worst case scenario, it will be assumed that all disposal operations take place in the western pit closest to the project site for the TM-CLKL+HKBCF+HKLR.

D5-4.2.5 Based on these worst case assumptions, it is proposed that the following disposal programme and loss rates taken from Reference 5 are again employed in the assessment of potential cumulative impacts with the construction of the TM-CLKL+HKBCF+HKLR.

Table 10 Assumed Schedule for Disposal Events ~ North Brothers MBA

Hour	Type	Capacity (m^3)	Hour	Type	Capacity (m^3)
00:00	Trailer	8,000	13:00	Barge	800
02:00	Trailer	8,000	14:00	Trailer	8,000
04:00	Trailer	8,000	16:00	Trailer	8,000
05:00	Barge	800	17:00	Barge	800
06:00	Trailer	8,000	18:00	Trailer	8,000
08:00	Trailer	8,000	20:00	Trailer	8,000
09:00	Barge	800	21:00	Barge	800
10:00	Trailer	8,000	22:00	Trailer	8,000
12:00	Trailer	8,000	**Total Volume (m^3)**		**100,000**

Table 11 Assumed Disposal Operation and Sediment Loss Parameters

Borrow Area	Total Dumped (m^3/day)		Number of events/day		Mud Density (kg/m^3)		Loss rate		Total Losses / dump (kg)	
	Trailer	Barge	Trailer	Barge	Trailer	Barge	Trailer	Barge	Trailer	Barge
North Brothers	96,000	4,000	12	5	556	750	5%	3%	222,400	18,000

Notes: Trailers are assumed to be 8,000m^3 capacity
Barges are assumed to have 800m^3 capacity

D5-5 LANTAU LOGISTICS PARK

D5-5.1 Introduction

D5-5.1.1 The LLP 72ha development (Phase I) will be constructed by first dredging a trench for the seawall and, once a length of trench has been dredged, sand filling and seawall construction will be carried out more or less simultaneously with the dredging. An opening in the seawall 100m wide will be left to provide access to the works area within the seawalls and the opening will be protected by a double silt curtain. All subsequent dredging and filling for the reclamation will be carried out within the area protected by the seawalls and silt curtains and no losses of sediment to suspension are expected to exit the works area. The only potential for cumulative impacts with the construction of the TM-CLKL+HKBCF+HKLR are, therefore, expected to arise during the seawall construction for the LLP.

D5-5.1.2 It is proposed that the seawall will be constructed beginning at both the east and west ends using 2 grab dredgers at each end. Construction for the seawall is expected to be completed within the first 6-7 months of the construction programme which is under review at present. However, at this stage, construction is expected to begin in quarter 2 of 2010.

D5-5.2 Estimated Dredging, Filling and Sediment Loss rates

D5-5.2.1 The maximum daily dredging rate will be no greater than 19,600m^3/day and it will be assumed that this is equivalent to a maximum daily dredging rate of 9,800m^3/day on each of the eastern and western seawall sections. Filling for the seawall foundation will is expected to proceed at a rate of 19,200m^3/day (assumed to be equivalent to 9,600m^3/day on each of the two seawall sections). Following completion of the foundations, it will be assumed that, compared to the dredging and filling works, there will be negligible loss of fine material when placing the seawall rock.

D5-5.2.2 The greatest potential for cumulative impacts is expected to arise when the seawall has been substantially completed and the grab dredgers on each section of the seawall are at their closest approach. At this time, the dredging will also be taking place in relatively open waters which could allow any sediment losses to disperse into the far field. Sand filling for the seawall foundation will also be taking place relatively close to the dredging works, say at 500m from the dredgers.

D5-5.2.3 It will be assumed that the sediment loss rate for grab dredgers is 17kg/m^3 dredged and that work proceeds 24 hours per day. As in previous studies in Hong Kong, it will be assumed that, assuming good quality sand is sourced, 5% of the fill material is fine (<63μm) and that 5% of that fine material will be lost to suspension. In order to calculate the rate of loss of sediment to suspension, it will be assumed that the fine material has a density of 1,600kg/m^3 which will not result in an underestimate of the loss of fine material. The sediment loss rates to be used in the model studies can, therefore, be summarised as follows in Table 12.

Table 12 Assumed Sediment Loss Rates for Each of the East and West Seawall Sections

Activity	Production Rate (m^3/day)	Loss Rate	Duration	Frequency	Sediment Loss Rate
Dredging[1] Western Seawall	9,800	17kg/m^3	Continuous	-	1.92kg/s
Dredging[1] Eastern Seawall	9,800	17kg/m^3	Continuous	-	1.92kg/s
Filling[2] Western Seawall	9,600	5% of material <63μm	Instantaneous	2hours	3,200 kg/event
Filling[2] Eastern Seawall	9,600	5% of material <63μm	Instantaneous	2 hours	3,200 kg/event

Notes: 1 Assuming 2 grab dredgers in operation on each seawall, the production rate per grab will be 4,900m^3/day with a loss rate per grab of 0.96kg/s

2 Based on bottom dumping of 12 barges of 800m^3

D5-6 TONGGU CHANNEL MAINTENANCE DREDGING

D5-6.1 Introduction

D5-6.1.1 Information on the maintenance dredging requirements for the Tonggu Channel (Figure 3) has been obtained from an EIA for the channel carried out in 2005 (Reference 2) and the sediment loss rates are presented below based on the data obtained from the EIA and parameters used in previous studies in Hong Kong.

D5-6.1.2 The Tonggu Channel has been divided into three Zones (Figure 4). In order to minimise impacts in Hong Kong waters, dredging in Zone I is only permitted on the flood tide and dredging in Zone II is only permitted on the ebb tide. In Zone III, there is no restriction on the tidal windows permitted for dredging.

D5-6.1.3 The dredged material is proposed to be placed either in the reclamation in Dachan Bay or at Aizhou South (Zone C) as shown in Figure 3. Considering the distance between the Tonggu Channel and the Aizhou South (Zone C) disposal ground, potential cumulative impacts between the disposal operations and construction losses from the TM-CLKL+HKBCF+HKLR will not be considered significant. It is also assumed that any dredged material placed in the Dachan Bay reclamation will be contained behind enclosing seawalls and the potential for significant losses to the Main estuary and possibly the Urmston Road will also be considered to be insignificant.

D5-6.1.4 It is noted that subsequent to the issue of the 2005 EIA report, the alignment of the Tonggu Channel was shifted north-west to avoid Hong Kong waters. As such, while data obtained from the 2005 EIA is used as a basis for deriving sediment losses, the modelling will use the actual alignment as obtained from the PRC Maritime Safety Administration (Figure 4). Figure 4 also present the schematic shift of the three zones from the proposed alignment in the 2005 EIA report to the actual alignment.

D5-6.2 Estimated Dredging and Sediment Loss rates

D5-6.2.1 Maintenance dredging for the Tonggu Channel is expected to take place for a period of no more than 12 weeks each year and, based on the 2005 EIA (Reference 2) it is expected that one TSHD with a hopper capacity of 12,500m^3 would be used to dredge Zones I and II while a second TSHD of the same capacity would dredge Zone III.

D5-6.2.2 The maximum volumes to be dredged from each Zone each year and the production rates are presented in Table 13 and have been taken from Reference 2.

Table 13 Dredging Volumes and Production Rates for the Tonggu Channel

Zone	Dredged Volume (m3)	Production Rate (m3/week)	Duration (days)
Zone I	336,000	36,746	64
Zone II	311,572	34,074	64
	198,428	68,149	20
Total Zone II	510,000	68,149	84
Zone III	912,000	95,896	67
Total	1,758,000		

D5-6.2.3 The operational performance of the 12,500m^3 capacity TSHD as detailed in the EIA is presented in Table 14.

Table 14 Expected Tonggu Channel Maintenance Dredging Performance Data

Dredger Parameter	Zone I	Zone II	Zone III
Hopper Volume (m^3)	12,500	12,500	12,500
In-situ Volume (m^3)	4,375	4,375	6,250
Loading Time (minutes)	35	35	60
Production Rate (m^3/min)	125	125	104
Cycle Time (minutes)	223	240	342
Weekly Production (m^3)	128,611	119,260	217,227

D5-6.2.4 In the EIA, it was assumed that the sediment losses for the TSHD without any overflow will be equivalent to 7kg/m^3 dredged which is the same as has been assumed in previous studies in Hong Kong. In the EIA, it was also stated that no overflowing would be permitted in Zones I and II but limited overflowing would be permitted in Zone III. When overflowing takes place, an environmental valve is used which encourages the overflow to descend rapidly to the seabed as a density current with minimal mixing of the sediment losses over the water column. It was assumed in the EIA that an additional 8kg/m^3 dredged would be lost if overflowing occurred and that it would only occur during the last 5minutes of the 60 minute dredging cycle. The additional overflow loss, therefore, amounts to approximately 5% of the total combined loss during a dredging cycle.

D5-6.2.5 From Table 13, it can be seen that the maintenance dredging works are anticipated to last 60 days or more and, when simulating the maintenance dredging, it will be assumed that dredging in all three Zones will be ongoing with dredging in Zones I and II alternating according to the tidal conditions.

D5-6.2.6 Based on this information from the EIA, the parameters defining the sediment loss rates proposed to be used in the current cumulative construction impact studies are summarised in Table 15.

Table 15 Assumed Sediment Loss Rate for the Tonggu Channel Maintenance Dredging

Location	Production Rate (m^3/min)	Sediment Loss Rate kg/m^3 / (kg/s)	Duration of Dredging (mins)	Interval between dredging cycles (minutes)
Zone I[1]	125	7 / 14.6	35	188[1]
Zone II[2]	125	7 / 14.6	35	205[2]
Zone III	104	7 / 12.1 15 / 26.0[3]	60	282 / 129[4]

Notes 1 Flood tide dredging only
2 Ebb tide dredging only
3 The loss rate of 12.1kg/s applies to the first 55 minutes of dredging while the loss rate of 26.0kg/s applies only to the last 5 minutes of dredging when overflowing could occur
4 129 minutes for disposal at Dachan Bay, 282 minutes for disposal at Aizhou.

D5-6.2.7 From Table 13, the required daily production rate for Zones I is equivalent to one flood tide dredging cycle per day while the required production rates for Zones II and III are equivalent to 2 dredging cycles per day with the Zone II dredging taking place on the ebb tide only. In the model studies, therefore, one flood tide dredging cycle will be simulated in Zone I and two dredging cycles will be simulated in each of Zones II and III and the dredging locations in each Zone will be selected to be closest to the TM-CLKL+HKBCF project site.

D5-7 MAINLAND SECTION OF HONG KONG ZHUHAI MACAO BRIDGE (HZMB)

D5-7.1 Background

D5-7.1.1 The construction programme for the HZMB has not yet been finalised and so it will be necessary to assume the worst case with respect to potential cumulative impacts resulting from sediment losses during the simultaneous construction of the HZMB, HLKR and the TM-CLKL+HKBCF. It may be that this worst case scenario will not arise once the construction works have begun but it will be assumed that if the worst case scenario is acceptable with respect to impacts on the marine environment, then the other possible construction scenarios which might arise should also be acceptable.

D5-7.1.2 When calculating sediment loss rates for dredging and filling for concurrent construction works in Hong Kong in the previous sections of this paper, standard parameters which have been used in previous Hong Kong studies have again been used. However, HPDI, the Mainland consultants who are responsible for the Ocean Environmental Impact Assessment (OEIA) for the Mainland sections of the HZMB, have used similar but different parameters. When deriving the potential sediment loss rates to be used in the current studies of cumulative construction impacts, both the standard Hong Kong parameters and the parameters employed in the HZMB OEIA (Reference 7) have been used to provide a comparison.

D5-7.1.3 One major difference between the assumptions made in the HZMB OEIA and in Hong Kong is that the OEIA assumed that the TSHD and CSD would be allowed to overflow when dredging mud. Overflowing from TSHD when dredging mud is not permitted in Hong Kong and the main issues relating to the inclusion of overflowing in the current studies is discussed further below.

D5-7.1.4 The HZMB will include piled bridge sections, a tunnel section, artificial islands at each end of the tunnel section and artificial islands for the boundary crossing facility at the Zhuhai and Macao landfalls. The Macao and Zhuhai boundary crossing facility artificial islands on the western side of the Pearl Estuary, however, are too far (40km) from the TM-CLKL+HKBCF+HKLR to be considered significant with respect to cumulative construction impacts. As a result, none of the works at the western end of the HZMB will be considered further.

D5-7.2 Artificial Islands

D5-7.2.1 At the eastern and western ends of the tunnel section, artificial islands will be constructed (Figure 5). The eastern island is approximately 150m from the Hong Kong SAR boundary while the western island is approximately 6.6km from the Hong Kong SAR boundary. The HZMB OEIA assumed that one 13 m^3 grab dredger, one 4500 m^3 TSHD and one 2500 m^3/h CSD would be deployed for the construction of each island and the construction works will be completed in 3 months (cf. Section 3.2.2 of Reference 7). Further to the meeting between the HKSAR Government, Highways Department (HyD) and the Advance Work

Coordination Group Project Office of HZMB (Reference 9), it was clarified that only a fleet of 3 x 10,000m^3 capacity TSHD would be deployed for the works at each island although only one dredger will be dredging at each island at any time. Based on the information available at present, it has been assumed that the seawalls for the islands will be constructed first (leaving a 100m wide gap to allow access, as a worse case) and that the east and west island seawalls will be built at the same time with one TSHD working simultaneously on each of the seawalls. The programem for the seawall construction was confirmed to be 8 months followed by 8 month reclamation behind the completed seawall.

D5-7.2.2 The dredging volumes, rates of dredging and dredging equipment to be used will be the same for both islands. As a result, the rates of sediment loss for each island will also be the same. The western island, in addition to being over 6km farther from the TM-CLKL+HKBCF+HKLR works, lies on the western side of the main flow channel in the lower Pearl Estuary where the strong tidal flows are in a North-South direction. These tidal flows will disperse any sediment losses rapidly and will tend to inhibit the dispersion of sediment towards the TM-CLKL+HKBCF+HKLR works. The construction of the eastern island, therefore, is expected to have a much greater potential to generate cumulative impacts with the TM-CLKL+HKBCF+HKLR works than the western island. However, for the worst case scenario, the simulations will include the simultaneous construction of the seawalls for both islands.

D5-7.3 Immersed Tube Tunnel

D5-7.3.1 The immersed tube tunnel below the main navigation channel will be constructed using dredging plant and its construction will also have the potential to generate cumulative impacts on the marine environment with the construction of the TM-CLKL+HKBCF+HKLR. The HZMB OEIA (Reference 7) also assumes 2 x 4,500m^3 TSHD, 2 x 2,500 m^3/h CSD and 2 x 13 m^3 grab will be used for the dredging works for the tunnel trench. The Advance Work Coordination Group Project Office of HZMB (Reference 9), however, has also clarified that only one 10,000m^3 capacity TSHD and one 13m^3 grab dredger will be deployed for tunnel trench dredging. It was explained that dredging for tunnel will only start after the artificial islands are reclaimed and it is intended that the construction works will begin at the western island and work towards the east island. It is anticipated that the works will be divided by about 35 x 200m sections and each 200m section of tunnel is to be completed in about 1 month.

D5-7.3.2 The tunnel works are slightly farther from the TM-CLKL+HKBCF+HKLR works than the eastern artificial island and the tunnel section lies below the relatively deep main flow channel. The main tidal flows in this channel are in a North-South direction and any sediment losses to suspension are expected to be dispersed rapidly along the main axis of the estuary with a relatively low potential to generate cumulative impacts with the construction of the TM-CLKL+HKBCF+HKLR.

D5-7.4 Piling Works for Bridge Sections

D5-7.4.1 The elevated road sections will require bored piles but it is expected that losses of sediment from the piling works will be mitigated using silt curtains or metal casting. In previous studies in Hong Kong, losses from the construction of bored piles have not been considered to be significant. However, the expected rates of sediment losses associated with the piling works will be small compared to other aspects of the construction works and remain local to the piling sites. In the OEIA for the HZMB, while a sediment loss rate during piling was specified, further modelling was not conducted because of the anticipated negligible impacts (Reference 7). Therefore, the loss due to bridge piling of the HZMB will also not be simulated for this exercise.

D5-7.5 Dredged Material Disposal

D5-7.5.1 The disposal grounds which will be used for the dredged material are shown in Figure 6 (Reference 7) and it can be seen that they are very far from the TM-CLKL+HKBCF project site. Cumulative impacts arising from the simultaneous construction of the TM-CLKL+HKBCF+HKLR, the HZMB and the disposal of dredged material are extremely unlikely and so the disposal operations for the HZMB will not be considered further.

D5-7.5.2 It is planned that some dredged material will be used in the construction of reclamations or islands at the HZMB landfalls in Macao and Zhuhai (Reference 7). However, any sediment losses associated with the reuse of the dredged material at these landfalls will be too remote from Hong Kong to result in any cumulative construction impacts with the TM-CLKL+HKBCF+HKLR works and will not be considered further.

D5-7.6 Sediment Loss Rates

D5-7.6.1 Based on this dredging programme employing only TSHDs and grab dredgers, it is expected that the TSHD will carry out the vast majority of the dredging and that the grabs would only be used for the final trimming of the tunnel trench.

D5-7.6.2 Daily dredging rates for the seawalls and tunnel section have been taken from the OEIA for the mainland section of the HZMB (Reference 3) and updated according to recent communications where relevant. The sediment loss rates for the TSHD and grab dredgers have been obtained in two ways:

(1) Based on the parameters established and used in previous studies in Hong Kong including the recent EIAs for the Backfilling of the North Brothers MBA (Reference 5), the Permanent Aviation Fuel Facility (Reference 6) and the proposed new contaminated mud pits (Reference 1); and.

(2) From the parameters which were quoted for dredging and filling in the OEIA (Reference 7) which were said to be based on previous studies and experimental results from mud dredging in the Yangtze River but no References were available.

D5-7.6.3 The rates of loss of fine sediment to suspension depends on the rate of dredging and filling. In Table 16 below, the potential loss rates during the construction of the HZMB artificial islands and tunnel section have been calculated using the dredging and filling rates specified in the HZMB OEIA (Reference 7) and the parameters taken from previous Hong Kong studies (References 1, 5, 6, 11-18) for comparison.

Table 16 Parameters Associated with Dredging and Filling in Hong Kong and in the Mainland section of HZMB

Activity / Mud Properties	Hong Kong	HZMB	REF
Grab Dredging Rate	-	6,240m^3/day	Reference 7
TSHD (10,000m^3 capacity) in-situ volume dredged		7,900m^3	Reference 8
TSHD Dredging Period	60 minutes	70 minutes	Reference 8
Mud Losses Grab Dredging	17-20kg/m^3	20 kg/m^3	Reference 7
Grab Dredging Loss Rate	Around 1kg/s	1.444kg/s	Reference 3
TSHD Draghead Losses	7kg/m^3	15kg/m^3	Reference 7
TSHD Overflow	Not permitted	1.5kg/m^3	Reference 7
Mud Losses Bottom Dumping (Barge)	3%	5%	Reference 3
Mud Losses Bottom Dumping (TSHD)	5%	5%	Reference 3
Dredged Mud Dry Density (Grab Dredged)	750kg/m^3	-	
Dredged Mud Dry Density (TSHD)	556kg/m^3	-	
Sand Fines Content	5% < 63μm	5% < 63μm	Reference 3
Sand Filling Losses (bottom dumping)	5% of fine	5% of fine	Reference 3
Dry Density of Fines Content In Sand Fill	1,600kg/m^3	-	
Leakage of fill when filling behind seawalls	-	5%	Reference 3
Bored Piling Sediment Loss Rate	0.0004kg/s	1.2kg/s	Reference 3

D5-7.6.4 In general, the assumed loss rates for the different types of dredgers are slightly higher than have been used in previous studies in Hong Kong where, in addition, TSHDs are not permitted to overflow when dredging mud.

D5-7.6.5 In the HZMB OEIA (Reference 7), it was specified that the grab dredgers would work 24 hours per day while the TSHD would work 8 hours per day and that the required average daily dredging rates would be as detailed in Table 17 below.

Table 17 Average Dredging Rates for the HZMB Tunnel and Island Seawalls

Mainland Section of HZMB	Total Daily Production Rate (m^3)
Immersed Tube Tunnel	45,500 (22,750 m^3 at each end)
Artificial Island Seawalls, Pearl Estuary	31,466 (15,733 m^3/seawall)

D5-7.6.6 Based on the required average daily dredging rates and the parameters presented in Table 17, the loss rates proposed for use in the construction impact model studies are presented below in Table 18 based on both the typical Hong Kong dredging parameters, those assumed for HZMB OEIA and also the clarification with the Advanced Work Coordination Group Project Office of HZMB. It should be noted, however, that the number of cycles for the TSHD were not specified in the EIA but it has been subsequently clarified that 2 cycles per day would be the worst case.

Table 18 Summary of Dredging and Filling Rates and Loss Rates for the Mainland Section of HZMB

Activity	Dredging, Filling Rates (m^3/cycle)	Duration	Loss Rate (kg/m^3)	Loss Rate (kg/s)	Frequency	Total Loss (kg/day)
Island Seawalls						
TSHD[1] Draghead	7,900	70 mins	15	28.2	4 hours	237,000 (2 cycles / TSHD)
TSHD Overflow		60 mins	1.5	2.82	4 hours	20,300 (2 cycles / TSHD)
Grab Dredger	6,240	24 hours	20	1.44	Continuous	124,800
Barge Filling	800	5 mins /event	3,200 kg/event	10.67	3 hours	25,600 (8 events)
TOTALS[1] (per seawall)						**922,300**
Tunnel						
TSHD[1] Draghead	7,900	70 mins	15	28.2	4 hours	237,000 (2 cycles / TSHD)
TSHD Overflow		60 mins	1.5	2.82	4 hours	20,300 (2 cycles / TSHD)
Grab Dredger	6,240	24 hours	20	1.44	Continuous	124,800
Barge Filling	800	5 mins /event	3,200 kg/event	10.67	3 hours	25,600 (8 events)
TOTALS[1] (at each end)						**922,300**
Bored Piles						
Per Pile	1.5 m^3/hour	24 hours	0.85	0.0004	Continuous	20.4

Notes

1. It has been assumed that each TSHD would complete 2 dredging cycles in an 8-hour working day and a maximum of 3 TSHDs will be deployed

D5-7.6.7 However, it is noted that the programmed average daily dredging rate for the construction of each island seawall (Table 17) is actually only 15,733m^3 compared to the worst case dredging scenario given in Table 18 of around 47,400m^3/day if 3 TSHDs complete 2 cycles per day. The average required total daily dredging rate for the tunnel section was specified as 45,500m^3/day (Table 17) which could be difficult to achieved using one TSHD and a grab dredger and it will be assumed that three 10,000m^3 TSHDs will be deployed as the worse case assumptions.

D5-7.6.8 It is considered that the production rates presented in Table 18 should not result in the potential sediment losses being underestimated and, indeed, the assumed production rates could well result in an overestimate of the worst case likely impacts from the construction works.

D5-7.6.9 The total daily loss rates presented in Table 18, however, of around 0.9M kg/day depending on the assumed stage of works, are still much less than were assessed for the backfilling of the North Brothers MBA which totaled over 2.7Mkg/day.

D5-7.6.10 It is noted that up to 60 piles could be under construction simultaneously with each pile taking 7 days to complete (Reference 7). However, it is unlikely that more than one pile could be constructed at the same location at the same time. As discussed above, the contribution of sediment loss from the bridge piling would unlikely be significant although the calculated loss rate is also presented in Table 18 above.

D5-7.6.11 When simulating the sediment losses in the water quality model, it will be assumed that draghead losses from TSHDs enter the bed layer of the model while the overflows enter the surface layer at the rates calculated above. For grab dredging, it will be assume that the sediment losses are distributed evenly over the water column.

TSHD Overflow

D5-7.6.12 Overflow losses from the TSHD will initially undergo a dynamic phase where the dense discharge from the overflow will descend rapidly under gravity through the water column mixing with the receiving waters to some small extent as it descends. It is expected that most of the overflowed material will impact the seabed where it will spread laterally as a density current and remain close to the seabed. The dynamic phase of overflow plumes is currently the subject of research and the amount of the overflowed, material which actually remains in suspension to be transport and dispersed by the tidal currents, also the subject of current research. The overflow losses to suspension will depend on many factors including trailing speed, tidal current speed, water depth, propeller wash and re-erosion and overflow design.

D5-7.6.13 It is not known how the overflow losses were calculated in the HZMB OEIA but it is noted that they are equivalent to around 10% of the draghead loss rates used in the OEIA.

Sand Filling

D5-7.6.14 Based on the OEIA, the seawalls for the two artificial islands would mainly consist of pre-cast cylindrical caissons (Reference 7) and, thus, significant filling is not anticipated. However, some initial trench preparation may still be required after the dredging, before placing the caissons and beginning of the main reclamation. It is, thus, assumed that once the trenches for the seawalls have been dredged, preparative sand filling will begin. It has been estimated that sand filling for the artificial island seawalls will require 1.18Mm^3 of sand for each seawall (Reference 3) and that 1.36Mm^3 of sand fill will be required for the two artificial islands reclamation (Reference 7). Assuming a 25-day working month and an 8 month (Reference 9) filling period results in a filling rate of 5,900m^3/day for each seawall and 6,800m^3/day for each island reclamation. As in previous studies in Hong Kong, it will be assumed that 5% of the fill material is fine (<63μm) and that, for bottom dumping from barges, 5% of the fine material will be lost to suspension evenly distributed over the water column. These same loss rates were also assumed in the HZMB OEIA (Table 16).

D5-7.6.15 It will also be assumed that the fill is placed using bottom dumping barges with a capacity of 800m^3. The loss of fine sediment to suspension would then be equivalent to 3,200kg/event using the assumptions in Table 16. To achieve the expected filling rates of 5,900m^3/day for each seawall and 6,800m^3/day for each island reclamation would require around 8 barge loads of sand per day for each seawall and 9 barges per day for each reclamation.

D5-7.6.16 The total daily loss rate would then be 25,600kg at each seawall (for 8 barge loads/day) which is around 10%-15% of the expected maximum daily losses due to the dredging work (Table 18). When filling the reclamations behind the completed seawalls containing a 100m gap, losses of fines will be greatly reduced and it will be assumed that only 15% of the potential loss of fines in open waters would result. For the filling rate of 9 barges per day, a loss rate from the reclamation would amount to 480kg/disposal event and a total daily loss rate of 4,320kg/day at each island.

D5-7.6.17 Sand filling for the tunnel trench of 5.1Mm^3 will also be required over a period of 32 months of 25 working days each month (Reference 3), equivalent to an average daily filling rate of 6,375m^3/day. This filling rate could be satisfied by 8 barges of 800m^3 capacity each day giving a total daily loss rate of 25,600kg/day based on the same assumptions as were used to calculate the loss rates for filling the seawalls. The losses of fine sediment to suspension during the filling works for the tunnel, therefore, are again expected to be much smaller than the losses of fine sediment to suspension during the dredging works. It is noted that that Advance Work Coordination Group Project Office of Hong Kong-Zhuhai-Macao Bridge (Reference 9) has clarified that the marine works for the tunnel construction would need about 35 months. Thus, the assumed higher working rate for a 32 months works period would not under estimate the potential impacts.

D5-7.7 Project Programme

D5-7.7.1 A broad brush programme of the HZMB is presented in the HZMB OEIA (Section 2.6 and Table 2.6-1 of Reference 7) which indicate the milestones of major elements. The report, however, does not include a detailed programme. During the meeting between HyD and the Advance Work Coordination Group Project Office of Hong Kong-Zhuhai-Macao Bridge (Reference 9), some details of the anticipated progress were discussed. The key information of particular relevance to the current water quality assessment is highlighted in Table 19 below.

Table 19 Milestone Programme of HZMB

Anticipated Date	Details	Reference
June 2010 – Jan 2011 (construction start in mid 2010)	Construction of seawalls for the two artificial islands at the same time.	Reference 9
Feb 2011 – Sept 2011 (Note 1)	Reclamation of filling the artificial islands (behind the seawall)	Reference 9
Oct 2011 – Aug 2014	Construction of the submarine tunnel between the two artificial islands starting from the western island. Works divided into about 35 sections each 200m. Each section completed in a month.	Reference 9
Jan 2011	Commence construction of Zhuhai and Macao BCFs	Section 2.6 of Reference 7
Feb 2011 – Jun 2011	Construction of seawall for Zhuhai and Macao BCFs using direct rock fills (no dredging)	Section 3.2.1(1) of Reference 7
Jul 2011 – Jan 2012	Reclamation filling of Zhuhai and Macao BCFs using direct rock fills (behind the seawall)	Section 3.2.1(1) of Reference 7
Jun 2011	Commence construction of the main span of the HZMB	Section 2.6 of Reference 7
Jun 2011 – Nov 2012	Bored piling of bridge piers (Note 2).	Section 3.2.4(3) of Reference 7

Note:
1. It is anticipated that reclamation filling will begin in early 2011, however, for the purpose of this study, it will be assumed that the seawall dredging and construction would still be in progress.
2. Based on Reference 7, the main span of HZMB requires about 3789 piles. A maximum of 60 piles could be concurrent at any one time and each pile take about 7 days to complete. Assuming an even spread of workloads, the 3789 piles will have to be divided into about 63 sections of works. However, the expected loss rates from the bored piles of around 0.0004kg/s remote from the TM-CLKL+HKBCF+HKLR works are considered to be insignificant and will not be simulated.

D5-8 TUEN MUN CHEK LAP KOK LINK (TM-CLKL)

D5-8.1 Background

D5-8.1.1 With respect to impacts from the construction works, the TM-CLKL can be divided into three main sections: (1) The Northern Landfall reclamation; (2) the Southern Landfall reclamation; and (3) viaduct connections to the North Lantau road system. The main tunnel section for the TM-CLKL will be a bored tunnel with no construction impacts on the marine environment.

D5-8.1.2 The main purpose of the reclamations are for construction of the launching and receiving shafts for the tunnel boring machine (TBM) as well as providing minimum soil cover of one tunnel diameter of 14m to facilitate the safe operation of the TBM. A cut-and-cover approach roads and ramps will then be connected to the TBM tunnel section at both the northern and southern reclamations. The construction of TM-CLKL requires the reclamation of about 14.9ha and 18.2ha of land at the northern and southern landfall respectively.

D5-8.1.3 The construction of the TM-CLKL will begin in November 2011, after plant mobilization in October 2011, and the construction programmes for the Northern and Southern Landfalls are presented in Figure 7a together with other works of HKBCF+HKLR. The Southern Landfall will require fully dredged seawalls and a non-dredged reclamation while the Northern Landfall will have a non-dredged reclamation and fully dredged seawalls. The dredged and SCP seawall sections are shown in Figure 8 and the construction sequence is presented in Figure 9 for both the northern and southern landfall reclamations.

D5-8.1.4 For non-dredged reclamation proposed for both the northern and southern reclamations, the marine deposits will be left in place and will be installed with band drain and loaded with surcharge to speed up consolidation of marine deposits, thus controlling the residual settlement of reclaimed land to acceptable level. This method has been successfully used in Hong Kong with proven track records in many major civil engineering projects. The primary engineering limitation of using this method is the time needed to be allowed for preloading with surcharge which normally takes 6 to 9 months but it is overall environmentally preferable.

D5-8.1.5 The southern tip of the northern reclamation seawall (Portion N-C) will be constructed first (Figure 9 (sheet 1)) as this will form the launching platform for the TBM. In line with government policy to minimise dredging, it is proposed to use sand compaction piles (SCP) for the majority of the seawall, except for this southern section adjacent to the TBM tunnel, where a tighter construction programme and increased stability for the launching of the TMB is required.

D5-8.1.6 SCPs refer to the construction of a column of dense sand through the full thickness of the sediment and broadly follows the following method:

- Possibly following the laying of a sand blanket, a steel tube, typically varying in diameter from 0.4 to 0.8 m, is pushed into the sediment to the required depth. Insertion of the tube can be assisted by vibration at the top

of the tube and air/water injection at the base of the tube. The tube is blocked during insertion and there is no boring or removal of spoil as the tube is inserted;

- When the steel tube has reached the required level it is withdrawn a short distance and at the same time sand is forced out of the base of the tube by compressed air;

- The level of the sand in the tube is monitored to ensure that the tube always contains sand and that the sediment around the tube is not allowed to collapse below the tube;

- The tube is then pushed back into the sand and vibrated back on top of the sand that has been deposited in the ground below the tube in order to increase the diameter of the sand column by pushing it out against the sediment and increasing the density of the sand at the same time; and

- When the desired diameter has been achieved (determined from the known volume of sand placed in the column) more sand is added to the tube and the process of sand placement and compaction is repeated and the process is continued until the sand compaction pile has reached the desired level.

D5-8.1.7 While the extraction of the steel tube during this process has the possibility of cause minor sediment plumes due to possible adherence of fine clay material to the outside of the device, given that the works are overall undertaken with the confines of the tube, SCPs have much less potential to release sediments into the marine environment during the construction process. SCPs are therefore, environmentally preferable to the fully dredged method of seawall construction in terms of water quality. However, as mentioned above for the purpose of this assessment, the worst case fully dredged method has been assumed and the numbers of equipment and sediment loss rates assumed reflects this.

D5-8.1.8 Figure 9 (sheet 1) shows the overall sequence for the northern reclamation. Following the dredging for the southern tip (portion N-C), work on the SCPs for portion N-B continues as work on construction of the seawall itself for Portion N-C commences. Reclamation filling for the southern tip will then commence and all three activities will be undertaken concurrently.

D5-8.1.9 Figure 9 (sheet 2) shows the overall sequence for the southern reclamation. In the same way, the seawall for the northern tip (Portion S-A) will be fully dredged to allow for the TBM works. The remaining seawall is proposed to be constructed using the minimum dredge SCP method but, again, in order to assess the worst case, this assessment has assumed all the seawall will be fully dredged. Once seawall construction has commenced for Portion S-A, as shown in Stage 2 of Figure 9 (sheet 2) sandfilling for the reclamation will also commence. As the HKBCF will contain the filing on the west, the leading seawall is on the east only. The process continues, with SCPs (assumed full dredging) for the seawall progressing in advance of seawall construction in advance of reclamation filling as shown in Stage 3 and 4 of Figure 9 (sheet 2).

D5-8.1.10 The southern viaduct is proposed to be constructed between January 2012 and February 2013. The viaduct will comprise approximately 50 piers with the 3 lane pile caps comprises 12 No. 1800mm diameter piles and the 2 and 1-lane slip roads both comprising 4 No. 1800mm each. The construction will commence on two work fronts and 15 piles could be working concurrently.

D5-8.2 Sediment Loss Rates

D5-8.2.1 Figure 7a presents the dredging and filling programmes. The Northern Landfall involves two dredging operations identified in Figure 7a as DN1 & DN2 and four filling operations identified as FN1-4. Similarly, the Southern Landfall involves three dredging operations identified as DS1-3 and six filling operations identified as FS1-6.

D5-8.2.2 The fill to be used includes both sand and rock/public fill (PF). In general, for seawall filling it is expected that 50% of public fill and rock will be used. In previous studies in Hong Kong, it has been assumed that the fines content (<63μm) in sand typically (dry density of 1,680kg/m^3) used should not exceed 5% and the same assumptions will be made. Public fill will be used principally when the reclamation level reaches +2.5mPD although some public fill may be used below that level. For the northern landfall, it is anticipated reclamation filling will be mainly using public fill while the for the southern reclamation, a mix of sand and PF will be used and the ratio of the two material is about 70% sand and 30% PF.

D5-8.2.3 Public fill materials are the inert portions of construction and demolition materials generated by construction and demolition activities. The use of public fill for reclamation is an innovative solution developed by CEDD to cope with the rapid generation of the C&D surplus material. Indeed, this is an environmentally sound solution as it reduces the amount of sand fill required and also encourages the reuse of C&D material. Following the General Specification of Civil Engineering Works (CED, 2002), public fill materials can be categorised as under water fill material (Type 2) as they do not consist of natural material excavated from the seabed or a riverbed. Based on the General Specification, public fill suitable for reclamation should have less than 25% fine content (<63um) and the Port Works Design Manual further suggested that type 2 under water fill should have a bulk density of 19 kN/m3 (=1900 kg/m^3). The restriction on fines content and other properties (plasticity index) are intended to limit the clay content of the fill material which would affect the overall temporal stability of seawalls. It will, thus, be assumed that the fine content in the public fill will be 25% at the most.

D5-8.2.4 When filling above +2.5mPD, zero losses of fine material to the surrounding waters has been assumed. Similarly, when using rock fill for the seawalls, it has been assumed that any fine material present is insignificant and zero loss of fine material has been assumed. In all cases where the construction of the seawall begins before any dredging or filling takes place for the reclamation, it has been assumed that any dredging or filling for the reclamation would begin 100-200m from the ends of the seawalls. The potential for fine sediment to escape into the surrounding water would be reduced significantly and, under these circumstances, it has been assumed that only a fraction of the potential loss of fines is released into the receiving waters at the entrance to the reclamation depending on the stage

of the completeness of the seawalls (Reference 11, 12, 16 and 17). The availability of the seawalls protection for reclamation dredging/filling is shown in the anticipated construction sequence drawing (Figure 9). The overall programme (Figure 7a) also indicate when the seawall protection can be assumed based on the anticipated works progress as indicated in the programme.

D5-8.2.5 It is anticipated that the dredging and filling works will proceed for 16 hours each day and that the grab dredging will be continuous throughout each working day. The sand filling will require each barge to make two deliveries per working day taking 45 minutes to offload on each trip.

D5-8.2.6 The maximum number of filling operations in any day is planned for the Northern Landfall Work Item FN1 when 6 pelican barges will make 2 trips each, a total of 12 filling operations with each lasting 45 minutes. As a result, all 12 filling operations can be accommodated with each 16-hour working day and there will be no need for more than one filling operation to take place at any one time. When simulating filling using pelican barges for each item of work, therefore, it will be assumed that the individual filling operations are spread evenly throughout the working day.

D5-8.2.7 For the bored piling works, it has been assumed that the excavation will proceed at a rate of 2,000kg/hour and that, as for grab dredging, a loss rate of conservative 20 kg/m^3 (cf. typical value used in Hong Kong ranged between $17kg/m^3$ – 20 kg/m^3; References 1, 5, 6, 11-18) would apply. However, when excavating bed sediments within the pile casing, the only opportunity for fine sediment to be lost to the surrounding waters will be when transferring the excavated material to a receiving barge which has been assumed to be equivalent to 5% of the typical total grab dredging losses (Reference 12). It has been estimated that the piles would be bored at a rate of 2,000kg/hour which, assuming a typical wet density for the seabed material of $1,340kg/m^3$ (Reference 12), is equivalent to a dredging rate of $1.5m^3$/hour. Based on a loss rate equivalent to 5% of $20kg/m^3$ dredged gives a loss rate of 0.0004kg/s.

D5-8.2.8 The numbers of dredgers and filling barges (pelican barges for sand fill and bottom dumping barges for public fill) for each dredging and filling operation at each landfall are presented in Tables 20 and 21. These tables also present the working rates (in-situ and un-bulked volumes) and expected sediment loss rates for each dredging and filling operation.

Table 20 TM-CLKL Northern Landfall: Summary of Losses of Sediment to Suspension (Dredging and Filling)

Work Item	Plant	No. of Plant	Working Rate (Note 1)	Loss Rate (kg/m^3)	Reduction Due to Seawalls	Sediment Losses (kg/s) (Note 2)	No. of barge events per day	Total Losses (kg/day) all plant	Material Assumed	No. of Active Plants	Daily No. of Plants Trips	Operation Time (min)	Daily Production Rate (Bulk volume, m3/day)
DN1	grab dredger	1	6,000	20	0%	2.08	-	120,000	-	1	1	960	7,200
FN1	dump barge (PF)	2	769	5% of 25% fines	0%	60.90	2	73,077	PF	1	4	5	4,000
FN2	dump barge (behind partial seawall)	6	769	5% of 25% fines	45%	33.49	2	120,577	PF	1	12	5	12,000
DN2	grab dredger	1	6,000	20	0%	2.08	-	120,000	-	1	1	960	7,200
FN3	dump barge (PF)	2	769	5% of 25% fines	0%	60.90	2	73,077	PF	1	4	5	4,000
FN4	dump barge (behind partial seawall)	6	769	5% of 25% fines	45%	33.49	2	120,577	PF	1	12	5	12,000
FN4	dump barge (behind full seawall)	6	769	5% of 25% fines	80%	12.18	2	43,846	PF	1	12	5	12,000
	Filling above +2.5mPD	-	-	0	-	-	-	-	-	-	-	-	-

Notes:

1. *All volumes mentioned are in situ volume except production rate which is based on bulked volume. The assumed bulking factor is 1.2 for grab dredging, 1.3 for filling barge and 1.5 for TSHD (if any). The working rate is per grab (m^3/day) or per barge/event (m^3).*
2. *The loss rate is per plant per event.*
3. *All plants assume daily working for 16 hour. Each pelican barge assume unloads in 45 minutes and dump barge assume unload in 5 minutes.*
4. *Partial Seawall = substantially completed seawall with 100-200m leading edge. Full Seawall = completed seawall with 50-100m opening gap for marine access.*
5. *When a mixture of public fill and rock (PF/Rock) are specified, only the portion of PF is included in the above calculation table. When a mixture of public fill and sand fill (PF/Sand) are specified, it is assumed to consist of 30% PF at the most. For calculation purpose, the filling barges for PF and sand is calculated separately using the ratio of 30/70, but rounded up for the PF barges to give a reasonable worse case estimate. The same principle applies to 50/50 PF/Rock fill calculation.*
6. *Operation time for grab dredgers is the total available time; for other plants is per event time.*
7. *The grab dredgers are assumed to be worked on site at all times.*
8. *The max. number of active filling barges is generally estimated as = (operation time x total no. of plant trips / 960) and rounded up to whole number.*

Table 21 TM-CLKL Southern Landfall: Summary of Losses of Sediment to Suspension Sediment (Dredging and Filling)

Work Item	Plant	No. of Plant	Working Rate (Note 1)	Loss Rate (kg/m^3)	Reduction Due to Seawalls	Sediment Losses (kg/s) (Note 2)	No. of barge events per day	Total Losses (kg/day) all plant	Material Assumed	No. of Active Plants	Daily No. of Plants Trips	Operation Time (min)	Daily Production Rate (Bulk volume, m3/day)
DS1	grab dredger	2	6,000	20	0%	2.08	-	240,000	-	2	2	960	14,400
FS1	dump barge (PF)	3	769	5% of 25% fines	0%	60.90	2	109,615	PF	1	6	5	6,000
FS2	filling barge (behind partial seawall)	3	769	-	45%	11.60	2	27,204	-	2	6	-	6,000
	dump barge	1	769	5% of 25% fines	45%	33.49	2	20,096	PF	1	2	5	2,000
	pelican barge	2	769	5% of 5% fines	45%	0.66	2	7,108	Sand	1	4	45	4,000
DS2	grab dredger	2	6,000	20	0%	2.08	-	240,000	-	2	2	960	14,400
FS3	dump barge (PF)	2	769	5% of 25% fines	0%	60.90	2	73,077	PF	1	4	5	4,000
FS4	filling barge (behind partial seawall)	3	769	-	45%	11.60	2	27,204	-	2	6	-	6,000
	dump barge	1	769	5% of 25% fines	45%	33.49	2	20,096	PF	1	2	5	2,000
	pelican barge	2	769	5% of 5% fines	45%	0.66	2	7,108	Sand	1	4	45	4,000
DS3	grab dredger	1	6,000	20	0%	2.08	-	120,000	-	1	1	960	7,200
FS5	dump barge (PF)	2	769	5% of 25% fines	0%	60.90	2	73,077	PF	1	4	5	4,000
FS6	pelican barge (behind partial seawall)	2	769	5% of 5% fines	45%	0.66	2	7,108	Sand	2	4	45	4,000
FS6	filling barge (behind full seawall)	3	769	-	45%	11.60	2	27,204	-	2	6	-	6,000
	dump barge	1	769	5% of 25% fines	45%	33.49	2	20,096	PF	1	2	5	2,000
	pelican barge	2	769	5% of 5% fines	45%	0.66	2	7,108	Sand	1	4	45	4,000
	Filling above +2.5mPD (public fill)	-	-	0	-	-	-	-	-	-	-	-	-
P	Piling for Viaducts	15	24	5% of 20	0%	0.0004	-	360	-	15	15	960	432

Notes:

1. *All volumes mentioned are in situ volume except production rate which is based on bulked volume. The assumed bulking factor is 1.2 for grab dredging, 1.3 for filling barge and 1.5 for TSHD (if any). The working rate is per grab (m^3/day) or per barge/event (m^3).*
2. *The loss rate is per plant per event.*
3. *All plants assume daily working for 16 hour. Each pelican barge assume unloads in 45 minutes and dump barge assume unload in 5 minutes.*
4. *Partial Seawall = substantially completed seawall with 100-200m leading edge. Full Seawall = completed seawall with 50-100m opening gap for marine access.*
5. *When a mixture of public fill and rock (PF/Rock) are specified, only the portion of PF is included in the above calculation table. When a mixture of public fill and sand fill (PF/Sand) are specified, it is assumed to consist of 30% PF at the most. For calculation purpose, the filling barges for PF and sand is calculated separately using the ratio of 30/70, but rounded up for the PF barges to give a reasonable worse case estimate. The same principle applies to 50/50 PF/Rock fill calculation.*

6. Operation time for grab dredgers is the total available time; for other plants is per event time.
7. The grab dredgers are assumed to be worked on site at all times.
8. The max. number of active filling barges is generally estimated as = (operation time x total no. of plant trips / 960) and rounded up to whole number.

D5-8.2.9 In Tables 20 and 21, it has been assumed that no mitigation measures, other than integrated advanced seawalls. The generally accepted sediment loss reduction rate by seawalls ranged between 75% - 100% (References 11, 12, 16 and 17). Based on a conservative assessment, it was proposed the reduction factor by a substantially completed seawall (with at least 100-200m leading edge) should be at least 45%. However, for a nearly completed seawall (with only 50-100m access opening), a 80% reduction should be assumed while that for a fully enclosed seawall without opening access, 100% reduction should be assumed. This is also inline with the generally accepted assumptions in the approved EIAs

D5-8.2.10 Based on the construction programme, the plant inventory for the construction works and the daily loss rates presented above, Figure 7a presents the total daily loss rates in kg/day for each month during the construction of the TM-CLKL. The daily production rate (bulk volume), daily no of plants trips and number of active plants (dredging and filling) on site are also included Table 20 and Table 21. Figures 7b, 7c and 7d present the overall programmes for the maximum daily production rate (bulk volume), the maximum daily number of plant trips and maximum number of active plants (dredging and filling) for the concurrent TM-CLKL+HKBCF+HKLR projects.

D5-9 HONG KONG BORDER CROSSING FACILITY (HKBCF)

D5-9.1 Background

D5-9.1.1 The proposed location of HKBCF is at the waters off the north-east of the Airport. In order to provide land for the various boundary crossing facilities, the reclamation area of HKBCF is about 130ha (excluding the area of about 18 ha for the southern landfall of TM-CLKL).

D5-9.1.2 It is anticipated that HKBCF would start construction in September 2010. In view of the tight construction programme to match with HZMB Main Bridge, the current planning is to complete the HKBCF in 2 phases. Phase 1 comprises a reclamation of about 100 ha to accommodate facilities for the operation of first few years and will be operational in 2014 or earlier and then Phase 2, comprising a reclamation of about 30 ha will be completed in 2016 to accommodate facilities for the long term needs of HKBCF.

D5-9.1.3 The dredging and filling works for both phases of the HKBCF, however, will begin in September 2010 and will finish in November 2013 and the programme for the reclamation is presented in Figure 7a with other projects.

D5-9.1.4 The HKBCF will include dredged and non-dredged reclamations and an immersed tube tunnel for the Automated Passenger Mover (APM) from the BCF to the airport island. One seawall may be constructed using Sand Compaction Piles (SCP) but while SCP has been successfully deployed overseas, it is still new to Hong Kong and, therefore, this method is subject to further review before its implementation. As SCPs are new to Hong Kong, a pilot study to confirm the local environmental performance shall be carried out during the initial stage of the consturcion in order to deterime whether additional mitigation measures are necessary in order to minimise all potential water quality impact. Also, as described in Section for TM-CLKL, SCP would have the potential to release less sediment into the water column. For these reasons, for the purposes of assessing worst case construction impacts, it will be assumed that all seawalls are fully dredged.

D5-9.1.5 In order to minimise the disposal of dredged material, priority has been given to consider non-dredged methods. For the seawall, the non-dredge method of Sand Compaction Piles (SCP) is proposed and band drains for the reclamation where possible. However, as both these methods are more time intensive, full dredging is required at some reclamation and seawalls in the HKBCF in order to meet the tight programme requirements and site constraints. The other site constraints for the HKBCF include the Airport Height Restriction which does not allow the use at some locations of the tall band drains machine for reclamation and the tall SCP machine for seawalls. Moreover, the shallow water depth at some site locations also prevents the use of SCP due to the up-heaving effect.

D5-9.1.6 The extent of dredged and non-dredged areas in HKBCF is shown in Figure 10. Based on the available site investigation results, the estimated quantity of the dredging and filing works in HKBCF is about 22.3 Mm^3 (in-situ volume) and 41.5 Mm^3 (in-situ volume) respectively.

D5-9.1.7 The reclamation sequence and envisaged construction programme of HKBCF is shown in Figures 10 to and the anticipated construction sequence in Figure 12. In general, it is envisaged that the reclamation works would start at Portion A of HKBCF Phase 1 first. In order to minimise the impact to the water quality, Portion A of HKBCF Phase 1 would be enclosed by the temporary seawall with a gap on the west side of about 100m for marine access before the reclamation filling. After completion of the reclamation filling in Portion A of HKBCF Phase 1, substantial length of seawalls would have been completed in Portions B and C of HKBCF Phase 1. Then the reclamation would be carried out in the sequence of Portion B, Portion C and finally Portion D of HKBCF Phase 1 and HKBCF Phase 2. The general reclamation sequence is as follows:

- Construct the temporary seawall and then reclamation filling in Portion A of HKBCF;
- Construct the seawalls at Portions B and C and start the reclamation filling in these areas;
- Start the construction of seawalls in HKBCF Phase 1;
- Dredging and filling for reclamation in Portion D; and
- Dredging and filling for reclamation in HKBCF Phase 2 after completion of the seawalls in HKBCF Phase 2.

D5-9.1.8 Assuming the reclamation of HKBCF commence in Aug 2010, the envisaged reclamation sequence is as follows:

1) Commence dredging for the temporary seawall at the north-west corner of Portion A in HKBCF Phase 1 and then along the perimeter of Portion A in the clockwise direction as shown in Stage 1 of Figure 12 (Sheet 1). This dredging activity is anticipated to be carried out from Sept 2010 to Mar 2011. After a portion of seawall trench is dredged, filling for seawall would also start from the north-west corner of Portion A and in the clockwise direction. A gap of about 100m seawall as shown in Stage 3 of Figure 12 (Sheet 2) would be left for the temporary marine access to enable the reclamation activities in Portion A. This section of seawall would be completed after the dredging and filling for reclamation in Portion A.

2) The dredging and filling for the seawall and reclamation of FSD rescue berth at the western side of HKBCF site would be carried out concurrently with Portion A as shown in Stages 1 and 2 of Figure 12 (Sheet 1).

3) Following completion of seawall dredging in Portion A, dredging for the reclamation in Portion A is anticipated to be commenced in Mar 2011. This dredging activity is anticipated to be commenced at the south-east corner of Portion A and in the direction of north-west towards the temporary access at the seawall. Meanwhile, seawall filling is continued at the western side of Portion A. As Portion A is small in area (about 500m X 250m), it is considered that the reclamation dredging and seawall filling in Portion A are carried out at the same time and no leading edge of seawall is assumed in this case.

4) As shown in Stage 3 of Figure 12 (Sheet 2), reclamation filling of Portion A is anticipated to be commenced in June 2011 after completion of the seawall filling in Portion A. Therefore, the reclamation filling of Portion A would be carried out within the area enclosed by seawall (except the 100m gap). Reclamation filling of Portion A would start at the south-east corner of Portion A and in the direction of north-west similar to the reclamation dredging of Portion A. The reclamation of Portion A is anticipated to be completed in Aug 2011.

5) While the seawall dredging and filling in Portion A is on-going, the dredging and filling for seawall in Portions B and C are also carried out concurrently. The direction of these activities is from the north-east corner of Portion A and in clockwise direction as shown in Stages 1 to 3 of Figure 12 (Sheets 1 and 2). In addition, a short section of seawall in Portion C at the western edge (i.e underneath Portion A) would also be constructed between Jan 2011 to Mar 2011.

6) After completion of the seawall in Portion C and the seawall up to nearly half of the southern edge of HKBCF site in Portion B, the reclamation filling in Portion C and reclamation dredging in Portion B would start at the north-east corner of Portions C and B respectively. The locations and directions of above reclamation dredging and filling are shown in Stage 3 of Figure 12 (Sheet 2). In this case, the leading edge of seawall is about 200m for the above activities.

7) The seawall in Portion B is anticipated to be completed in Jul 2011 leaving a gap for the temporary marine access at the south-west corner of Portions B and C as shown in Stage 4 of Figure 12 (Sheet 2). Then the reclamation dredging of Portion B would complete in Sept 2011 and the reclamation filling of Portions B and C would continue in the direction of south-west towards the above temporary marine access. After the completion of seawall in Jul 2011, the reclamation filling of Portions B and C would be carried out in the area enclosed by the seawall (except the 100m gap). The reclamation filling of Portions B and C are anticipated to be completed in Nov 2011 and Mar 2012 respectively.

8) After completion of the seawall in Portions B and C, the seawall dredging of HKBCF Phase 2 would start at the south-west corner of HKBCF Phase 2 and proceed in the clockwise direction. The seawall filling of HKBCF Phase 2 would also start when a portion of seawall trench is dredged and ready to receive the seawall fill. The location and direction of above reclamation dredging and filling are shown in Stage 4 of Figure 12 (Sheet 2).

9) Dredging and filling for the installation of immerse tube tunnel of Automatic People Mover (APM) are anticipated to be carried out from Feb 2012 to Jan 2013 which overlaps with the dredging and filling of seawall in HKBCF Phase 2 in Mid 2012.

10) After completion of dredging and filling for the immerse tube tunnel, the construction plant are anticipated to be moved to Portion D of HKBCF Phase 1. The seawall dredging would start at the south-east corner of Portion D and in the clockwise direction. The seawall filling is to follow when a portion of seawall trench is dredged and ready to receive the seawall fill. The seawall at Portion D is anticipated to be completed in May 2013. The temporary marine access mentioned in 7) above is moved to the south-east corner of Portion D. This 100m gap of seawall would be completed after the reclamation fill of Portion D is completed.

11) The reclamation dredging in Portion D is from the west to east with some overlapping with the seawall filling activity in Portion D. In this case, no leading edge of seawall is assumed. After completion of the seawall (except the above gap for temporary marine access), the reclamation filling would be carried out in the enclosed area of Portion D.

12) The seawall in HKBCF Phase 2 is anticipated to be completed in August 2012 leaving a gap of about 100m at the north-east corner to allow for the temporary marine access for the reclamation activities in HKBCF Phase 2. After the area of HKBCF Phase 2 is enclosed by the seawall (except the 100m gap), the reclamation dredging for the APM tunnel and underground station within HKBCF Phase 2 would be carried out . The reclamation filling would also be carried out within the area enclosed by the seawall as shown in Stage 7 of Figure 12 (Sheet 4).

13) The reclamation of HKBCF is completed after the filling in Phase 2 and completion of remaining section of seawall allow for the temporary marine access.

D5-9.1.9 As the landscape bund and other facilities for HKBCF are being considered, it is possible that the final layout of HKBCF would be larger than the current layout. In this case, in order to sasses the worst case situation, for the purposes of the water quality assessment and modelling, a 10% bigger reclamation and 10% increase in the plant for reclamation works has been assumed for the HKBCF, so as to take account of the above situation.

D5-9.1.10 The road viaduct stretching from the north-western corner of the HKBCF to the Airport Island will comprise 50m span piers which will be constructed using bored piling. The Immersed Tube Tunnel for the APM will require full dredging, followed by backfilling with sand and rock amour protection once the tunnel unit has been placed.

D5-9.2 Sediment Loss Rates

D5-9.2.1 Figure 7a presents the dredging and filling programme and it can be seen that there are seven separate dredging operations identified as (1) to (7) and six filling operations identified as (a) to (f).

D5-9.2.2 The fill to be used includes both sand and rock/public fill. The characteristics of the fill material is generally similar to those discussed for TM-CLKL although the material for seawall filling is generally assumed to be 70/30 of sand and public fill, except the very late stage when only rock fill is assumed.

D5-9.2.3 When filling above +2.5mPD, zero losses of fine material to the surrounding waters has been assumed. Similarly, when using rock fill for the seawalls, it has been assumed that any fine material present is insignificant and zero loss of fine material has been assumed. In all cases where the construction of the seawall begins before any dredging or filling takes place for the reclamation, it has been assumed that any dredging or filling for the reclamation would begin 100-200m from the ends of the seawalls. The potential for fine sediment to escape into the surrounding water would be reduced significantly and, under these circumstances, it has been assumed that only a fraction of the potential loss of fines is released into the receiving waters at the entrance to the reclamation depending on the stage of the completeness of the seawalls (Reference 11, 12, 16 and 17). The availability of the seawalls protection for reclamation dredging/filling is shown in the anticipated construction sequence drawing (Figure 12). The overall programme (Figure 7a) also indicate when the seawall protection can be assumed based on the anticipated works progress as indicated in the programme.

D5-9.2.4 It is anticipated that the dredging and filling works will proceed for 16 hours each day and that the grab dredging will be continuous throughout each working day. A TSHD may be used for dredging operation (2 and 7) and it is assumed that it will work 24 hours per day and make 3 trips per day. The sand filling will require each barge to make two deliveries per working day taking 45 minutes to offload on each trip.

D5-9.2.5 The numbers of dredgers and filling barges for each dredging and filling operation are presented in Table 22. This table also presents the working rates (in-situ and un-bulked volumes) and expected sediment loss rates for each dredging and filling operation.

Table 22 HKBCF: Summary of Losses of Sediment to Suspension

Work Item	Plant	No. of Plant	Working Rate (Note 1)	Loss Rate (kg/m^3)	Reduction Due to Seawalls	Sediment Losses (kg/s) (Note 2)	No. of barge events per day	Total Losses (kg/day) all plant	Material Assumed	No. of Active Plants	Daily No. of Plants Trips	Operation Time (min)	Daily Production Rate (Bulk volume, m3/day)
Dredging													
(1)	grab dredger	7	6,000	20	0%	2.08	-	840,000	-	7	7	960	50,400
(1)	grab dredger (behind partial seawall)	7	6,000	20	45%	1.15	-	462,000	-	7	7	960	50,400
(2)	TSHD ($9,000m^3$) (behind partial seawall)	1	27,000	7	45%	9.6	3	103,950	-	1	3	60	40,500
	grab dredger (behind partial seawall)	3	6,000	20	45%	1.15	-	198,000	-	3	3	960	21,600
(3)	grab dredger	5	6,000	20	0%	2.08	-	600,000	-	5	5	960	36,000
(3)	grab dredger (behind partial seawall)	5	6,000	20	45%	1.15	-	330,000	-	5	5	960	36,000
(4)	grab dredger	4	6,000	20	0%	2.08	-	480,000	-	4	4	960	28,800
(5)	grab dredger (behind full seawall)	3	6,000	20	80%	0.42	-	72,000	-	3	3	960	21,600
(6)	grab dredger	2	6,000	20	0%	2.08	-	240,000	-	2	2	960	14,400
(7)	TSHD ($9,000m^3$)	1	27,000	7	0%	17.5	3	189,000	-	1	3	60	40,500
	grab dredger	7	6,000	20	0%	2.08	-	840,000	-	7	7	960	50,400
Filling													
(a)	filling barge	44	769	-	0%	20.19	2	705,385	-	4	88	-	88,000
	dump barge	14	769	5% of 25% fines	0%	60.90	2	511,538	PF	1	28	5	28,000
	pelican barge	30	769	5% of 5% fines	0%	1.20	2	193,846	Sand	3	60	45	60,000
(a)	filling barge (behind partial seawall)	44	769	-	45%	11.11	2	387,962	-	4	88	-	88,000
	dump barge	14	769	5% of 25% fines	45%	33.49	2	281,346	PF	1	28	5	28,000
	pelican barge	30	769	5% of 5% fines	45%	0.66	2	106,615	Sand	3	60	45	60,000
(a)	filling barge (behind full seawall)	44	769	-	80%	4.04	2	141,077	-	4	88	-	88,000
	dump barge	14	769	5% of 25% fines	80%	12.18	2	102,308	PF	1	28	5	28,000
	pelican barge	30	769	5% of 5% fines	80%	0.24	2	38,769	Sand	3	60	45	60,000
(b)	filling barge	44	769	-	0%	20.19	2	705,385	-	4	88	-	88,000
	dump barge	14	769	5% of 25% fines	0%	60.90	2	511,538	PF	1	28	5	28,000
	pelican barge	30	769	5% of 5% fines	0%	1.20	2	193,846	Sand	3	60	45	60,000
(b)	filling barge (behind partial seawall)	44	769	-	45%	11.11	2	387,962	-	4	88	-	88,000
	dump barge	14	769	5% of 25% fines	45%	33.49	2	281,346	PF	1	28	5	28,000
	pelican barge	30	769	5% of 5% fines	45%	0.66	2	106,615	Sand	3	60	45	60,000
(b)	filling barge (behind full seawall)	44	769	-	80%	4.04	2	141,077	-	4	88	-	88,000
	dump barge	14	769	5% of 25% fines	80%	12.18	2	102,308	PF	1	28	5	28,000

Work Item	Plant	No. of Plant	Working Rate (Note 1)	Loss Rate (kg/m^3)	Reduction Due to Seawalls	Sediment Losses (kg/s) (Note 2)	No. of barge events per day	Total Losses (kg/day) all plant	Material Assumed	No. of Active Plants	Daily No. of Plants Trips	Operation Time (min)	Daily Production Rate (Bulk volume, m3/day)
	pelican barge	30	769	5% of 5% fines	80%	0.24	2	38,769	Sand	3	60	45	60,000
(c)	filling barge	20	769	-	0%	19.11	2	309,692	-	3	40	-	40,000
	dump barge	6	769	5% of 25% fines	0%	60.90	2	219,231	PF	1	12	5	12,000
	pelican barge	14	769	5% of 5% fines	0%	1.20	2	90,462	Sand	2	28	45	28,000
(c)	filling barge (behind full seawall)	20	769	-	80%	3.82	2	61,938	-	3	40	-	40,000
	dump barge	6	769	5% of 25% fines	80%	12.18	2	43,846	PF	1	12	5	12,000
	pelican barge	14	769	5% of 5% fines	80%	0.24	2	18,092	Sand	2	28	45	28,000
(d)	filling barge (behind full seawall)	17	769	-	80%	4.45	2	58,062	-	3	34	-	34,000
	dump barge	6	769	5% of 25% fines	80%	12.18	2	43,846	PF	1	12	5	12,000
	pelican barge	11	769	5% of 5% fines	80%	0.24	2	14,215	Sand	2	22	45	22,000
(e)	filling barge	11	769	-	0%	22.91	2	191,385	-	2	22	-	22,000
	dump barge	4	769	5% of 25% fines	0%	60.90	2	146,154	PF	1	8	5	8,000
	pelican barge	7	769	5% of 5% fines	0%	1.20	2	45,231	Sand	1	14	45	14,000
(e)	filling barge (behind partial seawall)	11	769	-	45%	12.60	2	105,262	-	2	22	-	22,000
	dump barge	4	769	5% of 25% fines	45%	33.49	2	80,385	PF	1	8	5	8,000
	pelican barge	7	769	5% of 5% fines	45%	0.66	2	24,877	Sand	1	14	45	14,000
(f)	filling barge	66	769	-	0%	19.29	2	1,028,000	-	6	132	-	132,000
	dump barge	20	769	5% of 25% fines	0%	60.90	2	730,769	PF	1	40	5	40,000
	pelican barge	46	769	5% of 5% fines	0%	1.20	2	297,231	Sand	5	92	45	92,000

Notes:

1. *All volumes mentioned are in situ volume except production rate which is based on bulked volume. The assumed bulking factor is 1.2 for grab dredging, 1.3 for filling barge and 1.5 for TSHD (if any). The working rate is per grab or TSHD (m^3/day) or per barge/event (m^3).*
2. *The loss rate is per plant per event.*
3. *All plants assume daily working for 16 hour, except TSHD in which 24 hour is assumed. Each pelican barge assume unloads in 45 minutes and dump barge assume unload in 5 minutes.*
4. *Partial Seawall = substantially completed seawall with 100-200m leading edge. Full Seawall = completed seawall with 50-100m opening gap for marine access.*
5. *When a mixture of public fill and rock (PF/Rock) are specified, only the portion of PF is included in the above calculation table. When a mixture of public fill and sand fill (PF/Sand) are specified, it is assumed to consist of 30% PF at the most. For calculation purpose, the filling barges for PF and sand is calculated separately using the ratio of 30/70, but rounded up for the PF barges to give a reasonable worse case estimate.*
6. *Operation time for grab dredgers is the total available time; for other plants is per event time.*
7. *The grab dredgers are assumed to be worked on site at all times.*
8. *The max. number of active filling barges is generally estimated as = (operation time x total no. of plant trips / 960) and rounded up to whole number.*

D5-9.2.6 Based on the calculated loss rates for each dredging and filling operation, Figure 7a also presents the total daily loss rates for each month during the construction programme. The daily production rate (bulk volume), daily no of plants trips and number of active plants (dredging and filling) on site are also included Table 20 and Table 21. Figures 7b, 7c and 7d present the overall programmes for the maximum daily production rate (bulk volume), the maximum daily number of plant trips and maximum number of active plants (dredging and filling) for the concurrent TM-CLKL+HKBCF+HKLR projects.

D5-9.2.7 In Table 22, it has been assumed that no mitigation measures, other than integrated advanced seawalls. The generally accepted sediment loss reduction rate by seawalls ranged between 75% - 100% (References 11, 12, 16 and 17). Based on a conservative assessment, it was proposed the reduction factor by a substantially completed seawall (with at least 100-200m leading edge) should be at least 45%. However, for a nearly completed seawall (with only 50-100m access opening), a 80% reduction should be assumed while that for a fully enclosed seawall without opening access, 100% reduction should be assumed. This is also inline with the generally accepted assumptions in the approved EIAs

D5-9.2.8 If each pelican barge filling event takes 45 minutes, the maximum number of filling events which can be carried out during each 16 hour working day without any concurrent filling from more than one barge is 21, equivalent to 10 barges making 2 trips per day. As a result, all pelican barge filling operations, except (e), required for the HKBCF will involve two or more barges offloading simultaneously for at least part of each filling event. In the model studies, the sediment loss for these pelican barges filling will be assumed to be continuous at a constant rate (total loss by all plants divided by the duration of works) through out the working time.

D5-9.2.9 For some dredging works, the dredging plant could be distributed over more than one item of work. For example, seawall dredging for Portions B & C. In these cases, the dredging plant will be assumed to be evenly distributed over the concurrent items of work.

D5-10 HZMB HONG KONG LINK ROAD (HKLR)

D5-10.1 Background

D5-10.1.1 The HKLR is a dual 3-lane carriageway of about 12km long connecting the HKBCF with the HZMB Main Bridge at the HKSAR boundary. The section of HKLR from the HKSAR boundary to Scenic Hill at the Airport is in the form of viaducts. The section of the HKLR between Scenic Hill and the HKBCF comprises a tunnel through Scenic Hill and the tunnel/at-grade road at the reclamation of about 19ha along the east coast of the Airport with viaducts at the end for final connection with HKBCF.

D5-10.1.2 The reclamation layout and construction sequencing of the HKLR is shown in Figures 13 and 14. Based on the available site investigation results, the estimated quantity of the dredging and filing works in HKBCF is about 4.0 Mm^3 (in-situ volume) and 5.0 Mm^3 (in-situ volume) respectively.

D5-10.1.3 The dredging and filling works required for the seawalls and reclamation for the HKLR are programmed to begin in February 2011 and end in January 2013 while the piling works for the bridge sections are programmed to begin in June 2011 and finish in December 2013. The construction programme is presented in Figure 7a with other projects.

D5-10.1.4 In general, the reclamation works of HKLR would be carried out in 3 portions. The general reclamation sequence is as follows:

- Construct the seawall at Portion 1 of HKLR. A gap of about 100m will be allows at the seawall for marine access during the reclamation works. The seawall at this small gap will be completed after the reclamation filling;
- Dredging and filling of the reclamation in Portion 1;
- Dredging and filling of the reclamation and seawalls in Portion 2. The reclamation in Portion 2 is small and, therefore, it is envisaged that the dredging and filling works of reclamation and seawall would be carried out at the same time; and
- Dredging and filling of the reclamation and seawalls in Portion 3. Similar to the case in Portion 2, the dredging and filling works of reclamation and seawall would be carried out at the same time.

D5-10.1.5 For the piled foundation of viaduct, bored piles would be adopted and, therefore, the excavated materials within the bored piles will need to be disposed. The envisaged construction sequence and programme of the piling works of the viaducts in HKLR is shown in Figures 7, 13 and 14. In general, it is anticipated that the piling works would be carried out on two work fronts, in the direction from west to east in the Airport channel and the area between HKSAR boundary and San Shek Wan. For the San Shek Wan section, the engineer advised that there are 105 piers and 35 consecutive piers could be working concurrently at time. For

the Airport Channel Section, the engineer advised that there are 30 piers and 10 piers could be working concurrently at time.

D5-10.1.6 Similar to HKBCF, it is assumed that a 10% bigger reclamation and 10% increase in the plant for reclamation works in the water quality modelling of HKLR. This assumption is made to take account of the possible widening of the existing East Coast Road at Airport Island and, thus, the reclamation in HKLR need to be enlarged to accommodate it in this case.

D5-10.2 Sediment Loss Rates

D5-10.2.1 The reclamation works have been divided into 3 portions and, in each portion, the same dredging and filling plant (3 grab dredgers and 14 filling barges) and working rates will be employed for the construction of the seawalls and reclamations. The characteristics of the fill material is generally similar to those discussed for TM-CLKL although the material for seawall filling is generally assumed to be 70/30 of sand and public fill, except the very late stage when only rock fill is assumed.

D5-10.2.2 When filling above +2.5mPD, zero losses of fine material to the surrounding waters has been assumed. Similarly, when using rock fill for the seawalls, it has been assumed that any fine material present is insignificant and zero loss of fine material has been assumed. In all cases where the construction of the seawall begins before any dredging or filling takes place for the reclamation, it has been assumed that any dredging or filling for the reclamation would begin 100-200m from the ends of the seawalls. The potential for fine sediment to escape into the surrounding water would be reduced significantly and, under these circumstances, it has been assumed that only a fraction of the potential loss of fines is released into the receiving waters at the entrance to the reclamation depending on the stage of the completeness of the seawalls (Reference 11, 12, 16 and 17). The availability of the seawalls protection for reclamation dredging/filling is shown in the anticipated construction sequence drawing (Figure 14). The overall programme (Figure 7a) also indicate when the seawall protection can be assumed based on the anticipated works progress as indicated in the programme.

D5-10.2.3 Based on a 16-hour working day and assuming the grab dredgers work continuously and that each filling barge makes two trips per day, the calculated loss rates are presented in Figure 7a and Table 23. The daily production rate (bulk volume), daily no of plants trips and number of active plants (dredging and filling) on site are also included Table 20 and Table 21. Figures 7b, 7c and 7d present the overall programmes for the maximum daily production rate (bulk volume), the maximum daily number of plant trips and maximum number of active plants (dredging and filling) for the concurrent TM-CLKL+HKBCF+HKLR projects.

D5-10.2.4 For the bored piling works, it has been assumed that the excavation will proceed at a rate of 2,000kg/hour and that, as for grab dredging, a loss rate of 20kg/m^3 would apply. However, when excavating bed sediments within the pile casing, the only opportunity for fine sediment to be lost to the surrounding waters will be when transferring the excavated material to a receiving barge which has been

assumed to be equivalent to 5% of the typical total grab dredging losses (Reference 12). It has been estimated that the piles would be bored at a rate of 2,000kg/hour and, assuming a typical wet density of 1,340kg/m^3 (Reference 12), is equivalent to a dredging rate of 1.5m^3/hour. Based on a loss rate equivalent to 5% of 20kg/m^3 dredged gives a loss rate of 0.0004kg/s.

Table 23 HKLR: Summary of Losses of Sediment to Suspension (Dredging and Filling)

Work Item	Plant	No. of Plant	Working Rate (Note 1)	Loss Rate (kg/m^3)	Reduction Due to Seawalls	Sediment Losses (kg/s) (Note 2)	No. of barge events per day	Total Losses (kg/day) all plant	Material Assumed	No. of Active Plants	Daily No. of Plants Trips	Operation Time (min)	Daily Production Rate (Bulk volume, m3/day)
(1)	grab dredger	3	6,000	20	0%	2.08	-	360,000	-	3	3	960	21,600
(1)	grab dredger (behind partial seawall)	3	6,000	20	45%	1.15	-	198,000	-	3	3	960	21,600
(1)	grab dredger (behind full seawall)	3	6,000	20	80%	0.42	-	72,000	-	3	3	960	21,600
(a)	filling barge	14	769	-	0%	22.52	2	240,846	-	2	28	-	28,000
	dump barge	5	769	5% of 25% fines	0%	60.90	2	182,692	PF	1	10	5	10,000
	pelican barge	9	769	5% of 5% fines	0%	1.20	2	58,154	Sand	1	18	45	18,000
(b)	filling barge (behind partial seawall)	14	769	-	45%	12.39	2	132,465	-	2	28	-	28,000
	dump barge	5	769	5% of 25% fines	45%	33.49	2	100,481	PF	1	10	5	10,000
	pelican barge	9	769	5% of 5% fines	45%	0.66	2	31,985	Sand	1	18	45	18,000
(b)	filling barge (behind full seawall)	14	769	-	80%	4.50	2	48,169	-	2	28	-	28,000
	dump barge	5	769	5% of 25% fines	80%	12.18	2	36,538	PF	1	10	5	10,000
	pelican barge	9	769	5% of 5% fines	80%	0.24	2	11,631	Sand	1	18	45	18,000
(p1)	Bored Piling (Marine)	35	24	1	0%	0.0004	-	836	-	35	35	960	1,003
(p2)	Bored Piling (Marine)	10	24	1	0%	0.0004	-	239	-	10	10	960	287
(p3)	Bored Piling (Non Marine)	-	-	-	-	-	-	-	-	-	-	-	-

Notes:

1. *All volumes mentioned are in situ volume except production rate which is based on bulked volume. The assumed bulking factor is 1.2 for grab dredging, 1.3 for filling barge and 1.5 for TSHD (if any). The working rate is per grab or TSHD (m^3/day) or per barge/event (m^3).*
2. *The loss rate is per plant per event.*
3. *All plants assume daily working for 16 hour, except TSHD in which 24 hour is assumed. Each pelican barge assume unloads in 45 minutes and dump barge assume unload in 5 minutes.*
4. *Partial Seawall = substantially completed seawall with 100-200m leading edge. Full Seawall = completed seawall with 50-100m opening gap for marine access.*
5. *When a mixture of public fill and rock (PF/Rock) are specified, only the portion of PF is included in the above calculation table. When a mixture of public fill and sand fill (PF/Sand) are specified, it is assumed to consist of 30% PF at the most. For calculation purpose, the filling barges for PF and sand is calculated separately using the ratio of 30/70, but rounded up for the PF barges to give a reasonable worse case estimate.*
6. *Operation time for grab dredgers is the total available time; for other plants is per event time.*
7. *The grab dredgers are assumed to be worked on site at all times.*
8. *The max. number of active filling barges is generally estimated as = (operation time x total no. of plant trips / 960) and rounded up to whole number.*

D5-10.2.5 In Table 23, it has been assumed that no mitigation measures, other than integrated advanced seawalls. The generally accepted sediment loss reduction rate by seawalls ranged between 75% - 100% (References 11, 12, 16 and 17). Based on a conservative assessment, it was proposed the reduction factor by a substantially completed seawall (with at least 100-200m leading edge) should be at least 45%. However, for a nearly completed seawall (with only 50-100m access opening), a 80% reduction should be assumed while that for a fully enclosed seawall without opening access, 100% reduction should be assumed. This is also inline with the generally accepted assumptions in the approved EIAs.

D5-11 SUMMARY

D5-11.1 Introduction

D5-11.1.1 With respect to the potential construction impacts, principally elevations in suspended solids concentrations in Hong Kong coastal waters, which could arise during the construction of the TM-CLKL+HKBCF+HKLR, there are a number of concurrent construction projects which could give rise to cumulative impacts as discussed in preceding chapters of this Appendix.

D5-11.1.2 In this Chapter, each of the TM-CLKL, HKBCF, HKLR and all concurrent projects are re-assessed with respect to the worst case dredging and filling scenarios.

D5-11.1.3 The construction of the HKBCF will begin in September 2010 with the construction of the HKLR beginning in February 2011 and the TM-CLKL in November 2011.

D5-11.1.4 Once construction begins for the HKBCF, the construction of the first seawalls will proceed relatively rapidly. The works will begin with the dredging of trenches for the seawalls. This will then be followed by sand filling of the trenches followed by rock filling for the seawalls. As the works progress, the number of concurrent works for the TM-CLKL, HKBCF and HKLR will increase and, with respect to the models studies, it is intended to simulate construction impacts for three scenarios representative of:

1) The initial construction works when dredging and filling rates are at their maximum but when the construction works will have had little impact on existing tidal flows;
2) An intermediate stage when dredging and filling rates are still large and significant changes to local tidal flows can be expected due to the completion of large parts of the reclamations;
3) The final stages of construction when dredging and filling rates are still large and it can be expected that any major changes to the local tidal flow patterns which the completed reclamations might generate will have already become established.

D5-11.1.5 These scenarios will be simulated for wet and dry season conditions and the impacts due to the construction of the TM-CLKL+HKBCF+HKLR will be simulated when no mitigation measures is applied (i.e., unmitigated projects only), when appropriate mitigation measures (i.e., mitigated projects only) are applied and when concurrent projects are also included in the mitigated situation. Therefore, a total of nine construction scenarios for wet and dry season conditions will be simulated (i.e., 18 cases).

D5-11.2 Proposed Construction Phases to be Simulated in the Model Studies

D5-11.2.1 Based on the anticipated works progress for the TM-CLKL, HKBCF and HKLR as illustrated in Figures 8 to 23, the tentative plant inventory for each construction activities, the anticipated production rate and the potential sediment loss associated with them have as calculated and shown in Tables 20 to 23. The

potential sediment loss for these activities are put in the programme timeline as shown in Figure 24 (this is the same as Figure 7a, but repeated here for clarity). Figure 24 also include consideration of the construction activities in relation to the progress of seawalls construction and where application, potential reduction in sediment loss due to the presences of the seawalls are incorporated. With Figure 24, the total daily loss rate for all three projects can be determined and the montly total sediment loss rate are presented in Figure 25.

D5-11.2.2 It should be note that there are several built-in conservative mechanisms to ensure the Figures 24 and 25 will not underestimate the potential sediment loss and these are summarised below:

- The engineering programme provided are weekly (TM-CLKL) or bi-weekly (HKBCF and HKLR). For the purpose of this exercise, however, monthly programme is used and, thus, allow for certain degree of variation in the works progress. All activities scheduled in a month are assumed to be concurrent within that month. One exception to this is when the engineer indicate the same set of plants would be required for different activities. In this case, the set of plants are either split by half (indicated with "/2" in Figure 24) or assigned to the works that could potentially leading to a higher sediment loss rate (e.g., area without seawall protection) (marked as "linked activities" in Figure 24);
- In assigning the fleets of filling barges for various fill material, instead of a simple pro-rata calculation, the number of barge for each fill material is calculated separately using the ratio of fill material, but rounded up for the public fill barges to give a conservative estimate as the fine contents of public fill materials is generally higher (see Tables 20-23);
- A 10% increase in the plant and, hence, the production rate for reclamation works has been assumed for the HKBCF and HKLR;
- The potentially more environmental friendly sand compaction piles (SCP) seawall is assumed to have the same potential of sediment release as a fully dredged seawall;
- The assumed sediment loss rate for grab dredger (20 kg/m^3) is highly conservative compared with other studies in this area; and
- The assumed potential reduction by advanced seawalls are conservative.

D5-11.2.3 Based on Figure 25, it can be seen that loss rates peak shortly after the start of construction of the HKBCF in February 2011, peak again in April 2012 before decreasing rapidly after April 2013.

D5-11.2.4 The extent of completed construction and construction and activities in progress for the TM-CLKL, HKBCF and HKLR in February 2011, April 2012 and April

2013 are summarised in Figures 15 to 23. It should be noted there these Figures are prepared based on the anticipated works progress at the selected scenario time frame provided by the engineers. As such, it is a reasonable accurate reflection of the anticipated construction progress and planned activities of the scenario time.

D5-11.2.5 In February 2011 (Figures 15, 18 and 21), construction of the TM-CLKL will not have begun but dredging for the seawall (Portion 1) of the HKLR will be about to begin. Some seawall sections for the HKBCF will have been completed in Portion A and C which will have some impacts on local tidal flows. However, concern has been expressed over possible siltation in the airport sea channel as a result of sediment losses during the construction works for the TM-CLKL+HKBCF+HKLR and, in February 2011, the potential loss rates are at their maximum near the start of the project at locations close to the eastern entrance to the sea channel.

D5-11.2.6 In April 2012 (Figures 16, 19 and 22), most of the seawalls for the HKBCF will have been completed and it is expected that local tidal flows will have changed significantly compared to existing conditions. Dredging and filling for the seawalls at the north east extent of the HKBCF will be underway and dredging and filling for the seawall at the north east tip of the southern reclamation for the TM-CLKL will also be underway Filling of the TM-CLKL southern reclamation will also have begun and bored piling works for the viaduct connections will have begun. Any sediment lost to suspension in the north eastern extent of the southern reclamations will be exposed to the relatively strong tidal currents between the new reclamations and Tai Mo To and are likely to be transported from the dredging and filling areas along the northern side of the airport where sensitive receivers (artificial reefs and the Sha Chau and Lung Kwu Chau Marine Park) may be impacted.

D5-11.2.7 Dredging for the HKLR seawalls in Portions 2 and 3 will also be underway in April 2012 and, at the TM-CLKL northern landfall, the seawalls and reclamation in Portion N-C will be being filled and the seawalls in Portions N-A and N-B will be being dredged.

D5-11.2.8 In April 2013 (Figures 17, 20 and 23), dredging and filling for the seawalls and reclamation for the HKBCF Portion D and filling for the Phase 2 reclamation will be underway. The TM-CLKL northern land fall reclamation (Portions N-A and N-B) will be being filled but behind completed seawalls and so no significant sediment losses are anticipated. At the TM-CLKL southern reclamation, sand filling of Portions S-B and seawall dredging and filling for Portion S-C will be underway. All seawalls and reclamations will be nearing completion and any changes to the tidal flow regime as a result of the completed reclamations will have become established. After April 2013, dredging and filling rates reduce rapidly and it is proposed that April 2013 should be simulated in the model studies as the scenario towards the end of the construction works when there remains the potential for significant impacts from sediment losses to suspension.

D5-11.2.9 The overall programme for the construction of the TM-CLKL+HKBCF+HKLR and all concurrent projects is presented in Figure 24. For the proposed target dates of February 2011 and April 2012, all relevant concurrent projects will be

underway. In April 2012, the Lantau Logistics park dredging and filling works will be fully protected with advanced seawalls and silt curtain and no sediment loss will be assumed but all other concurrent projects will still be underway and, apart from the HZMB (which is discussed further below), the expected sediment loss rates for these concurrent projects are not expected to change significantly during the course of the construction of the TM-CLKL+HKBCF+HKLR. One exception might be the new contaminated mud pit at East of Sha Chau / South Brothers where backfilling of one pit may coincide with the excavation of the next pit.

D5-11.2.10 The proposed target dates for the simulations fall in February and April. In February each year, it is expected that dry season conditions will prevail. In April, however, local tidal hydraulic conditions could be representative of either wet or dry season conditions depending on the freshwater discharge from the Pearl River Delta. While it is expected that the construction programme will begin in September 2010, and so the start of the dredging and filling works will coincide with dry season conditions, it is proposed that all scenarios are simulated for both wet and dry season conditions.

D5-11.2.11 In summary, it is proposed that the three target dates of February 2011, April 2012 and April 2013 are used as the basis for the simulations of construction impacts.

D5-11.3 Proposed Modelling scenarios

D5-11.3.1 For the three target dates selected above, construction impacts for each of the target dates for the TMCLKL+HKBCF+HKLR are simulated both with and without special mitigation measures (apart from the integrated advanced seawalls) and then the mitigated scenario with the concurrent projects. These simulations will allow an assessment to be made of both the cumulative impacts which might arise during the construction works and the construction impacts which might be generated by the TMCLKL+HKBCF+HKLR works on their own. This would give a total of 9 construction scenarios (identified as P1-P9) to be simulated for wet and dry season conditions. While it is common practice to employ silt curtains around grab dredgers and when filing reclamations, initially the simulations do not include these mitigation measures to allow identification of potential extend of the construction impacts.

D5-11.3.2 For the 3 selected scenario years, not all the construction activities indicated in Tables 20-23 are relevant to the modelling. Those relevant activities and the corresponding daily sediment loss rate can be directly read from Figure 24. As a summary, the relevant activities and modelling parameters for the 3 scenario year are presented in Tables 24-26 below.

Table 24 Summary of Relevant Project Works Item and Loss Rate for 2011 Scenario

Works Items	Works Description	Plant	No. of Plant	Working Rate (Note 1)	Loss Rate (kg/m^3) (Note 2)	Reduction due to Seawalls	No. of barge events per day	Total Losses (kg/day) - All Plants	Material	Plant ID	Sediment Loss Rate (kg/s)	Frequency	Duration of Each Operation
BCF (f)	Filling with public fill	dump barge	20	769	5% of 25% fines	-	2	730,769	PF	BCFfd	60.9	19.5 minutes	5 minutes
BCF (f)	Filling with sand	pelican barge	46	769	5% of 5% fines	-	2	297,231	Sand	BCFfp	5.2	continuous	-
BCF (7)	Dredging	grab dredger	7	6,000	20	-	-	840,000	-	BCF7	14.6	continuous	-
BCF (7)	Dredging	TSHD (9,000m3)	1	27,000	7	-	3	189,000	-	BCF7t	17.5	7 hours	1 hour
BCF (a)	Filling with public fill	dump barge	14	769	5% of 25% fines	-	2	511,538	PF	BCFad	60.9	30 minutes	5 minutes
BCF (a)	Filling with sand	pelican barge	30	769	5% of 5% fines	-	2	193,846	Sand	BCFap	3.4	continuous	-
BCF (1)	Dredging	grab dredger	7	6,000	20	-	-	840,000	-	BCF1	14.6	continuous	-
BCF (e)	Filling with public fill	dump barge	4	769	5% of 25% fines	-	2	146,154	PF	BCFed	60.9	131 minutes	5 minutes
BCF (e)	Filling with sand	pelican barge	7	769	5% of 5% fines	-	2	45,231	Sand	BCFep	1.2	25 minutes	-
BCF (6)	Dredging	grab dredger	2	6,000	20	-	-	240,000	-	BCF6	4.2	continuous	-
LR (1)	Dredging	grab dredger	3	6,000	20	-	-	360,000	-	LR1	6.3	continuous	-

Notes:

1. The working rate is per grab or TSHD (m^3/day) or per barge/event (m^3).

2. The loss rate is per plant per event.

3. All plants assume daily working for 16 hour, except TSHD in which 24 hour is assumed. Each pelican barge assume unloads in 45 minutes and dump barge assume unload in 5 minutes.

4. The last 4 columns (grey) provided specific details about the model input.

Table 25 Summary of Relevant Project Works Item and Loss Rate for 2012 Scenario

Works Items	Works Description	Plant	No. of Plant	Working Rate (Note 1)	Loss Rate (kg/m^3) (Note 2)	Reduction due to Seawalls	No. of barge events per day	Total Losses (kg/day) - All Plants	Material	Plant ID	Sediment Loss Rate (kg/s)	Frequency	Duration of Each Operation
BCF (e)	Filling with public fill	dump barge	4	769	5% of 25% fines	-	2	146,154	PF	BCFed	60.9	131 minutes	5 minutes
BCF (e)	Filling with sand	pelican barge	7	769	5% of 5% fines	-	2	45,231	Sand	BCFep	1.2	25 minutes	45 minutes
BCF (6)	Dredging	grab dredger	2	6,000	20	-	-	240,000	-	BCF6	4.2	continuous	-
BCF (4)	Dredging	grab dredger	4	6,000	20	-	-	480,000	-	BCF4	8.3	continuous	-
BCF (c)	Filling with public fill	dump barge	6	769	5% of 25% fines	-	2	219,231	PF	BCFcd	60.9	81.5 minutes	5 minutes
BCF (c)	Filling with sand	pelican barge	14	769	5% of 5% fines	-	2	90,462	Sand	BCFcp	1.6	continuous	-
LR (b)	Filling with public fill	dump barge	5	769	5% of 25% fines	80%	2	36,538	PF	LRbd	12.2	101 minutes	5 minutes
LR (b)	Filling with sand	pelican barge	9	769	5% of 5% fines	80%	2	11,631	Sand	LRbp	0.2	8.5 minutes	45 minutes
LR (1)	Dredging	grab dredger	3	6,000	20	-	-	360,000	-	LR1	6.3	continuous	-
TM (FN2)	Filling with public fill	dump barge	6	769	5% of 25% fines	45%	2	120,577	PF	TMFN2	33.5	81.5 minutes	5 minutes
TM (DN2)	Dredging	grab dredger	1	6,000	20	-	-	120,000	-	TMDN2	2.1	continuous	-
TM (FS2)	Filling with public fill	dump barge	1	769	5% of 25% fines	45%	2	20,096	PF	TMFS2d	33.5	8 hours	5 minutes
TM (FS2)	Filling with sand	pelican barge	2	769	5% of 5% fines	45%	2	7,108	Sand	TMFS2p	0.7	4 hours	45 minutes
TM (FS1)	Filling with public fill	dump barge	3	769	5% of 25% fines	-	2	109,615	PF	TMFS1	60.9	3 hours	5 minutes
TM (P)	Bored Piling	grab dredger	15	24	5% of 20	-		360		TMPx	6.3E-03	continuous	-
LR (p1)	Bored Piling	grab dredger	35	24	5% of 20	-	-	836		LRpx	1.5E-02	continuous	-
LR (p2)	Bored Piling	grab dredger	10	24	5% of 20	-	-	239		LRpx	4.1E-03	continuous	-

Notes:

1. The working rate is per grab or TSHD (m^3/day) or per barge/event (m^3).

2. The loss rate is per plant per event.

3. All plants assume daily working for 16 hour, except TSHD in which 24 hour is assumed. Each pelican barge assume unloads in 45 minutes and dump barge assume unload in 5 minutes.

4. The last 4 columns (grey) provided specific details about the model input.

Table 26 Summary of Relevant Project Works Item and Loss Rate for 2013 Scenario

Works Items	Works Description	Plant	No. of Plant	Working Rate (Note 1)	Loss Rate (kg/m^3) (Note 2)	Reduction due to Seawalls	No. of barge events per day	Total Losses (kg/day) - All Plants	Material	Plant ID	Sediment Loss Rate (kg/s)	Frequency	Duration of Each Operation
BCF (d)	Filling with public fill	dump barge	6	769	5% of 25% fines	80%	2	43,846	PF	BCFdd	12.2	81.5 minutes	5 minutes
BCF (d)	Filling with sand	pelican barge	11	769	5% of 5% fines	80%	2	14,215	Sand	BCFdp	0.2	continuous	-
BCF (3)	Dredging	grab dredger	5	6,000	20	-	-	600,000	-	BCF3	10.4	continuous	-
BCF (b)	Filling with public fill	dump barge	14	769	5% of 25% fines	-	2	511,538	PF	BCFbd	60.9	30 minutes	5 minutes
BCF (b)	Filling with sand	pelican barge	30	769	5% of 5% fines	-	2	193,846	Sand	BCFbp	3.4	continuous	-
TM (FN4)	Filling with sand	dump barge	6	769	5% of 25% fines	45%	2	120,577	PF	TMFN4	33.5	81.5 minutes	5 minutes
TM (FS4)	Filling with public fill	dump barge	1	769	5% of 25% fines	45%	2	20,096	PF	TMFS4d	33.5	8 hours	5 minutes
TM (FS4)	Filling with sand	pelican barge	2	769	5% of 5% fines	45%	2	7,108	Sand	TMFS4p	0.7	4 hours	-
TM (FS5)	Filling with public fill	dump barge (PF)	2	769	5% of 25% fines	-	2	73,077	-	TMFS5	60.9	5 hours	5 minutes
TM (DS3)	Bored Piling	grab dredger	1	6,000	20	-	-	120,000	-	TMDS3	2.1	continuous	-
LR (p1)	Bored Piling	grab dredger	35	24	5% of 20	-	-	836		LRpx	1.5E-02	continuous	-

Notes:

1. The working rate is per grab or TSHD (m^3/day) or per barge/event (m^3).

2. The loss rate is per plant per event.

3. All plants assume daily working for 16 hour, except TSHD in which 24 hour is assumed. Each pelican barge assume unloads in 45 minutes and dump barge assume unload in 5 minutes.

4. The last 4 columns (grey) provided specific details about the model input.

D5-11.3.3 As noted in previous section, the rate at which the contaminated mud pits are backfilled depends on the rate of supply of contaminated material and so is uncertain. In order to ensure that the worst case scenario with respect to the contaminated mud pits is simulated, it was previously proposed to assumed that, for each simulation period, one pit is being backfilled while another is being excavated at the same time (Reference 1). However, based on further discussion with CEDD, it was advised it could be more likely that Pit Va be developed earlier and both Pit IVc and Va be backing in early 2011. At early 2012, both Pit Va and Vb could be backfilling while Vc being constructed. At early 2013, Pit Vc backfilling while Pit Vd and also the South Brothers Pit A and Pit B be constructed. As the number of plants involved and concurrent work sites based on this anticipated progress is higher, it is considered more appropriate to assume this as the worse case for the CMPs.

D5-11.3.4 Based on the anticipated programme from Advanced Work Coordination Group Project Office of HZMB (Reference 9) , the seawalls for the artificial islands will have been completed in January 2011 and filling of the reclamations will be underway. As a result, the cumulative construction impact scenario for February 2011 will include the expected losses of fine sediment to suspension during the filling operation behind almost completed seawalls. It is assumed that 5% of the sand fill will be fine (<63μm) and it is normally assumed that, in unconfined waters, 5% of that fine material will be lost to suspension. However, when filling behind the almost completed seawalls, it will be assumed that only 15% of that potential loss rate would be achieved. The filling rate is anticipated to be equivalent to 23 barges of 800m^3 capacity per day with a total daily loss rate of 17,940m3/day at each island. As a result, for the simulation of February 2011, it will be assumed that 23 bottom dumping barges arrive at 1-hour intervals at each island with a loss of 780kg/fill event.

D5-11.3.5 As explained before, however, to allow for possible programme slippage, it will be assumed that the seawall construction is still in progress at early 2011. A fleet of 3 TSHDs dredging at the side of the island closer to Hong Kong and each making 2 cycles per day will be assumed. As the mainland authority has confirmed the 3 TSHDs will not be working concurrently and the daily working hour is 8, it will be assumed that the 3 TSHDs will be working sequentially and the first cycle start in the morning while the second cycle start in the afternoon. As discussed before, each dredging cycle will last 70 minutes and it will be assumed that sediment losses are 28.2kg/s for the first 10 minutes of each cycle increasing to 31kg/s (28.2 kg/s draghead + 2.8 kg/s for overflow) for the remaining 60 minutes of each cycle. For the tunnel filling, it will be assumed that the fill is placed using bottom dumping barges with a capacity of 800m^3. The loss of fine sediment to suspension would then be equivalent to 3,200kg/event using the assumptions in Table 16. To achieve the expected filling rates of 6,375m^3/day around 8 barge loads of sand per day will be assumed.

D5-11.3.6 In April 2012 and April 2013, filling the artificial island reclamations will have

been completed and dredging for the tunnel trench will be underway. The tunnel dredging will begin at the western end of the tunnel and proceed at around 200m/month beginning in October 2011. As a result, dredging should be taking place approximately 1.5km from the western end of the tunnel in April 2012.

D5-11.3.7 It is proposed, therefore, that the cumulative construction impact scenario for the HZMB in April 2012 includes 3 TSHDs each completing 2 dredging cycles in an 8 hour working day are simulated 1.5km from the western end of the HZMB tunnel section. If the time taken to complete a dredging and disposal cycle for the tunnel dredging is similar to that for the nearby dredging in Zone III of the Tonggu Channel, a complete cycle could take just over 4 hours (282 minutes). However, for the worst case, it will be assumed that 2 dredging cycles can be completed by each of the three TSHD each day. Similar to the seawall trench dredging for artificial island, it will be assumed the 3 TSHDs will be working sequentially and each dredging cycle will last 70 minutes. It will also be assumed that sediment losses are 28.2kg/s for the first 10 minutes of each cycle increasing to 31kg/s for the remaining 60 minutes of each cycle. For the tunnel filling, it will be assumed that the fill is placed using bottom dumping barges with a capacity of $800m^3$. The loss of fine sediment to suspension would then be equivalent to 3,200kg/event using the assumptions in Table 16. To achieve the expected filling rates of $6,375m^3$/day around 8 barge loads of sand per day will be assumed.

D5-11.3.8 In April 2013, dredging of the tunnel will be continuing and, after 19 months work, the dredging site should be around 4km from the western end of the trench. For the simulation of cumulative impacts in April 2013, therefore, the dredging losses described above for April 2012 will be simulated 4km from the western end of the tunnel trench.

D5-11.3.9 Once each tunnel section has been put in position, the trench will be backfilled with sand at a rate of $6,375m^3$/day with a potential loss rate of fine material of 5,200kg/event. In the cumulative impact simulations for April 2012 and April 2013, it will be assumed that sand filling takes place 200m behind the dredging site with 8 barges arriving at 3-hourly intervals each day.

D5-11.3.10 In setting up the scenarios, it will be necessary to select locations at which it will be assumed the dredgers and sand barges are working. Based on the expected construction programmes for the TM-CLKL, HKBCF, HKLR and all concurrent projects and the dredging and filling plant to be used for each item of work, Figures 26 to 31 present the working locations for each piece of plant in the selected target years.

D5-11.3.11 Figures 32 and 33 also presents a summary of all the tidal flow and construction impact simulations which are planned to be carried out.

D5-12 REFERENCES

1 Detailed Site Selection Study for a Proposed Contaminated Mud Disposal Facility within the Airport East/East of Sha Chau Area Agreement No. CE 12/2002(EP), ERM May 2005

2 Environmental Impact Assessment Report for Tonggu Channel of Shenzhen Port, December 2005. CINOTECH Consultants Ltd in association with Black & Veatch Hong Kong Ltd

3 Communication between HDPI and ARUP

4 Scoping the Assessment of Sediment Plumes from Dredging. Construction Industry Research and Information Association (CIRIA) Publication C547, 2000.

5 Environmental Assessment Study for Backfilling of Marine Borrow Pits at North of the Brothers, Agreement No GEO 01/2001

6 Permanent Aviation Fuel Facility. EIA Report. Environmental Permit EP-139/200, Mouchel, 2002.

7 港珠澳大橋工程海洋環境影響報告書(2008 年十月)(HZMB OEIA).

8 Communication between HyD and HDPI.

9 Meeting between HyD and the Advance Work Coordination Group Project Office of Hongkong-Zhuihai-Macao Bridge.

10 Silt Protector, Taiyo Kogyo Corporation

11 Agreement No. CE 87/2001 (CE) Further Development of Tseung Kwan O Feasibility Study, Environmental Impact Assessment.

12 Agreement No. CE 39/2001Shenzhen Western Corridor - Investigation and Planning Environmental Impact Assessment Report, September 2002.

13 Agreement No. CE 74/98: Wan Chai Development Phase II Comprehensive Feasibility Study. Environmental Impact Assessment.

14 Agreement No. CE 42/2005 (WS) Laying of Western Cross Harbour Main and Associated Land Mains From West Kowloon to Sai Ying Pun – Investigation.

15 Agreement No. CE 35/2006(CE) Kai Tak Development Engineering Study cum Design and Construction of Advance Works – Investigation, Design and Construction. Dredging Works for Proposed Cruise Terminal at Kai Tak.

16 Liquefied Natural Gas (LNG) Receiving Terminal and Associated Facilities

17 Agreement No. CE 60/96). Northshore Lantau Development Feasibility Study

Figure 1 Existing and Proposed Mud Pits at East of Sha Chau and South Brothers

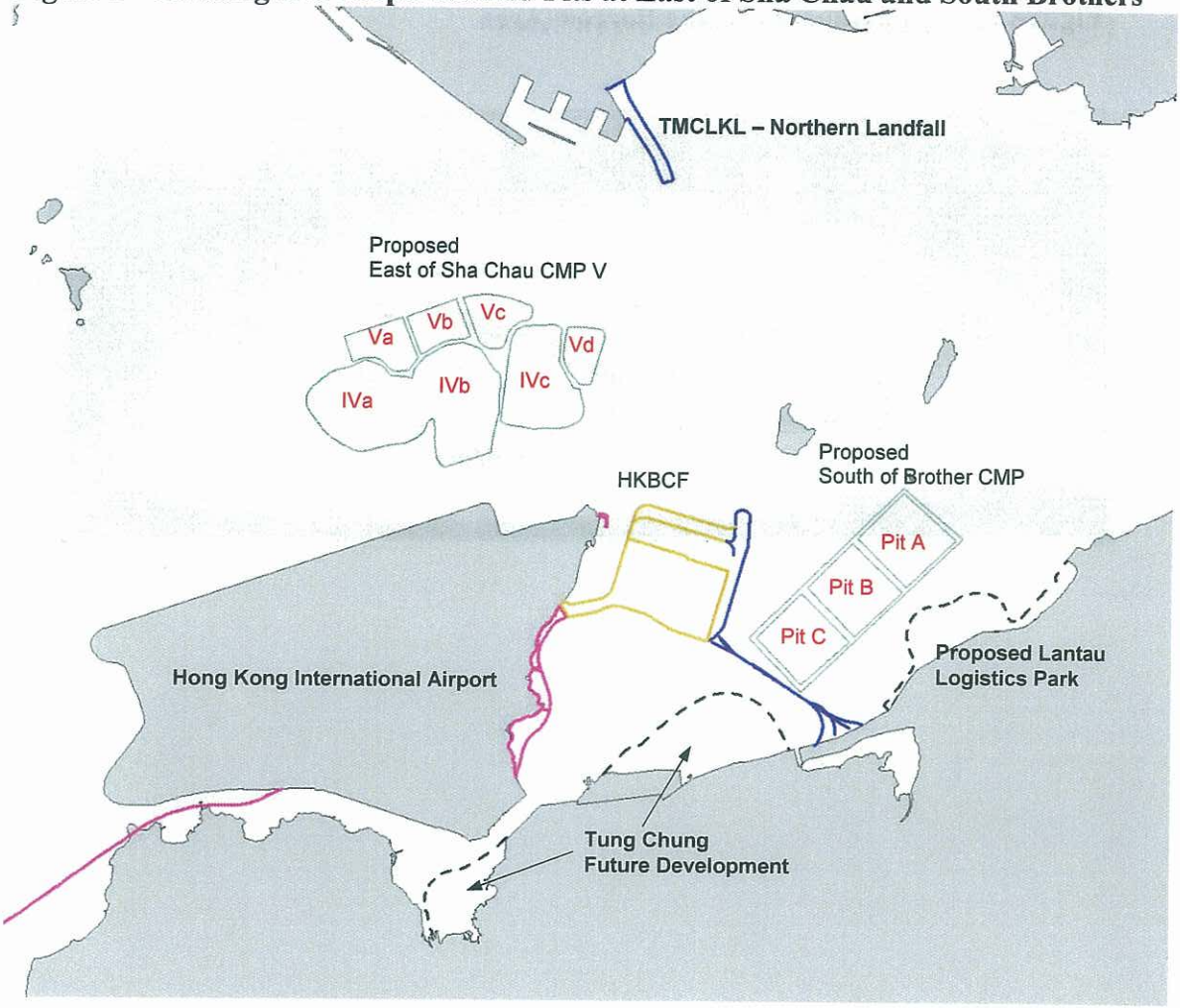


Figure 2 North Brothers Marine Borrow Area

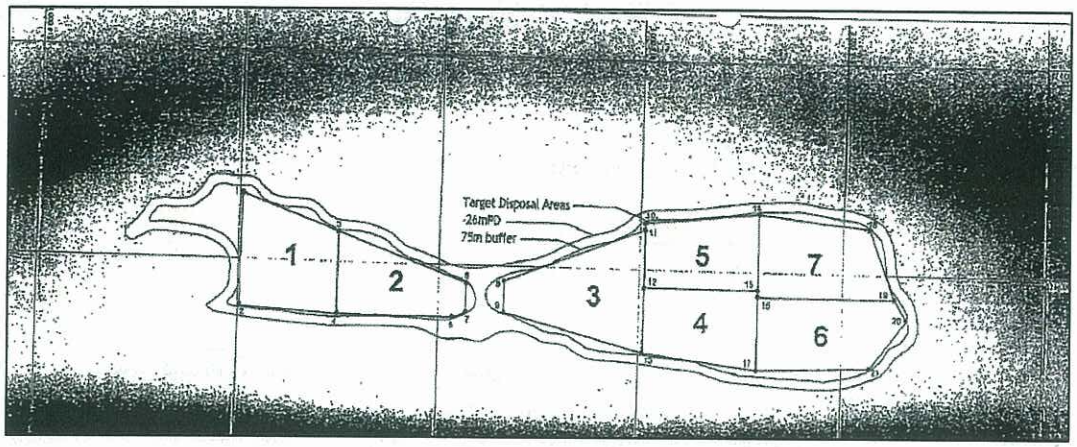


Figure 3 Location of the Tonggu Channel and Disposal Grounds for Tonggu Channel Maintenance Dredging

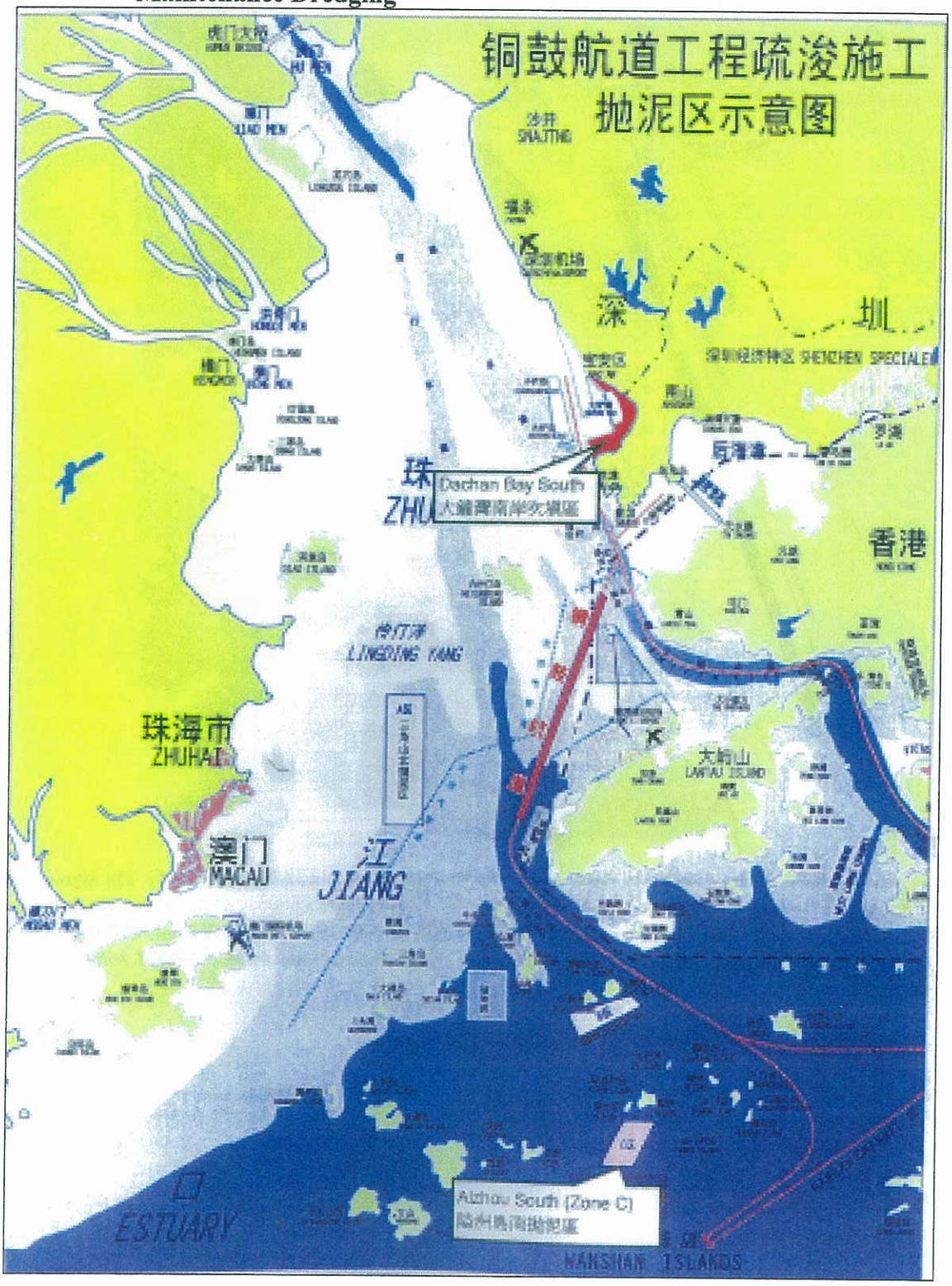
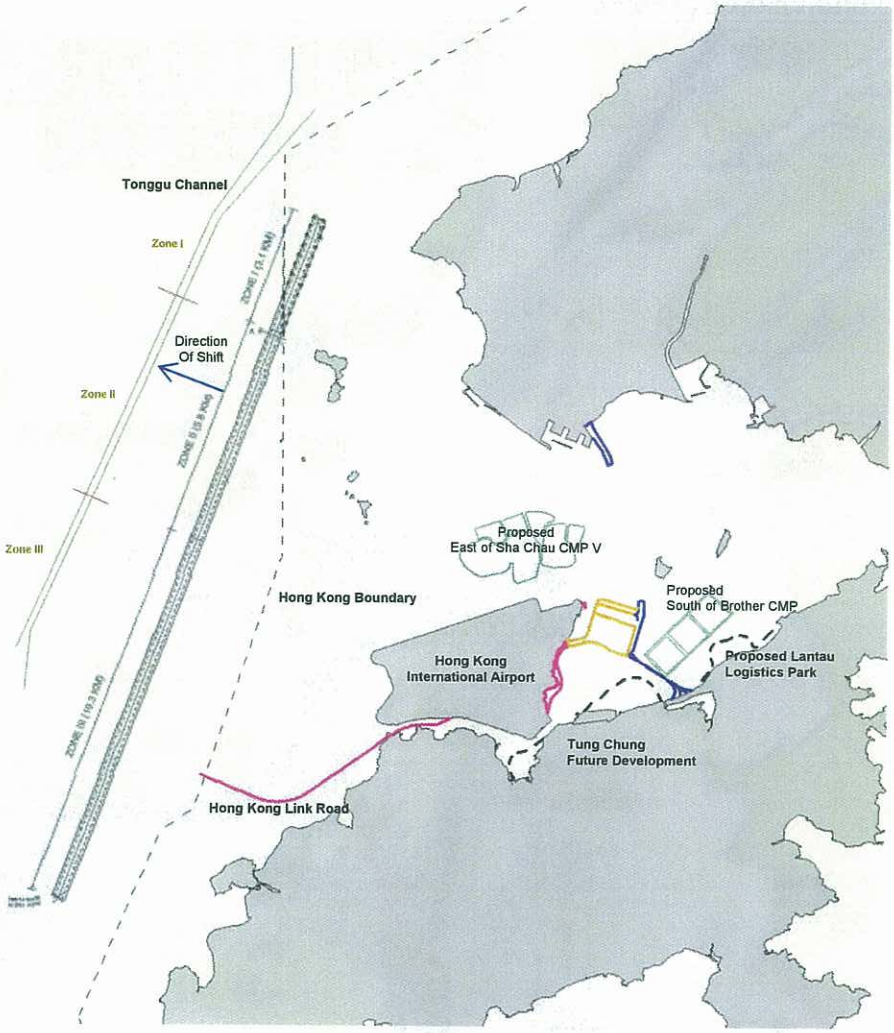


Figure 4 Tonggu Channel Showing Dredging Zones I to III



The grey lines indicate the alignment and zones as per the Tonggu Channel EIA Report (2005). The brown lines indicate the actual location of Tonggu Channel based on the marine chart (80831) of the Pearl River Estuary updated to 2008 produced by the Maritime Safety Administration of the PRC. The actual alignment is parallel to the one indicated in the Tonggu Channel EIA Report and the delineation the three dredging zones are shift accordingly.

Figure 5 Proposed Hong Kong Zhuhai Macau Bridge

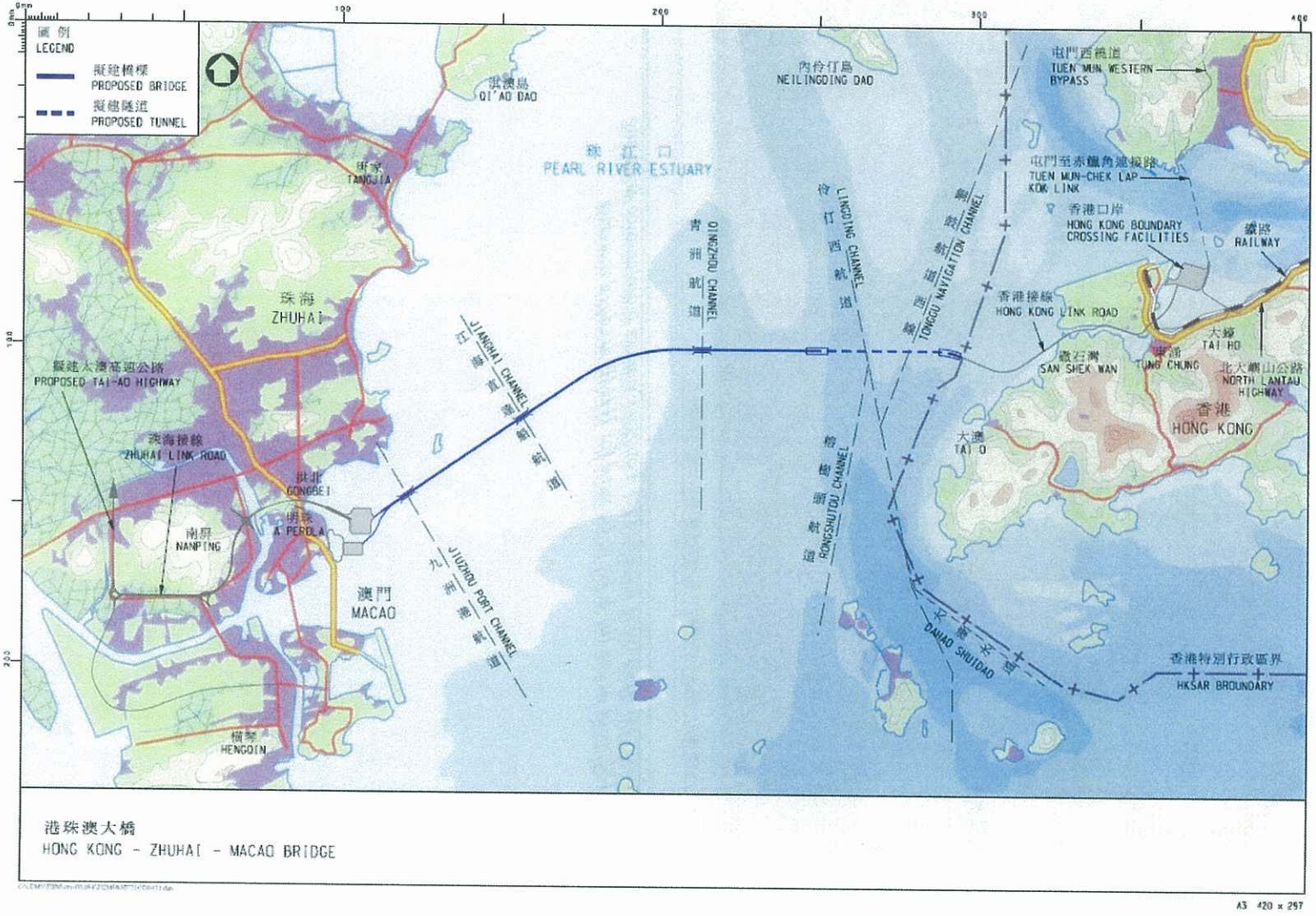
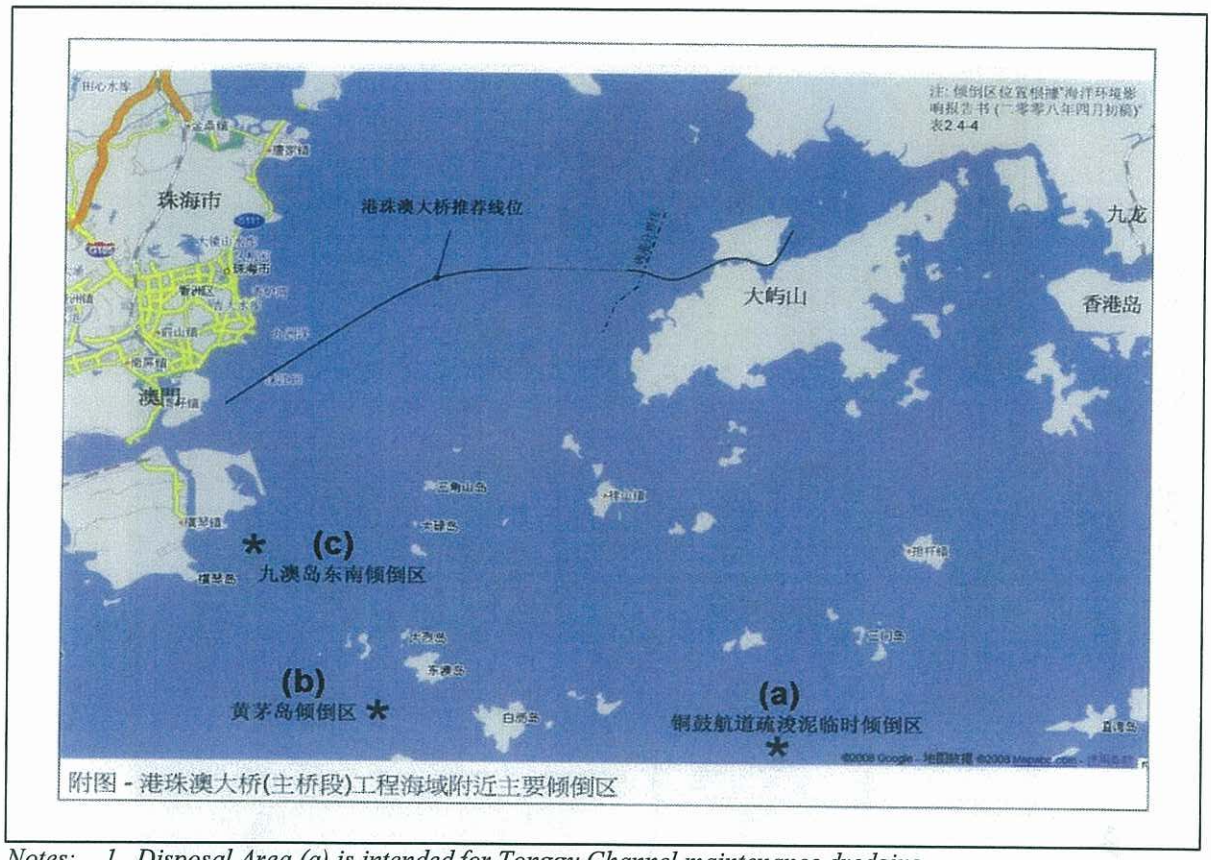
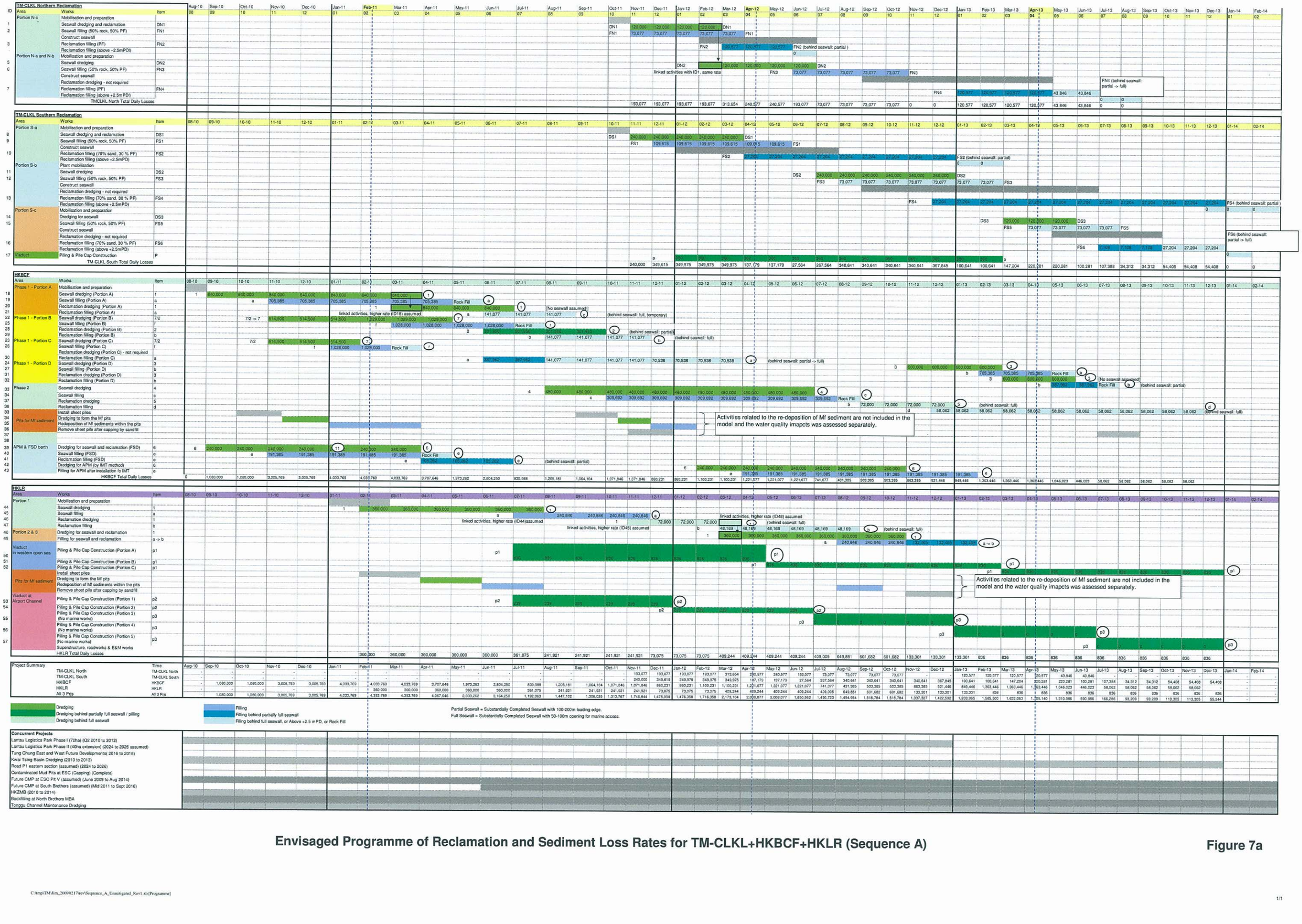


Figure 6 Location of Disposal Grounds for HZMB Dredged Material



Notes: 1 Disposal Area (a) is intended for Tonggu Channel maintenance dredging
2 Disposal Areas (b) & (c) to be used for HZMB dredged material



Envisaged Programme of Reclamation and Sediment Loss Rates for TM-CLKL+HKBCF+HKLR (Sequence A)

Figure 7a

Sequence A

A. TM-CLKL Northern Reclamation

ID	Area	Works	Item
	Portion N-c	Mobilisation and preparation	
1		Seawall dredging and reclamation	DN1
2		Seawall filling (50% rock, 50% PF)	FN1
		Construct seawall	
3		Reclamation filling (PF)	FN2
		Reclamation filling (above +2.5mPD)	
	Portion N-a and N-b	Mobilisation and preparation	
5		Seawall dredging	DN2
6		Seawall filling (50% rock, 50% PF)	FN3
		Construct seawall	
		Reclamation dredging - not required	
7		Reclamation filling (PF)	FN4
		Reclamation filling (above +2.5mPD)	
		Total Daily Production Rate	

B. TM-CLKL Southern Reclamation

	Area	Works	Item
	Portion S-a	Mobilisation and preparation	
8		Seawall dredging and reclamation	DS1
9		Seawall filling (50% rock, 50% PF)	FS1
		Construct seawall	
10		Reclamation filling (70% sand, 30 % PF)	FS2
		Reclamation filling (above +2.5mPD)	
	Portion S-b	Plant mobilisation	
11		Seawall dredging	DS2
12		Seawall filling (50% rock, 50% PF)	FS3
		Construct seawall	
		Reclamation dredging - not required	
13		Reclamation filling (70% sand, 30 % PF)	FS4
		Reclamation filling (above +2.5mPD)	
	Portion S-c	Mobilisation and preparation	
14		Dredging for seawall	DS3
15		Seawall filling (50% rock, 50% PF)	FS5
		Construct seawall	
		Reclamation dredging - not required	
16		Reclamation filling (70% sand, 30 % PF)	FS6
		Reclamation filling (above +2.5mPD)	
17	Viaduct	Piling & Pile Cap Construction	P
		Total Daily Production Rate	

C. HKBCF

	Area	Works	Item
	Phase 1 - Portion A	Mobilisation and preparation	
18		Seawall dredging (Portion A)	1
19		Seawall filling (Portion A)	a
20		Reclamation dredging (Portion A)	1
21		Reclamation filling (Portion A)	a
22	Phase 1 - Portion B	Seawall dredging (Portion B)	7/2
25		Seawall filling (Portion B)	f
28		Reclamation dredging (Portion B)	2
29		Reclamation filling (Portion B)	b
23	Phase 1 - Portion C	Seawall dredging (Portion C)	7/2
26		Seawall filling (Portion C)	f
		Reclamation dredging (Portion C) - not required	
30		Reclamation filling (Portion C)	a
24	Phase 1 - Portion D	Seawall dredging (Portion D)	3
27		Seawall filling (Portion D)	b
31		Reclamation dredging (Portion D)	3
32		Reclamation filling (Portion D)	b
33	Phase 2	Seawall dredging	4
34		Seawall filling	c
37		Reclamation dredging	5
38		Reclamation filling	d
33		Install sheet piles	
34	Pits for Mf sediment	Dredging to form the Mf pits	
35		Redeposition of Mf sediments within the pits	
36		Remove sheet pile after capping by sandfill	
39	APM & FSD barth	Dredging for seawall and reclamation (FSD)	6
40		Seawall filling (FSD)	e
41		Reclamation filling (FSD)	e
42		Dredging for APM (by IMT method)	6
43		Filling for APM after installation to IMT	e
		Total Daily Production Rate	

D. HKLR

	Area	Works	Item
	Portion 1	Mobilisation and preparation	
44		Seawall dredging	1
45		Seawall filling	a
46		Reclamation dredging	1
47		Reclamation filling	b
48	Portion 2 & 3	Dredging for seawall and reclamation	1
49		Filling for seawall and reclamation	a -> b
50	Viaduct in western open sea	Piling & Pile Cap Construction (Portion A)	p1
51		Piling & Pile Cap Construction (Portion B)	p1
52		Piling & Pile Cap Construction (Portion C)	p1
		Install sheet piles	
	Pits for Mf sediment	Dredging to form the Mf pits	
		Redeposition of Mf sediments within the pits	
		Remove sheet pile after capping by sandfill	
53	Viaduct at Airport Channel	Piling & Pile Cap Construction (Portion 1)	p2
54		Piling & Pile Cap Construction (Portion 2)	p2
55		Piling & Pile Cap Construction (Portion 3) (No marine works)	p3
56		Piling & Pile Cap Construction (Portion 4) (No marine works)	p3
57		Piling & Pile Cap Construction (Portion 5) (No marine works)	p3
		Superstructure, roadworks & E&M works	
		Total Daily Production Rate	

E. Project Summary

	Time
TM-CLKL North	TM-CLKL North
TM-CLKL South	TM-CLKL South
HKBCF	HKBCF
HKLR	HKLR
All 3 Prjs	All 3 Prjs

Dredging
Dredging behind partially full seawall / pilling
Dredging behind full seawall

Filling
Filling behind partially full seawall
Filling behind full seawall, or Above +2.5 mPD, or Rock Fill

Partial Seawall = Substantially Completed Seawall with 100-200m leading edge.
Full Seawall = Substantially Completed Seawall with 50-100m opening for marine access.

F. Summary of Project Activities

		Max rate
TM-CLKL North	Dredging	7,200
	Filling	16,000
TM-CLKL South	Dredging	14,400
	Filling	16,000
HKBCF	Dredging	155,700
	Filling	330,000
HKLR	Dredging	21,600
	Filling	56,000

Remark: Works items (2) and (7) include a TSHD; Table F exclude the quantity for viaduct bored piling works.

Activities related to the re-deposition of Mf sediment are not included in the model and the water quality imapcts was assessed separately.

Activities related to the re-deposition of Mf sediment are not included in the model and the water quality imapcts was assessed separately.

Overall Programme for TM-CLKL + HKBCF + HKLR - Maximum Daily Production Rate (bulked volume, m3/day) (Sequence A)

Figure 7b

Sequence A

A. TM-CLKL Northern Reclamation

ID	Area	Works	Item
	Portion N-c	Mobilisation and preparation	
1		Seawall dredging and reclamation	DN1
2		Seawall filling (50% rock, 50% PF)	FN1
		Construct seawall	
3		Reclamation filling (PF)	FN2
		Reclamation filling (above +2.5mPD)	
	Portion N-a and N-b	Mobilisation and preparation	
5		Seawall dredging	DN2
6		Seawall filling (50% rock, 50% PF)	FN3
		Construct seawall	
		Reclamation dredging - not required	
7		Reclamation filling (PF)	FN4
		Reclamation filling (above +2.5mPD)	
		Total Daily No. of Plant Trips	

B. TM-CLKL Southern Reclamation

	Area	Works	Item
	Portion S-a	Mobilisation and preparation	
8		Seawall dredging and reclamation	DS1
9		Seawall filling (50% rock, 50% PF)	FS1
		Construct seawall	
10		Reclamation filling (70% sand, 30 % PF)	FS2
		Reclamation filling (above +2.5mPD)	
	Portion S-b	Plant mobilisation	
11		Seawall dredging	DS2
12		Seawall filling (50% rock, 50% PF)	FS3
		Construct seawall	
		Reclamation dredging - not required	
13		Reclamation filling (70% sand, 30 % PF)	FS4
		Reclamation filling (above +2.5mPD)	
	Portion S-c	Mobilisation and preparation	
14		Dredging for seawall	DS3
15		Seawall filling (50% rock, 50% PF)	FS5
		Construct seawall	
		Reclamation dredging - not required	
16		Reclamation filling (70% sand, 30 % PF)	FS6
		Reclamation filling (above +2.5mPD)	
17	Viaduct	Piling & Pile Cap Construction	P
		Total Daily No. of Plant Trips	

C. HKBCF

	Area	Works	Item
	Phase 1 - Portion A	Mobilisation and preparation	
18		Seawall dredging (Portion A)	1
19		Seawall filling (Portion A)	a
20		Reclamation dredging (Portion A)	1
21		Reclamation filling (Portion A)	a
22	Phase 1 - Portion B	Seawall dredging (Portion B)	7/2
25		Seawall filling (Portion B)	f
28		Reclamation dredging (Portion B)	2
29		Reclamation filling (Portion B)	b
23	Phase 1 - Portion C	Seawall dredging (Portion C)	7/2
26		Seawall filling (Portion C)	f
		Reclamation dredging (Portion C) - not required	
30		Reclamation filling (Portion C)	a
24	Phase 1 - Portion D	Seawall dredging (Portion D)	3
27		Seawall filling (Portion D)	b
31		Reclamation dredging (Portion D)	3
32		Reclamation filling (Portion D)	b
33	Phase 2	Seawall dredging	4
34		Seawall filling	c
37		Reclamation dredging	5
38		Reclamation filling	d
33		Install sheet piles	
34	Pits for Mf sediment	Dredging to form the Mf pits	
35		Redeposition of Mf sediments within the pits	
36		Remove sheet pile after capping by sandfill	
37			
38			
39	APM & FSD berth	Dredging for seawall and reclamation (FSD)	6
40		Seawall filling (FSD)	e
41		Reclamation filling (FSD)	e
42		Dredging for APM (by IMT method)	6
43		Filling for APM after installation fo IMT	e
		Total Daily No. of Plant Trips	

Activities related to the re-deposition of Mf sediment are not included in the model and the water quality imapcts was assessed separately.

D. HKLR

	Area	Works	Item
	Portion 1	Mobilisation and preparation	
44		Seawall dredging	1
45		Seawall filling	a
46		Reclamation dredging	1
47		Reclamation filling	b
48	Portion 2 & 3	Dredging for seawall and reclamation	1
49		Filling for seawall and reclamation	a -> b
	Viaduct in western open sea	Piling & Pile Cap Construction (Portion A)	p1
50			
51		Piling & Pile Cap Construction (Portion B)	p1
52		Piling & Pile Cap Construction (Portion C)	p1
		Install sheet piles	
	Pits for Mf sediment	Dredging to form the Mf pits	
		Redeposition of Mf sediments within the pits	
		Remove sheet pile after capping by sandfill	
	Viaduct at Airport Channel	Piling & Pile Cap Construction (Portion 1)	p2
53			
54		Piling & Pile Cap Construction (Portion 2)	p2
55		Piling & Pile Cap Construction (Portion 3) (No marine works)	p3
56		Piling & Pile Cap Construction (Portion 4) (No marine works)	p3
57		Piling & Pile Cap Construction (Portion 5) (No marine works)	p3
		Superstructure, roadworks & E&M works	
		Total Daily No. of Plant Trips	

Activities related to the re-deposition of Mf sediment are not included in the model and the water quality imapcts was assessed separately.

E. Project Summary

	Time	Aug-10	Sep-10	Oct-10	Nov-10	Dec-10	Jan-11	Feb-11	Mar-11	Apr-11	May-11	Jun-11	Jul-11	Aug-11	Sep-11	Oct-11	Nov-11	Dec-11	Jan-12	Feb-12	Mar-12	Apr-12	May-12	Jun-12	Jul-12	Aug-12	Sep-12	Oct-12	Nov-12	Dec-12	Jan-13	Feb-13	Mar-13	Apr-13	May-13	Jun-13	Jul-13	Aug-13	Sep-13	Oct-13	Nov-13	Dec-13	Jan-14	Feb-14
TM-CLKL North	TM-CLKL North	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5	5	5	5	17	13	13	5	4	4	4	4			12	12	12	12	12	12	-	-	-	-	-	-	-	-
TM-CLKL South	TM-CLKL South	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	8	23	23	23	27	27	21	23	27	27	27	27	33	25	25	7	11	11	10	14	10	10	10	12	12	-	-
HKBCF	HKBCF	-	9	9	129	129	261	261	261	259	161	343	182	274	186	220	220	88	88	90	90	68	68	64	24	27	27	30	64	61	127	127	127	127	122	34	34	34	34	-	-	-	-
HKLR	HKLR	-	-	-	-	-	-	-	3	3	3	3	3	48	73	73	73	73	48	48	48	76	76	76	76	66	94	66	66	63	63	63	35	35	35	35	35	35	35	35	35	35	-	-
All 3 Pjts	All 3 Pjts	-	9	9	129	129	261	264	264	262	164	346	230	347	259	293	300	149	164	166	206	184	184	170	157	149	124	124	120	160	161	199	181	185	185	179	83	79	79	81	81	47	-	-

Dredging
Dredging behind partially full seawall / pilling
Dredging behind full seawall

Filling
Filling behind partially full seawall
Filling behind full seawall, or Above +2.5 mPD, or Rock Fill

Partial Seawall = Substantially Completed Seawall with 100-200m leading edge.
Full Seawall = Substantially Completed Seawall with 50-100m opening for marine access.

F. Summary of Project Activities

		Max no.	Aug-10	Sep-10	Oct-10	Nov-10	Dec-10	Jan-11	Feb-11	Mar-11	Apr-11	May-11	Jun-11	Jul-11	Aug-11	Sep-11	Oct-11	Nov-11	Dec-11	Jan-12	Feb-12	Mar-12	Apr-12	May-12	Jun-12	Jul-12	Aug-12	Sep-12	Oct-12	Nov-12	Dec-12	Jan-13	Feb-13	Mar-13	Apr-13	May-13	Jun-13	Jul-13	Aug-13	Sep-13	Oct-13	Nov-13	Dec-13	Jan-14	Feb-14
TM-CLKL North	Dredging	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1	1	1	1	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Filling	16	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	4	4	4	16	12	12	4	4	4	4	4	-	-	12	12	12	12	12	12	-	-	-	-	-	-	-	-
TM-CLKL South	Dredging	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	2	2	2	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Filling	16	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	2	2	2	2	2	2	2	2	2	2	-	-	1	1	1	1	-	-	-	-	-	-	-	-
HKBCF	Dredging	19	-	9	9	19	19	19	19	19	17	7	13	6	10	10	4	4	4	6	6	6	6	6	6	6	10	10	10	10	16	10	10	6	10	10	10	14	10	10	12	12	12	-	-
	Filling	330	-	-	-	110	110	242	242	242	242	154	330	176	264	-	176	216	216	84	84	84	84	62	62	62	22	22	22	22	56	56	122	122	122	122	34	34	34	34	-	-	-	-
HKLR	Dredging	3	-	-	-	-	-	-	-	3	3	3	3	3	-	-	-	-	3	3	3	3	3	3	3	3	3	3	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Filling	56	-	-	-	-	-	-	-	-	-	-	-	-	28	28	28	28	-	-	-	28	28	28	28	28	56	28	28	28	28	28	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Remark: Works items (2) and (7) include a TSHD; Table F exclude the quantity for viaduct bored piling works.

Overall Programme for TM-CLKL + HKBCF + HKLR - Daily No. of Plant Trips (Sequence A)

Figure 7c

Sequence A

A. TM-CLKL Northern Reclamation

ID	Area	Works	Item
	Portion N-c	Mobilisation and preparation	
1		Seawall dredging and reclamation	DN1
2		Seawall filling (50% rock, 50% PF)	FN1
		Construct seawall	
3		Reclamation filling (PF)	FN2
		Reclamation filling (above +2.5mPD)	
	Portion N-a and N-b	Mobilisation and preparation	
5		Seawall dredging	DN2
6		Seawall filling (50% rock, 50% PF)	FN3
		Construct seawall	
		Reclamation dredging - not required	
7		Reclamation filling (PF)	FN4
		Reclamation filling (above +2.5mPD)	
		Total No. of Active Plants on Site	

B. TM-CLKL Southern Reclamation

	Area	Works	Item
	Portion S-a	Mobilisation and preparation	
8		Seawall dredging and reclamation	DS1
9		Seawall filling (50% rock, 50% PF)	FS1
		Construct seawall	
10		Reclamation filling (70% sand, 30 % PF)	FS2
		Reclamation filling (above +2.5mPD)	
	Portion S-b	Plant mobilisation	
11		Seawall dredging	DS2
12		Seawall filling (50% rock, 50% PF)	FS3
		Construct seawall	
		Reclamation dredging - not required	
13		Reclamation filling (70% sand, 30 % PF)	FS4
		Reclamation filling (above +2.5mPD)	
	Portion S-c	Mobilisation and preparation	
14		Dredging for seawall	DS3
15		Seawall filling (50% rock, 50% PF)	FS5
		Construct seawall	
		Reclamation dredging - not required	
16		Reclamation filling (70% sand, 30 % PF)	FS6
		Reclamation filling (above +2.5mPD)	
17	Viaduct	Piling & Pile Cap Construction	P
		Total No. of Active Plants on Site	

C. HKBCF

	Area	Works	Item
	Phase 1 - Portion A	Mobilisation and preparation	
18		Seawall dredging (Portion A)	1
19		Seawall filling (Portion A)	a
20		Reclamation dredging (Portion A)	1
21		Reclamation filling (Portion A)	a
22	Phase 1 - Portion B	Seawall dredging (Portion B)	7/2
25		Seawall filling (Portion B)	f
28		Reclamation dredging (Portion B)	2
29		Reclamation filling (Portion B)	b
23	Phase 1 - Portion C	Seawall dredging (Portion C)	7/2
26		Seawall filling (Portion C)	f
		Reclamation dredging (Portion C) - not required	
30		Reclamation filling (Portion C)	a
24	Phase 1 - Portion D	Seawall dredging (Portion D)	3
27		Seawall filling (Portion D)	b
31		Reclamation dredging (Portion D)	3
32		Reclamation filling (Portion D)	b
33	Phase 2	Seawall dredging	4
34		Seawall filling	c
37		Reclamation dredging	5
38		Reclamation filling	d
33		Install sheet piles	
34	Pits for Mf sediment	Dredging to form the Mf pits	
35		Redeposition of Mf sediments within the pits	
36		Remove sheet pile after capping by sandfill	
37			
38			
39	APM & FSD berth	Dredging for seawall and reclamation (FSD)	6
40		Seawall filling (FSD)	e
41		Reclamation filling (FSD)	e
42		Dredging for APM (by IMT method)	6
43		Filling for APM after installation fo IMT	e
		Total No. of Active Plants on Site	

D. HKLR

	Area	Works	Item
	Portion 1	Mobilisation and preparation	
44		Seawall dredging	1
45		Seawall filling	a
46		Reclamation dredging	1
47		Reclamation filling	b
48	Portion 2 & 3	Dredging for seawall and reclamation	1
49		Filling for seawall and reclamation	a -> b
50	Viaduct in western open sea	Piling & Pile Cap Construction (Portion A)	p1
51		Piling & Pile Cap Construction (Portion B)	p1
52		Piling & Pile Cap Construction (Portion C)	p1
	Pits for Mf sediment	Install sheet piles	
		Dredging to form the Mf pits	
		Redeposition of Mf sediments within the pits	
		Remove sheet pile after capping by sandfill	
53	Viaduct at Airport Channel	Piling & Pile Cap Construction (Portion 1)	p2
54		Piling & Pile Cap Construction (Portion 2)	p2
55		Piling & Pile Cap Construction (Portion 3) (No marine works)	p3
56		Piling & Pile Cap Construction (Portion 4) (No marine works)	p3
57		Piling & Pile Cap Construction (Portion 5) (No marine works)	p3
		Superstructure, roadworks & E&M works	
		Total No. of Active Plants on Site	

E. Project Summary

	Time	Aug-10	Sep-10	Oct-10	Nov-10	Dec-10	Jan-11	Feb-11	Mar-11	Apr-11	May-11	Jun-11	Jul-11	Aug-11	Sep-11	Oct-11	Nov-11	Dec-11	Jan-12	Feb-12	Mar-12	Apr-12	May-12	Jun-12	Jul-12	Aug-12	Sep-12	Oct-12	Nov-12	Dec-12	Jan-13	Feb-13	Mar-13	Apr-13	May-13	Jun-13	Jul-13	Aug-13	Sep-13	Oct-13	Nov-13	Dec-13	Jan-14	Feb-14
TM-CLKL North	TM-CLKL North	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	2	2	2	3	2	2	2	1	1	1	1	-	-	1	1	1	1	1	1	-	-	-	-	-	-	-	-
TM-CLKL South	TM-CLKL South	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	3	16	18	18	18	18	17	19	20	20	20	20	22	18	18	3	4	4	3	5	4	4	4	4	4	-	-
HKBCF	HKBCF	-	9	9	23	23	29	29	29	29	27	15	27	12	20	16	15	15	9	9	11	11	11	11	11	7	4	7	7	10	13	10	12	12	12	12	7	3	3	3	3	3	-	-
HKLR	HKLR	-	-	-	-	-	-	-	3	3	3	3	3	48	47	47	47	47	48	48	48	48	50	50	50	40	42	40	40	37	37	37	35	35	35	35	35	35	35	35	35	35	-	-
All 3 Pits	All 3 Pits	-	9	9	23	23	29	32	32	30	18	30	60	67	63	62	66	62	77	79	82	81	81	80	67	67	68	68	67	72	66	66	51	52	52	46	43	42	42	42	42	39	-	-

Dredging
Dredging behind partially full seawall / pilling — Filling
Dredging behind full seawall — Filling behind partially full seawall
Filling behind full seawall, or Above +2.5 mPD, or Rock Fill

Partial Seawall = Substantially Completed Seawall with 100-200m leading edge.
Full Seawall = Substantially Completed Seawall with 50-100m opening for marine access.

F. Summary of Project Activities

		Max no.	Aug-10	Sep-10	Oct-10	Nov-10	Dec-10	Jan-11	Feb-11	Mar-11	Apr-11	May-11	Jun-11	Jul-11	Aug-11	Sep-11	Oct-11	Nov-11	Dec-11	Jan-12	Feb-12	Mar-12	Apr-12	May-12	Jun-12	Jul-12	Aug-12	Sep-12	Oct-12	Nov-12	Dec-12	Jan-13	Feb-13	Mar-13	Apr-13	May-13	Jun-13	Jul-13	Aug-13	Sep-13	Oct-13	Nov-13	Dec-13	Jan-14	Feb-14
TM-CLKL North	Dredging	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1	1	1	1	1	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Filling	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1	1	1	2	1	1	1	1	1	1	1	-	-	-	1	1	1	1	1	1	-	-	-	-	-	-	-
TM-CLKL South	Dredging	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	2	2	2	-	-	-	2	2	2	2	2	2	2	-	-	1	1	1	1	-	-	-	-	-	-	-	-
	Filling	5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1	1	1	3	3	2	2	3	3	3	3	5	3	3	2	3	3	3	5	4	4	4	4	4	-	-
HKBCF	Dredging	17	-	9	9	17	17	17	17	17	15	7	11	4	8	8	4	4	4	6	6	6	6	6	2	2	5	5	8	8	5	5	5	5	5	-	-	-	-	-	-	-	-
	Filling	16	-	-	-	6	6	12	12	12	12	8	16	8	12	8	11	11	5	5	5	5	5	5	5	2	2	2	2	5	5	7	7	7	7	7	3	3	3	3	3	-	-
HKLR	Dredging	3	-	-	-	-	-	-	-	3	3	3	3	-	-	-	-	-	3	3	3	3	3	3	3	3	3	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Filling	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	2	2	2	2	4	2	2	2	2	2	-	-	-	-	-	-	-	-	-	-	-	-	-

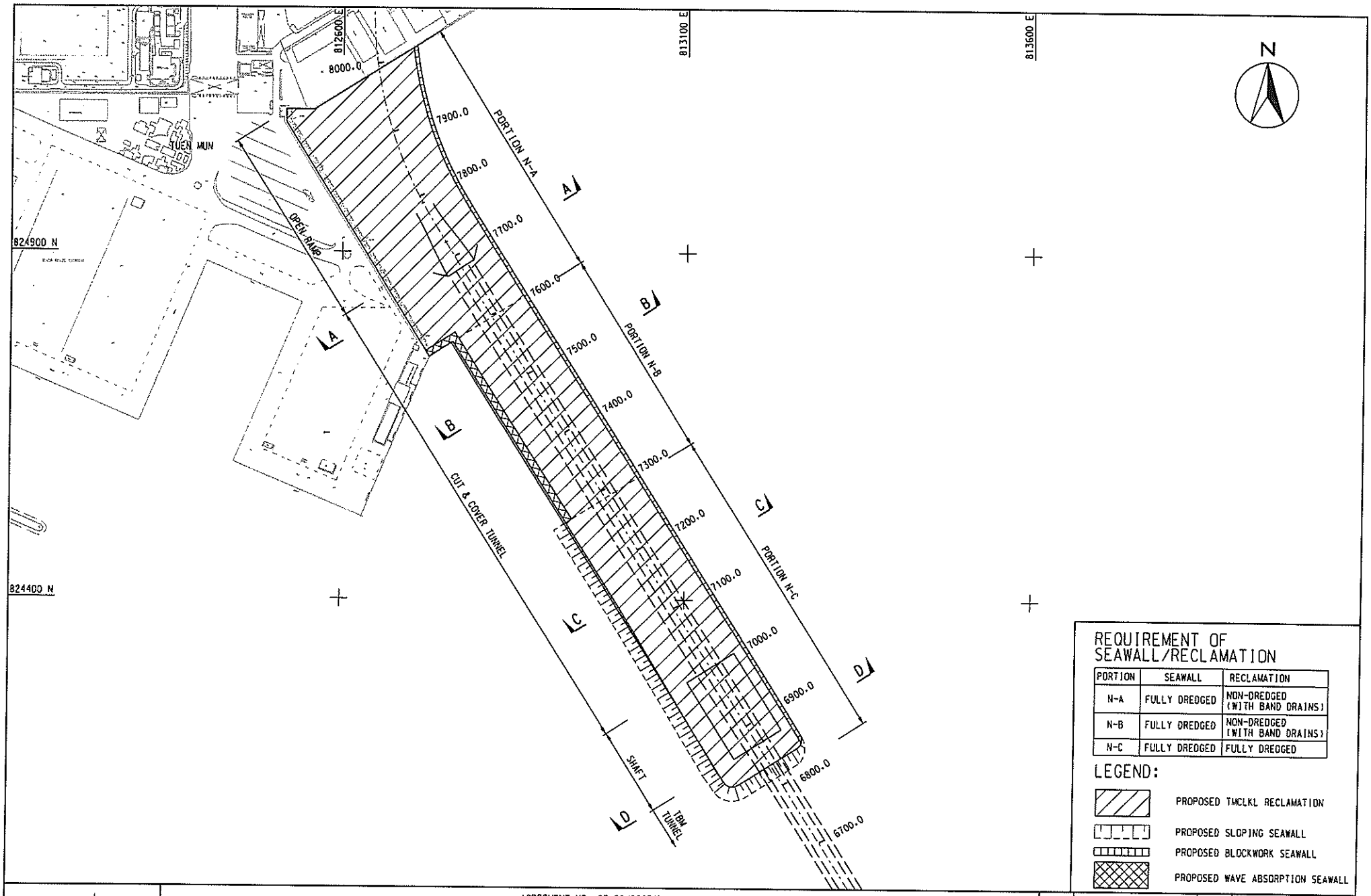
Remark: Works items (2) and (7) include a TSHD; Table F exclude the quantity for viaduct bored piling works.

Activities related to the re-deposition of Mf sediment are not included in the model and the water quality imapcts was assessed separately.

Activities related to the re-deposition of Mf sediment are not included in the model and the water quality imapcts was assessed separately.

Overall Programme for TM-CLKL + HKBCF + HKLR - No. of Active Dredging/Filling Plants on Site (Sequence A)

Figure 7d



REQUIREMENT OF SEAWALL/RECLAMATION

PORTION	SEAWALL	RECLAMATION
N-A	FULLY DREDGED	NON-DREDGED (WITH BAND DRAINS)
N-B	FULLY DREDGED	NON-DREDGED (WITH BAND DRAINS)
N-C	FULLY DREDGED	FULLY DREDGED

LEGEND:

- PROPOSED TMCLKL RECLAMATION
- PROPOSED SLOPING SEAWALL
- PROPOSED BLOCKWORK SEAWALL
- PROPOSED WAVE ABSORPTION SEAWALL

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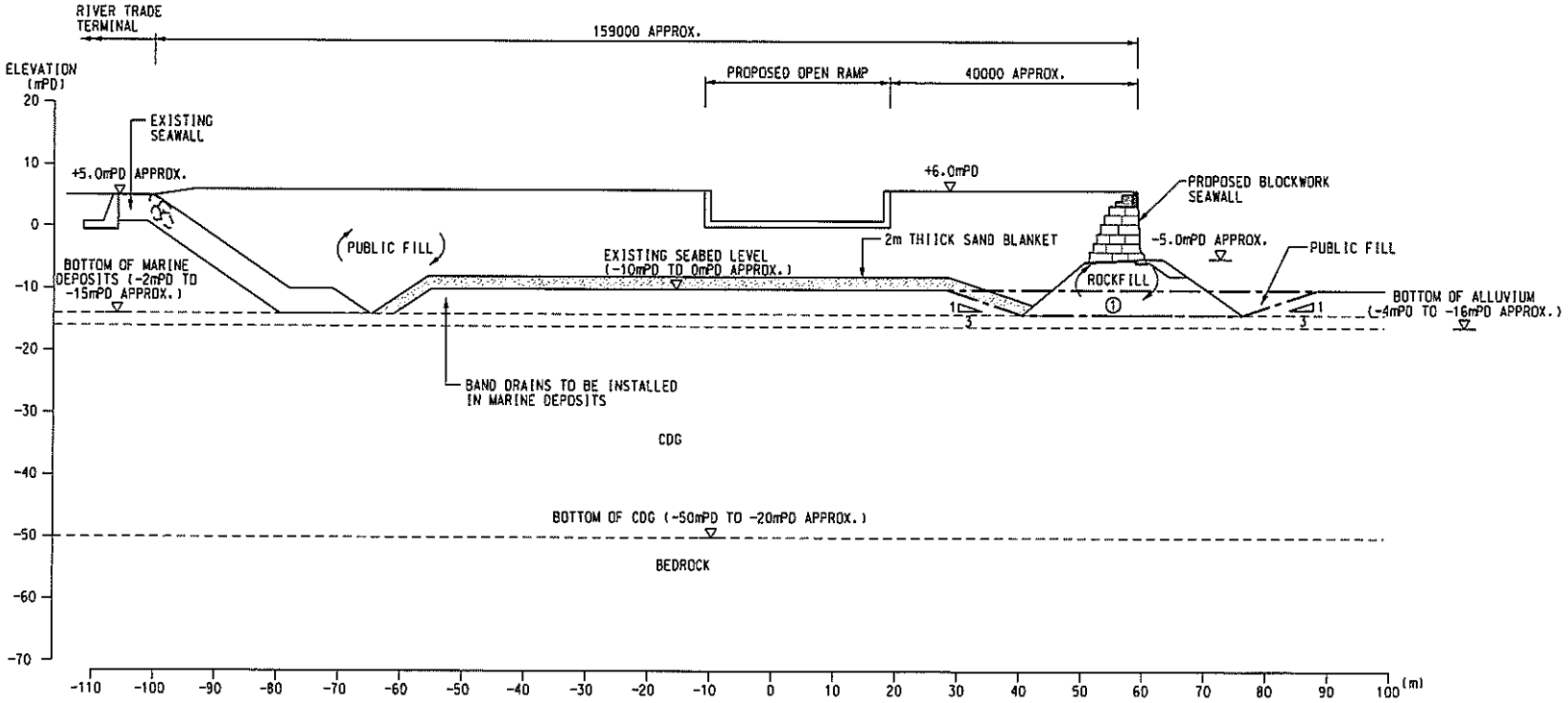
AGREEMENT NO. CE 52/2007(HY)
TUEN MUN - CHEK LAP KOK LINK - INVESTIGATION

EXTENT OF DREDGED AREA AND TYPICAL SEAWALL SECTIONS IN NORTHERN LANDFALL OF TM - CLKL

SHEET 1 OF 3

SCALE	A3 1:5000	DATE	MAR. 2009
CHECK	--	DRAWN	LCG
JOB No.	60044963	DRAWING No.	FIGURE 8
		REV	A

p:\PROJECTS\60044963\DRAWING\FIGURE\DRAWINGS FOR EIA REPORT\Ch6\FIGURE 8-1.dgn



LEGEND:

EXTENT OF MARINE DEPOSITS TO BE DREDGED

① DREDGING DURING CONSTRUCTION OF SEAWALL

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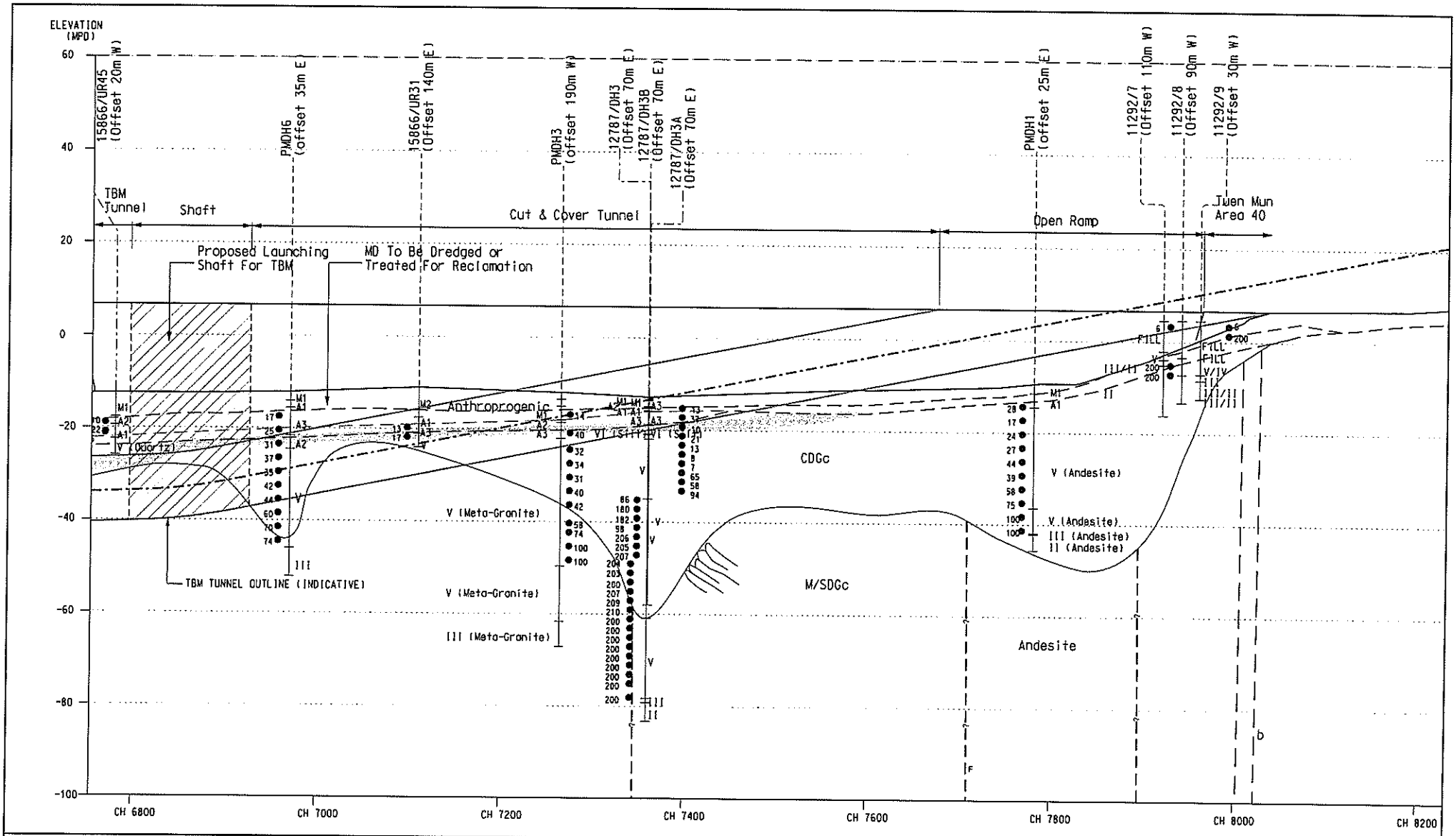
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TUEN MUN - CHEK LAP KOK LINK - INVESTIGATION

EXTENT OF DREDGED AREA AND TYPICAL SEAWALL SECTIONS IN NORTHERN LANDFALL OF TM - CLKL

SHEET 2 OF 3

SCALE	A3 1:800	DATE	MAR. 2009
CHECK	---	DRAWN	LCG
JOB No.	60044963	DRAWING No.	FIGURE 8
		REV	A

p:\PROJECTS\60044963\DRAWING\FIGURE\DRAWINGS FOR EIA REPORT\Ch6\FIGURE 8-2.dgn



NOTE:

ROCKHEAD LEVEL & MATERIAL PROFILES ARE REFERRED FROM ADJACENT DRILLHOLES & GEOPHYSICAL SURVEY RESULTS

—?—?— INFERRED FAULT FROM GEOPHYSICAL DATA/BOREHOLE INFORMATION

——— INFERRED ROCKHEAD ALONG ORIGINAL ALIGNMENT

SCALE VOR. 1 : 800 @ A3
HOR. 1 : 4000 @ A3

LEGEND:

ALLUVIAL SAND

M - MARINE DEPOSIT

A - ALLUVIAL DEPOSIT

1 CLAY
2 SILT
3 SAND

V - COMPLETELY DECOMPOSED ROCKS
IV - HIGHLY DECOMPOSED ROCKS
III - MODERATELY DECOMPOSED ROCKS
II - SLIGHTLY DECOMPOSED ROCKS
$\bullet^{20}$ - SPT N VALUE

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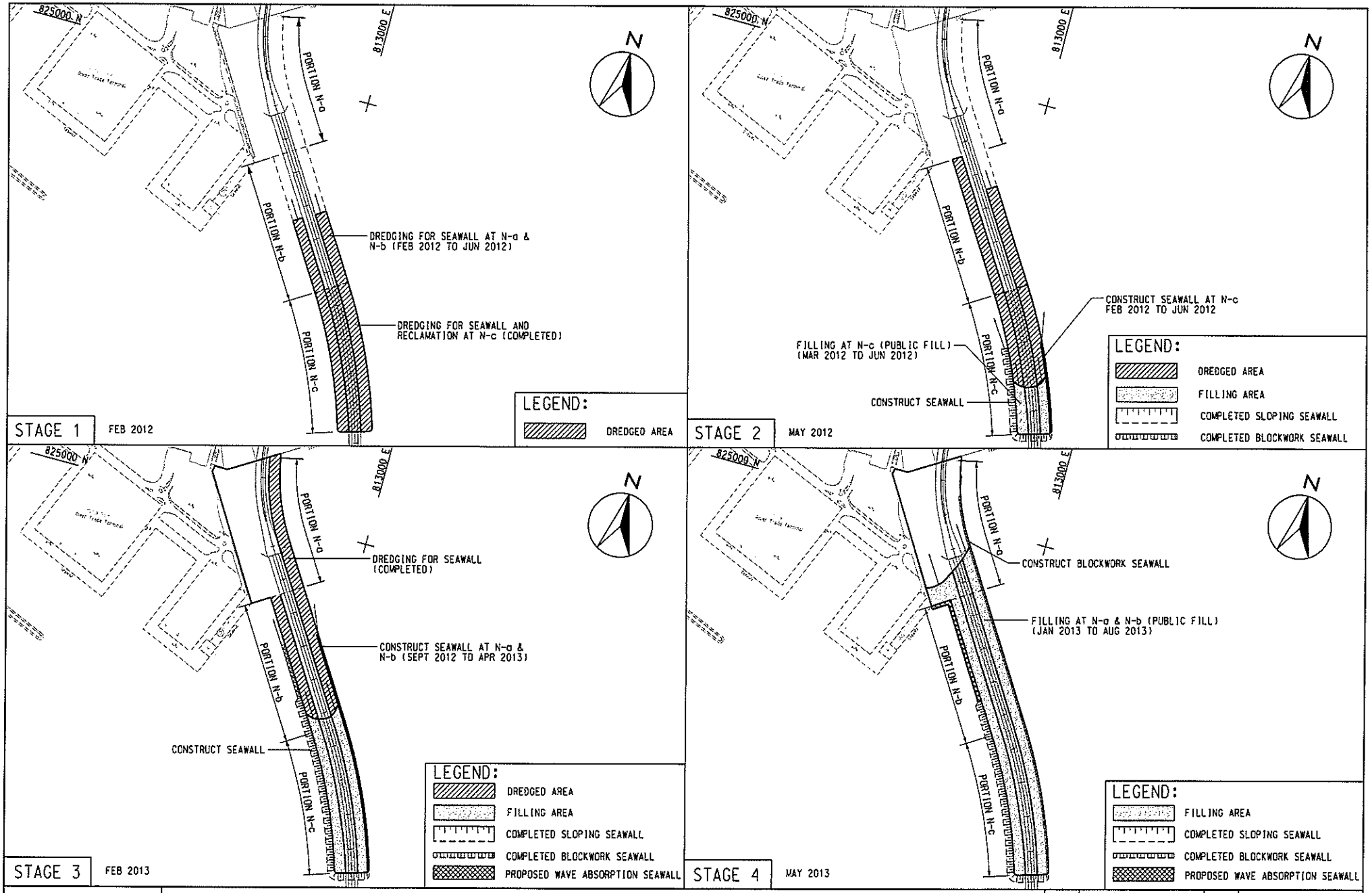
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TUEN MUN - CHEK LAP KOK LINK - INVESTIGATION

EXTENT OF DREDGED AREA AND TYPICAL SEAWALL SECTIONS IN NORTHERN LANDFALL OF TM - CLKL

SHEET 3 OF 3

SCALE	AS SHOWN	DATE	MAR.2009
CHECK	--	DRAWN	LCC
JOB No.	60044963	DRAWING No.	FIGURE 8
		REV	A

p:\PROJECTS\60044963\DRAWING\FIGURE\DRAWINGS FOR EIA REPORT\Ch6\FIGURE 8-3.dgn



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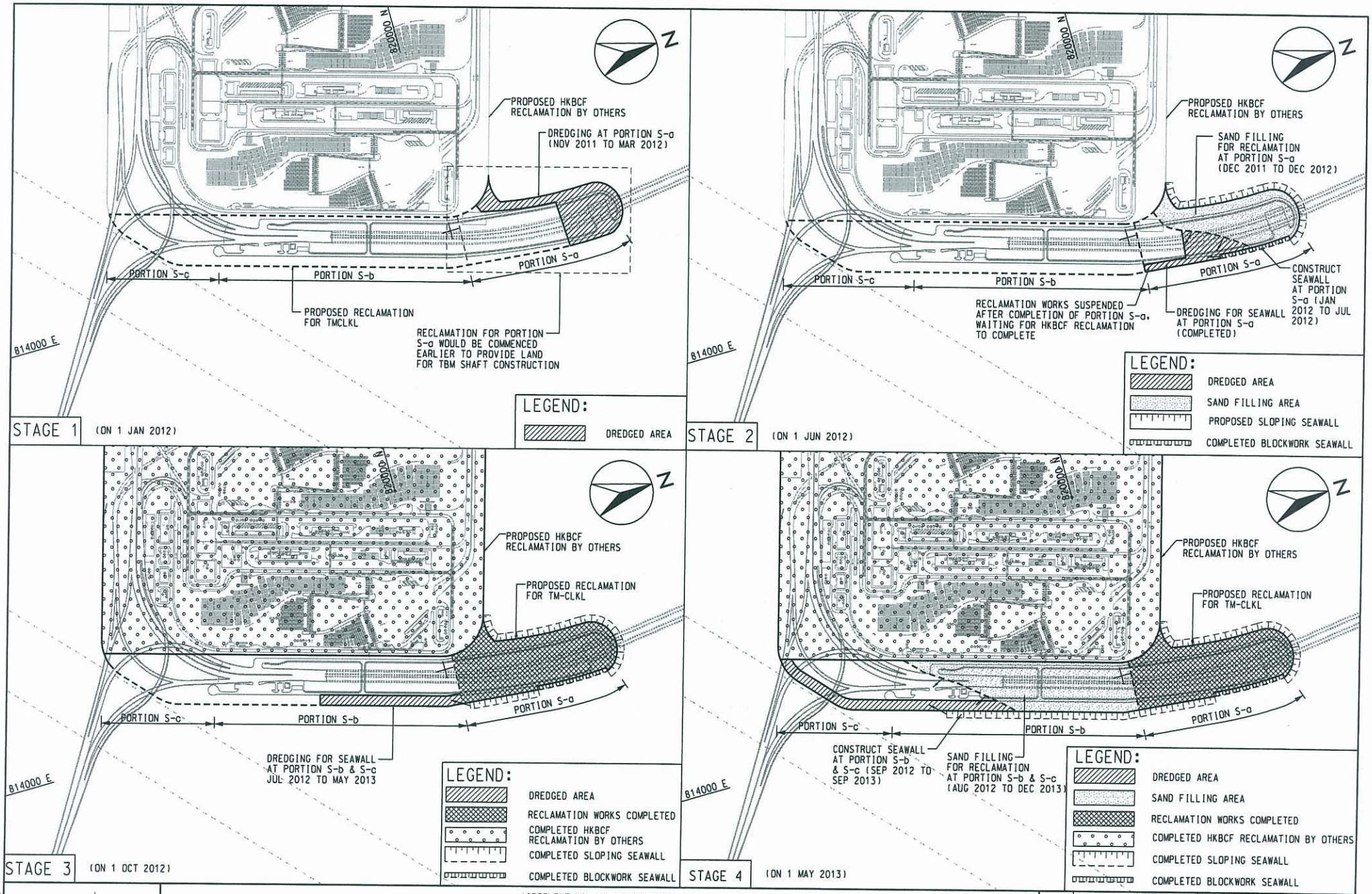
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TUEN MUN - CHEK LAP KOK LINK - INVESTIGATION

ANTICIPATED CONSTRUCTION SEQUENCE OF TM-CLKL

(SHEET 1 OF 2)

SCALE	A3 1:5000	DATE	MAR.2009
CHECK	--	DRAWN	LCG
JOB No.	60044963	DRAWING No.	FIGURE 9
		REV	--

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AGREEMENT NO. CE 52/2007(HY)
TUEN MUN - CHEK LAP KOK LINK - INVESTIGATION

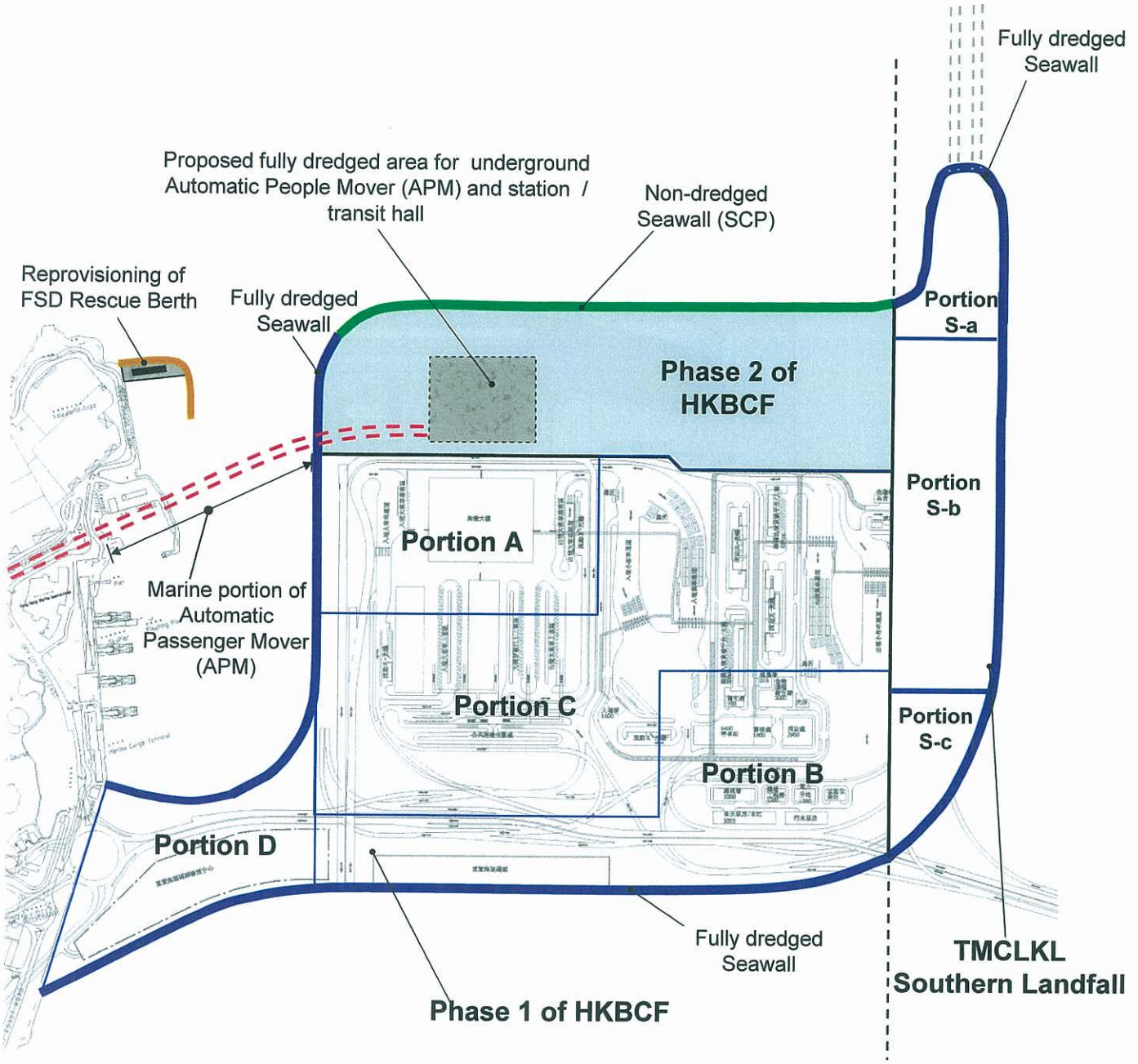
ANTICIPATED CONSTRUCTION SEQUENCE OF TM-CLKL

(SHEET 2 OF 2)

SCALE	A3 1:10000	DATE	MAY 2009
CHECK	--	DRAWN	CL
JOB No.	60044963	DRAWING No.	FIGURE 9
		REV	--

Plotting By: 2009-5-19
PLOT SCALE: 1.0:0917

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Phase 1 of HKBCF

Seawall – Fully Dredged

Reclamation:
Portion A – Dredged
Portion B – Dredged
Portion C – Non dredged (with Band Drains)
Portion D – Dredged

Phase 2 of HKBCF

Seawall – Fully Dredged / SCP (refer the extent shown in the sketch)

Reclamation – Non-dredged (with Band Drains) except the underground APM station and ARL station where the removal of marine sediment for underground construction is required

TM-CLKL Southern Landfall

Seawall – Fully Dredged

Reclamation:
Portion S-a – Non dredged (with Band Drains)
Portion S-b – Non dredged (with Band Drains)
Portion S-c – Non dredged (with Band Drains)

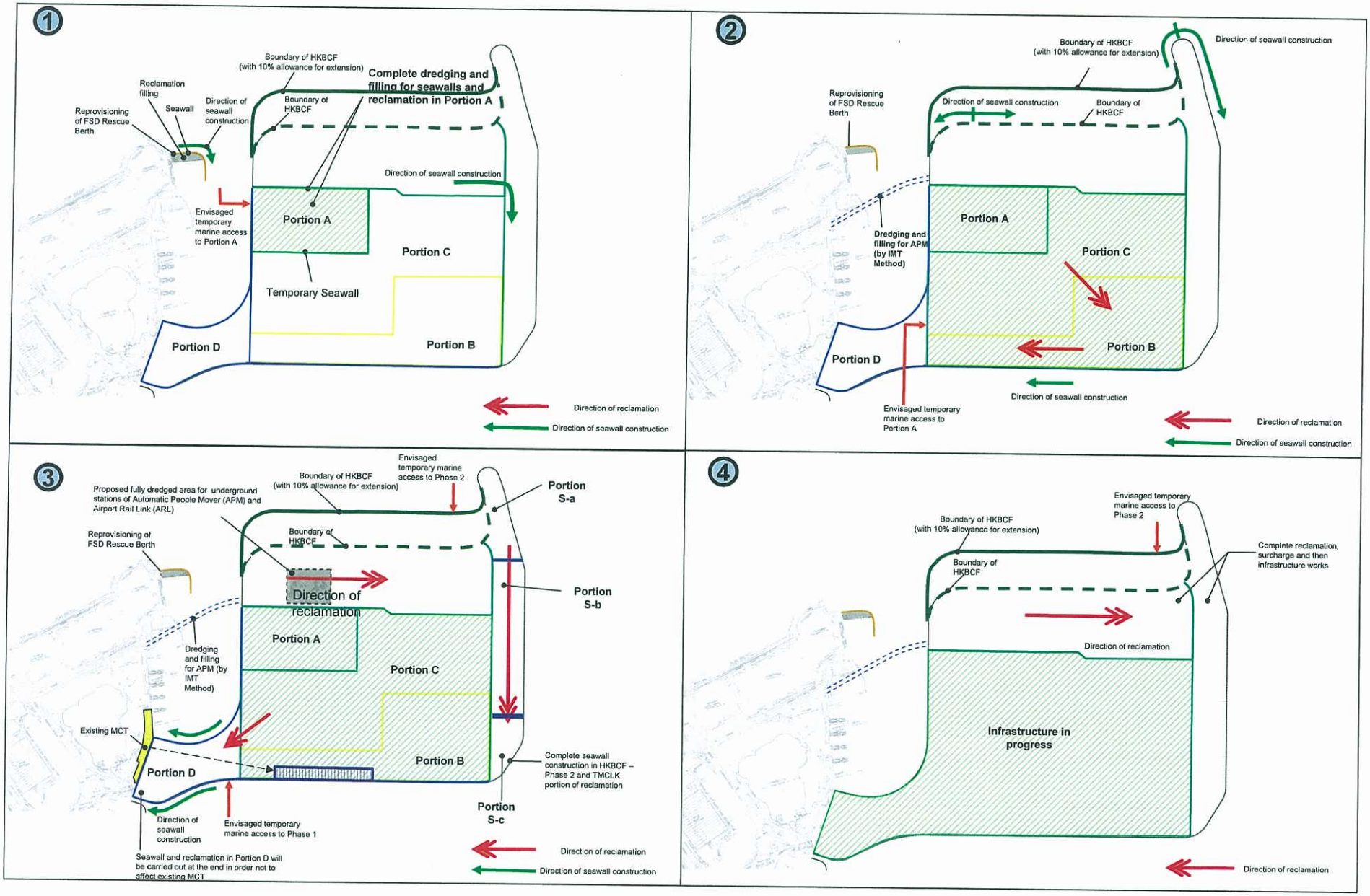
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AGREEMENT No. CE 52/2007 (HY)
TUEN MUN – CHECK LAP KOK LINK - INVESTIGATION

Extent of Dredged and Non-dredged Areas in HKBCF and Southern Landfall of TM-CLKL

SCALE	NTS	DATE	MAY. 2009
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JOB No.	60044963	DRAWING No.	10
		REV	

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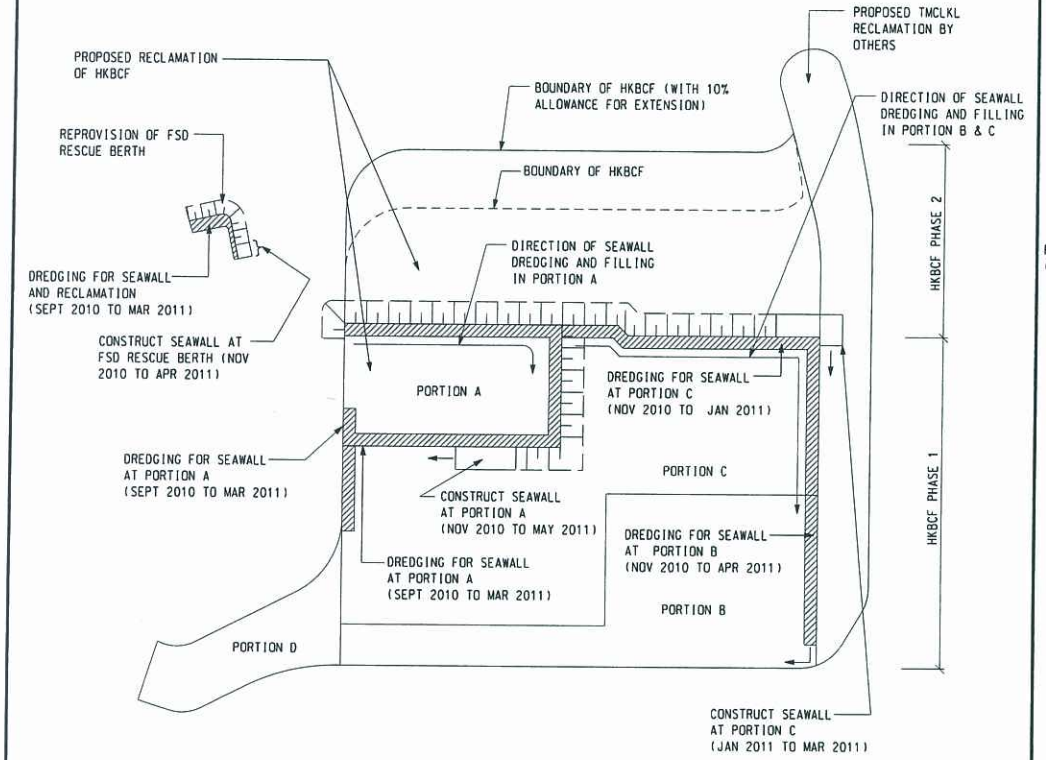
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TUEN MUN – CHECK LAP KOK LINK - INVESTIGATION

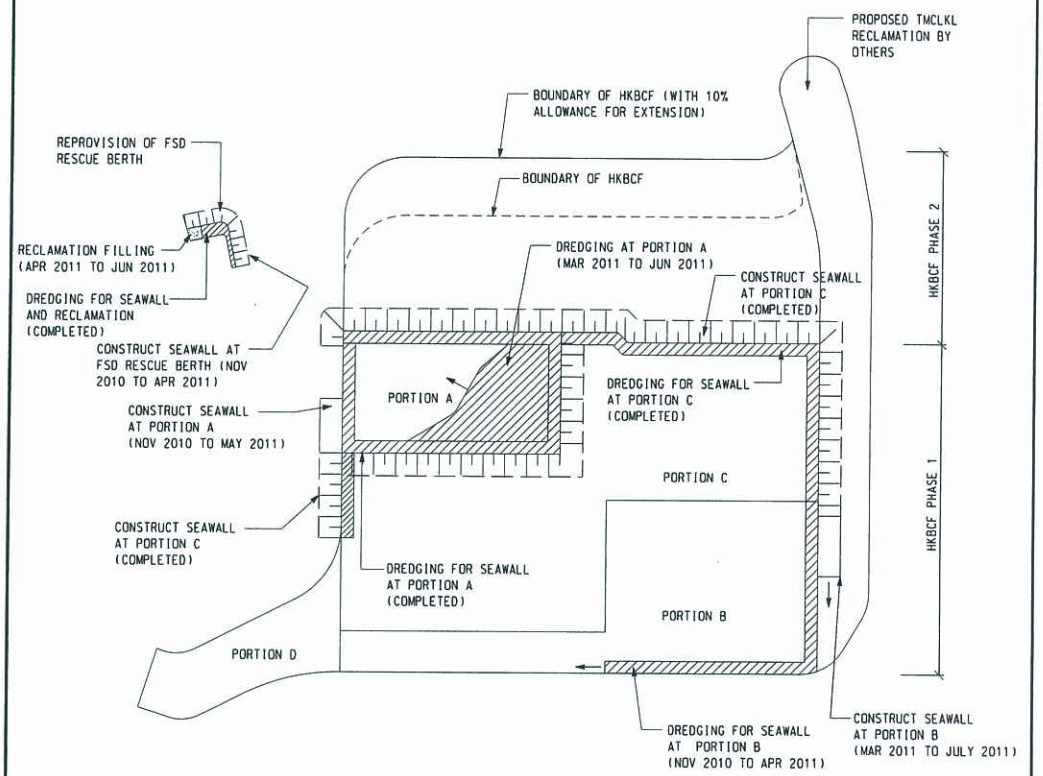
Schematic Construction Sequence of HKBCF

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JOB No.	60044963	DRAWING No.	11
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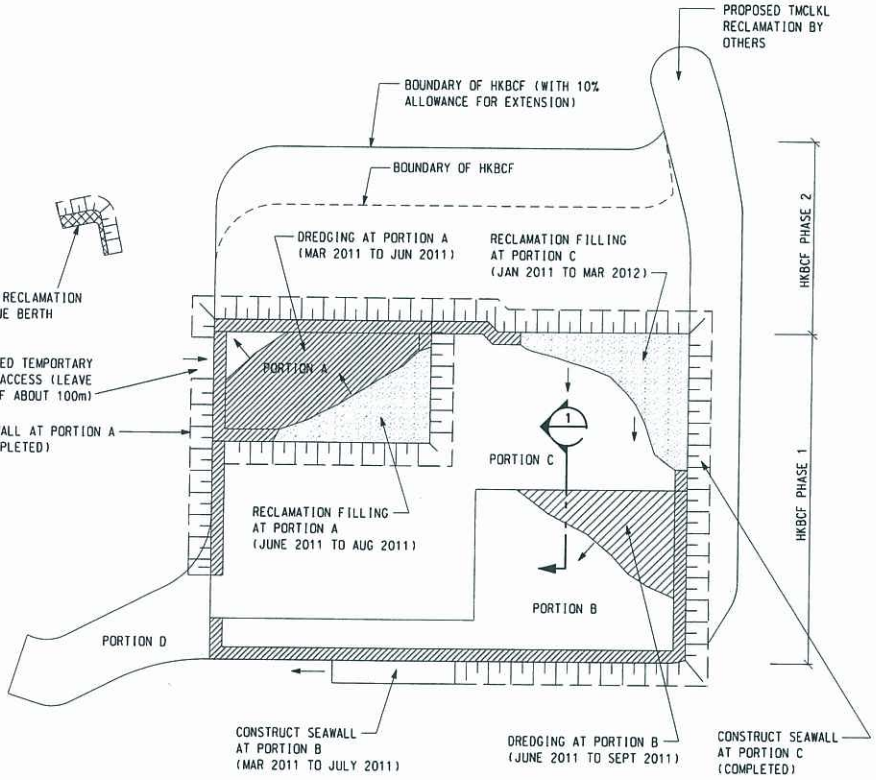


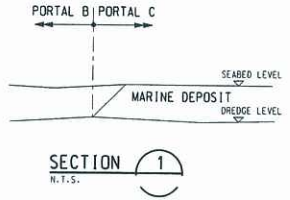
STAGE 2 (ON APRIL 2011)

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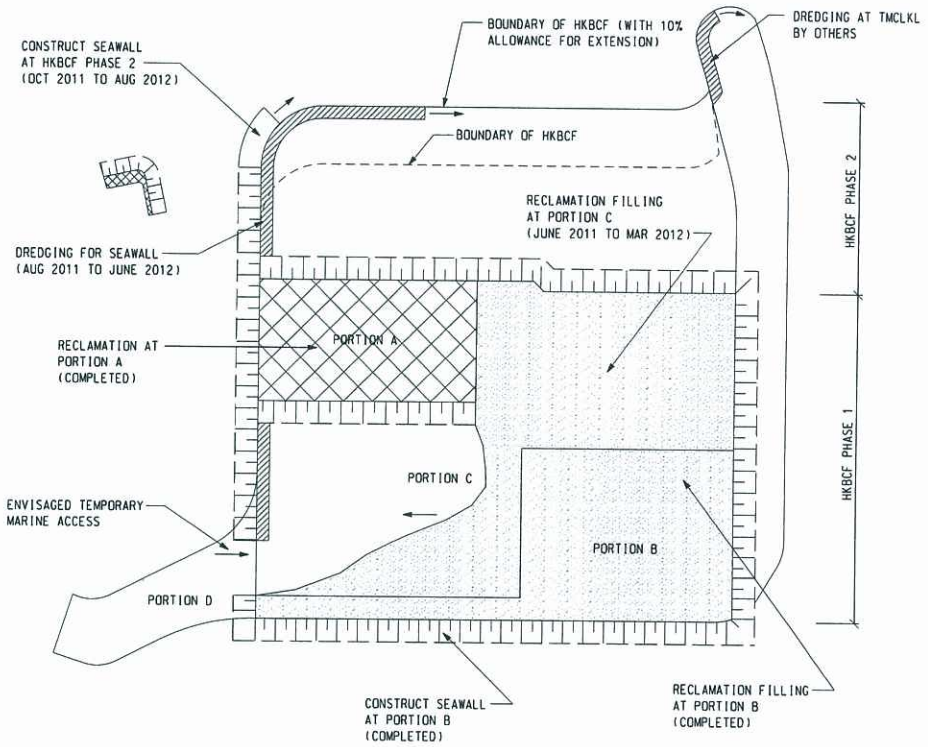




LEGEND:

- DREDGED AREA
- COMPLETED SLOPING SEAWALL
- RECLAMATION WORKS COMPLETED
- RECLAMATION FILLING AREA

STAGE 3 (ON JUNE 2011)



LEGEND:

- DREDGED AREA
- COMPLETED SLOPING SEAWALL
- RECLAMATION WORKS COMPLETED
- RECLAMATION FILLING AREA

STAGE 4 (ON DEC 2011)

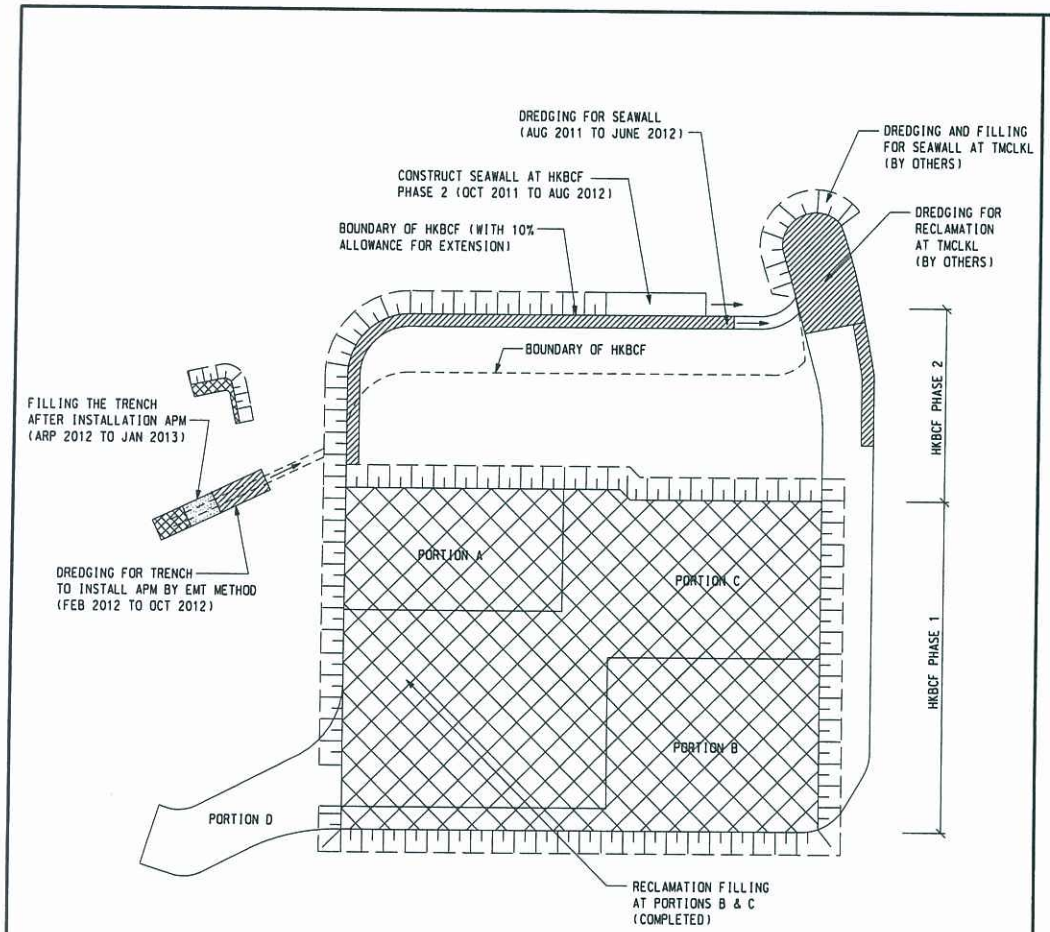
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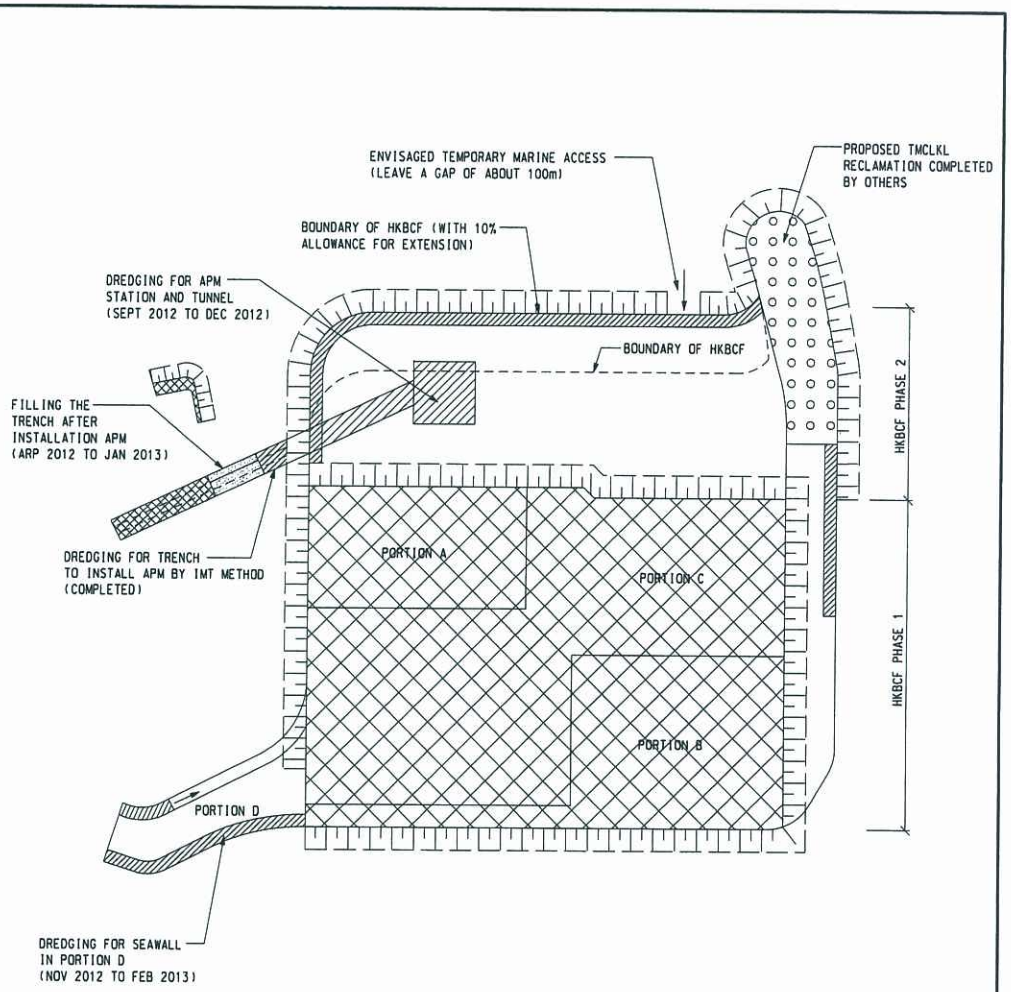
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A	FIRST ISSUE	02/09

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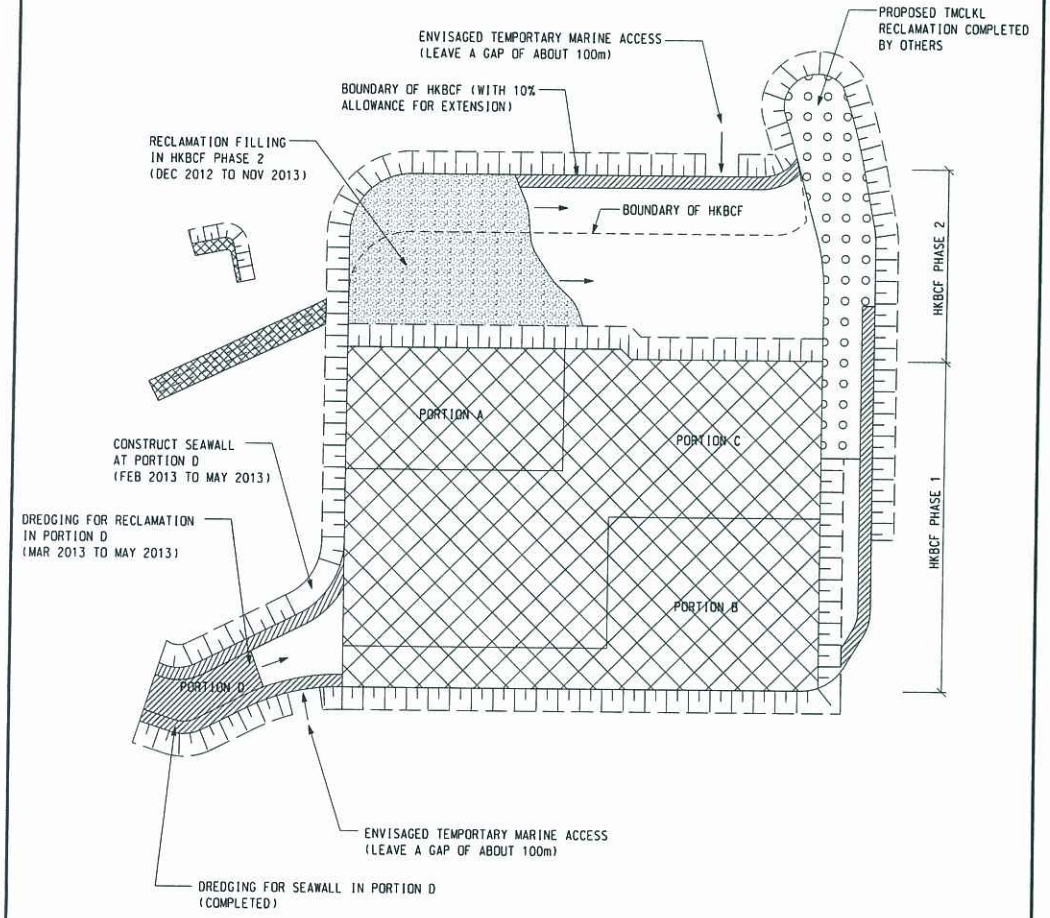
STAGE 5 (ON APR 2012)



STAGE 6 (ON DEC 2012)

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LEGEND:

- DREDGED AREA
- COMPLETED SLOPING SEAWALL
- RECLAMATION WORKS COMPLETED
- RECLAMATION FILLING AREA
- COMPLETE TMCLKL RECLAMATION BY OTHERS

STAGE 7 (ON APR 2013)

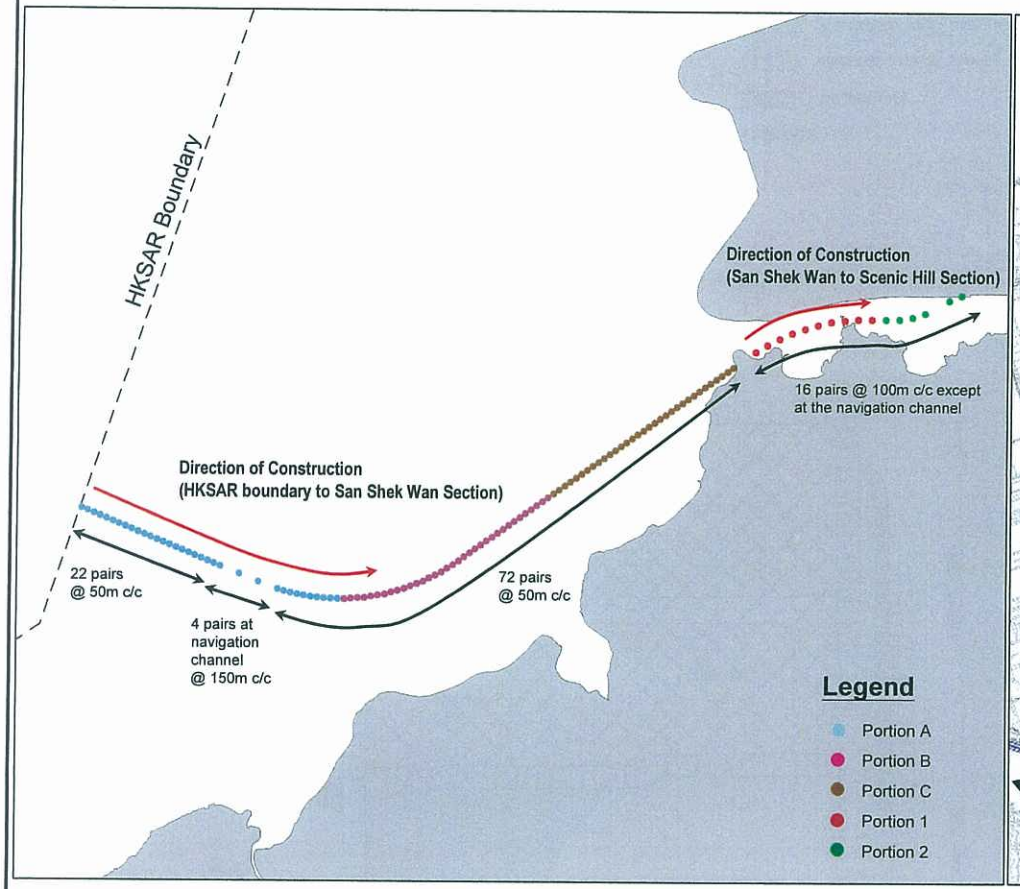
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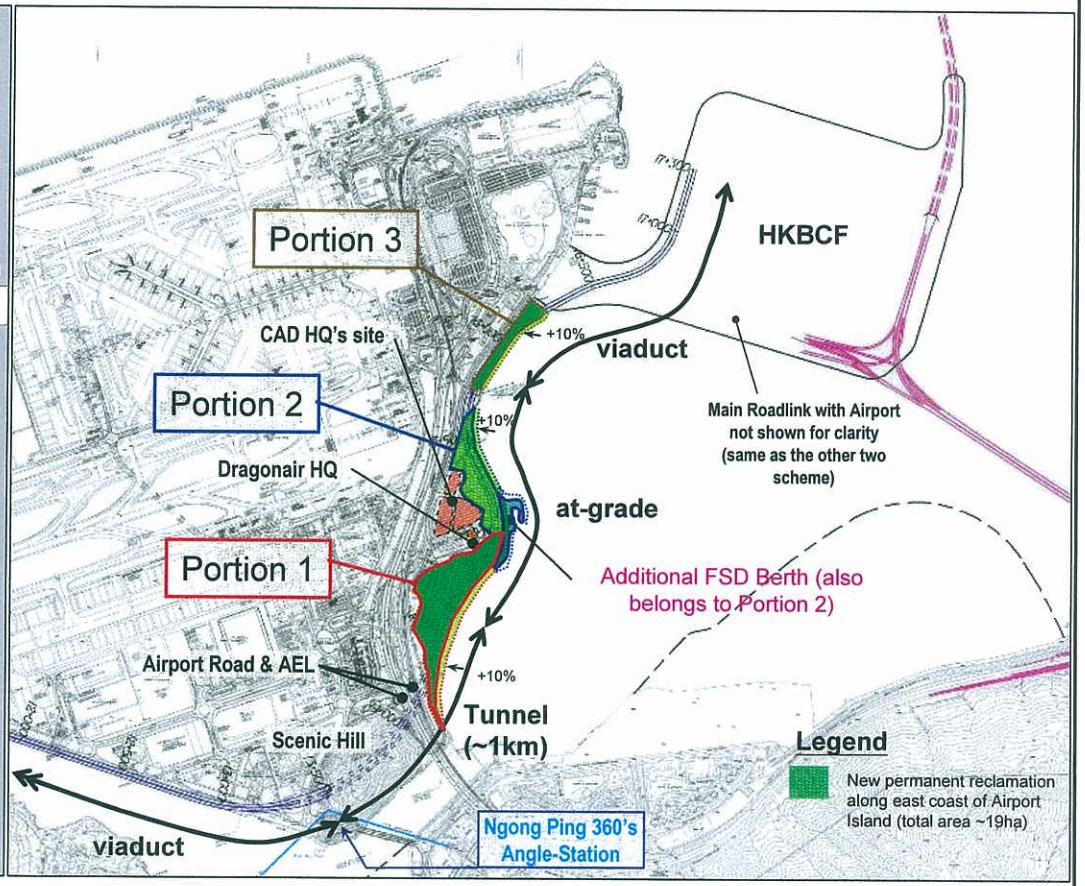
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Rev.	Description	Date
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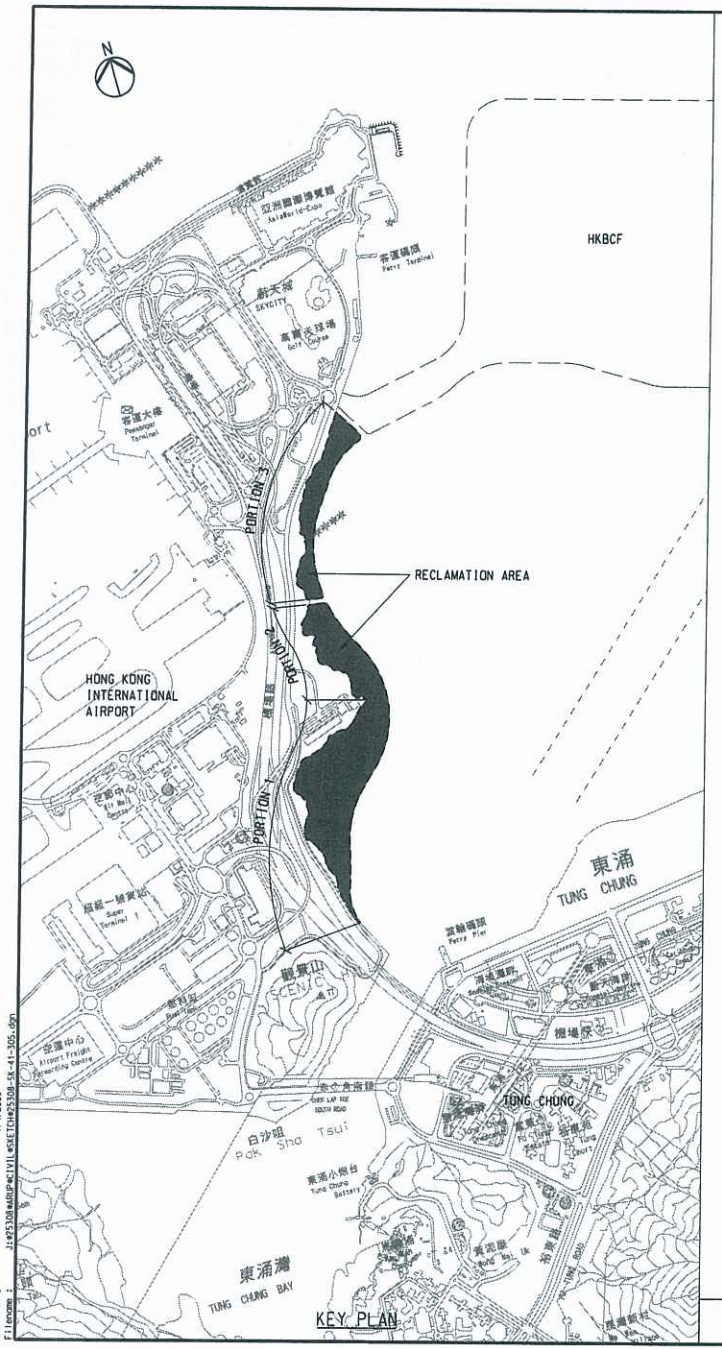
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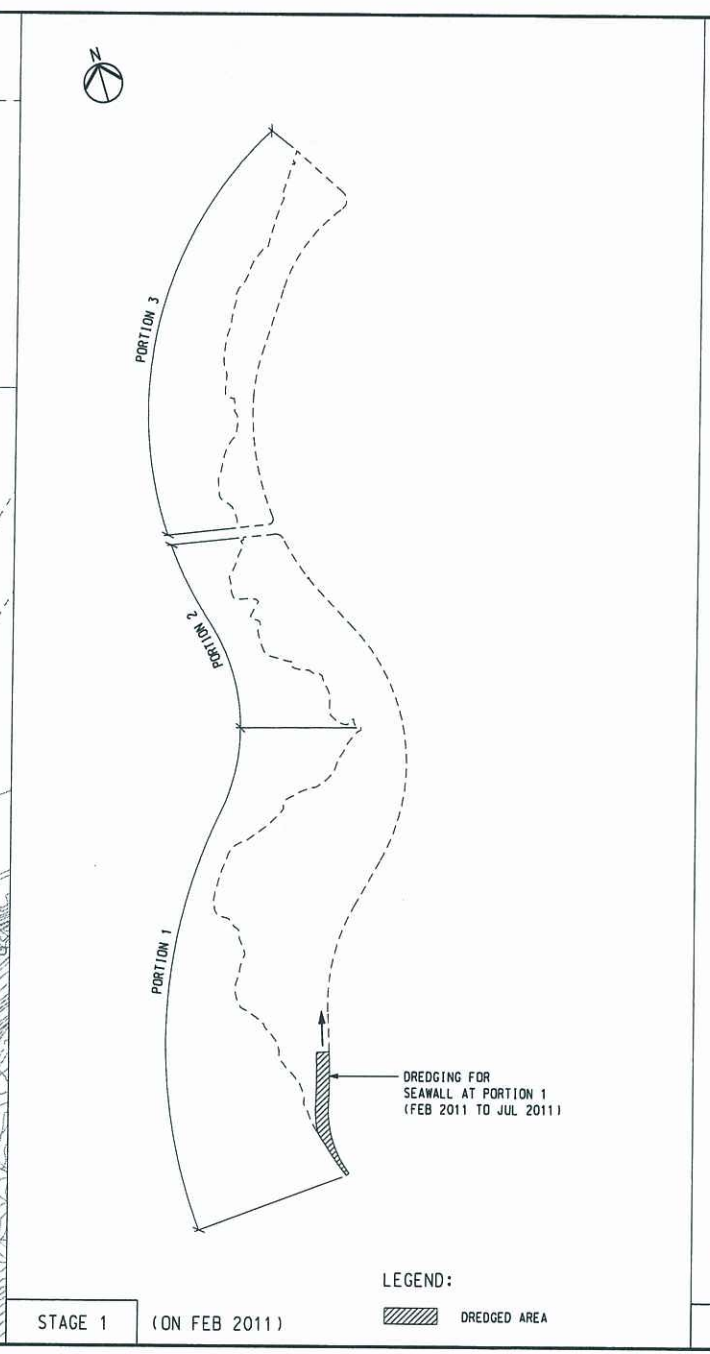
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TUEN MUN – CHECK LAP KOK LINK - INVESTIGATION

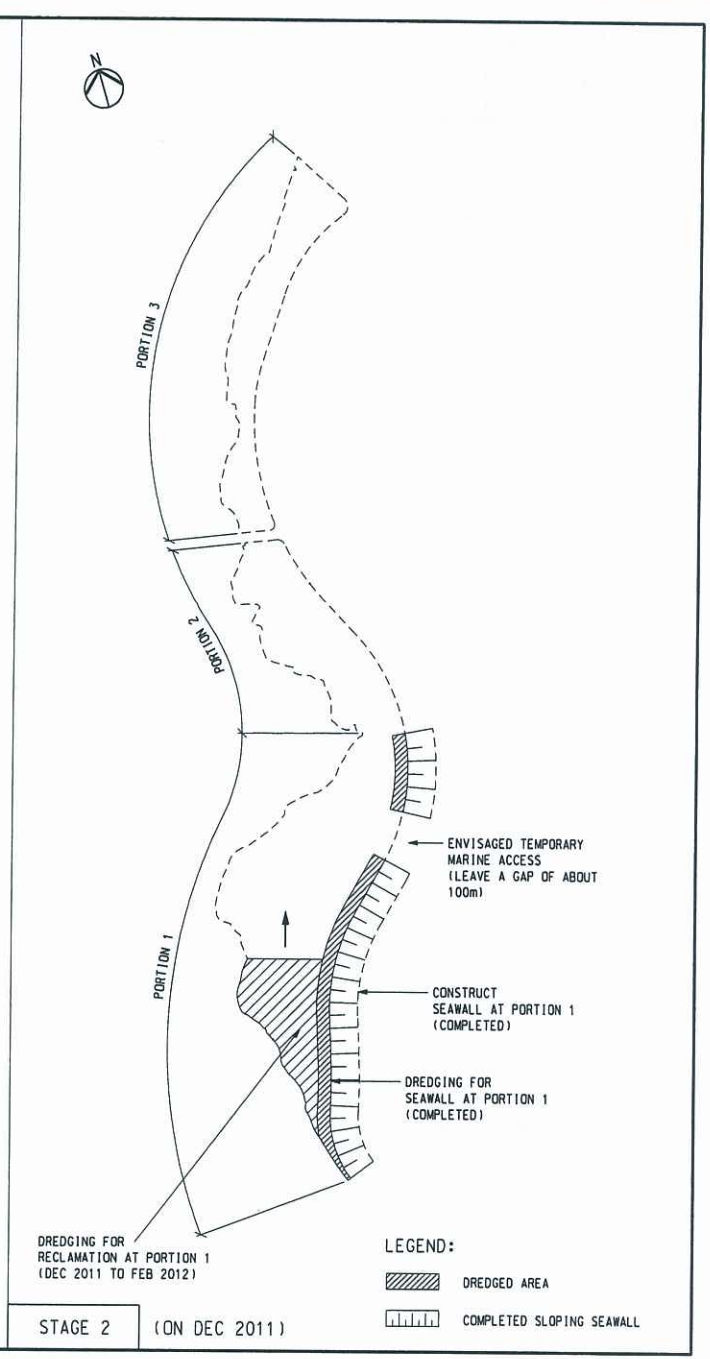
Layout of Tunnel cum At-Grade Scheme of HKLR and Viaduct Alignment

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JOB No.	60044963	DRAWING No.	13
		REV	

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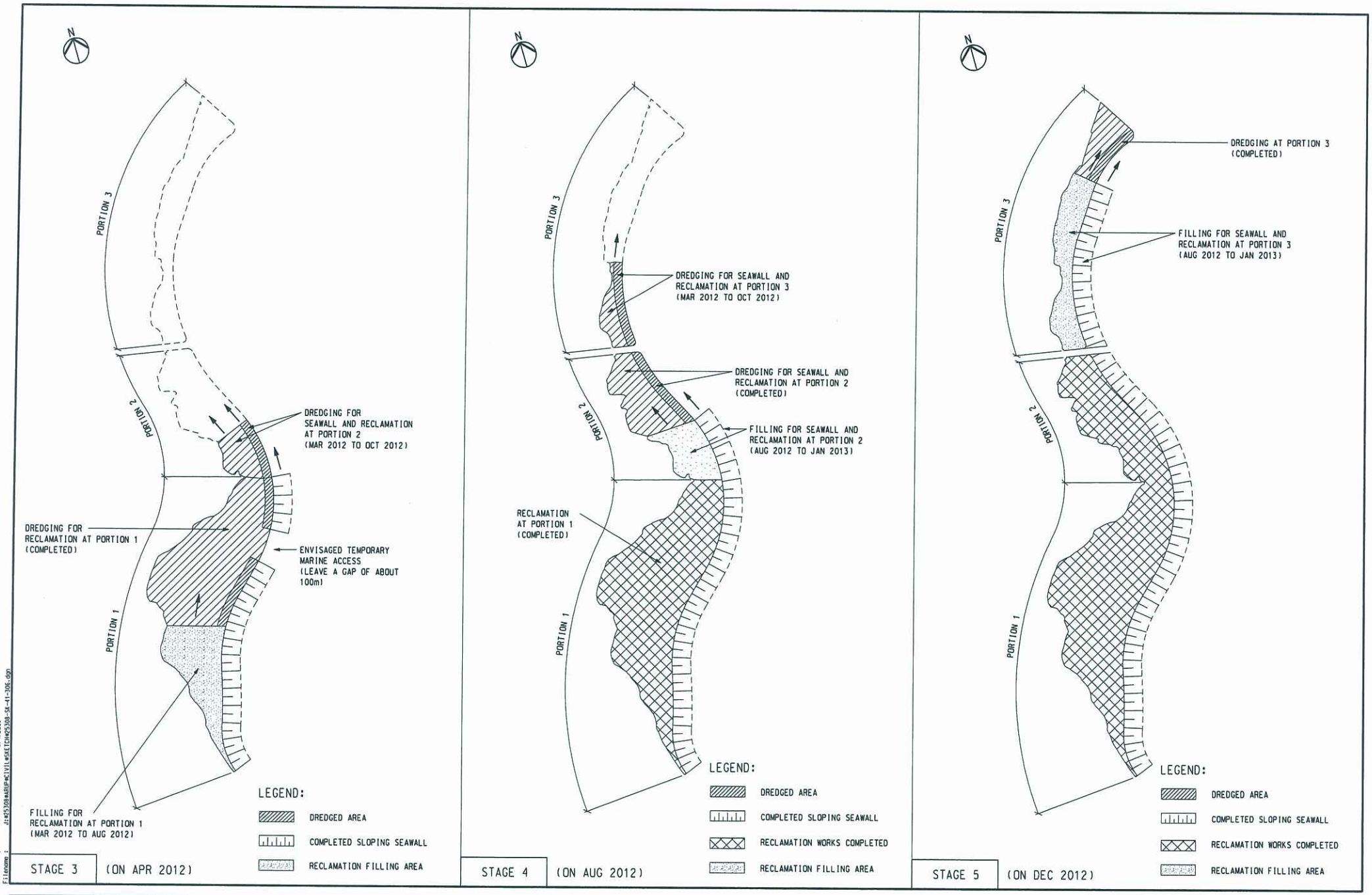




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Hong Kong - Zhuhai - Macao Bridge
Hong Kong Project Management Office

ARUP Ove Arup & Partners Hong Kong Limited

Job Title
Agreement No. CE 14/2008 (CE)
Hong Kong-Zhuhai-Macao Bridge Hong Kong
Boundary Crossing Facilities – Investigation

Drawing Title
ANTICIPATED CONSTRUCTION SEQUENCE OF HKLR
Sheet 2 of 2

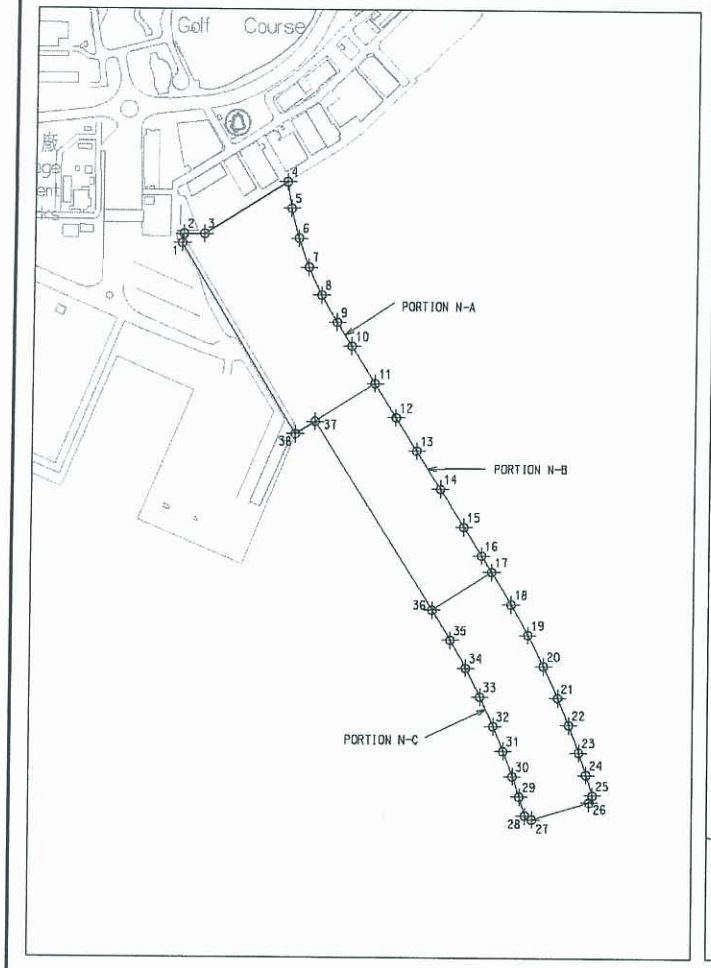
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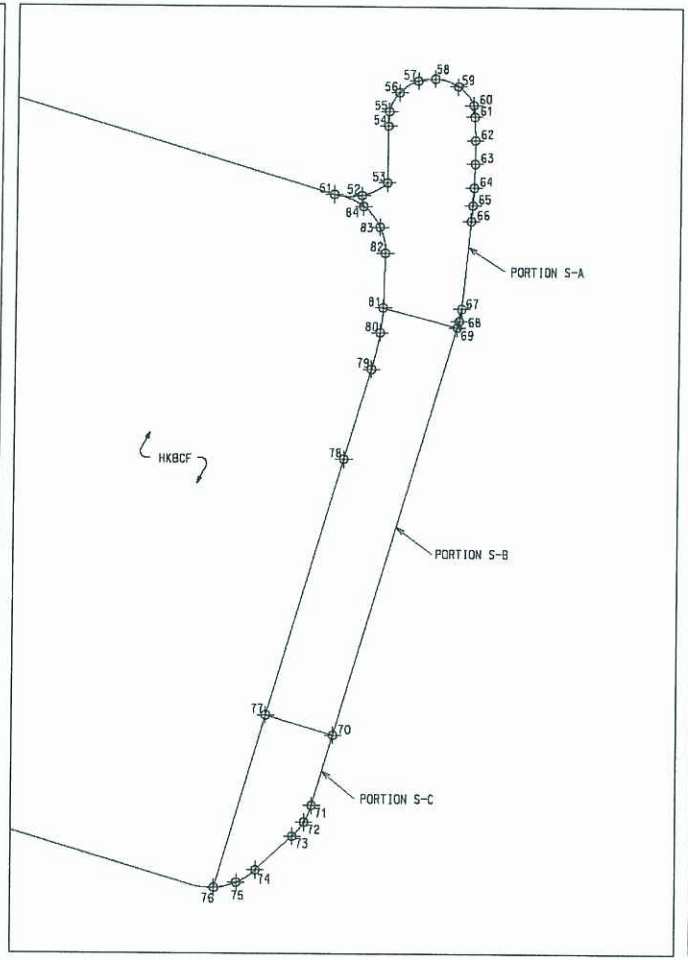
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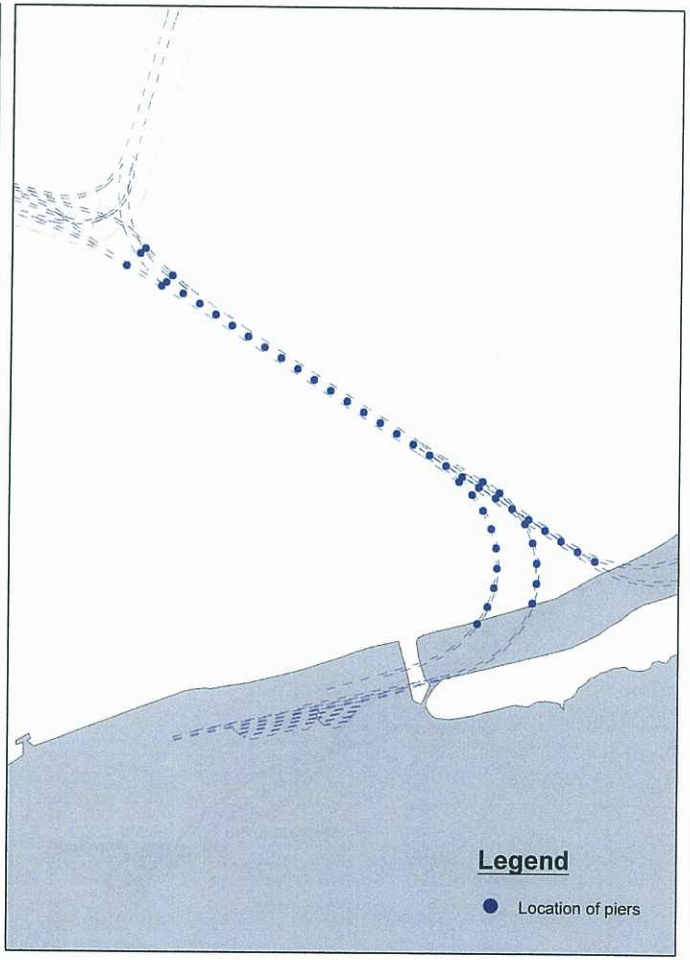
Northern Landfall (works not yet commence)



Southern Landfall (works not yet commence)



Southern Connection (works not yet commence)



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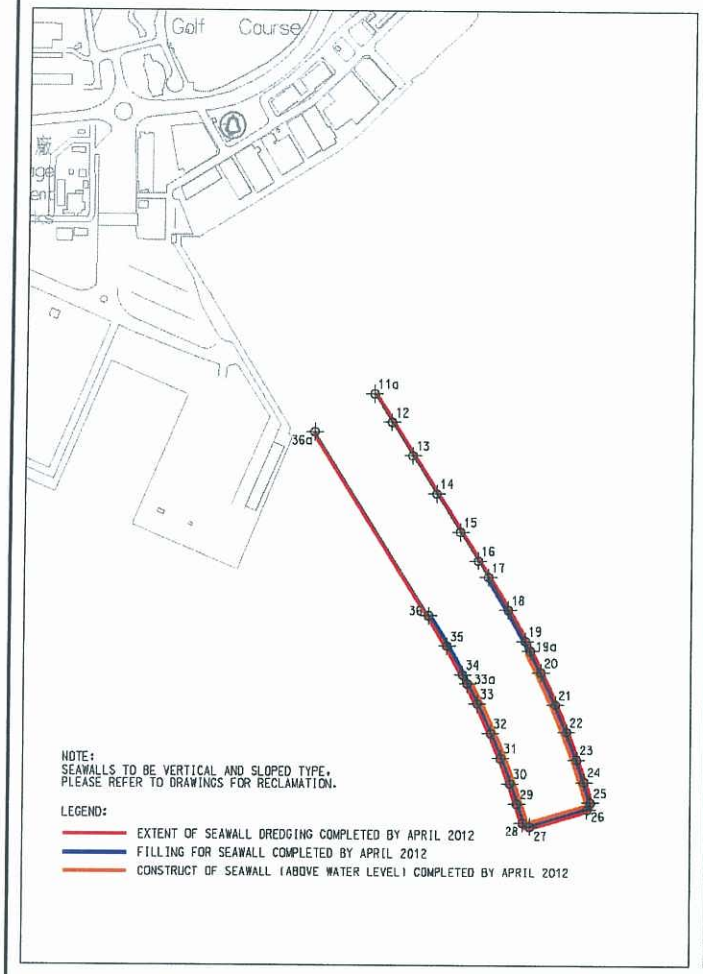
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TUEN MUN – CHECK LAP KOK LINK - INVESTIGATION

Anticipated Progress of Marine Works for TM-CLKL at Year 2011

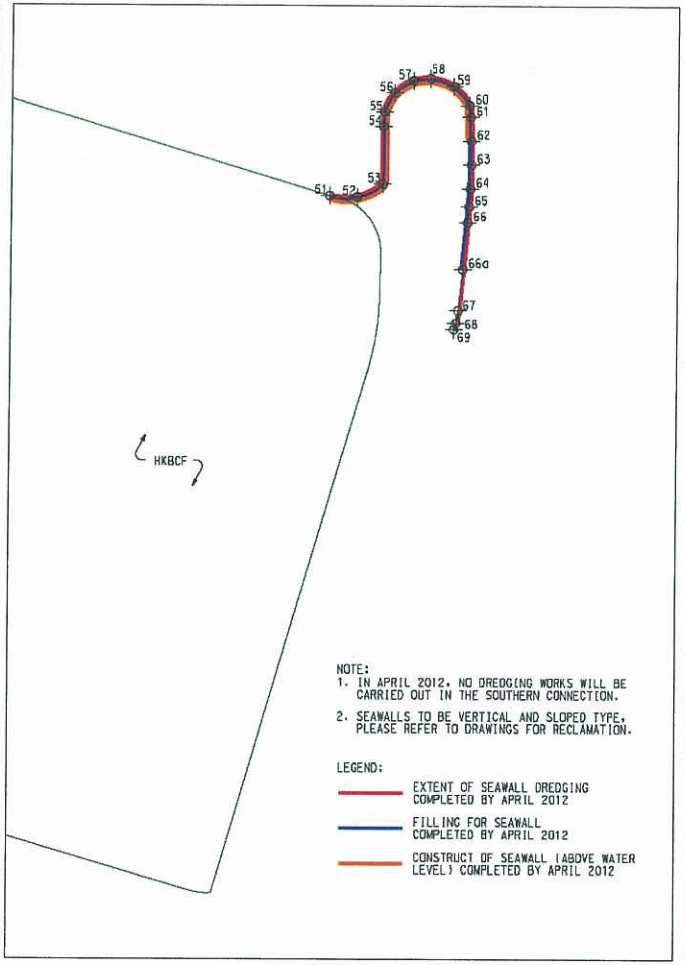
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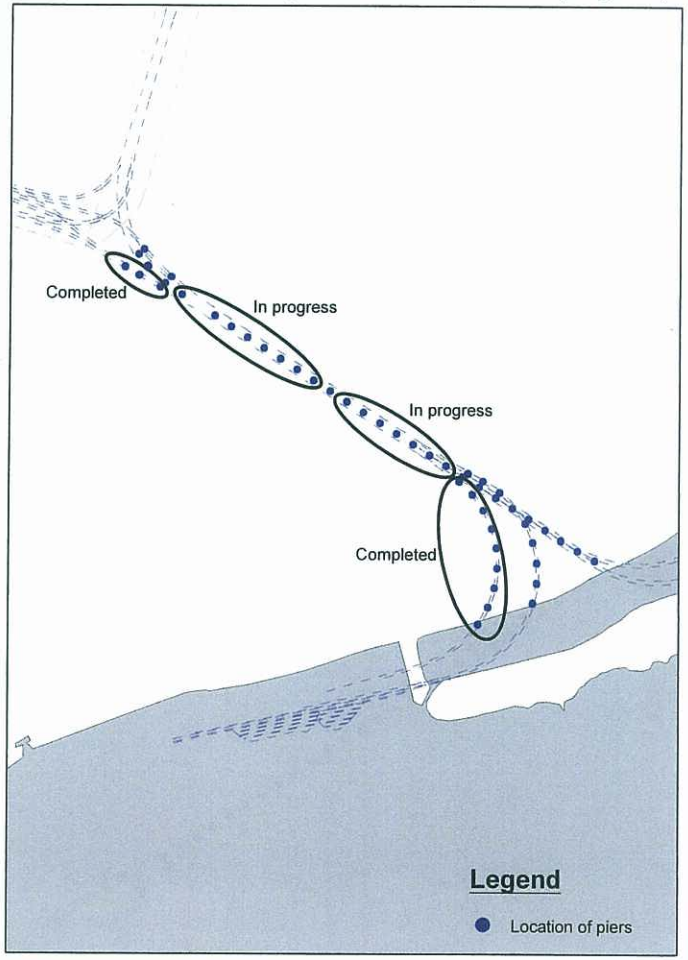
Northern Landfall



Southern Landfall



Southern Connection (construction of piers in progress)



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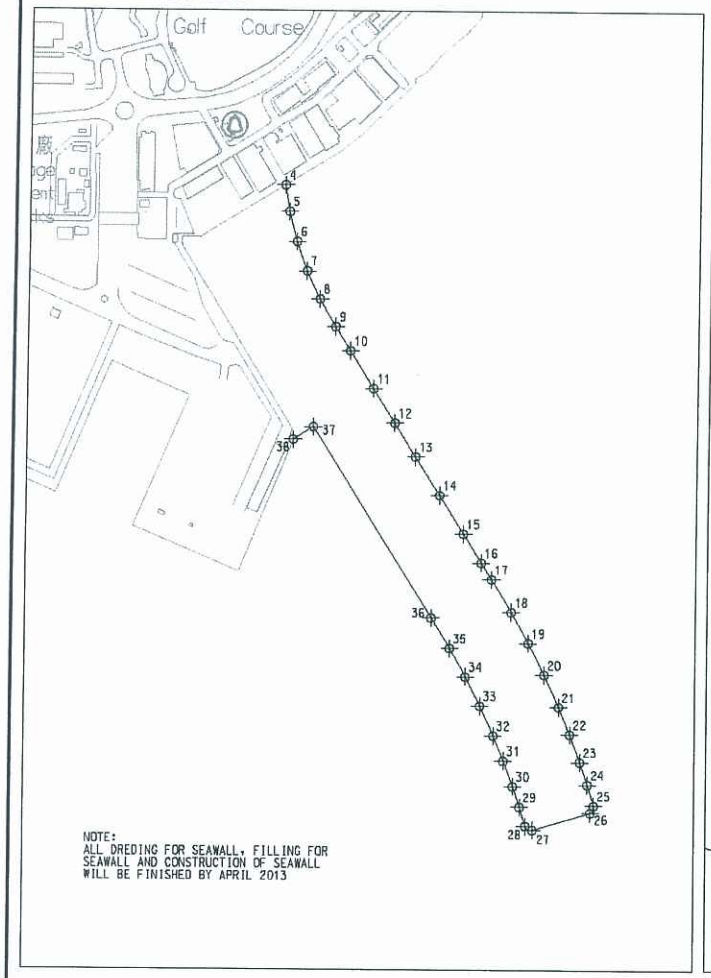
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TUEN MUN – CHECK LAP KOK LINK - INVESTIGATION

Anticipated Progress of Marine Works for TM-CLKL at Year 2012

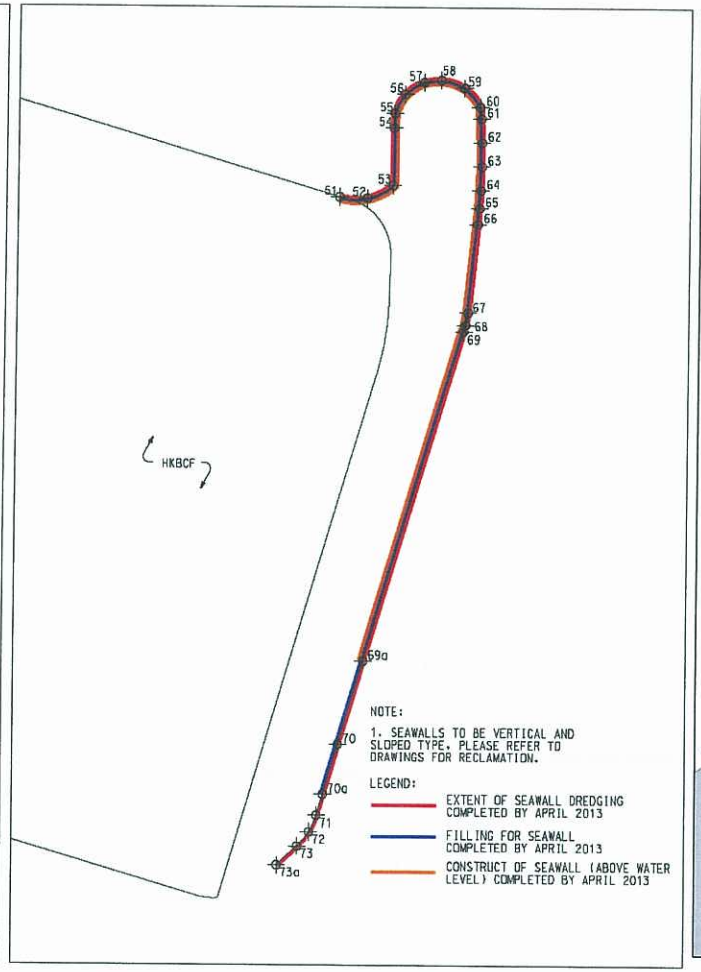
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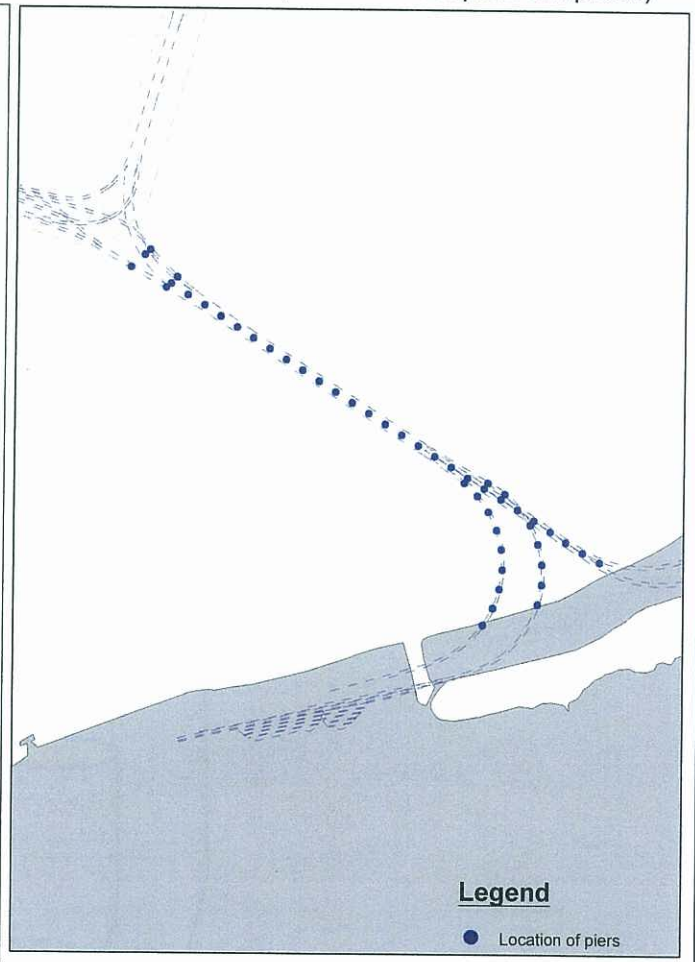
Northern Landfall



Southern Landfall



Southern Connection (construction of piers completed)



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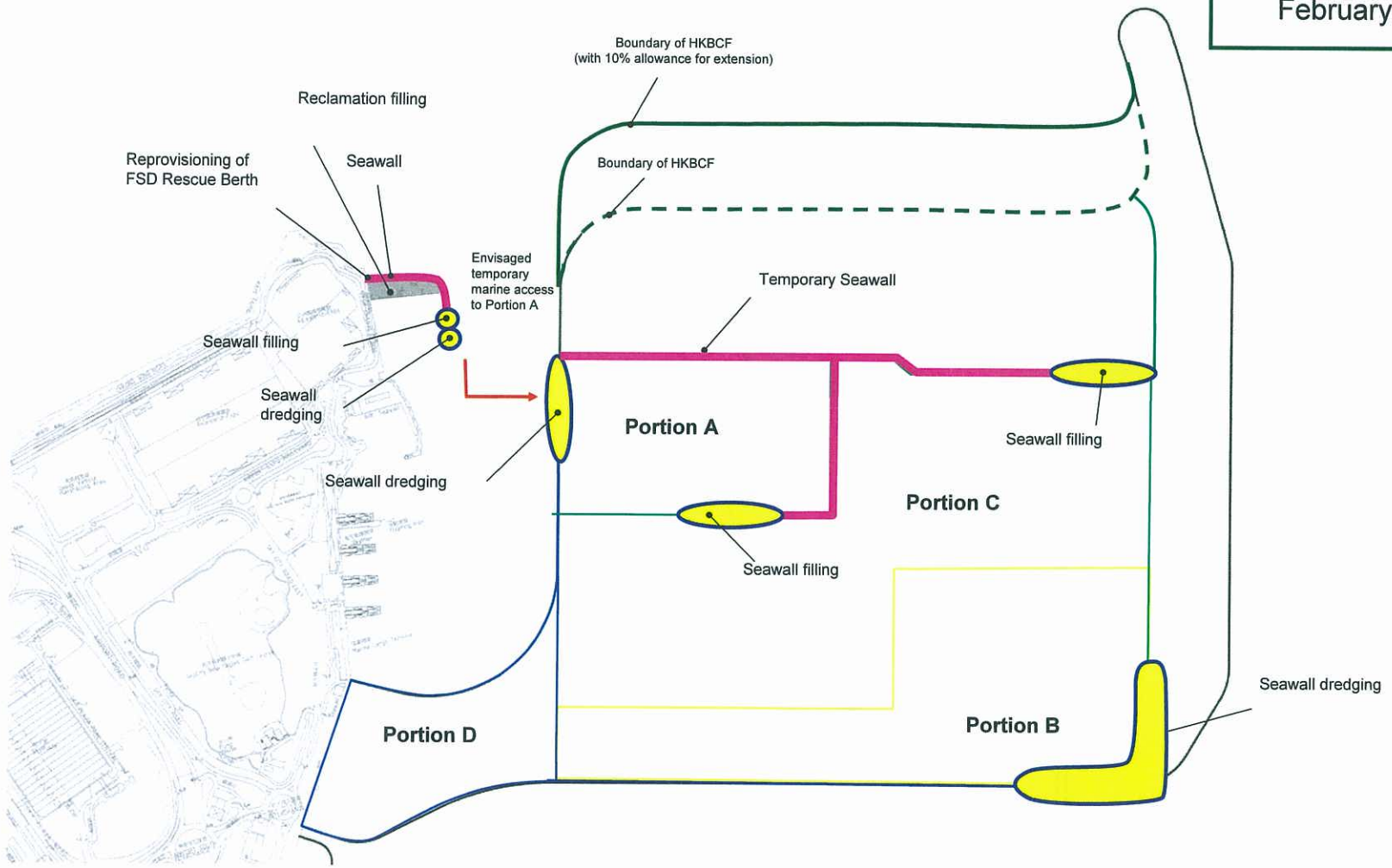
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TUEN MUN – CHECK LAP KOK LINK - INVESTIGATION

Anticipated Progress of Marine Works for TM-CLKL at Year 2013

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February 2011



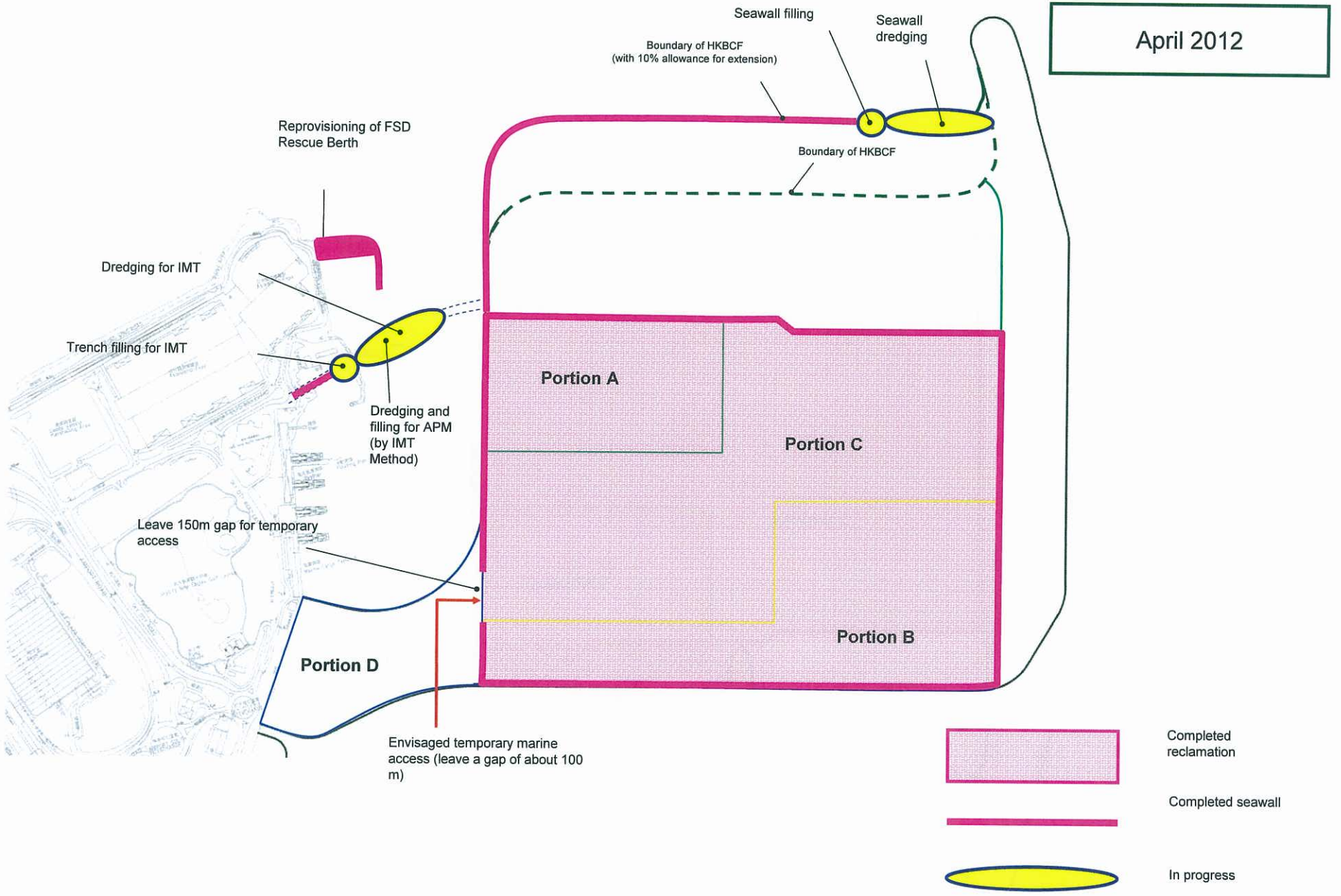
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AGREEMENT No. CE 52/2007 (HY)
TUEN MUN – CHECK LAP KOK LINK - INVESTIGATION

Anticipated Progress of Marine Works for HKBCF at Year 2011

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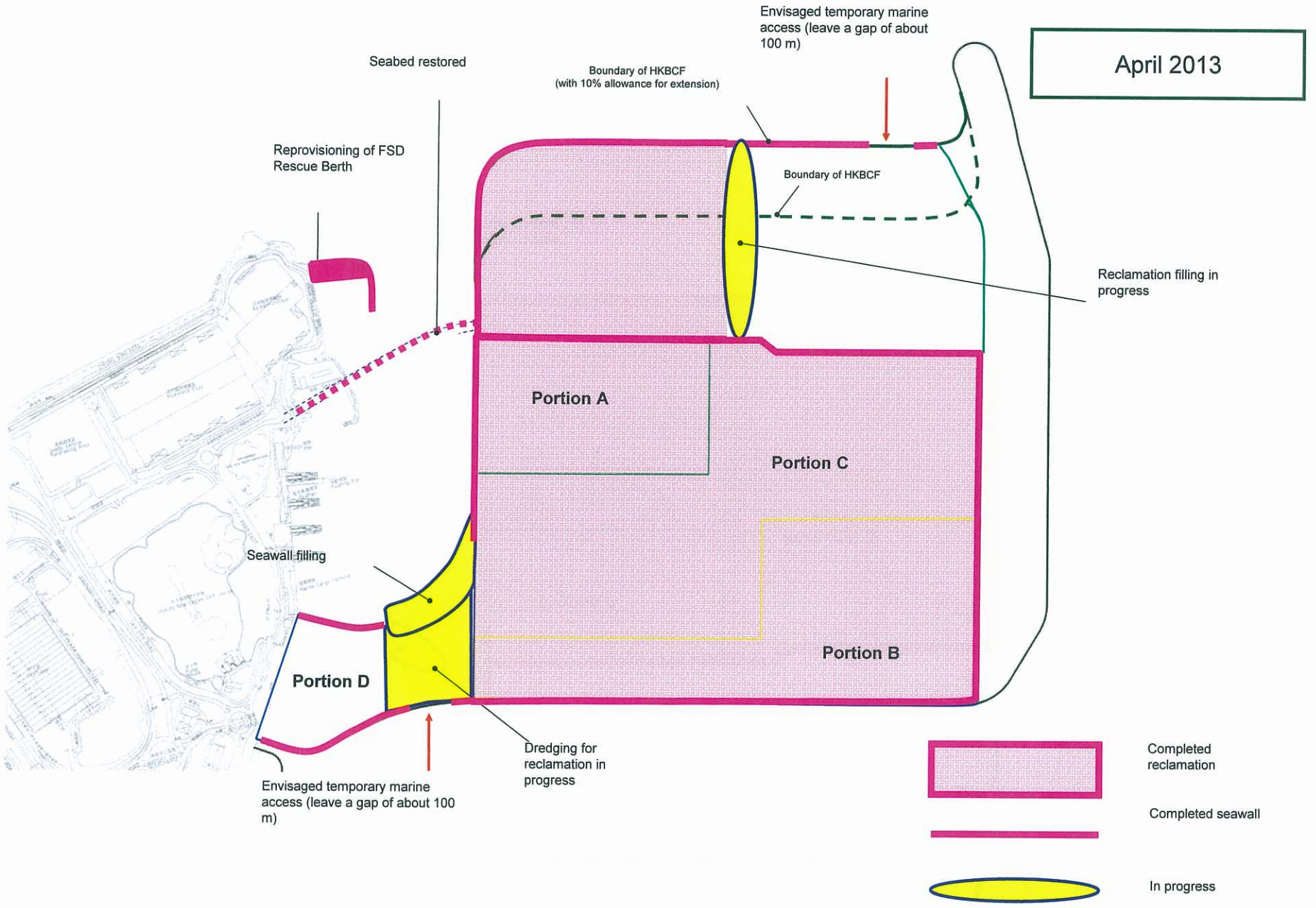
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AGREEMENT No. CE 52/2007 (HY)
TUEN MUN – CHECK LAP KOK LINK - INVESTIGATION

Anticipated Progress of Marine Works for HKBCF at Year 2012

SCALE	NTS	DATE	MAY. 2009
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JOB No.	60044963	DRAWING No.	19
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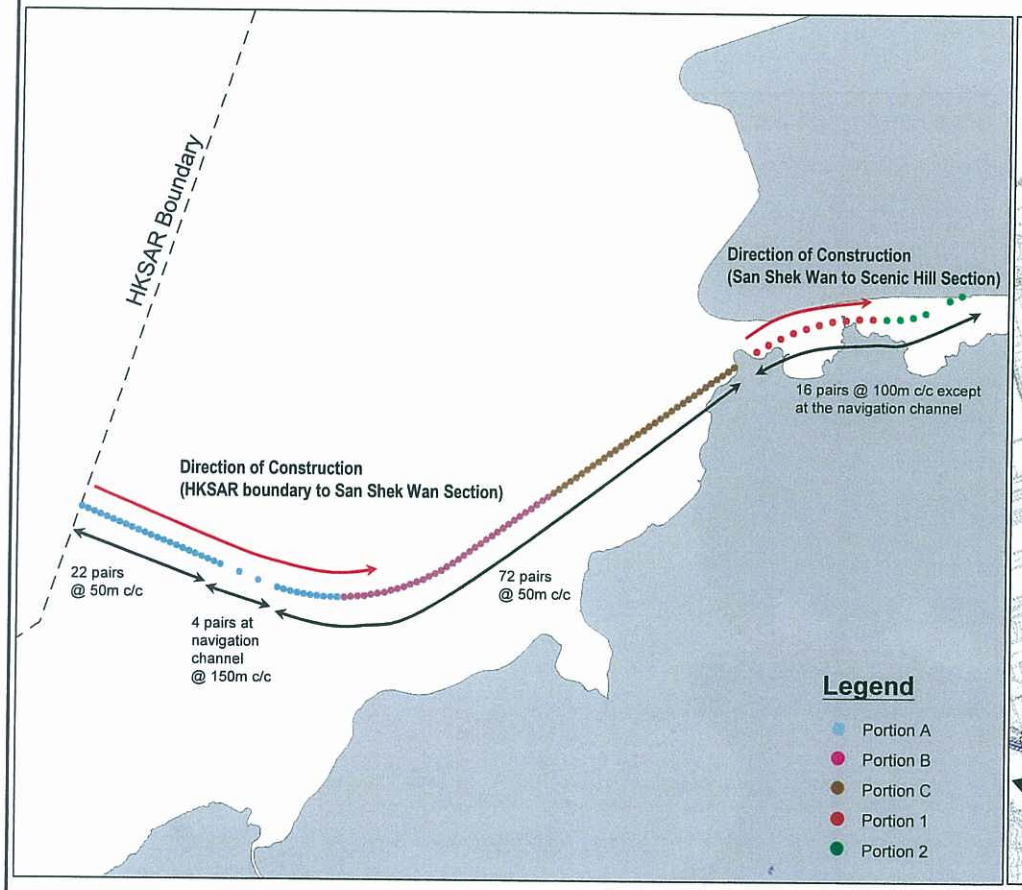
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TUEN MUN – CHECK LAP KOK LINK - INVESTIGATION

Anticipated Progress of Marine Works for HKBCF at Year 2013

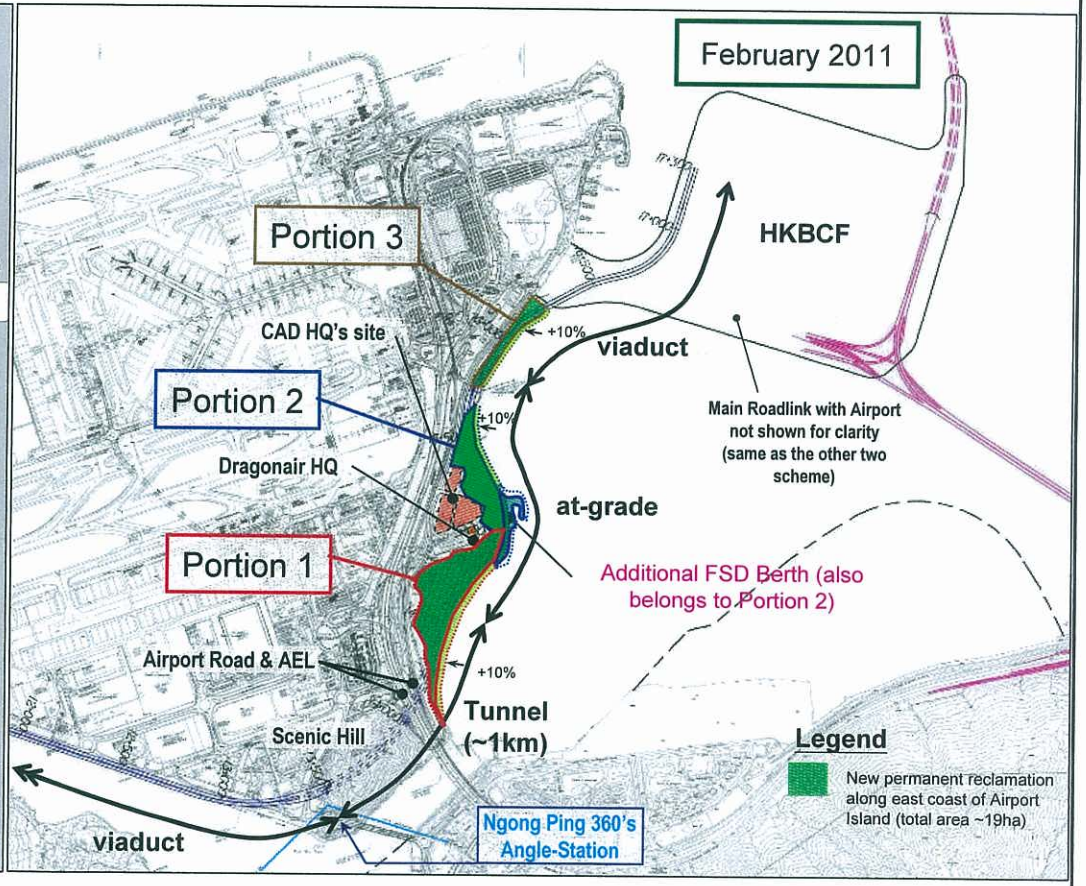
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Construction of piles not yet commence



Dredging / reclamation not yet commence



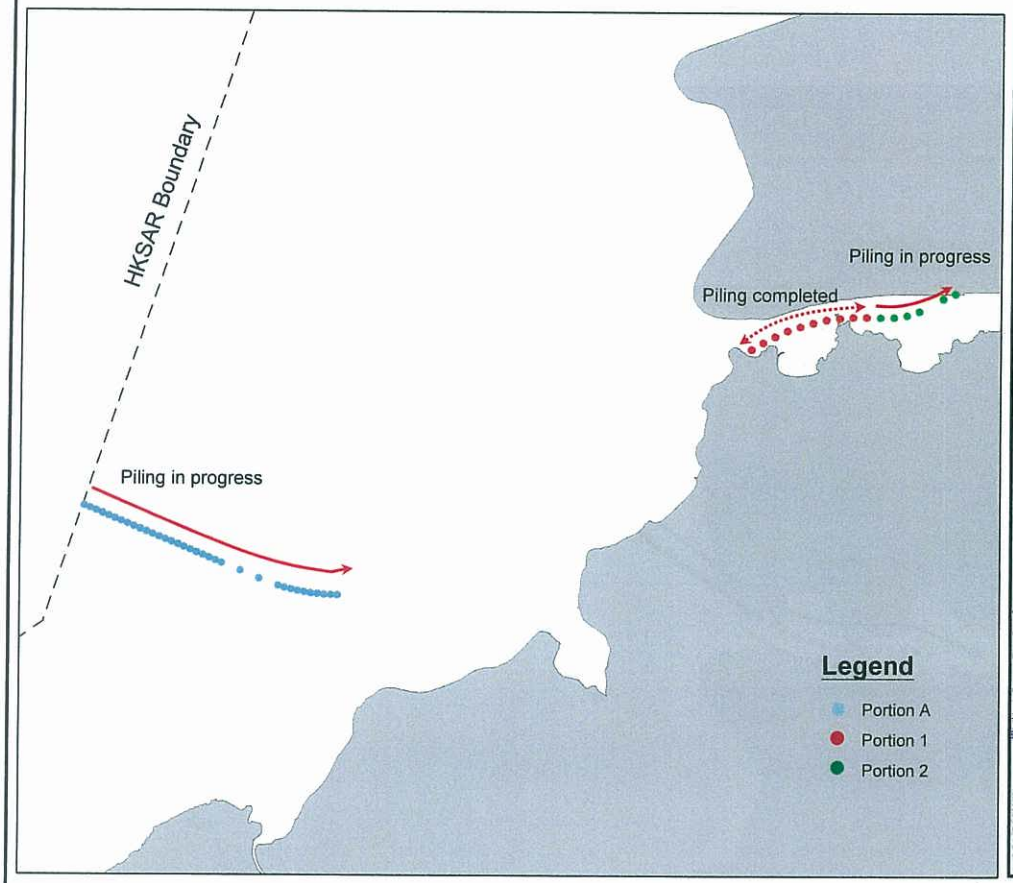
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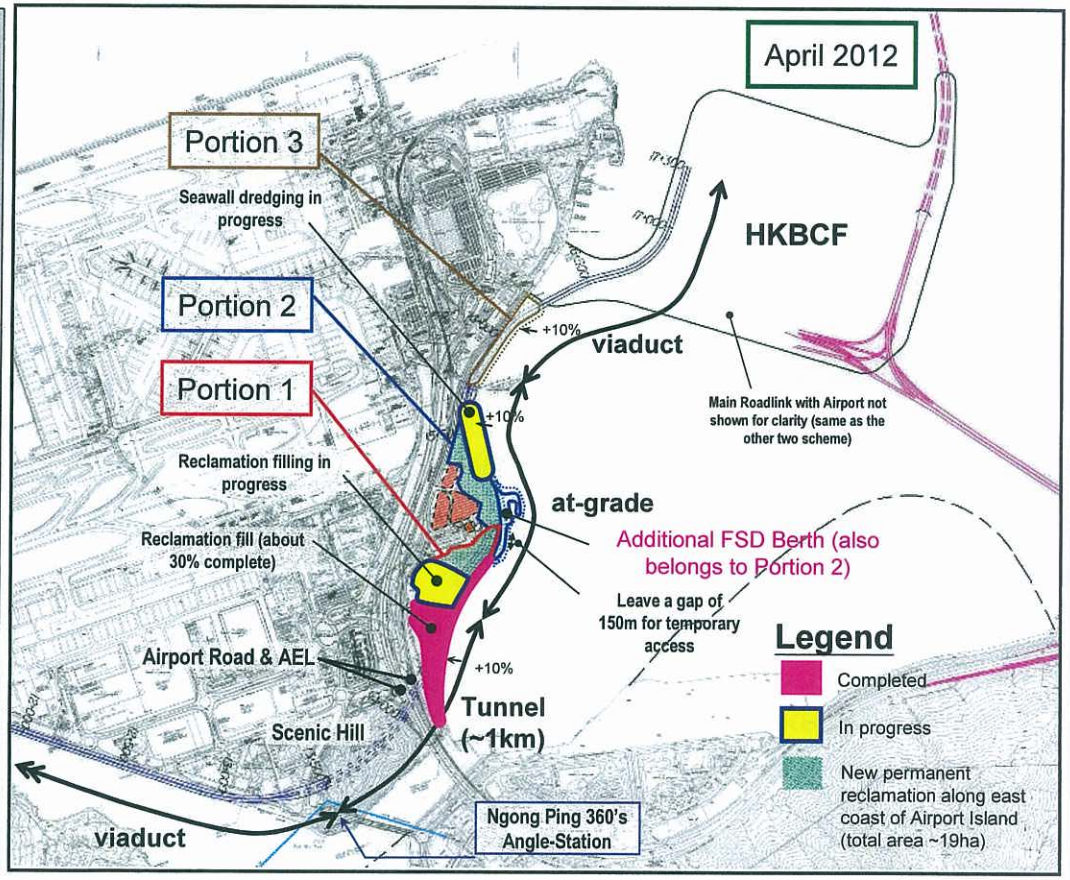
AGREEMENT No. CE 52/2007 (HY)
TUEN MUN – CHECK LAP KOK LINK - INVESTIGATION

Anticipated Progress of Marine Works for HKLR at Year 2011

SCALE	NTS	DATE	FEB. 2009
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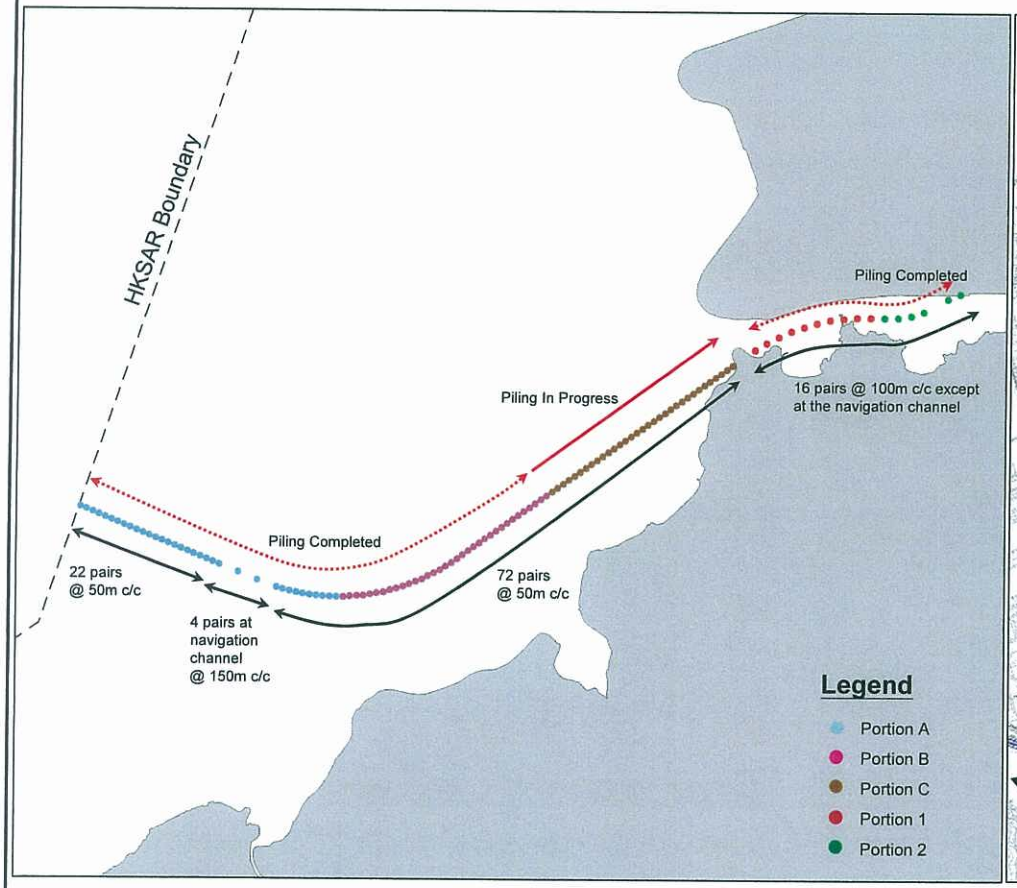
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TUEN MUN – CHECK LAP KOK LINK - INVESTIGATION

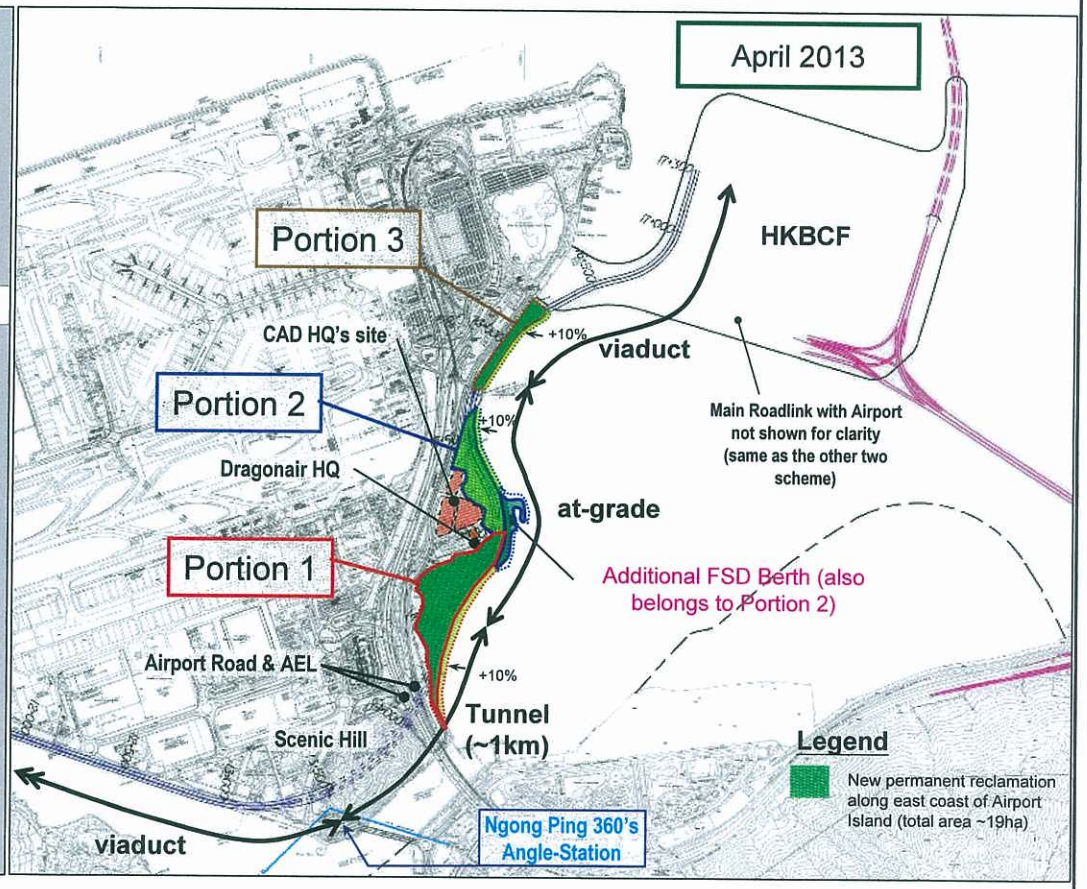
Anticipated Progress of Marine Works for HKLR at Year 2012

SCALE	NTS	DATE	FEB. 2009
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JOB No.	60044963	DRAWING No.	22
			REV

FILE:

Dredging / reclamation completed





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AGREEMENT No. CE 52/2007 (HY)
TUEN MUN – CHECK LAP KOK LINK - INVESTIGATION

Anticipated Progress of Marine Works for HKLR at Year 2013

SCALE	NTS	DATE	FEB. 2009
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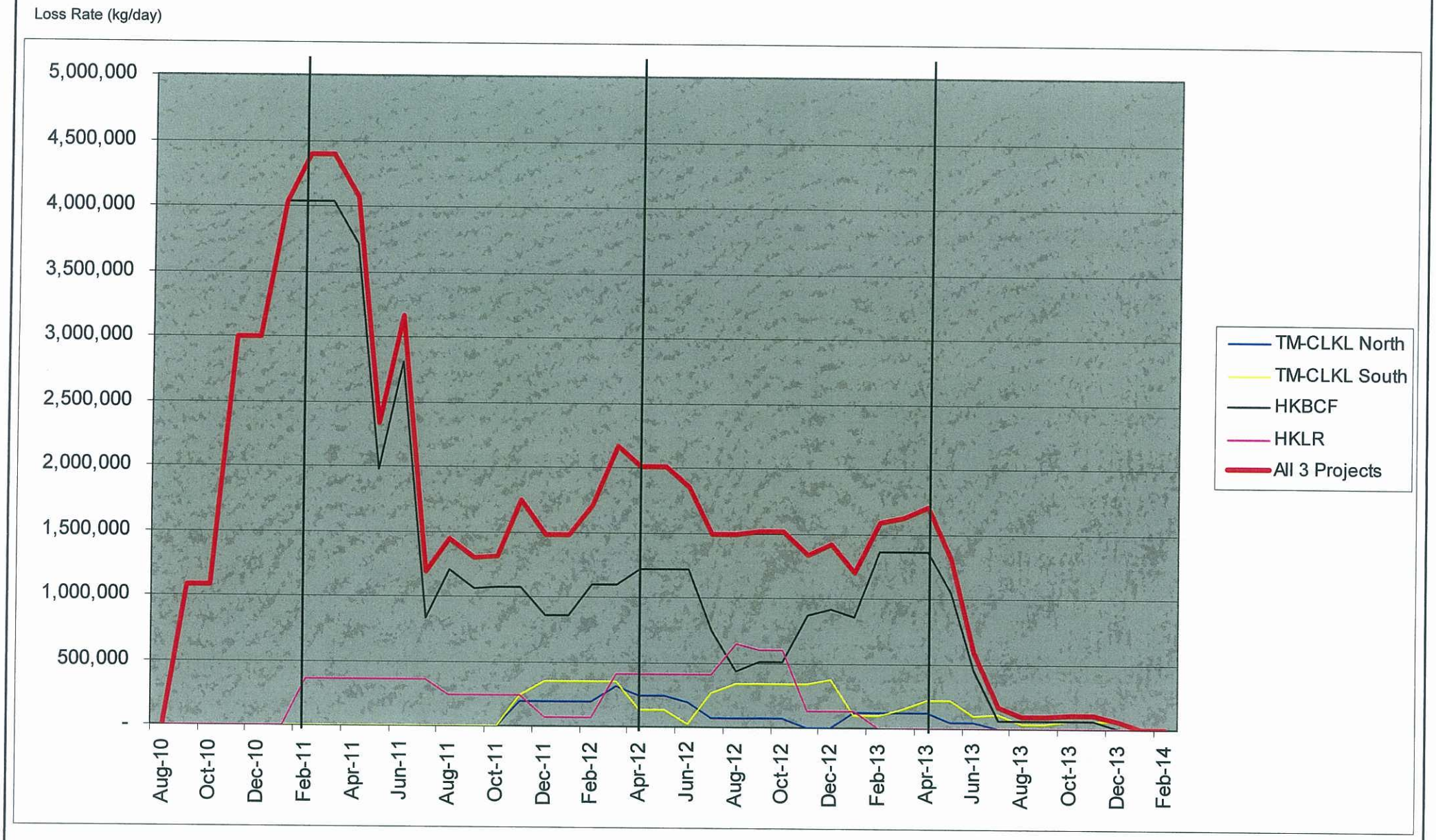
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AGREEMENT No. CE 52/2007 (HY)
TUEN MUN – CHECK LAP KOK LINK - INVESTIGATION

Envisaged Programme of Reclamation and Sediment Loss Rates for TM-CLKL +HKBCF + HKLR

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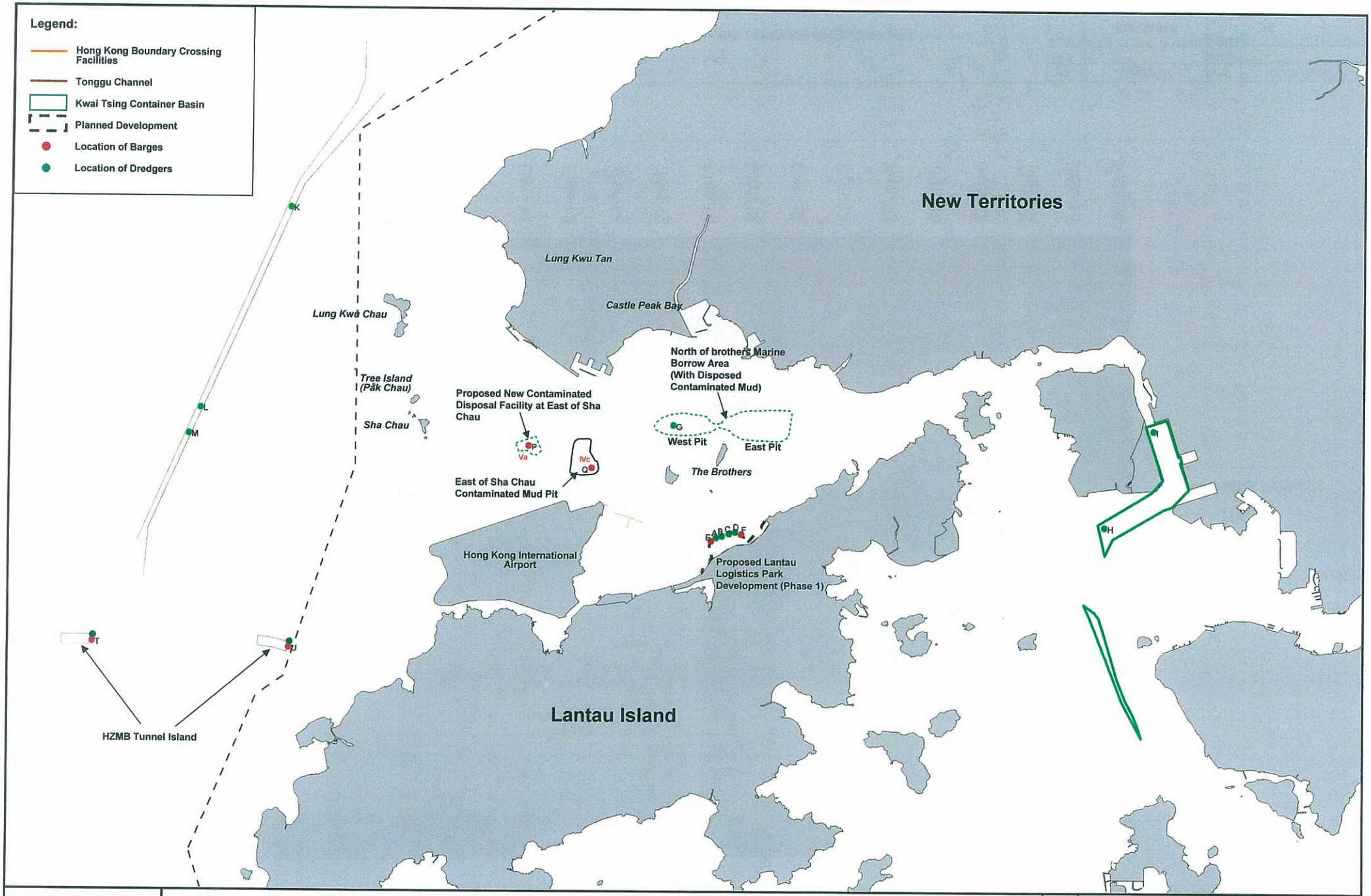
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AGREEMENT No. CE 52/2007 (HY)
TUEN MUN – CHECK LAP KOK LINK - INVESTIGATION

Total and Individual Unmitigated Sediment Loss Rates for the TM-CLKL+HKBCF+HKLR

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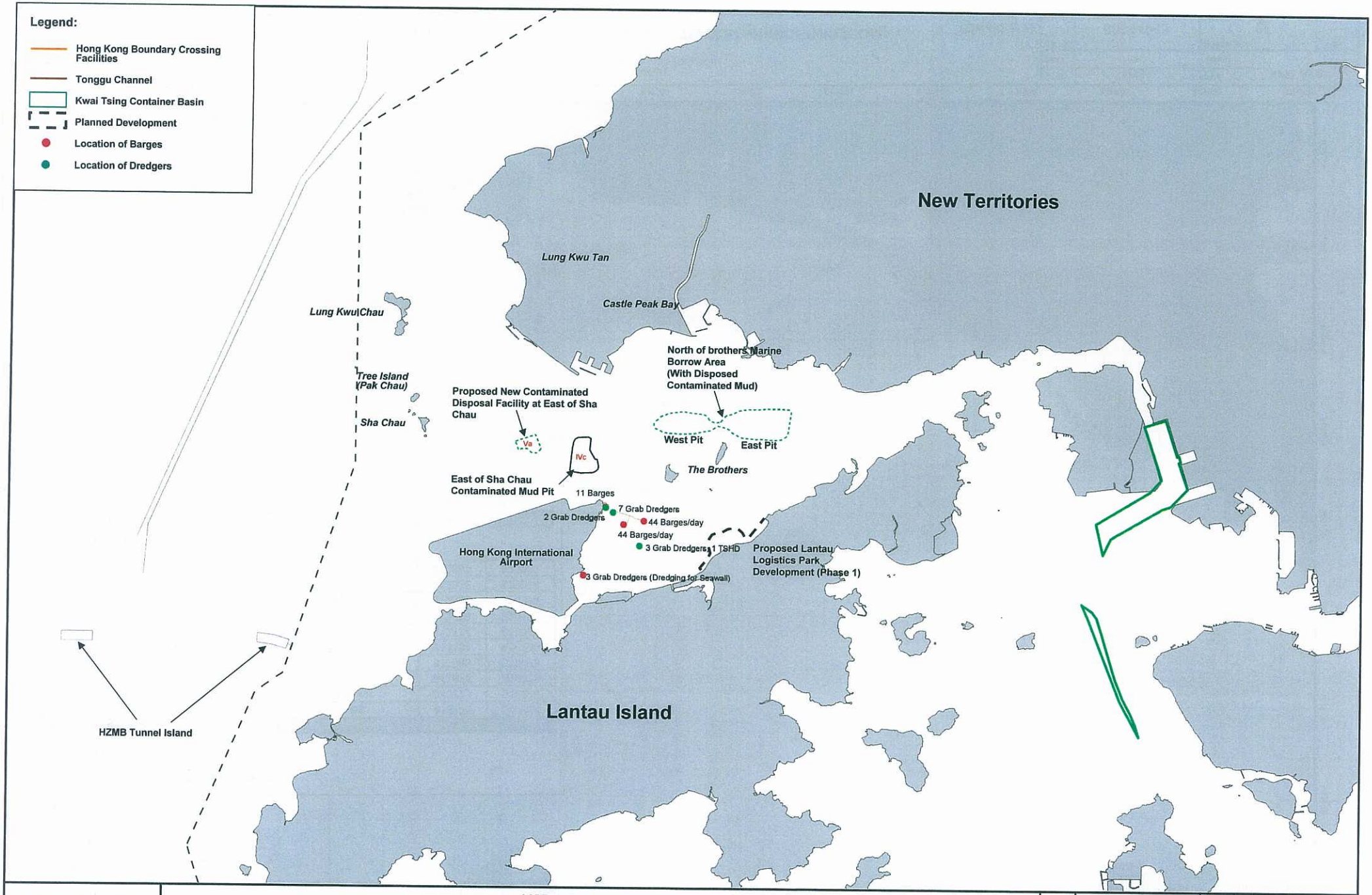
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AGREEMENT No. CE 52/2007 (HY)
TUEN MUN – CHECK LAP KOK LINK - INVESTIGATION

Assumed Coastline at 2011 with Indicative Location of Marine Plants For Concurrent Projects

SCALE	NTS	DATE	MAY. 2009
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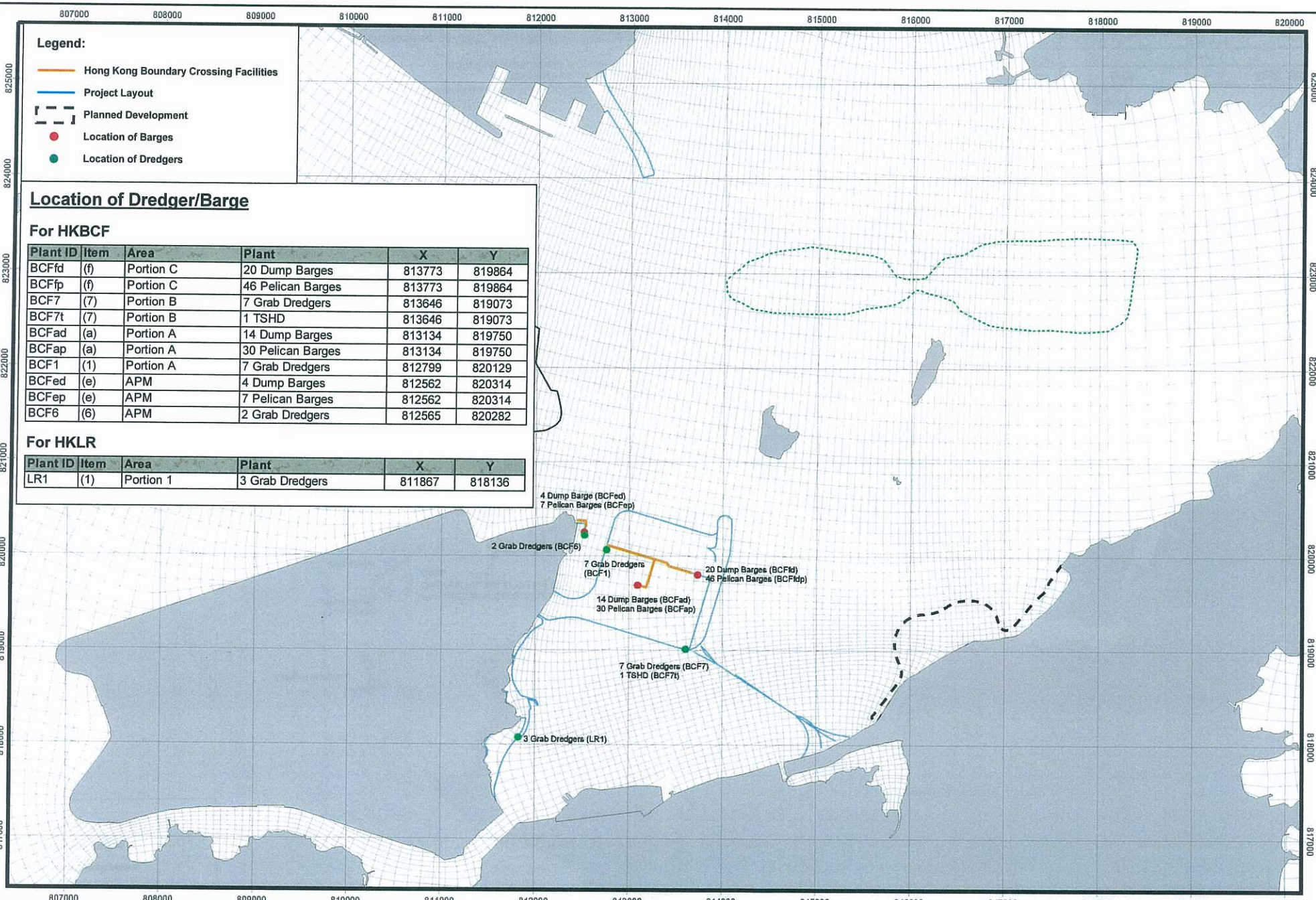
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TUEN MUN – CHECK LAP KOK LINK - INVESTIGATION

Assumed Coastline at 2011 with Marine Plants for TM-CLKL+HKBCF+HKLR Only

(Sheet 1 of 2)

SCALE	NTS	DATE	FEB. 2009
CHECK		DRAWN	
JOB No.	60044963	DRAWING No.	27
		REV	

FILE:



Location of Dredger/Barge

For HKBCF

Plant ID	Item	Area	Plant	X	Y
BCFfd	(f)	Portion C	20 Dump Barges	813773	819864
BCFfp	(f)	Portion C	46 Pelican Barges	813773	819864
BCF7	(7)	Portion B	7 Grab Dredgers	813646	819073
BCF7t	(7)	Portion B	1 TSHD	813646	819073
BCFad	(a)	Portion A	14 Dump Barges	813134	819750
BCFap	(a)	Portion A	30 Pelican Barges	813134	819750
BCF1	(1)	Portion A	7 Grab Dredgers	812799	820129
BCFed	(e)	APM	4 Dump Barges	812562	820314
BCFep	(e)	APM	7 Pelican Barges	812562	820314
BCF6	(6)	APM	2 Grab Dredgers	812565	820282

For HKLR

Plant ID	Item	Area	Plant	X	Y
LR1	(1)	Portion 1	3 Grab Dredgers	811867	818136

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TUEN MUN - CHEK LAP KOK LINK - INVESTIGATION

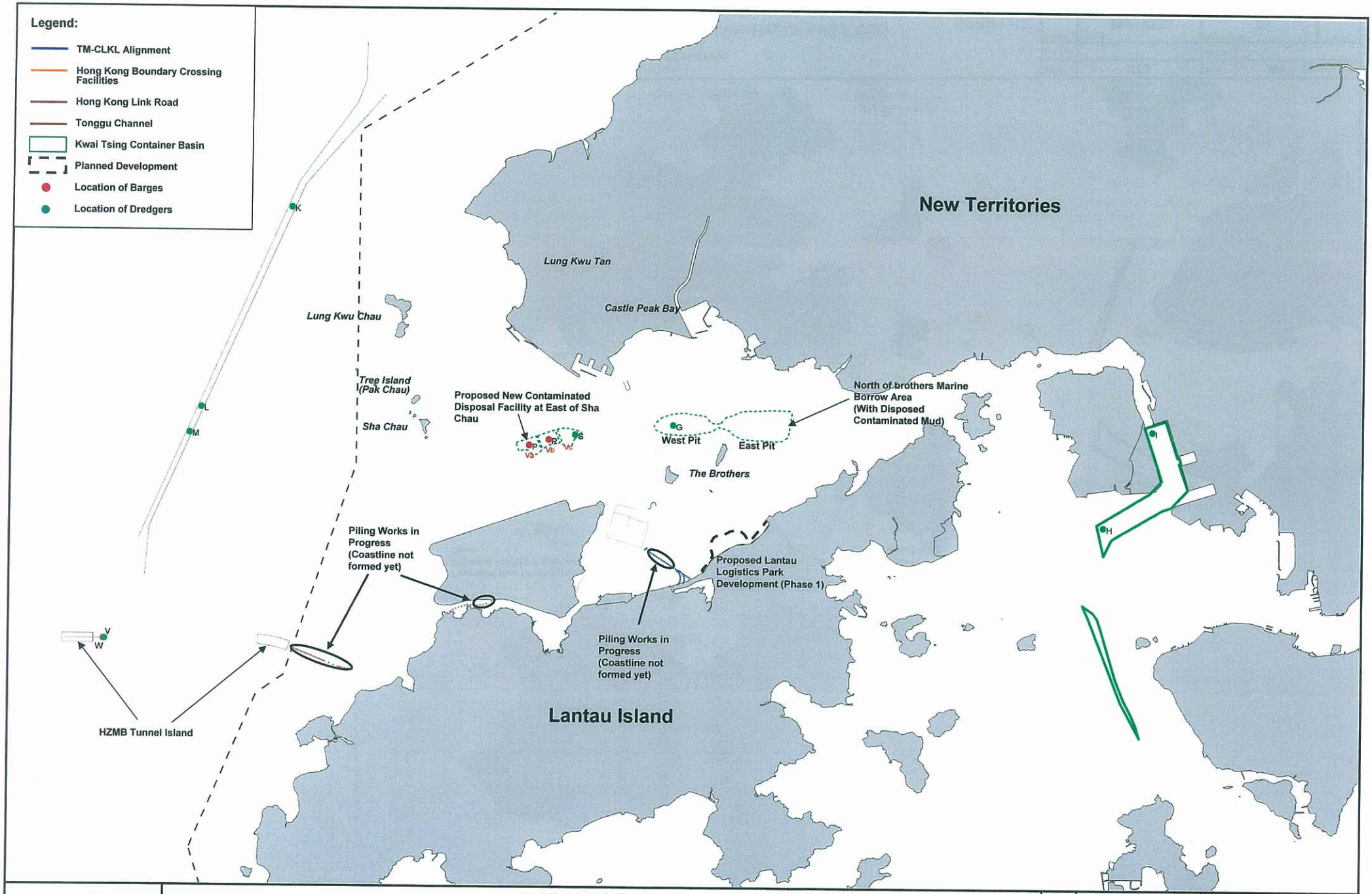
Assumed Coastline at 2011 with Marine Plants for TM-CLKL+HKBCF+HKLR Only

(Sheet 2 of 2)

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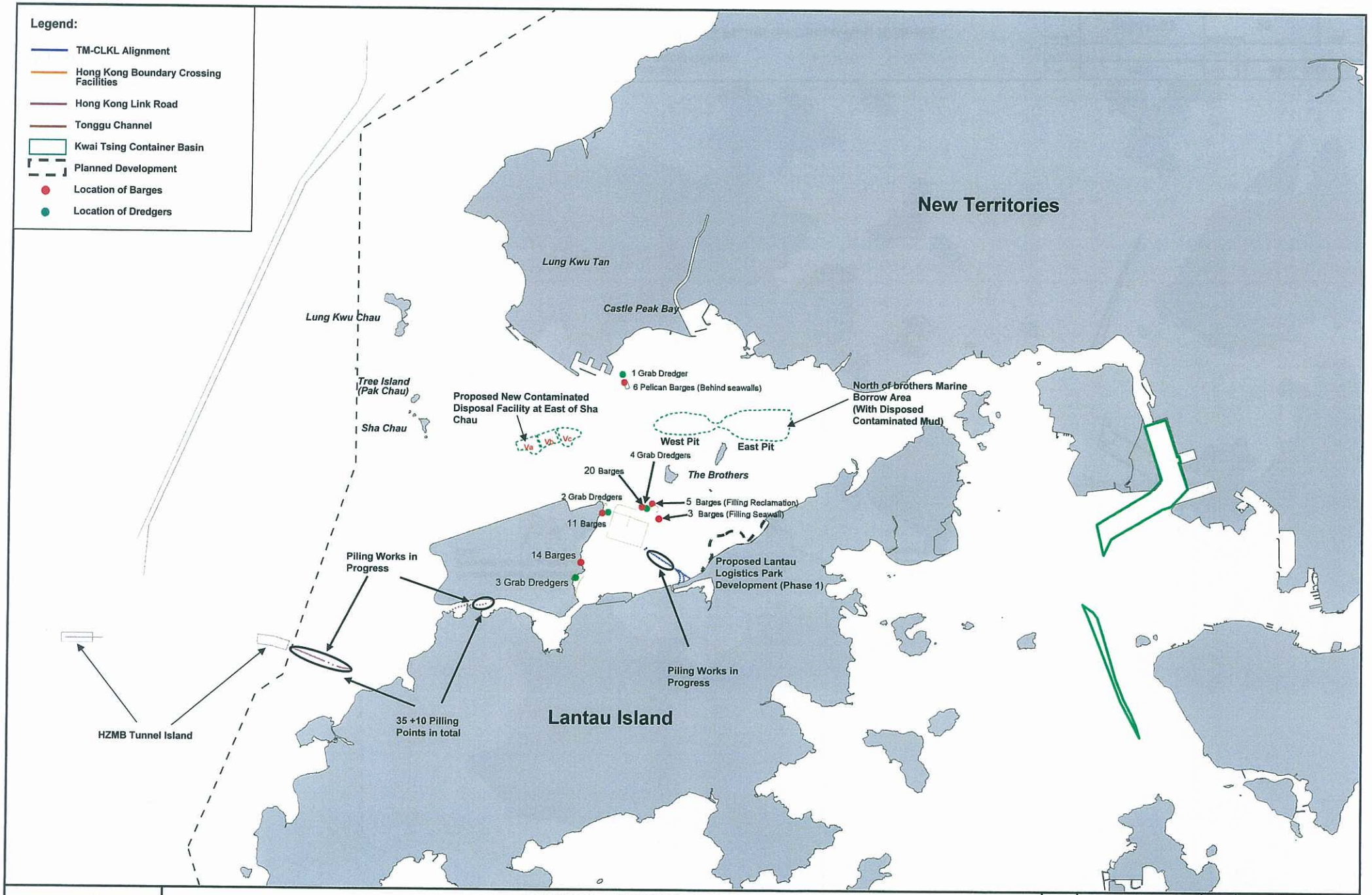
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AGREEMENT No. CE 52/2007 (HY)
TUEN MUN – CHECK LAP KOK LINK - INVESTIGATION

Assumed Coastline at 2012 with Indicative Location of Marine Plants for Concurrent Projects

SCALE	NTS	DATE	MAY. 2009
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JOB No.	60044963	DRAWING No.	28
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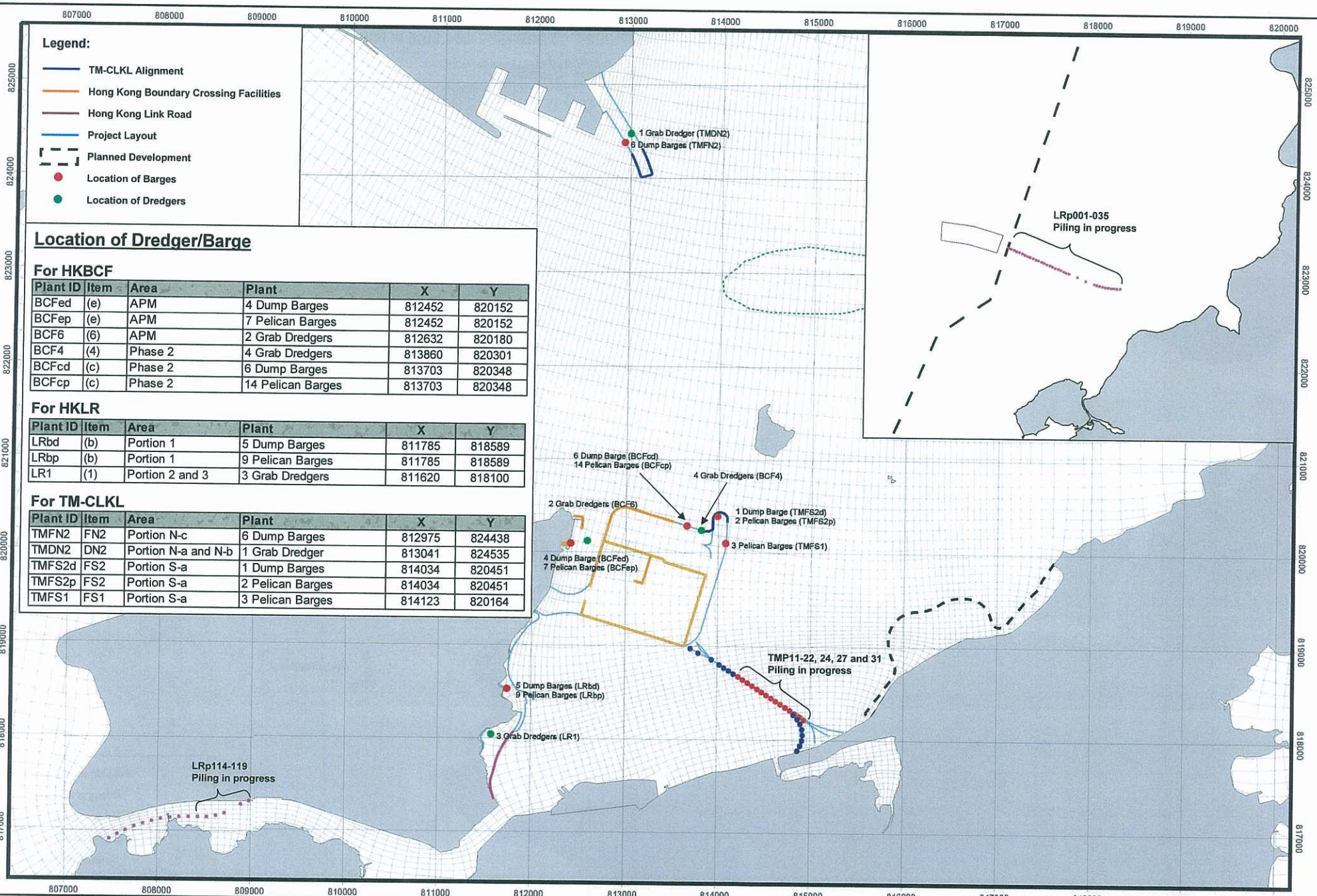
AGREEMENT No. CE 52/2007 (HY)
TUEN MUN – CHECK LAP KOK LINK - INVESTIGATION

Assumed Coastline at 2012 with Marine Plants for TM-CLKL+HKBCF+HKLR Only

(Sheet 1 of 2)

SCALE	NTS	DATE	MAY. 2009
CHECK		DRAWN	
JOB No.	60044963	DRAWING No.	29
			REV

FILE:



Location of Dredger/Barge

For HKBCF

Plant ID	Item	Area	Plant	X	Y
BCFed	(e)	APM	4 Dump Barges	812452	820152
BCFep	(e)	APM	7 Pelican Barges	812452	820152
BCF6	(6)	APM	2 Grab Dredgers	812632	820180
BCF4	(4)	Phase 2	4 Grab Dredgers	813860	820301
BCFcd	(c)	Phase 2	6 Dump Barges	813703	820348
BCFcp	(c)	Phase 2	14 Pelican Barges	813703	820348

For HKLR

Plant ID	Item	Area	Plant	X	Y
LRbd	(b)	Portion 1	5 Dump Barges	811785	818589
LRbp	(b)	Portion 1	9 Pelican Barges	811785	818589
LR1	(1)	Portion 2 and 3	3 Grab Dredgers	811620	818100

For TM-CLKL

Plant ID	Item	Area	Plant	X	Y
TMFN2	FN2	Portion N-c	6 Dump Barges	812975	824438
TMDN2	DN2	Portion N-a and N-b	1 Grab Dredger	813041	824535
TMFS2d	FS2	Portion S-a	1 Dump Barges	814034	820451
TMFS2p	FS2	Portion S-a	2 Pelican Barges	814034	820451
TMFS1	FS1	Portion S-a	3 Pelican Barges	814123	820164

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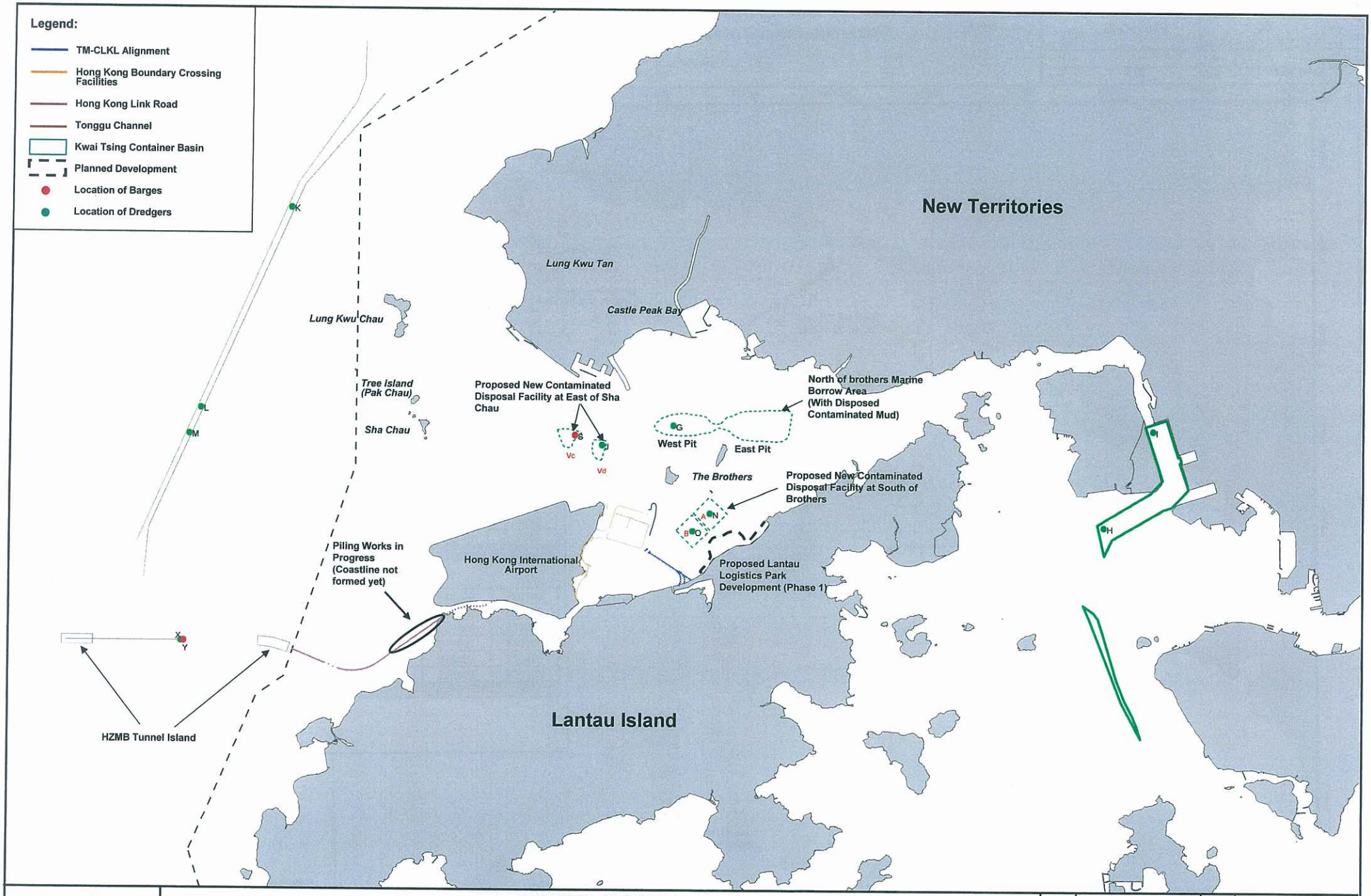
AGREEMENT NO. CE 52 / 2007 (HY)
TUEN MUN - CHEK LAP KOK LINK - INVESTIGATION

Assumed Coastline at 2012 with Marine Plants for TM-CLKL+HKBCF+HKLR Only

(Sheet 2 of 2)

SCALE	NTS	DATE	MAY. 2009
CHECK	--	DRAWN	--
JOB No.	60044963	DRAWING No.	29
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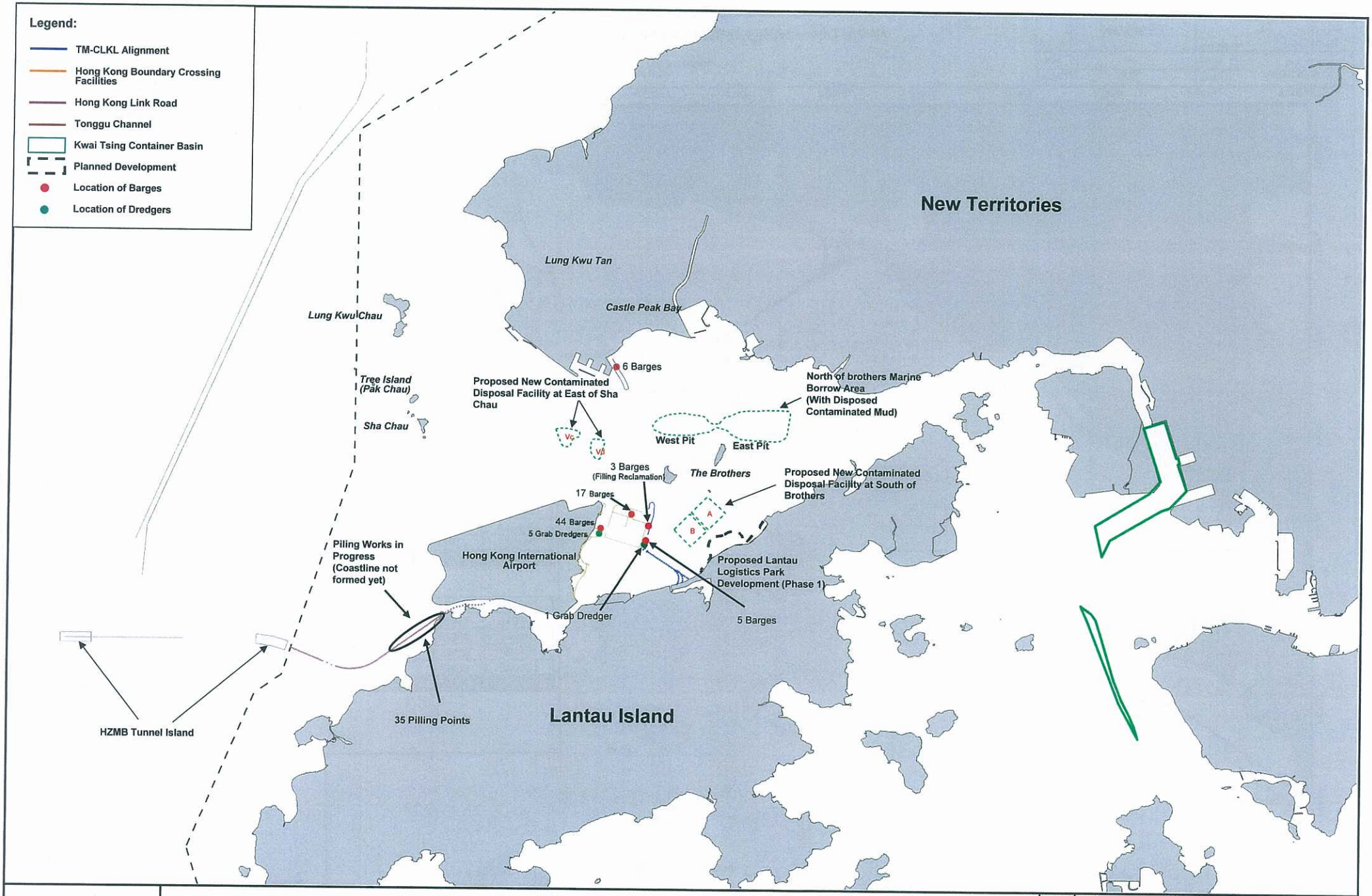
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AGREEMENT No. CE 52/2007 (HY)
TUEN MUN – CHECK LAP KOK LINK - INVESTIGATION

Assumed Coastline at 2013 with Indicative Location of Marine Plants For Concurrent Projects

SCALE	NTS	DATE	FEB. 2009
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		REV	

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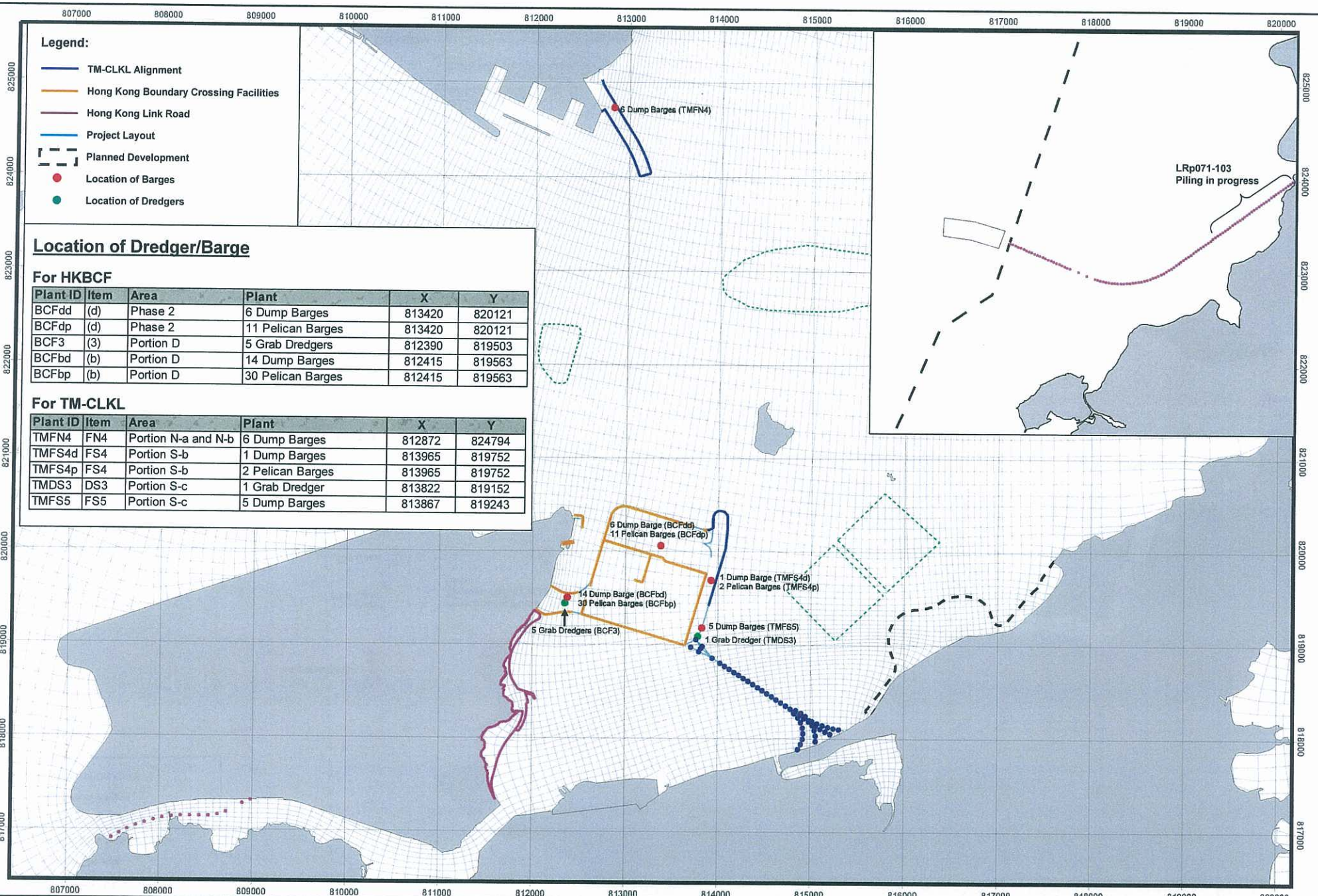
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TUEN MUN – CHECK LAP KOK LINK - INVESTIGATION

Assumed Coastline at 2013 with Marine Plants for TMCLKL+HKBCF+HKLR only

SHEET 1 OF 2

SCALE	NTS	DATE	FEB. 2009
CHECK		DRAWN	
JOB No.	60044963	DRAWING No. 31	REV

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Location of Dredger/Barge

For HKBCF

Plant ID	Item	Area	Plant	X	Y
BCFdd	(d)	Phase 2	6 Dump Barges	813420	820121
BCFdp	(d)	Phase 2	11 Pelican Barges	813420	820121
BCF3	(3)	Portion D	5 Grab Dredgers	812390	819503
BCFbd	(b)	Portion D	14 Dump Barges	812415	819563
BCFbp	(b)	Portion D	30 Pelican Barges	812415	819563

For TM-CLKL

Plant ID	Item	Area	Plant	X	Y
TMFN4	FN4	Portion N-a and N-b	6 Dump Barges	812872	824794
TMFS4d	FS4	Portion S-b	1 Dump Barges	813965	819752
TMFS4p	FS4	Portion S-b	2 Pelican Barges	813965	819752
TMDS3	DS3	Portion S-c	1 Grab Dredger	813822	819152
TMFS5	FS5	Portion S-c	5 Dump Barges	813867	819243

Plotting By: BAKER
PLOT SCALE: 1.00ALES=SHORTS

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AGREEMENT NO. CE 52 / 2007 (HY)
TUEN MUN - CHEK LAP KOK LINK - INVESTIGATION

Assumed Coastline at 2013 with Marine Plants for TMCLKL+HKBCF+HKLR only

SHEET 1 OF 2

SCALE	NTS	DATE	MAY. 2009
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JOB No.	60044963	DRAWING No.	31
		REV	--

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Scenario No.	Year	Description	Purpose	Model Output	Concurrent Projects Included
Simulations of Tidal Flows (Wet and Dry Season Simulations)					
V1	Verification (2010)	Simulation of the Baseline (2010) Scenario using the original model grid before any grid refinement	To verify that the grid refinement has not changed the simulation of the large scale tidal flows	The model results (tidal levels, water velocities and salinity at selected locations and discharges across selected sections) will be compared with the Baseline Simulation (No. 1 below) to verify that the grid refinement has not modified large scale tidal flows	see No 1. below
V2	Verification (2010)	Repeat the Baseline (2010) Scenario using the refined model grid for successive 15 days simulaiton period.	To verify that the spin up and simulation periods are sufficient and results stabilised	The model results (tidal levels, water velocities and salinity at selected locations and discharges across selected sections) will be compared with the Baseline Simulation (No. 1 below) to verify that the model has stabilised	see No 1. below
1	2010	Baseline Scenario using the refined model grid	Baseline Scenario before construction of the TM-CLKL+HKBCF+HKLR	The model results will be compared with the Verification simulations	Tonggu Channel changed bathymetry, CMPs 2010, Cooling water discharges from Black Point, Castle Peak and Lamma Power Stations
2	Feb 2011	Simulation of the coastline and exrtent of seawall construction in February 2011	To provide the tidal flows for the simulation of the initial worst case dredging and filling scenario	The model results will be compared with the Verification simulation and will provide tidal flow fields for the sediment plume simulations for the TM-CLKL+HKBCF+HKLR plus all concurrent projects expected to begin construction or be underway in 2011	Tonggu Channel changed bathymetry, CMPs 2011, Kwai Tsing Basin changed bathymetry, Cooling water discharges from Black Point, Castle Peak and Lamma Power Stations, part seawall for Portion A of HKBCF, HZMB artificial islands
3	Apr 2012	Intermediate construction phase on bulk completion of the HKBCF Phase I in April 2012	Tidal flow fields required for assessment of the construciton impact of the intermediate phase of TM-CLKL+HKBCF+HKLR and all concurrent works in 2012.	Model results will provide tidal flow fields for the sediment plume simulations for the TM-CLKL+HKBCF+HKLR plus all concurrent projects expected to be under construction in this year at the time the Phase I works are finishing	Tonggu Channel changed bathymetry, CMPs at interim year, Kwai Tsing Basin changed bathymetry at 2012, Cooling water discharges from Black Point, Castle Peak and Lamma Power Stations, portion A, B and C and part phase II seawall for HKBCF, part TM-CLKL southern viaduct piers, seawall for southern nib and northern nib of northern and southern TM-CLKL reclamations respectively, Portion 1 and part of piers for HKLR, HZMB artifical islands, seawall for LLP 72ha.
4	Apr 2013	Simulation of the substantially completed TM-CLKL+HKBCF+HKLR and concurrent works in April 2013 when works are nearing completion but potential sediment losses are still significant	Tidal flow fields required for assessment of the construciton impact of the nearly completed TM-CLKL+HKBCF+HKLR and all concurrent works in 2013.	Model results will provide tidal flow fields for the sediment plume simulations for the TM-CLKL+HKBCF+HKLR plus all concurrent projects expected to be under construction in this year at the time the Phase II works are finishing	Tonggu Channel changed bathymetry, CMPs at 2013, complete Kwai Tsing Basin changed bathymetry, Cooling water discharges from Black Point, Castle Peak and Lamma Power Stations, complete Phase I HKBCF, part complete Phase II reclamation and Portion D for HKBCF, complete northern reclamation for TM-CLKL, complete southern viaduct for TM-CLKL, complete reclamation for HKLR, part complete piers for HKLR, HZMB artificial islands, complete LLP 72ha
5	end 2026	Simulation of the completed TM-CLKL+HKBCF+HKLR and concurrent works including Road P1 in 2026	Tidal flow fields required for the assessment of the impact the completed TM-CLKL+HKBCF+HKLR compared to other concurrent works in completed 2026 has on tidal flows	Model results will provide the tidal flow fields required for the simulation of water quality on completion of the TM-CLKL+HKBCF+HKLR and all concurrent works in 2026	Tonggu Channel changed bathymetry, CMPs at 2016, complete Kwai Tsing Basin changed bathymetry, Cooling water discharges from Black Point, Castle Peak and Lamma Power Stations, complete HKBCF, complete TM-CLKL, complete HKLR, complete HZMB, LLP 72ha, LLP 40ha, Tung Chung East and West developments, Road P1 eastern section
6	end 2026	Simulation of the completed concurrent works including Road P1but without the TM-CLKL+HKBCF+HKLR	Tidal flow fields required for the assessment of the impact the completed concurrent works in 2026 has on tidal flows without the TM-CLKL+HKBCF+HKLR.	Model results will provide the tidal flow fields required for the simulation of water quality on completion of all concurrent works in 2026 without the TM-CLKL+HKBCF+HKLR	Tonggu Channel changed bathymetry, CMPs at 2016, complete Kwai Tsing Basin changed bathymetry, Cooling water discharges from Black Point, Castle Peak and Lamma Power Stations, complete HZMB, LLP 72ha, LLP 40ha, Tung Chung East and West developments, Road P1 eastern section
Simulations of Sediment Plumes (Wet and Dry Season Simulations) - Construction Impacts					**Notes**
P1	2011	Simulation of the start of construction of the TM-CLKL+HKBCF+HKLR together with all concurrent projects underway or beginning in 2011	To assess cumulative impacts on suspended solids concentrations arising from losses of fine sediment to suspension during the construction of the TM-CLKL+ HKBCF+HKLR and all other concurrent works in 2011	The model results (in terms of elevations in suspended solids concentrations and deposition rates) will be assessed with respect to the Water Quality Objectives and other water quality standards set for, for example, seawater intakes, marine life and deposition rates on coral sites. If the sediment to be dredged is contaminated, the model results will be interpreted in terms of the maximum contaminant concentrations in the water column and at the sensitive receivers.	These simulations will use the tidal flow model results from the Flow simulation No. 2 above and including sediment losses from concurrent projects listed above.
P2	2012	Simulation of the interim stages of construction of the TM-CLKL+HKBCF+HKLR Phase I together with all concurrent projects underway in 2012	To assess cumulative impacts on suspended solids concentrations arising from losses of fine sediment to suspension during the interim stages of construction of the TM-CLKL+ HKBCF+HKLR Phase I and all other concurrent works in 2012	same as P1	These simulations will use the tidal flow model results from the Flow simulation No. 3 above and including sediment losses from concurrent projects listed above.
P3	2013	Simulation of the interim stages of construction of the TM-CLKL+HKBCF+HKLR Phase II together with all concurrent projects underway in 2013	To assess cumulative impacts on suspended solids concentrations arising from losses of fine sediment to suspension during the interim stages of construction of the TM-CLKL+ HKBCF+HKLR Phase II and all other concurrent works in 2013	Same as P1	These simulations will use the tidal flow model results from the Flow simulation No. 4 above and including sediment losses from concurrent projects listed above.
P4	2011	Simulation of the start of construction of the TM-CLKL+HKBCF+HKLR in 2011	To assess impacts on suspended solids concentrations arising from losses of fine sediment to suspension during the construction of the TM-CLKL+ HKBCF+HKLR in 2011	Same as P1	Similar to Simulation P1, but the sediment losses from concurrent projects excluded.
P5	2012	Simulation of the interim stages of construction of the TM-CLKL+HKBCF+HKLR Phase I	To assess impacts on suspended solids concentrations arising from losses of fine sediment to suspension during the interim stages of construction of the TM-CLKL+ HKBCF+HKLR Phase I in 2012	same as P1	Similar to Simulation P2, but the sediment losses from concurrent projects excluded.
P6	2013	Simulation of the interim stages of construction of the TM-CLKL+HKBCF+HKLR Phase II	To assess impacts on suspended solids concentrations arising from losses of fine sediment to suspension during the interim stages of construction of the TM-CLKL+ HKBCF+HKLR Phase II in 2013	Same as P1	Similar to Simulation P3, but the sediment losses from concurrent projects excluded.
P7	2011	Simulation of the start of construction of the TM-CLKL+HKBCF+HKLR in 2011	Similar to P4, but with specific mitigation measures applied to lower the sediment losses.	Same as P1	Similar to Simulation P4, but the sediment losses from the project mitigated.
P8	2012	Simulation of the interim stages of construction of the TM-CLKL+HKBCF+HKLR Phase I	Similar to P5, but with specific mitigation measures applied to lower the sediment losses.	same as P1	Similar to Simulation P5, but the sediment losses from the project mitigated.
P9	2013	Simulation of the interim stages of construction of the TM-CLKL+HKBCF+HKLR Phase II	Similar to P6, but with specific mitigation measures applied to lower the sediment losses.	Same as P1	Similar to Simulation P6, but the sediment losses from the project mitigated.
Simulations of Marine Water Quality (Annual Simulations) - Operational Impacts					
WQ1	2026	Simulation of the completed TM-CLKL+HKBCF+ HKLR and all other concurrent projects in 2026	This simulation is required to determine future water quality patterns following completion of the TM-CLKL+ HKBCF+ HKLR and all expected concurrent works	The results from this simulation will be compared with the relevant Water Quality Objectives and other water quality standards which might apply. The results will also be compared with those from WQ2 below in order to assess the potential impacts from the completed TM-CLKL+HKBCF+HKLR on marine water quality.	
WQ2	2026	Simulation of the completed concurrent projects in 2026 but without the TM-CLKL+HKBCF+HKLR	This simulation is required to determine future water quality patterns assuming the TM-CLKL+HKBCF+ HKLR is not constructed	The results from this simulation will be compared with the relevant Water Quality Objectives and other water quality standards which might apply. The results will also be compared with those from WQ1 above in order to assess the potential impacts from the completed TM-CLKL+HKBCF+HKLR on marine water quality.	

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Summary of Proposed Simulations for Water Quality Modelling for the HKBCF, HKLR and TM-CLKL

SCALE	NTS	DATE	MAY. 2009
CHECK		DRAWN	
JOB No.	60044963	DRAWING No.	32
		REV	

FILE:

Item	Project	Construction Works Start	Construction Works End	Results of Liaison	Dredging/Filling Plant	Filling Plant	Working Day	Dredging Rate	Filling Rate	Dredging Losses[1]	Mitigated Dredging Losses[2]	Filling Losses[3]	Dredging/Filling Frequency	Filling Frequency	Dredging Locations	Filling Locations	Remarks
1	Lantau Logistics Park (LLP) - 72ha.	2010	2012	CEDD/HKIS (CR)/2/1/92 letter 26.9.08 to Arup gave the following information: Seawall dredging and filling would begin simultaneously from both the eastern and western ends of the seawall. At each end, 2 grabs and one barge would be used and dredging and filling would proceed concurrently. For each of the eastern and western seawalls, the following parameters would apply:	2 Closed Grabs (on each of east and west seawalls)	1 2 Barges of 800m^3 (on each of east and west seawalls)	24 hours	204m^3/hr for each of 4 grab dredgers (2 on each seawall)	9,600m^3/day (1 2 barges of 800m^3 on each seawall)	0.96kg/s/grab dredger	0.19kg/s/grab dredger	3,200kg/event (assuming barges of 800m^3 capacity	Continuous (24-hours/day)	2-hourly for 1 2 filling events on each seawall	A, B, C, D	E, F	The dredging and filling locations have been selected to coincide with the final stages of construction when all 4 grab dredgers (2 on each half seawall) are closest together. It will be assumed that the grabs on each seawall are 300m apart and that filling proceeds 300m behind the closest grab.
2	Tonggu Channel	(completed)		This project has already been completed. Annual maintenance dredging is required in each of 3 Zones. Zone I is only dredged on a flood tide while Zone II is only dredged on an ebb tide. Zone III has no restriction on dredging times.	Zone I & II : 1 TSHD (4,375m^3) III : 1 TSHD (6,250m^3)		24 hours			Zone I : 14.6kg/s II : 14.6kg/s III : 12.1kg/s (1st 55 minutes) : 26.0kg/s (final 5 minutes)			Zone I : once per day II : twice per day III : twice per day	Zone I : 1x35 minute dredging period on flood tide II : 2x35 minute dredging periods on ebb tide separated by 205 minutes III : 2 60 minute dredging periods separated by 282 minutes during day time	Zone I : K II : L III : M		
3	Marine Borrow Pits - North of the Brothers	(re-opened by 2009)		CEDD's letter to the TMCLKL Consultant (Maunsell) dated 8.9.08 gave updated information on these facilities. The facility could be backfilled using Category L material at a maximum rate of 100,000m3/day or using Category M material at a maximum rate of 26,700m3/day. Assuming it is used for Category L material at 100,000m3/day is assumed to be the worst case with respect to sediment losses)		12 TSHD (8,000m^3) and 5 barges (800m^3) per day	24-hours		100,000m^3/day			Losses per disposal event assuming the dry density of barge material is 750kg/m^3 and the dry density of TSHD material is 556kg/m^3 TSHD (5%): 222,400kg Barge (3%) : 18,000kg		TSHD:every 2hrs (beginning at 00:00 until 22:00) Barge: every 4 hrs (beginning at 05:00 until 21:00)		G	Include for Water Quality Impact Assessment, both operation (flow) and construction phases, based on: (a) CEDD's letter dated 8.9.08; (b) EIA report prepared under Consultancy CE 12/2002 which was already approved under the EIAO and is available from EPD's web-page.
4	Contaminated Mud-Pits - East of Sha Chau (IV)	mid 2010		CEDD's letter to the TMCLKL Consultant (Maunsell) dated 8.9.08 gave updated information on these facilities.		TSHD (4,500m^3 dredging 3050m^3 in-situ material per cycle) 23.375 barges of 800m^3 capacity	24-hours		26,700m^3/day (13,500m^3/day from 3 TSHD, 13,200m^3/day from 16.5 barges)			Losses per disposal event assuming the dry density of barge material is 750kg/m3 and the dry density of TSHD material is 556kg/m^3 Barge (3%) : 18,000kg TSHD (5%) : 125,100kg		TSHD every 8 hours Barge every minutes 87		G	Include for Water Quality Impact Assessment, both operation (flow)and construction phases, based on: (a) CEDD's letter dated 8.9.08; (b) EIA report prepared under Consultancy CE 12/2002 which was already approved under the EIAO and is available from EPD's web-page.
5	Contaminated Mud-Pits - Proposed East of Sha Chau (V)	(commence construction in 2009)		CEDD's letter to the TMCLKL Consultant (Maunsell) dated 8.9.08 gave updated information on these facilities.	2 Grab Dredgers	TSHD (4,500m^3 dredging 3050m^3 in-situ material per cycle) 23.375 barges of 800m^3 capacity	24-hours	506m^3/hour	26,700m^3/day (13,500m^3/day from 3 TSHD, 13,200m^3/day from 16.5 barges)	2.8kg/s		Losses per disposal event assuming the dry density of barge material is 750kg/m3 and the dry density of TSHD material is 556kg/m^3 Barge (3%) : 18,000kg TSHD (5%) : 125,100kg	Continuous	TSHD every 8 hours Barge every minutes 87	S J	S P R	Include for Water Quality Impact Assessment, both operation and construction phases, based on: (a) CEDD's letter dated 8.9.08; (b) EIA report prepared under Consultancy CE 12/2002 which was already approved under the EIAO and is available from EPD's web-page.
6	Contaminated Mud-Pits - South of Brothers	(commencement not later than 2011)		CEDD's letter to the TMCLKL Consultant (Maunsell) dated 8.9.08 gave updated information on these facilities.	2 Grab Dredgers	TSHD (4,500m^3 dredging 3050m^3 in-situ material per cycle) 23.375 barges of 800m^3 capacity	24-hours		26,700m^3/day (13,500m^3/day from 3 TSHD, 13,200m^3/day from 16.5 barges)	2.8kg/s		Losses per disposal event assuming the dry density of barge material is 750kg/m3 and the dry density of TSHD material is 556kg/m^3 Barge (3%) : 18,000kg TSHD (5%) : 125,100kg	Continuous	TSHD every 8 hours Barge every minutes 87	B N		Include for Water Quality Impact Assessment, both operation (flow) and construction phases, based on: (a) CEDD's letter dated 8.9.08; (b) EIA report prepared under Consultancy CE 12/2002 which was already approved under the EIAO and is available from EPD's web-page.
7	Kwai Tsing Container Basin & Approach Channel	2010	2013	Enquiry has been made to CEDD (the proponent of this project) for relevant information.		1 TSHD (4,500m^3)	8 hours	8,000m^3/day		20.9 kg/s on each dredging period each lasting for 17 minutes			11.63 hours (2.62 cycles per day)		H, I		For the water quality assessment, the dredging activities of the basin will be included construction phase assessment and the dredged bathymetry will be included in the operational phase assessment. Excluded for all other aspects.
8	HZMB	2010	2014	Commencement : February 2011 Intermediate : April 2012 Final : April 2013	3 TSHD + 1 Grab Dredger 3 TSHD + 1 Grab Dredger 3 TSHD + 1 Grab Dredger	8 barges per island 8 barges 8 barges	Grab: 24 hr TSHD: 8 hr Barge: 24hr	47,400m^3/day	6,400m^3/day	TSHD: 28.2kg/s (10 ms)+31 kg/s (60 ms) Grab: 1.44 kg/s/grab		3,200kg/event	TSHD: 2 cycles each at 4 hrs Grab: Continuous	3-hours (for 8 events)	T, U V X	T, U W Y	To be constructed concurrently with TMCLKL
9	TMCLKL	2011	2014	Commencement : February 2011 Intermediate : April 2012 Final : April 2013	See Tables 24 - 26 for details.												
10	HKBCF	2010	2013	Commencement : February 2011 Intermediate : April 2012 Final : April 2013													
11	HZMB HKLR	2011	2013	Commencement : February 2011 Intermediate : April 2012 Final : April 2013													

Notes:
1 Losses of sediment to suspension from grab dredging assumed to be 17kg/m^3 dredged without mitigation
2 Cage type silt curtains will be used around the closed dedgers which is assumed to reduce losses by 80% (Reference 9)
3 Losses of fine material to suspension from filling are based on 5% of fill assumed to be fine (<63um) with 5% of fines being lost to suspension

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Summary of Modelling Activities for Concurrent Projects

SCALE	NTS	DATE	MAY. 2009
CHECK		DRAWN	
JOB No.	60044963	DRAWING No.	33
		REV	

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APPENDIX 9D6

Water Quality Mitigation – Silt Curtain Application

APPENDIX D6

WATER QUALITY MITIGATION -

SILT CURTAIN APPLICATION

D6-1 INTRODUCTION

D6-1.1 For the combined TM-CLKL+HKBCF+HKLR projects, 3 scenario years have been selected for hydrodynamic and water quality modelling based on the worst case calculated sediment losses following the anticipated project programme. The anticipated programme is shown in Figure 24 of **Appendix D5**.

D6-1.2 The results of the construction phase water quality modelling has shown that, even with the integrated measures described in Section 6, exceedances of the water quality objectives would occur and that further mitigation would be required. The implementation of silt curtains have been proposed as the primary mitigation option. However, the application and effectiveness of silt curtains does depend on the aquatic conditions in which they are proposed and issues such as water depth and current speed can affect the viability and effectiveness of this measure, with speeds of about 0.5m/s generally being considered as allowing effective anchoring and use of silt curtains.

D6-1.3 In order to assess the viability of the use of silt curtains as mitigation for the works sites, the flow velocities in the study area have been reviewed. The modelled flow patterns indicating the peak ebb and flood at 3 depth (surface, mid-depth and bottom) are presented in the vector plots in Annex A for each of the 3 scenario years, 2011, 2012 and 2013 (Figures 013 to 036 for each year). The location of the construction plant at those times is, also, indicated. Review of the plots shows that the flows over most of the site area, where the HKBCF, TM-CLKL southern landfall and HKLR reclamation will be constructed, are, in general, below 0.5m/s and, therefore, suitable for silt curtain deployment.

D6-1.4 However, at the northern end of the HKBCF/TM-CLKL southern landfall works (Phase 2 of the HKBCF work), the site will be influenced by the higher east-west flows which are typically between 1-2m/s. As such, in this area, silt curtain would unlikely be effective unless additional measures to protect against the flow are deployed. Therefore, to protect against the higher flows and allow the use of the silt curtain for the Phase 2 HKBCF works, a steel sheet piled wall is proposed to reduce the flow to ensure the effectiveness of the silt curtain system.

D6-1.5 At the TM-CLKL northern landfall works site, the southern section of the reclamation falls within areas of higher flows (again, typically 1-2m/s) and, in addition, the water depths in this area are high at over 10m and as such, the deployment of silt curtains is deemed not feasible for portions N-C and N-B of the landfall. However, in the shallow and low speed waters close to the coastline when portion N-A of the northern landfall is being constructed, a silt curtain would be able to be used.

D6-1.6 Based upon the review, it was concluded that silt curtains could be deployed in the majority of the works site for the protection of the marine environment. Further details on the proposed silt curtain arrangement and suitability are provided below.

D6-2 SILT CURTAINS ARRANGEMENT

D6-2.1 As discussed above, in order to minimise the water quality impacts during the construction stage, deployment of silt curtains has been proposed and the following systems have been recommended:

- Frame type silt curtain to fully enclose the working area of each grab dredger while carrying out the dredging works; and
- Silt curtain (single layer or double layer) around or adjacent to the site while the dredging works and filling works are in progress.

D6-2.2 Both systems are applied for the HKBCF, TM-CLKL southern landfall and HKLR reclamations while only the latter is applicable for Portion N-A of the TM-CLKL northern landfall reclamation. Indicative layouts of the proposed silt curtain arrangements are provided in Annex B, see Figures No. 25308/041/301 to 308 for HKBCF, TM-CLKL southern landfall and HKLR and Figure 9a for the TM-CLKL northern landfall reclamation.

D6-2.3 As the first measure, the frame type silt curtain is designed to enclose local pollution caused by the grab dredger. This frame type silt curtain is made by a steel frame with floating buoy fixed on the top frame such that it is floating on water. A silt curtain membrane (see attached catalogue in Annex C) or similar product is mounted on the four sides of the steel frame and ballast attached to the bottom of silt curtain extending from the seabed to the seawater level so as to cover the entire water column. The dredging works by the grab dredger would then be carried out within the frame type silt curtain. The position of this frame type silt curtain would be maintained by a chain fixed between the frame structure of silt curtain and the dredger. Details of this frame type silt curtain are shown in Figure No. 25308/041/308 in Annex B.

D6-2.4 Apart from the frame type silt curtain, deployment of silt curtain (single layer or double layer) around the site is recommended. The indicative layout of silt curtains for HKBCF, TM-CLKL southern landfall and HKLR at different stages of the construction process are shown in Figures No. 25308/041/301 to 306 in Annex B and the curtain proposed during the construction of Portion N-A of the TM-CLKL northern landfall shown in Figure 9a of Annex B. The silt curtains would basically consist of a curtain membrane made by synthetic textile (see Annex C) or similar product, a float system that hangs the curtain in the water, and a weight at the bottom of curtain to fix it at the seabed. Sufficient length of the curtain membrane will be allowed such that there is an amount of slack for the extension of the silt curtain due to wave and tidal effects.

D6-2.5 While the modelling results have indicated that single silt curtain would be effective, the proposed system would also allow for the application of a double layer of curtain should additional mitigation be required. If a double layer silt curtain is used, a second layer of silt curtain would be placed next to the fist layer curtain with a separation distance of about 10m. As the water depth at the HKBCF/TM-CLKL southern landfall is about 4m to 10m and at the HKLR is about 3m to 4m, the vertical length of silt curtain would not be too long and, therefore, the separation distance of 10m between the two layers of silt curtain is

considered to be adequate, even allowing for the relative movement of the curtains under the tidal and wave actions. As a further measure, installation of silt curtains at specific sensitive receivers such as the seawater intakes could also be considered to mitigate the water quality impact if necessary.

D6-2.6 The silt curtain should allow access of vessels that enter into or exit from the reclamation area. This could be achieved by the opening formed by two piece of silt curtain with overlapping length of 150m min and a separation distance of about 60m to allow the passage of vessels. The indicative position and details of the above openings are shown in Annex B. Local adjustment of the position of these openings is expected during construction stage to suit the actual site condition and the Contractor's working method.

D6-2.7 The silt curtain is suitable for use in the site condition where the current velocity of 0.5m/s or less. However, as noted above, the velocity of currents near the northern edge of reclamation site for HKBCF Phase 2 is higher due to its exposure to the area of main flows. In order to enable the deployment of silt curtain to mitigate the water quality impact due to the reclamation activities in HKBCF Phase 2, a sheet pile wall is proposed to protect the silt curtain along the northern edge of the reclamation as shown in Annex B. With the implementation of the sheet piled wall, the silt curtain will not be subject to the influences of the strong currents and can be used. A separate distance of 5m between the silt curtain and sheet pile wall is allowed in this case (see Section 2-2 in figure No. 25308/041/307 in Annex B.

D6-2.8 Yellow marker buoys fitted with yellow flashing lights will be laid along the top surface of the silt curtains at a spacing of about 50m to mark the extent of the silt curtain. As the silt curtain will not the installed in the navigation channel and the flashing lights of the marker buoys of silt curtain will be small in size, it is not considered that there would be significant impacts to the marine traffic and aviation due to the installation of silt curtain.

D6-3 LOSS REDUCTION ASSUMPTIONS

D6-3.1 The assumed effectiveness of the cage type silt curtain for grab dredgers and the single layer of silt curtains proposed are presented in **Table D6-1** below, together with the loss reductions that could be assumed for an additional layer of silt curtain if this was considered.

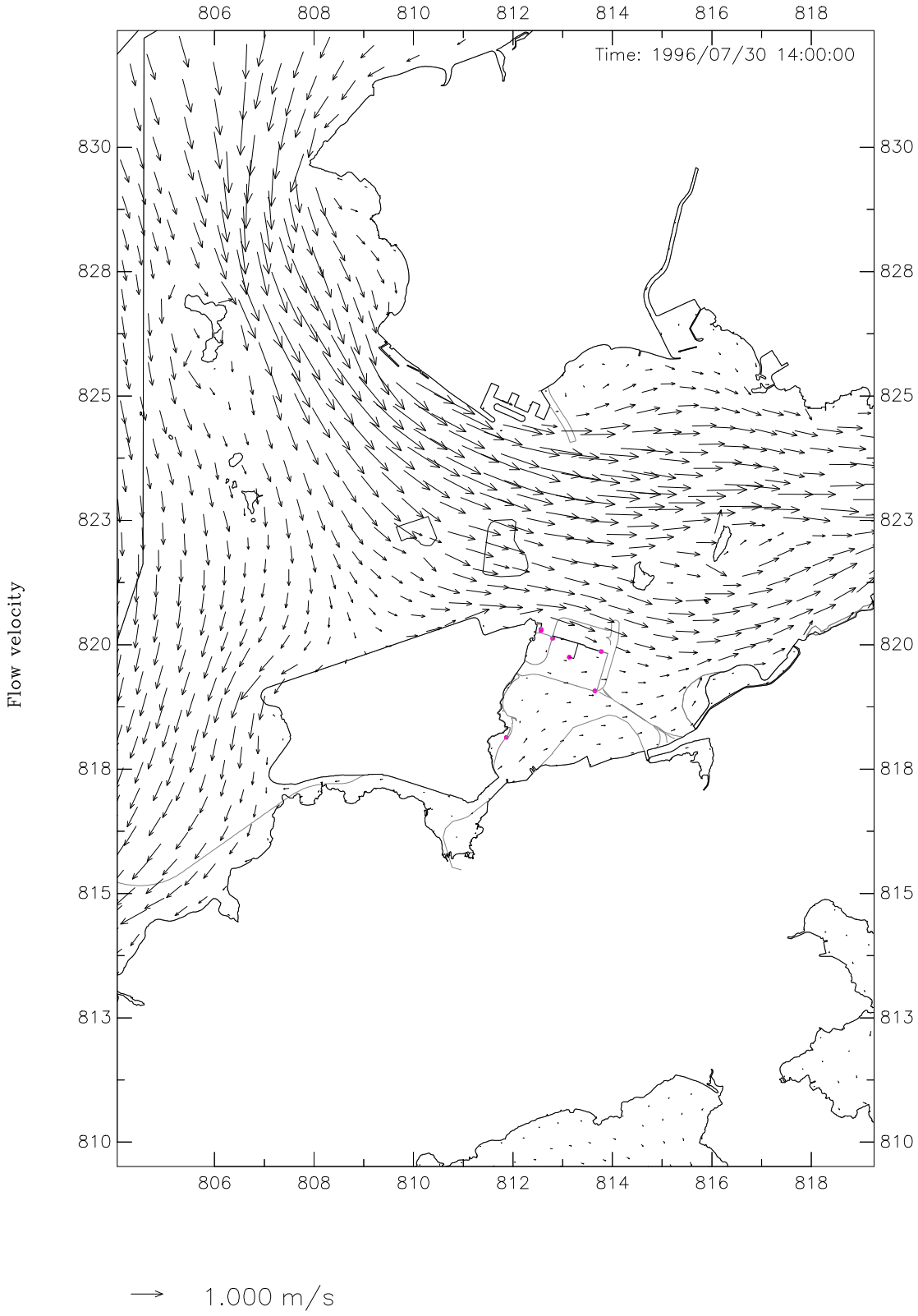
Table D6-1 Summary Table of Loss Reductions from Silt Curtain Configurations

Silt Curtain Type	Loss Reduction Factor	Remark
Dredging Activities		
Cage type for Grab Dredger (1)	80%	Typical, also reviewed in LNG Terminal EIA
Floating Single Silt Curtain (2)	75%	Manufactures Brochure
Second layer of Floating Silt Curtain (3)	50%	LNG Terminal EIA
Combined Reduction (1+2)	95%	For grab dredger only
Combined Reduction (1+2+3)	97%	For grab dredger only
Combined Reduction (2+3)	87%	
Filling Activities		
Floating Single Silt Curtain (4)	45%	
Second layer of Floating Silt Curtain (5)	30%	Proportional scaling following the reduction for dredging
Combined Reduction (4+5)	61%	

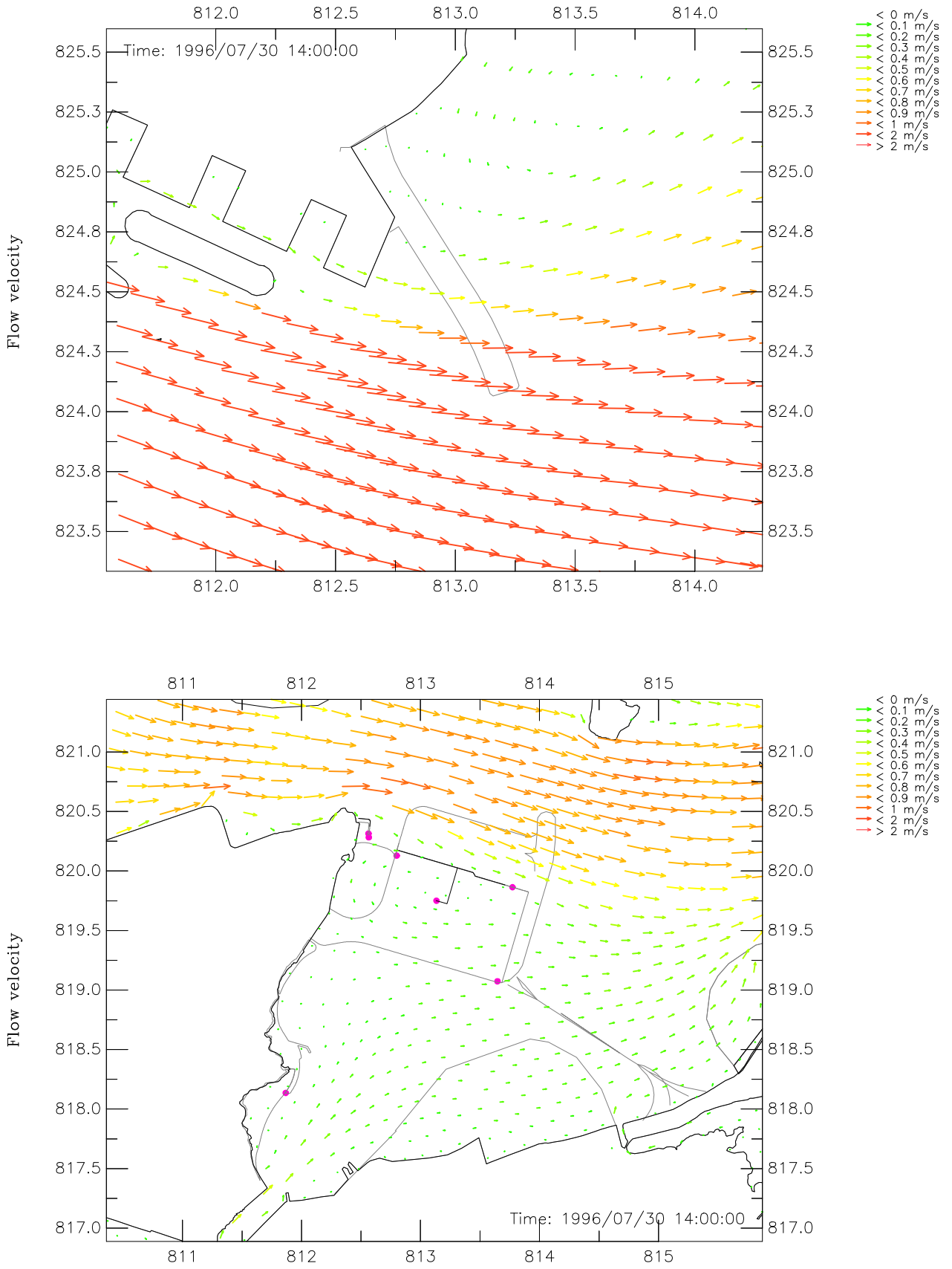
D6-3.2 The calculated reduction in sediment losses for these mitigation options are summarised in **Table D6-2** below.

Table D6-2 Summary of Daily Losses With and Without Silt Curtain Deployment

Option	Silt Curtain	Public Fill for Seawall	2011 Loss (kg/day)	2012 Loss (kg/day)	2013 Loss (kg/day)	Remark
0	0	30%	4,394,000	2,008,000	1,705,000	Base case
1	1+1	30%	1,220,000	672,000	577,000	Single layer of silt curtain. Always cage for grab dredger. TM-CLKL, no silt curtain for northern reclamation except FN4
2	2+1	30%	844,000	541,000	406,000	Double layers of silt curtain. Always cage for grab dredger. TM-CLKL, no silt curtain for northern reclamation except FN4



Year 2011 Dry Season Velocity Vector Plot at Ebb Tide – Surface Layer	Apr 2009	Figure 013
MAUNSELL | AECOM		

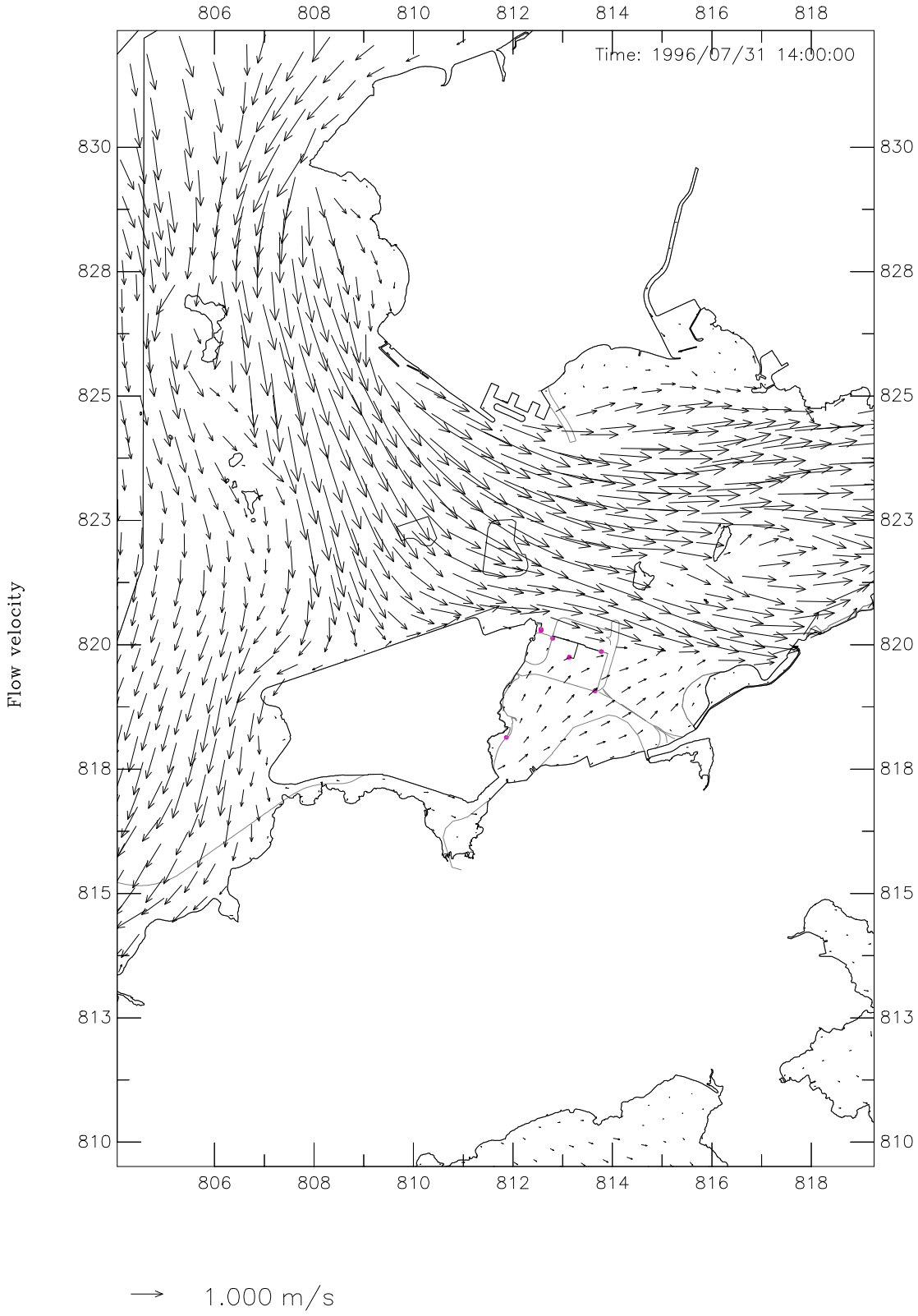


Year 2011
Dry Season Velocity Vector Plot at Ebb Tide – Surface Layer
(Top: Northern Reclamation; Bottom: Southern Reclamation)

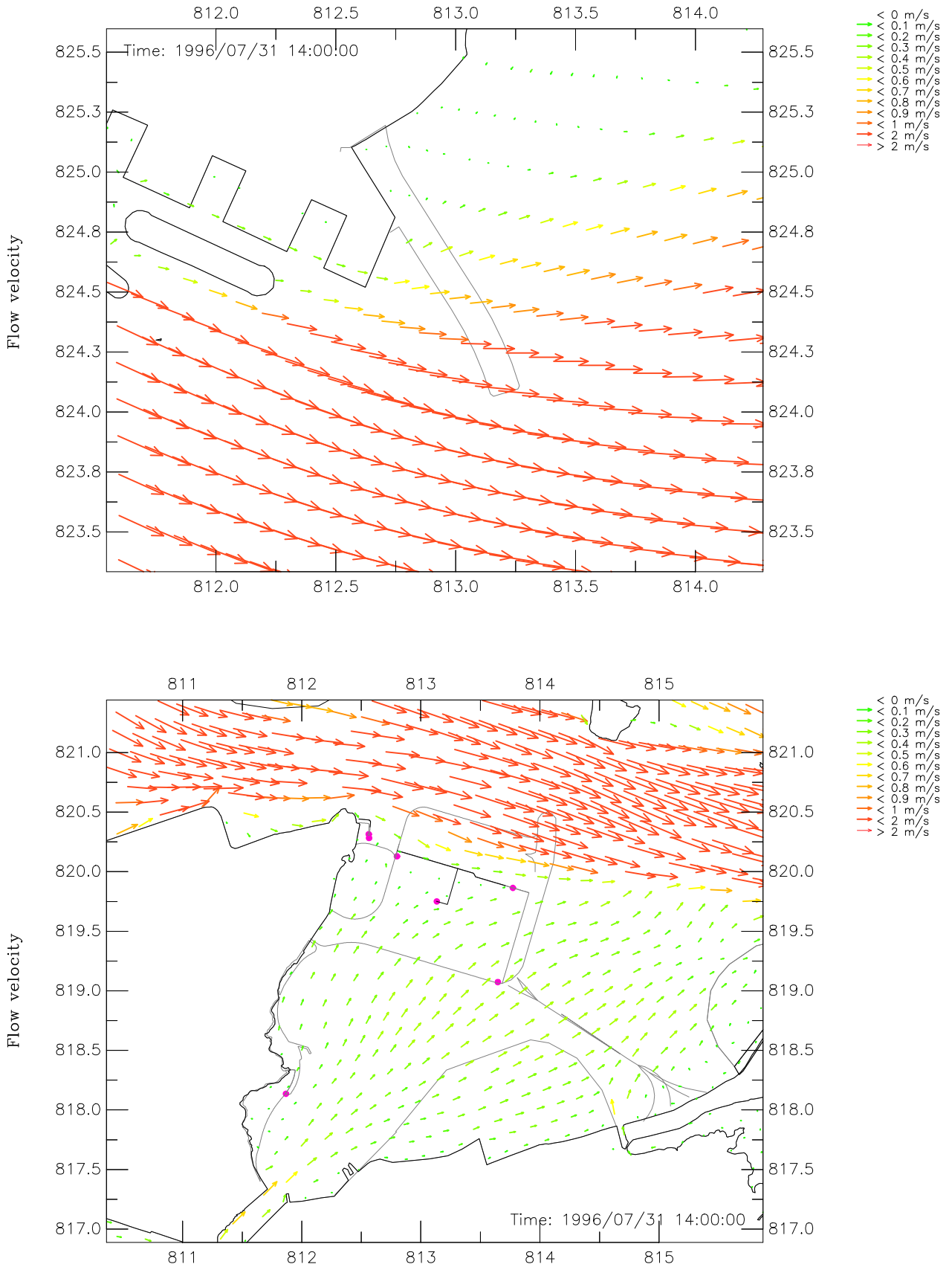
Apr 2009

Figure 014

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Year 2011 Wet Season Velocity Vector Plot at Ebb Tide – Surface Layer	Apr 2009	Figure 015
MAUNSELL | AECOM		

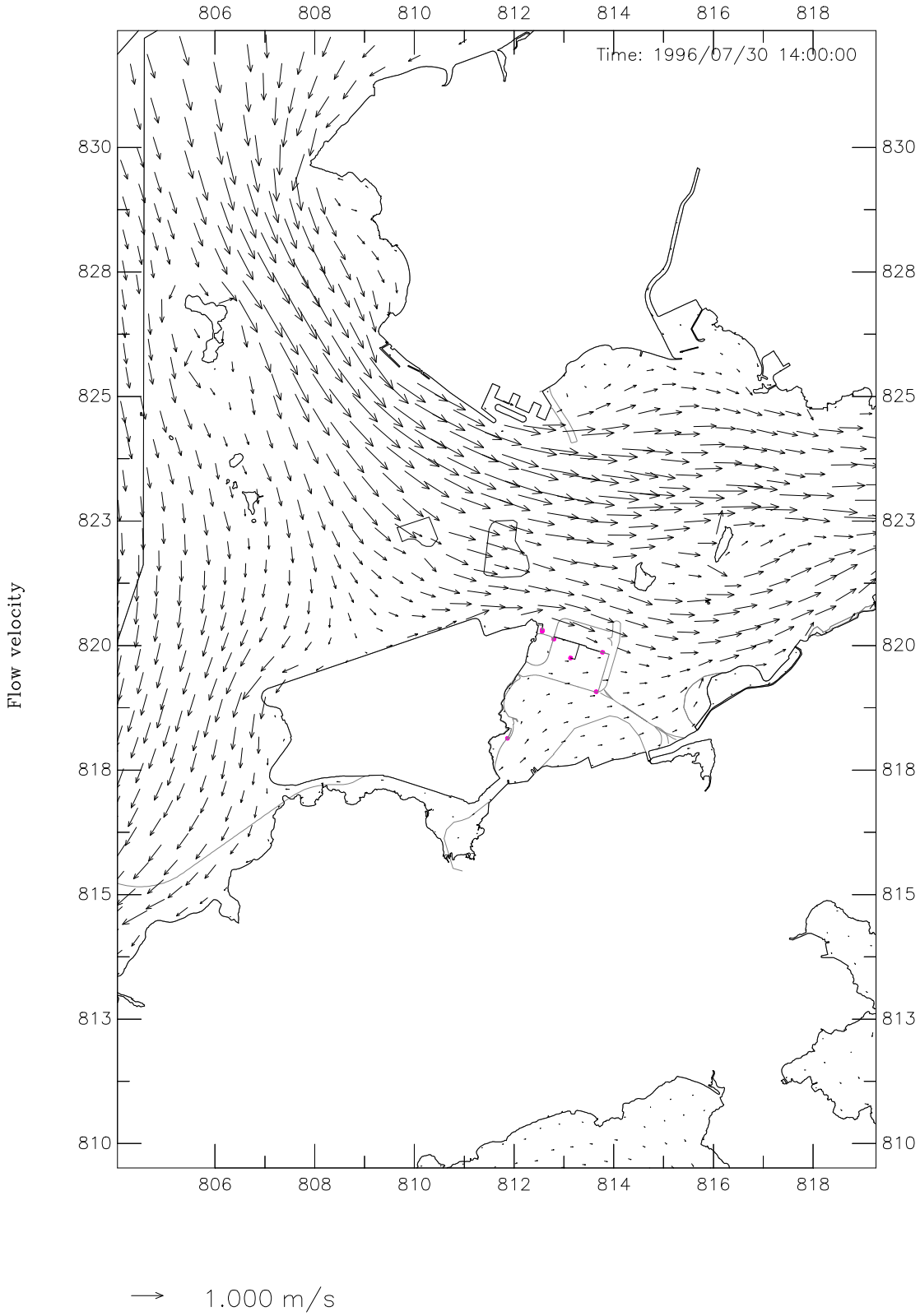


Year 2011
Wet Season Velocity Vector Plot at Ebb Tide – Surface Layer
(Top: Northern Reclamation; Bottom: Southern Reclamation)

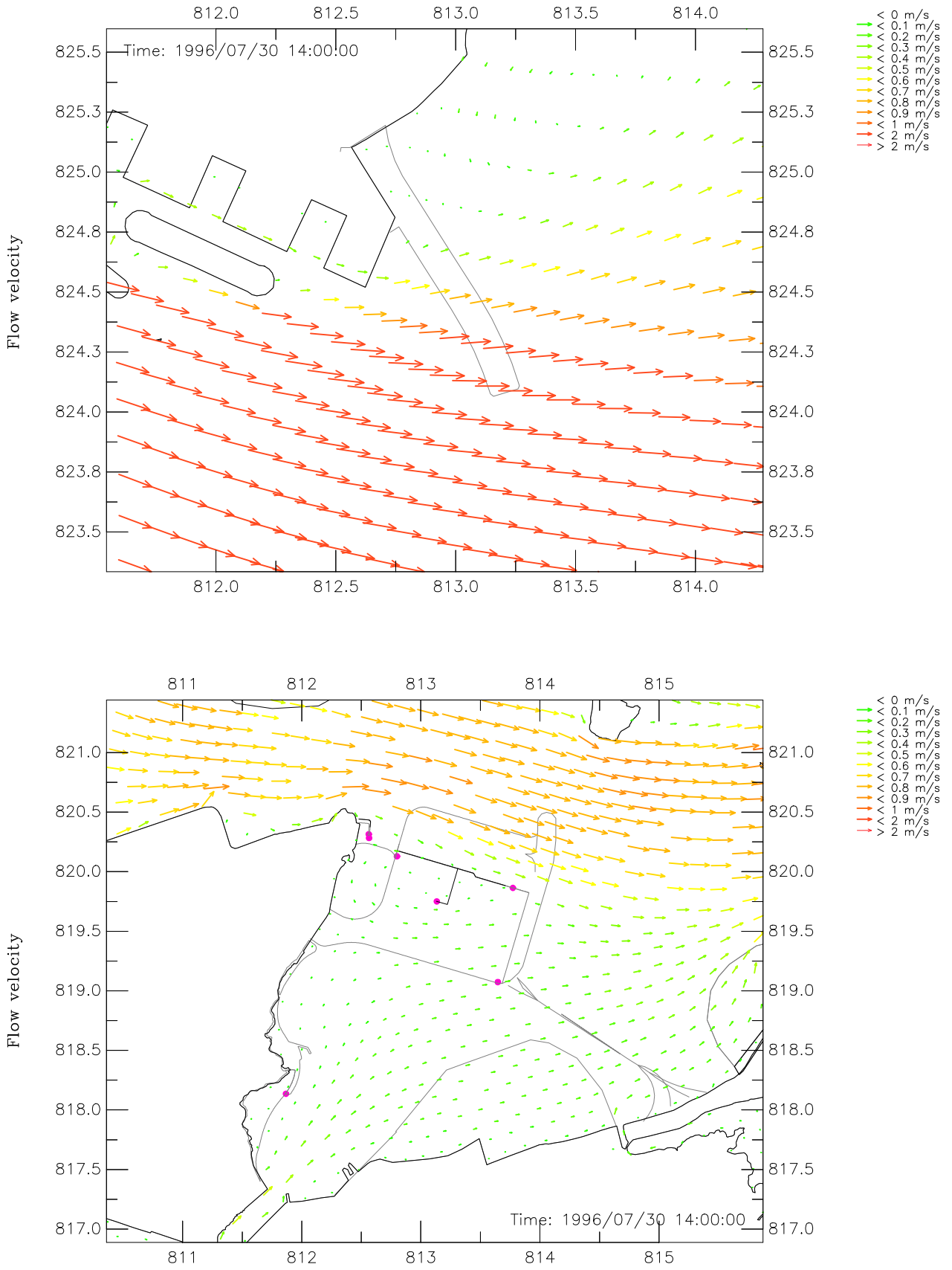
Apr 2009

Figure 016

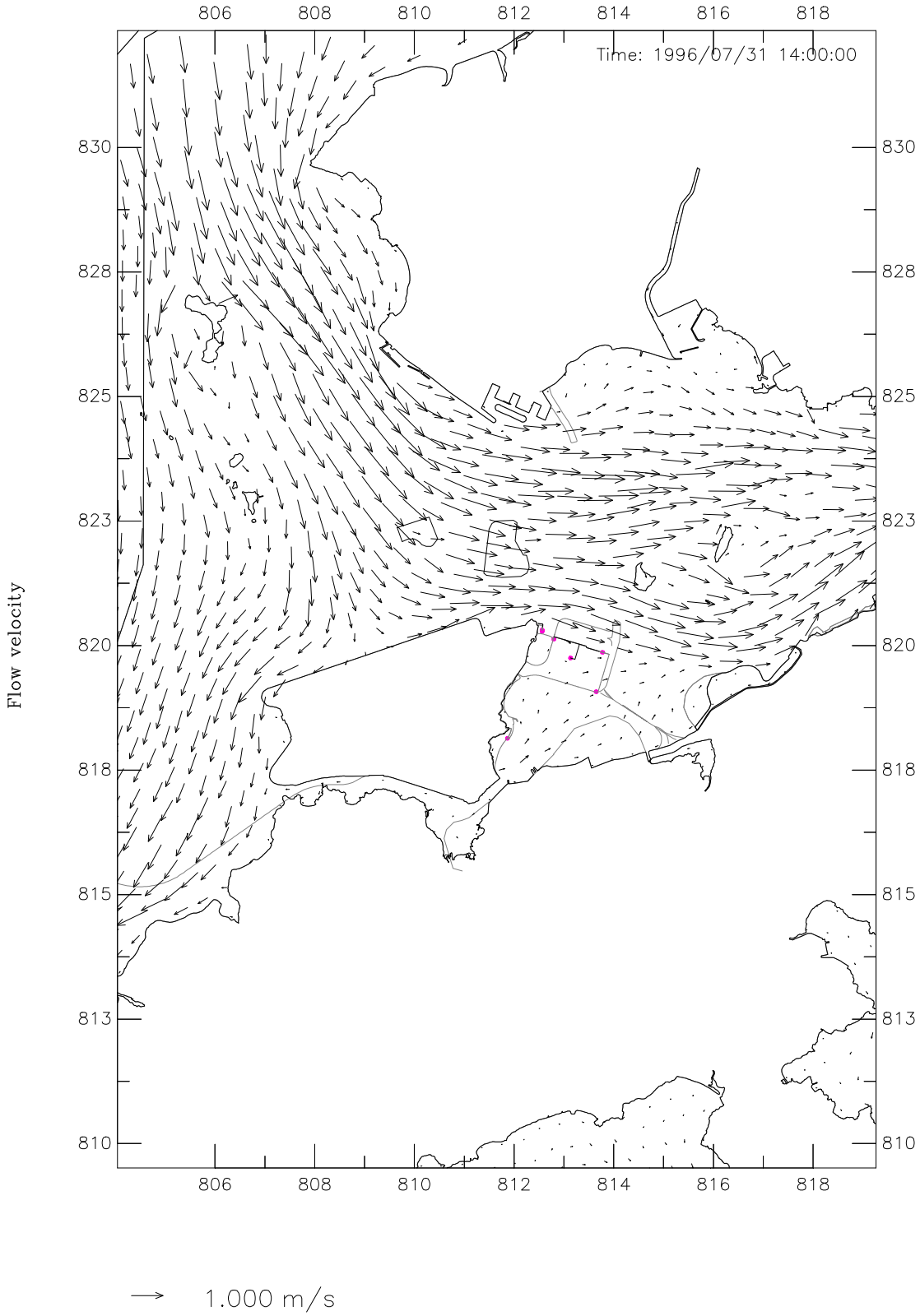
MAUNSELL | AECOM



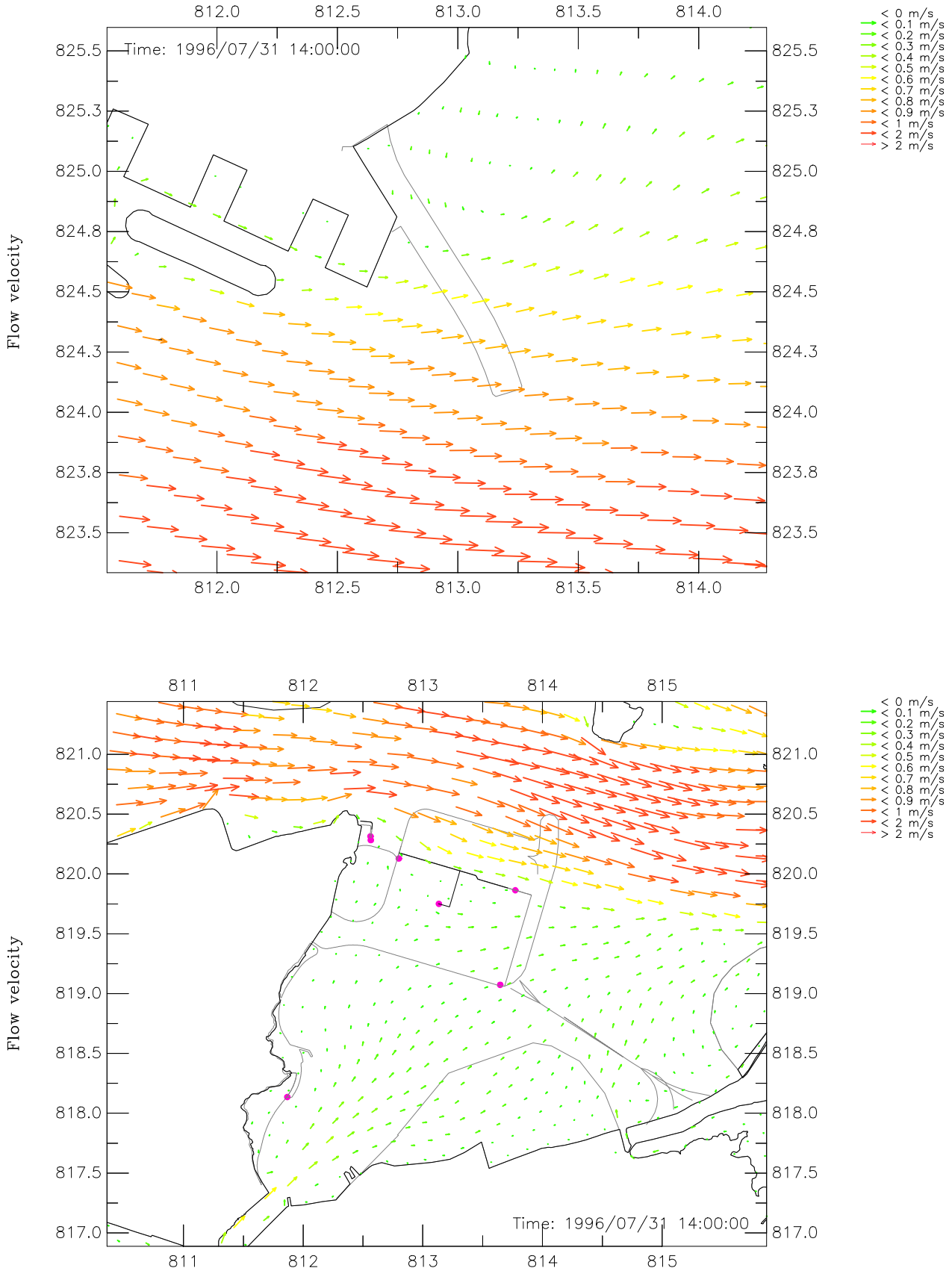
Year 2011 Dry Season Velocity Vector Plot at Ebb Tide – Mid–Depth	Apr 2009	Figure 017
MAUNSELL | AECOM		



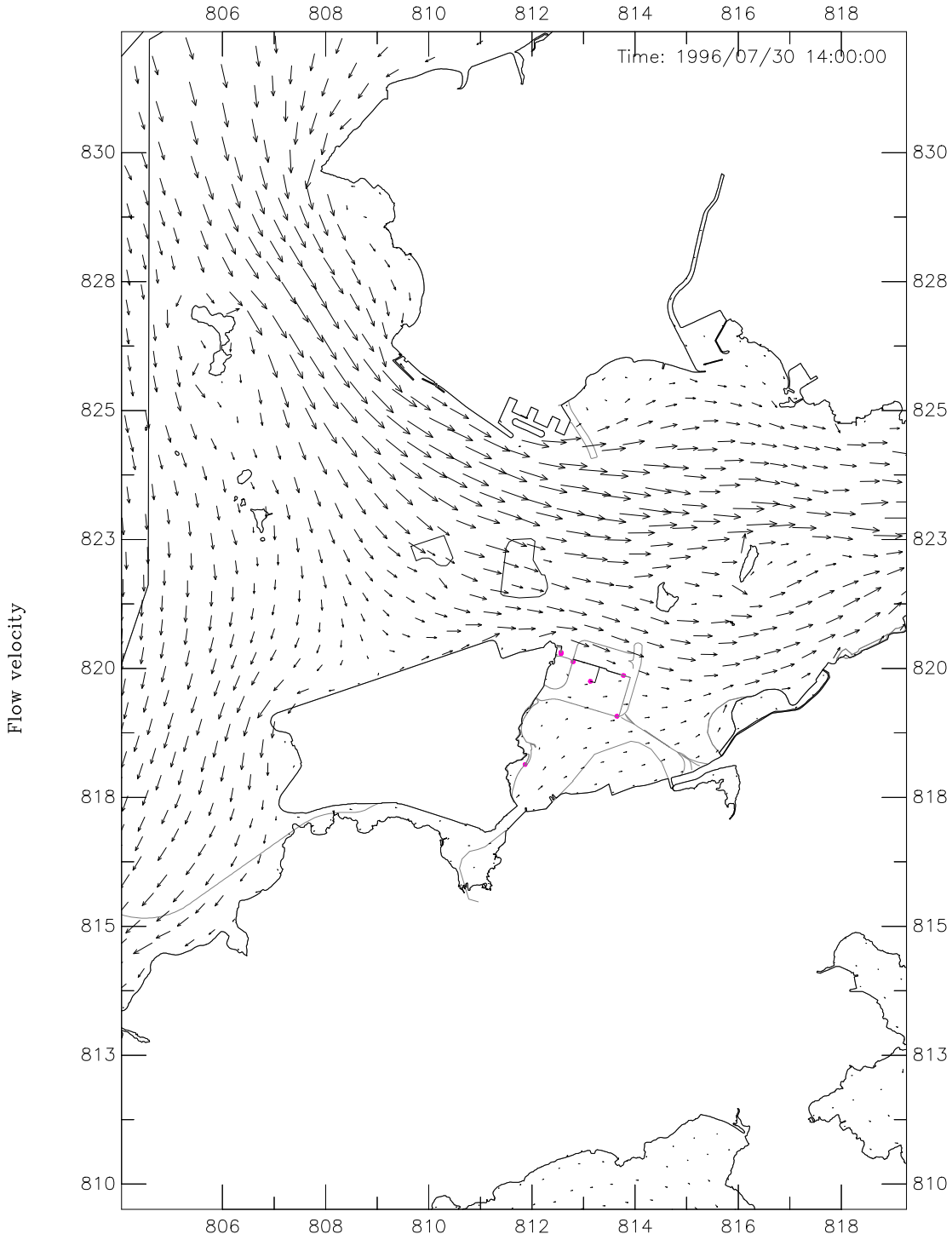
Year 2011 Dry Season Velocity Vector Plot at Ebb Tide – Mid-Depth (Top: Northern Reclamation; Bottom: Southern Reclamation)	Apr 2009	Figure 018
MAUNSELL | AECOM		



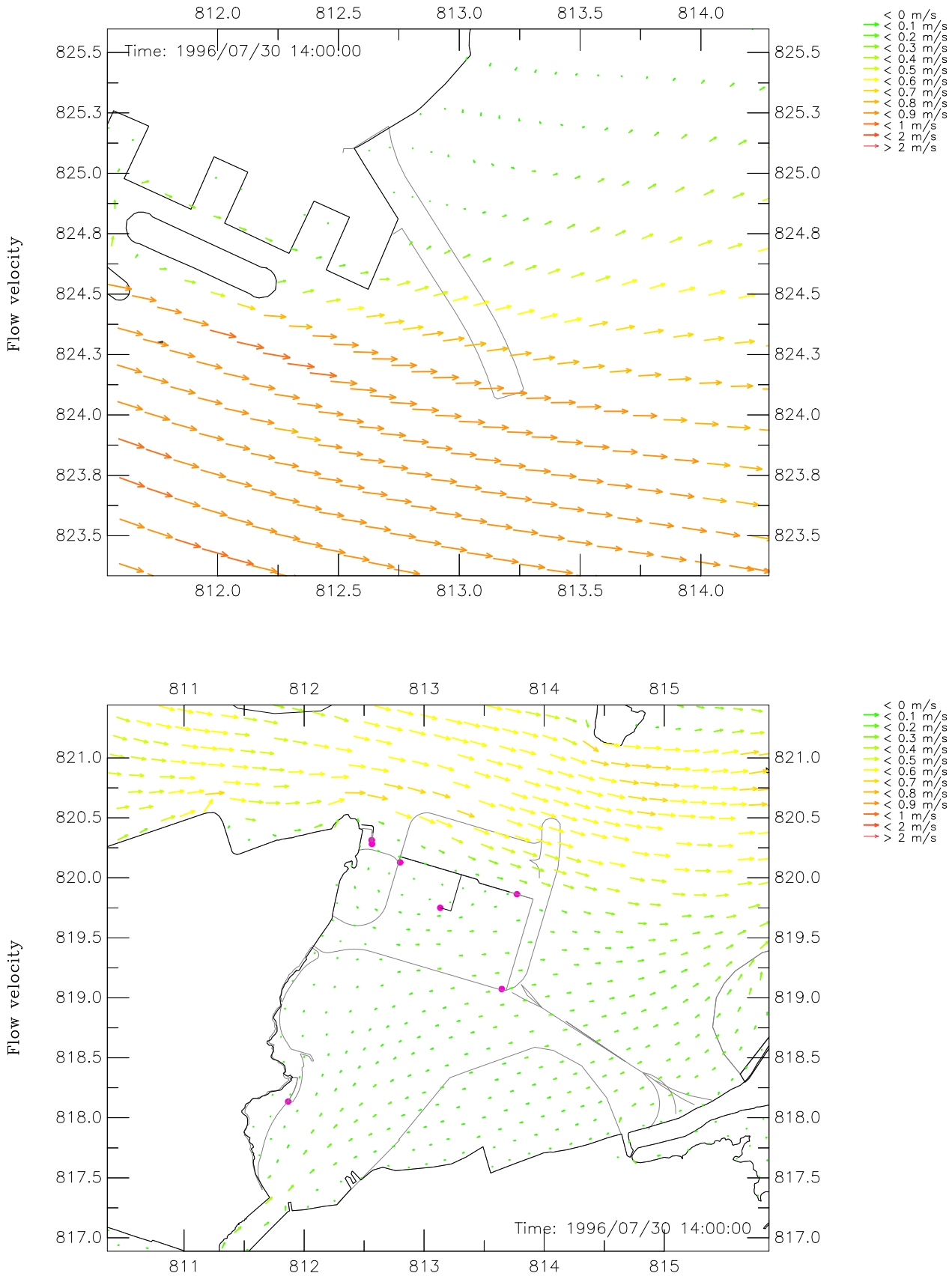
Year 2011 Wet Season Velocity Vector Plot at Ebb Tide – Mid–Depth	Apr 2009	Figure 019
MAUNSELL | AECOM		



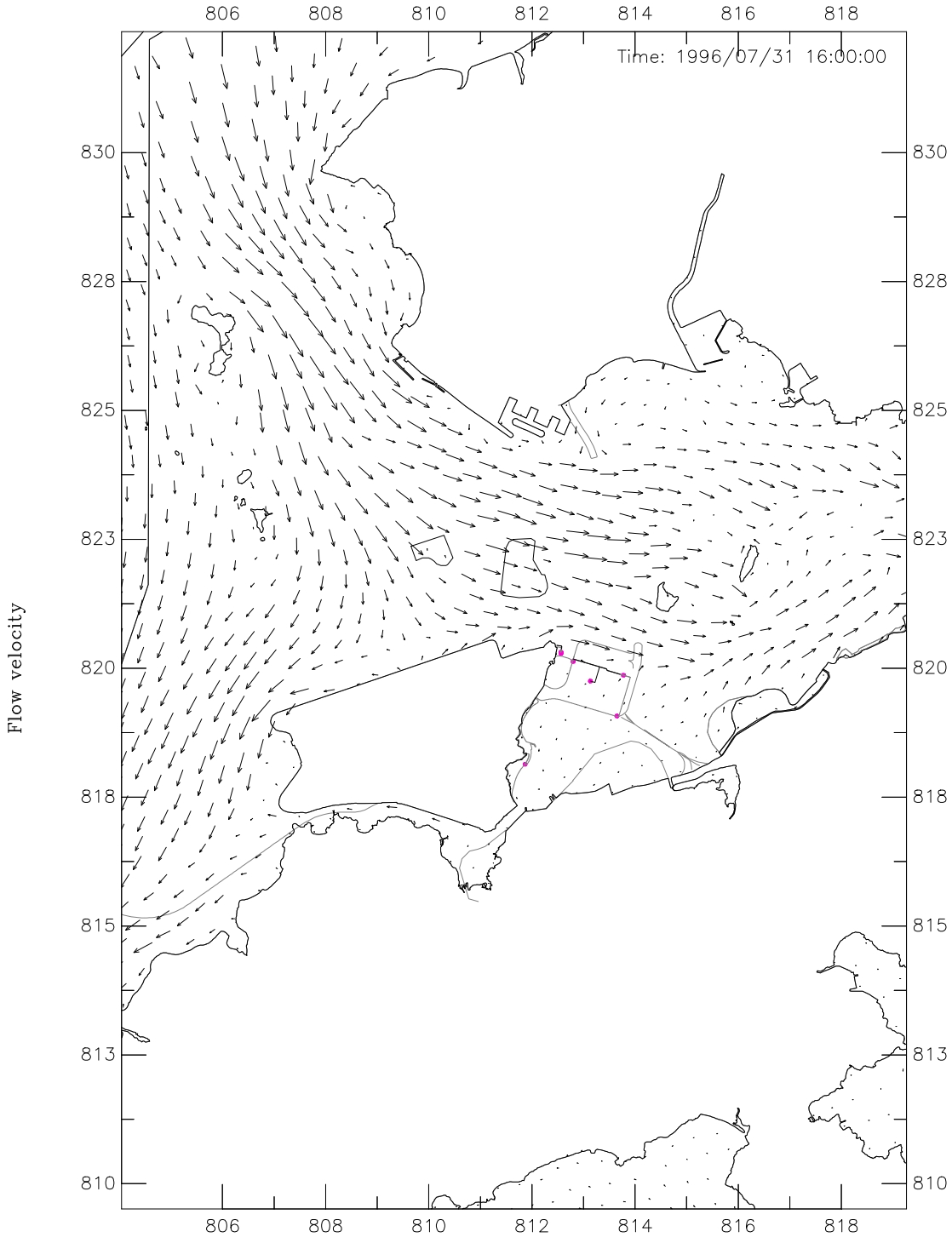
Year 2011 Wet Season Velocity Vector Plot at Ebb Tide – Mid-Depth (Top: Northern Reclamation; Bottom: Southern Reclamation)	Apr 2009	Figure 020
MAUNSELL | AECOM		



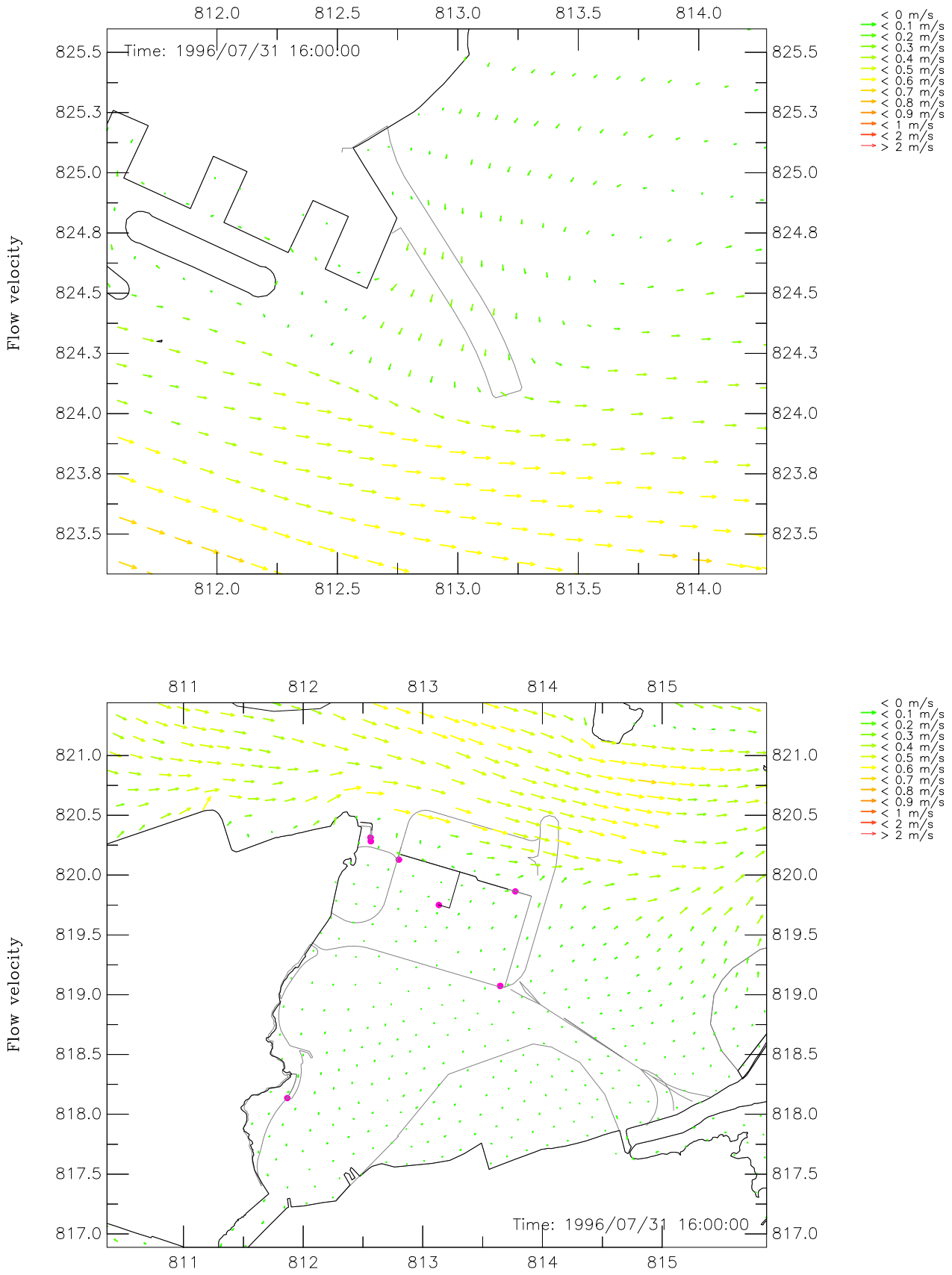
Year 2011 Dry Season Velocity Vector Plot at Ebb Tide – Bottom Layer	Apr 2009	Figure 021
MAUNSELL | AECOM		



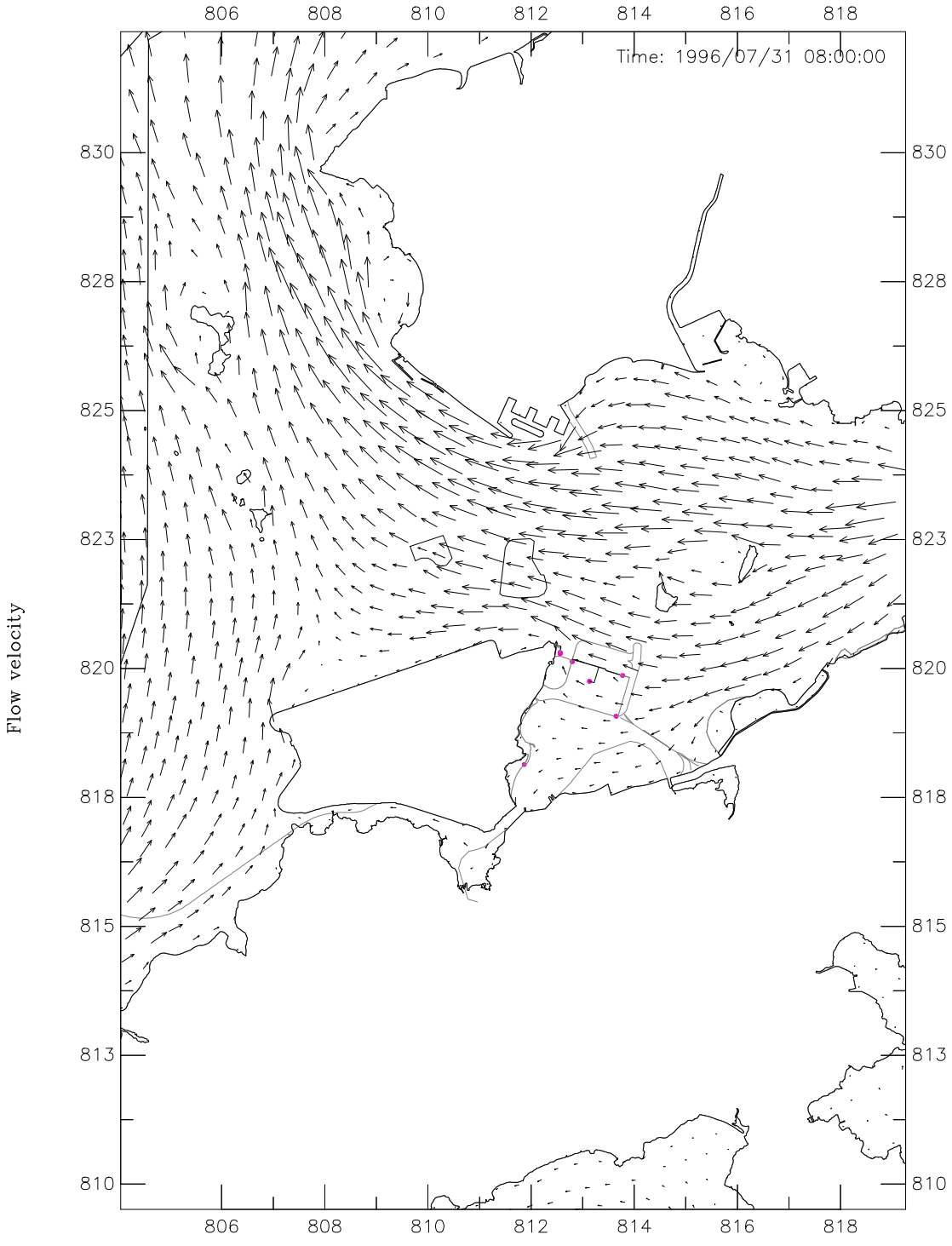
Year 2011 Dry Season Velocity Vector Plot at Ebb Tide – Bottom Layer (Top: Northern Reclamation; Bottom: Southern Reclamation)	Apr 2009	Figure 022
MAUNSELL | AECOM		



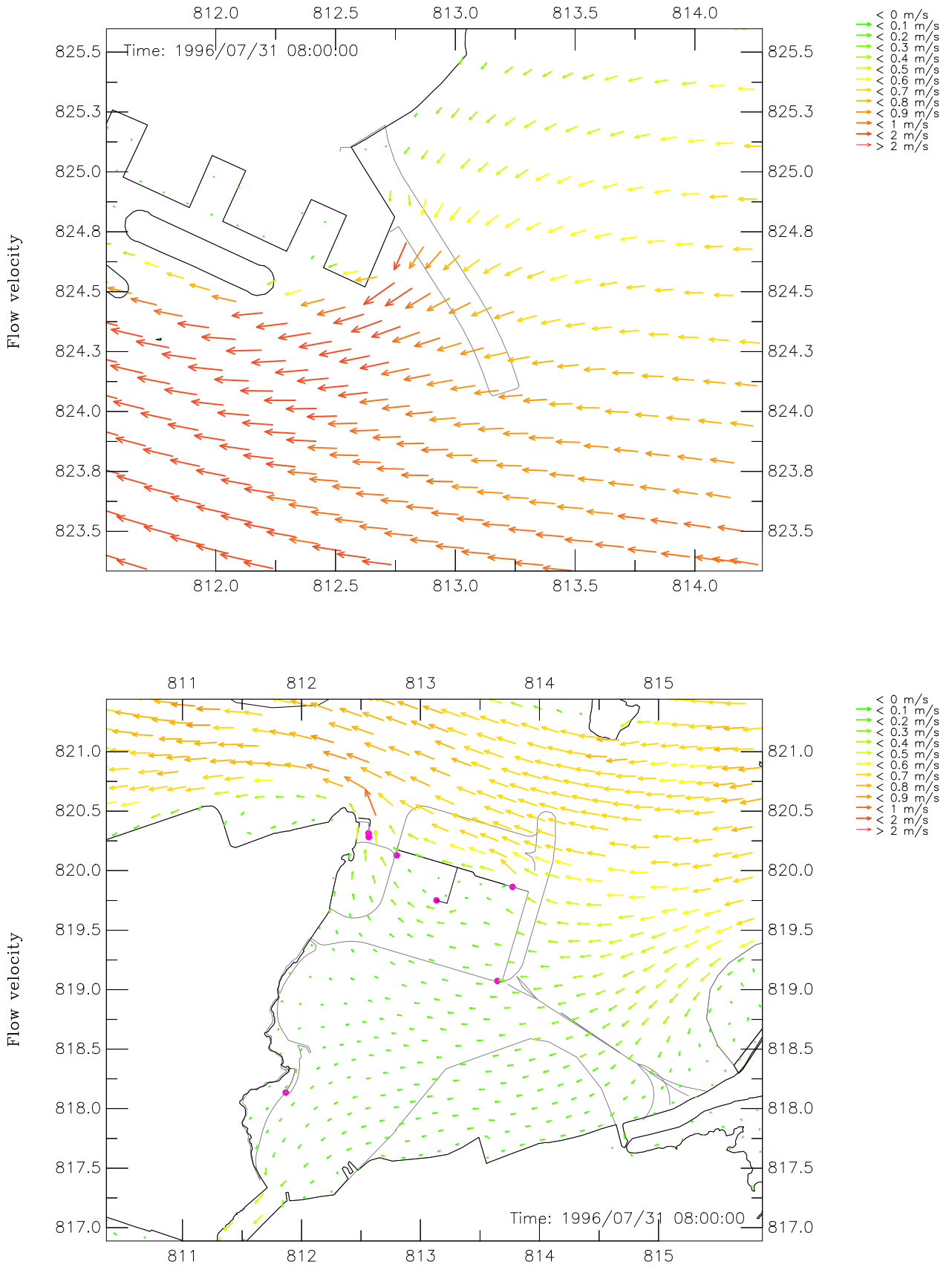
Year 2011 Wet Season Velocity Vector Plot at Ebb Tide – Bottom Layer	Apr 2009	Figure 023
MAUNSELL | AECOM		



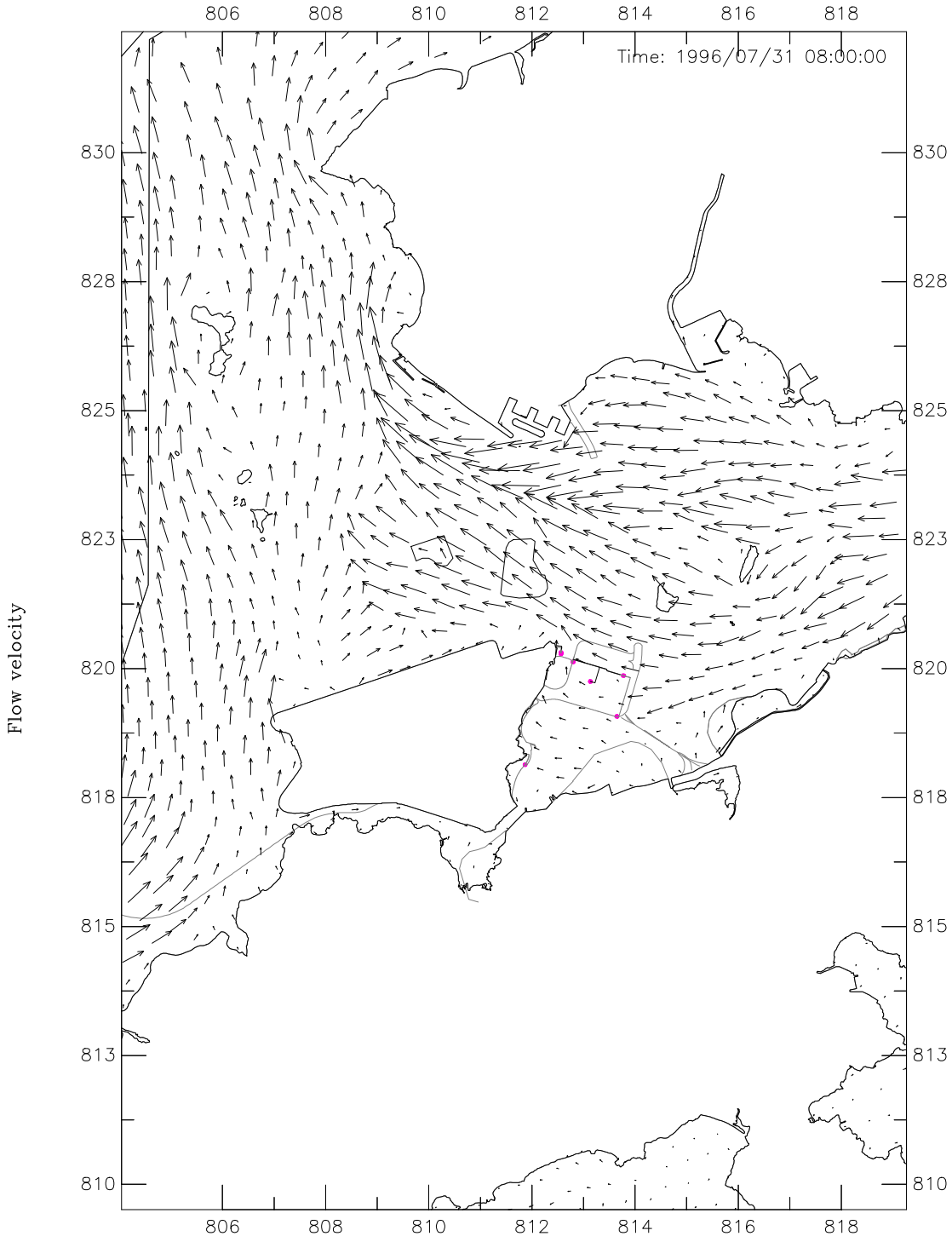
Year 2011 Wet Season Velocity Vector Plot at Ebb Tide – Bottom Layer (Top: Northern Reclamation; Bottom: Southern Reclamation)	Apr 2009	Figure 024
MAUNSELL | AECOM		



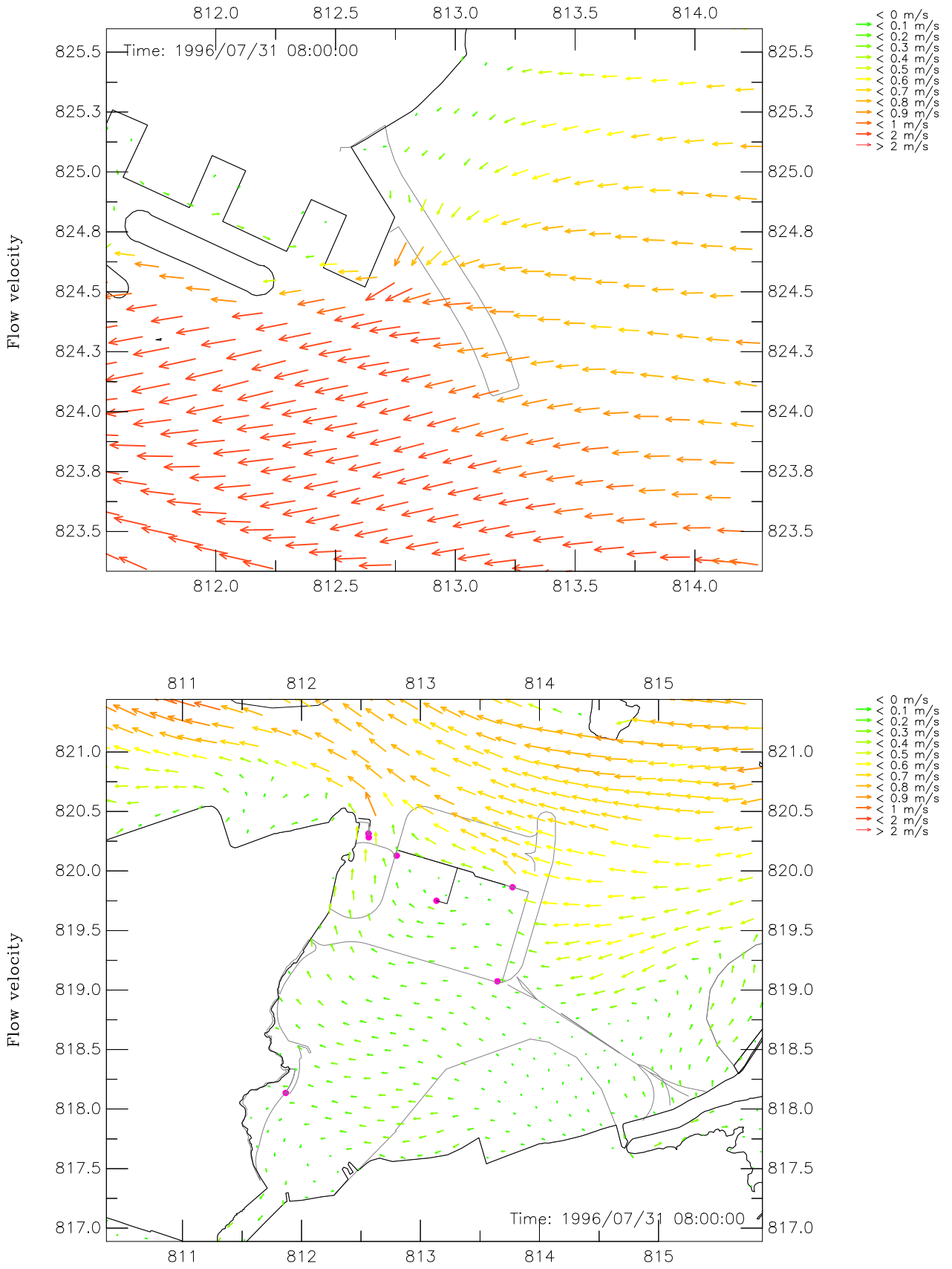
Year 2011 Dry Season Velocity Vector Plot at Flood Tide – Surface Layer	Apr 2009	Figure 025
MAUNSELL | AECOM		



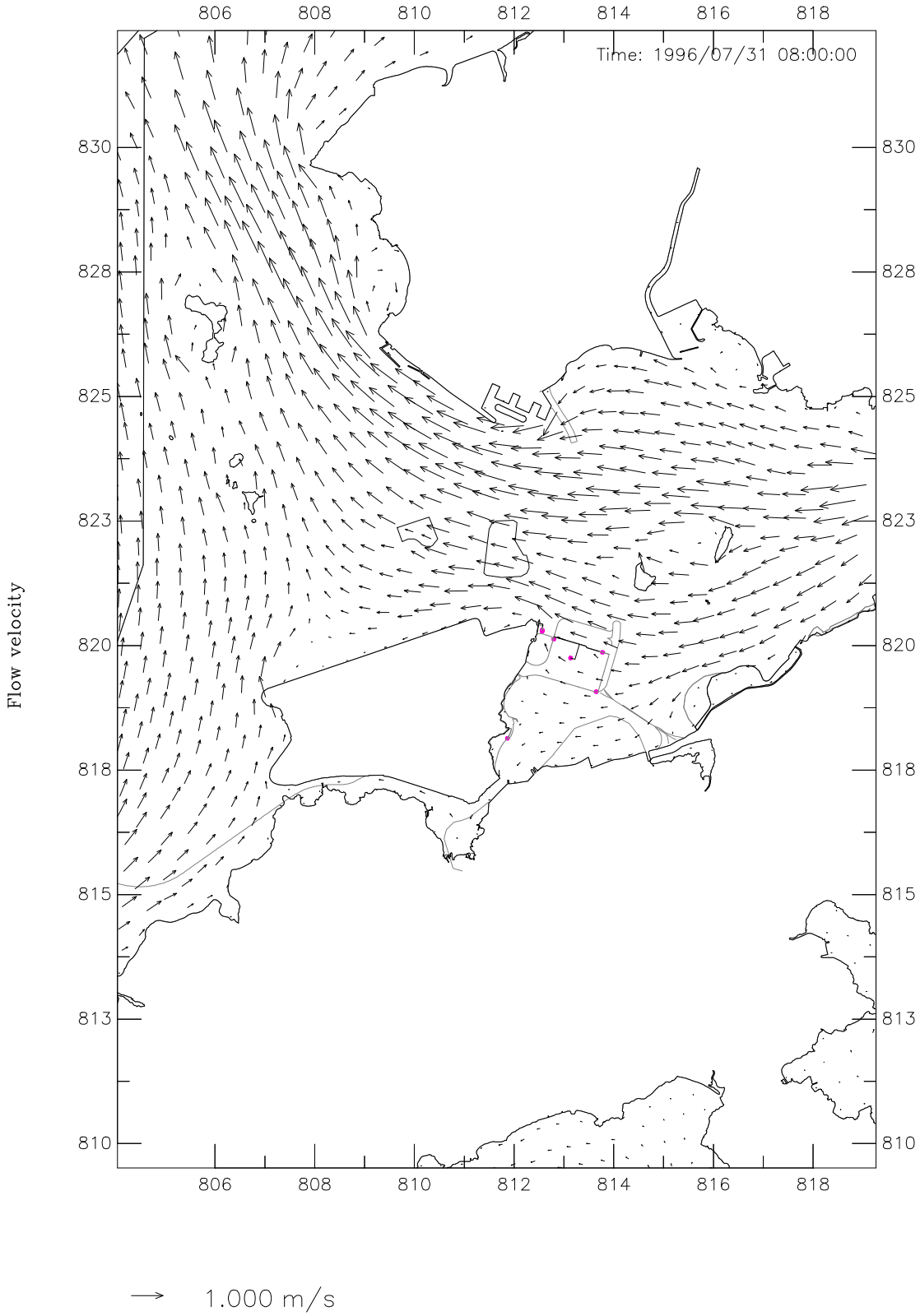
Year 2011 Dry Season Velocity Vector Plot at Flood Tide – Surface Layer (Top: Northern Reclamation; Bottom: Southern Reclamation)	Apr 2009	Figure 026
MAUNSELL | AECOM		



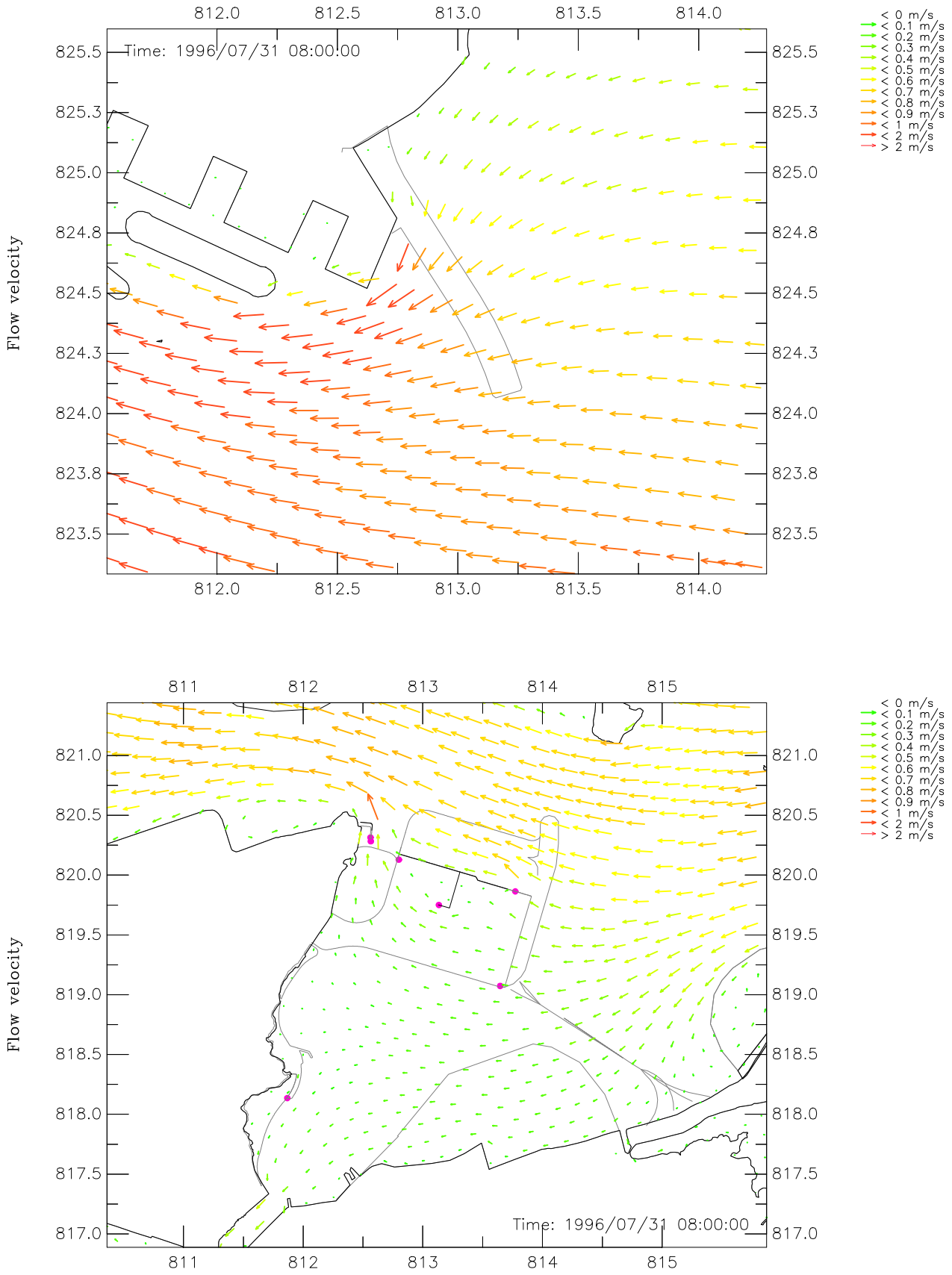
Year 2011 Wet Season Velocity Vector Plot at Flood Tide – Surface Layer	Apr 2009	Figure 027
MAUNSELL | AECOM		



Year 2011 Wet Season Velocity Vector Plot at Flood Tide – Surface Layer (Top: Northern Reclamation; Bottom: Southern Reclamation)	Apr 2009	Figure 028
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Year 2011 Dry Season Velocity Vector Plot at Flood Tide – Mid-Depth	Apr 2009	Figure 029
MAUNSELL | AECOM		

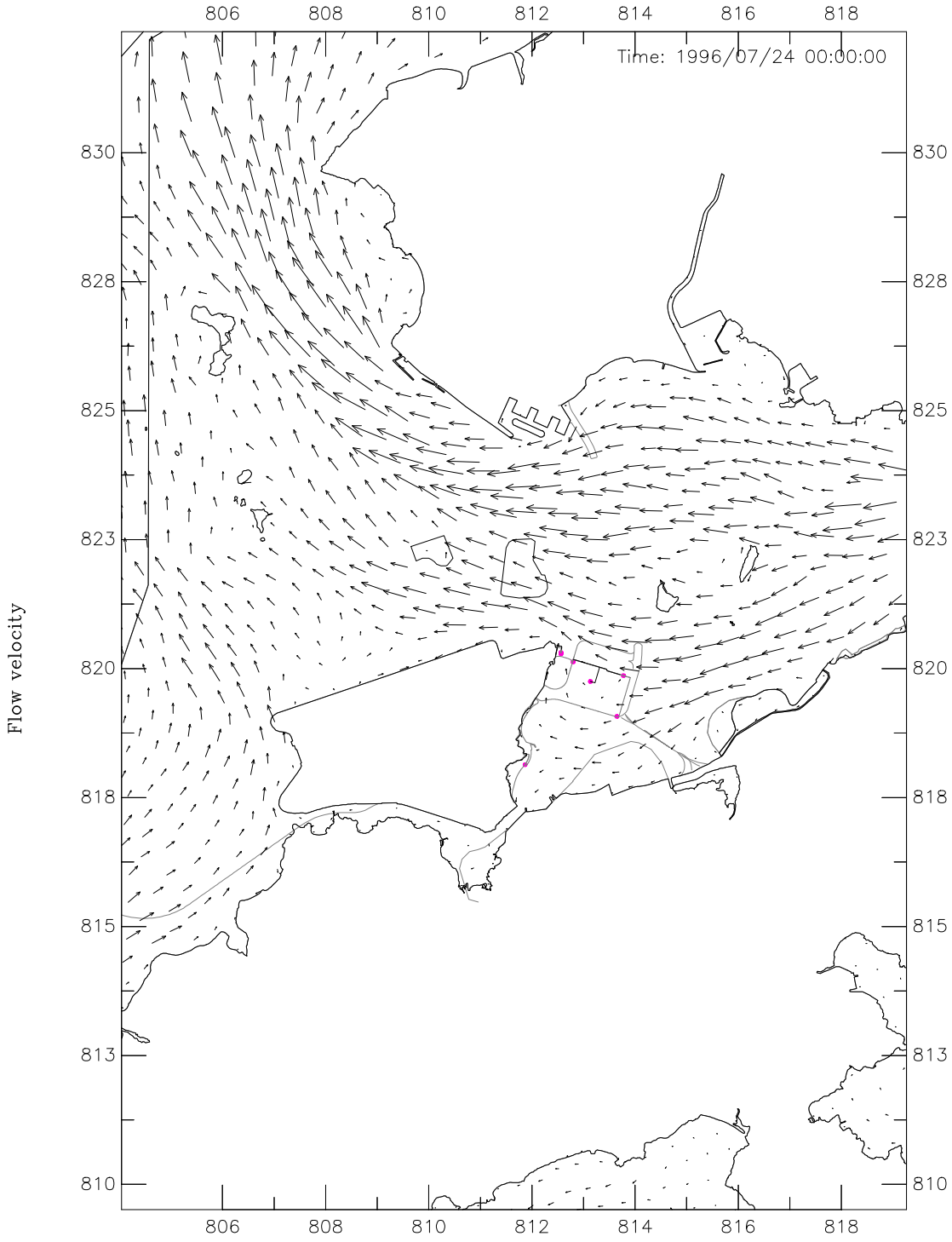


Year 2011
Dry Season Velocity Vector Plot at Flood Tide – Mid-Depth
(Top: Northern Reclamation; Bottom: Southern Reclamation)

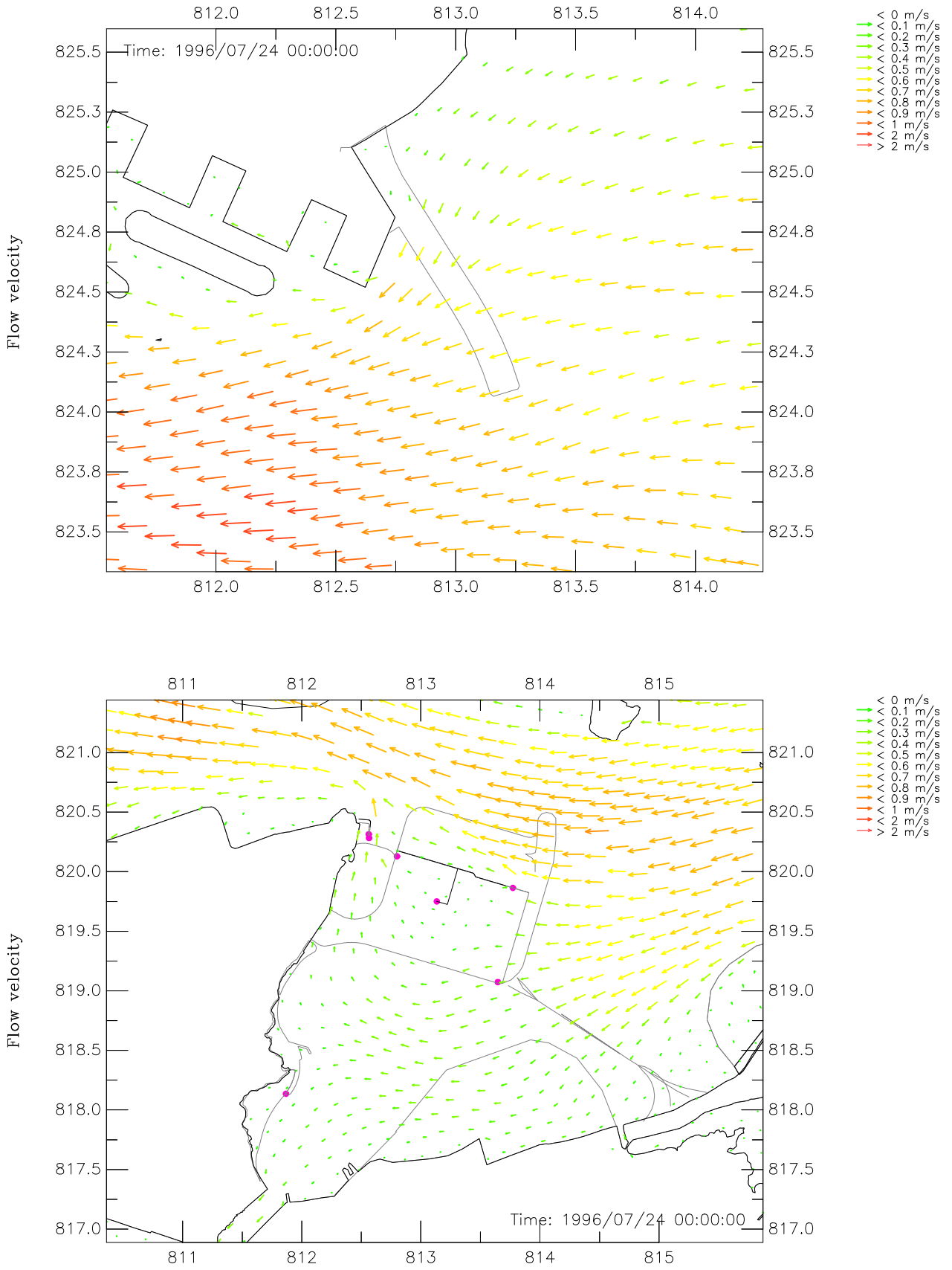
Apr 2009

Figure 030

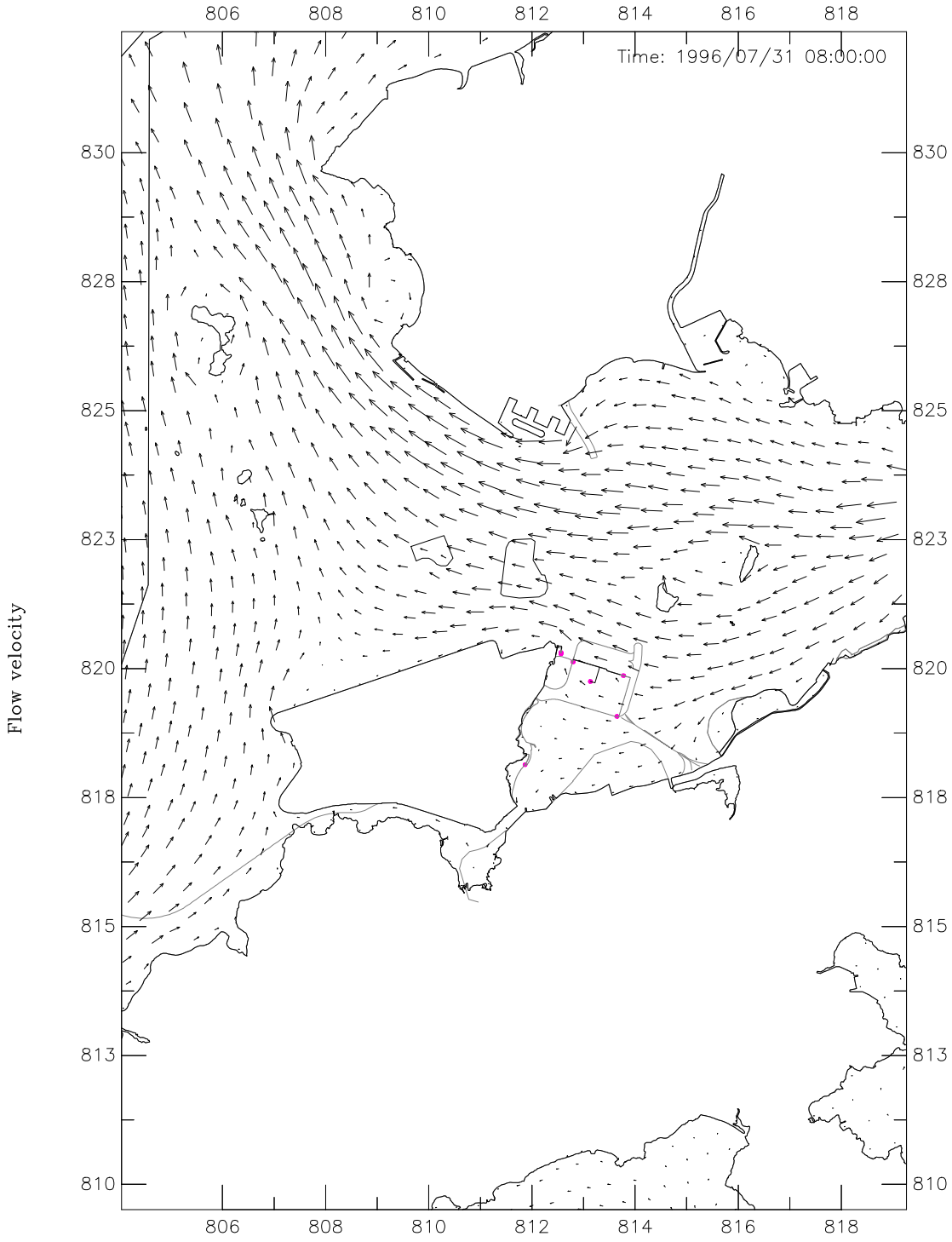
MAUNSELL | AECOM



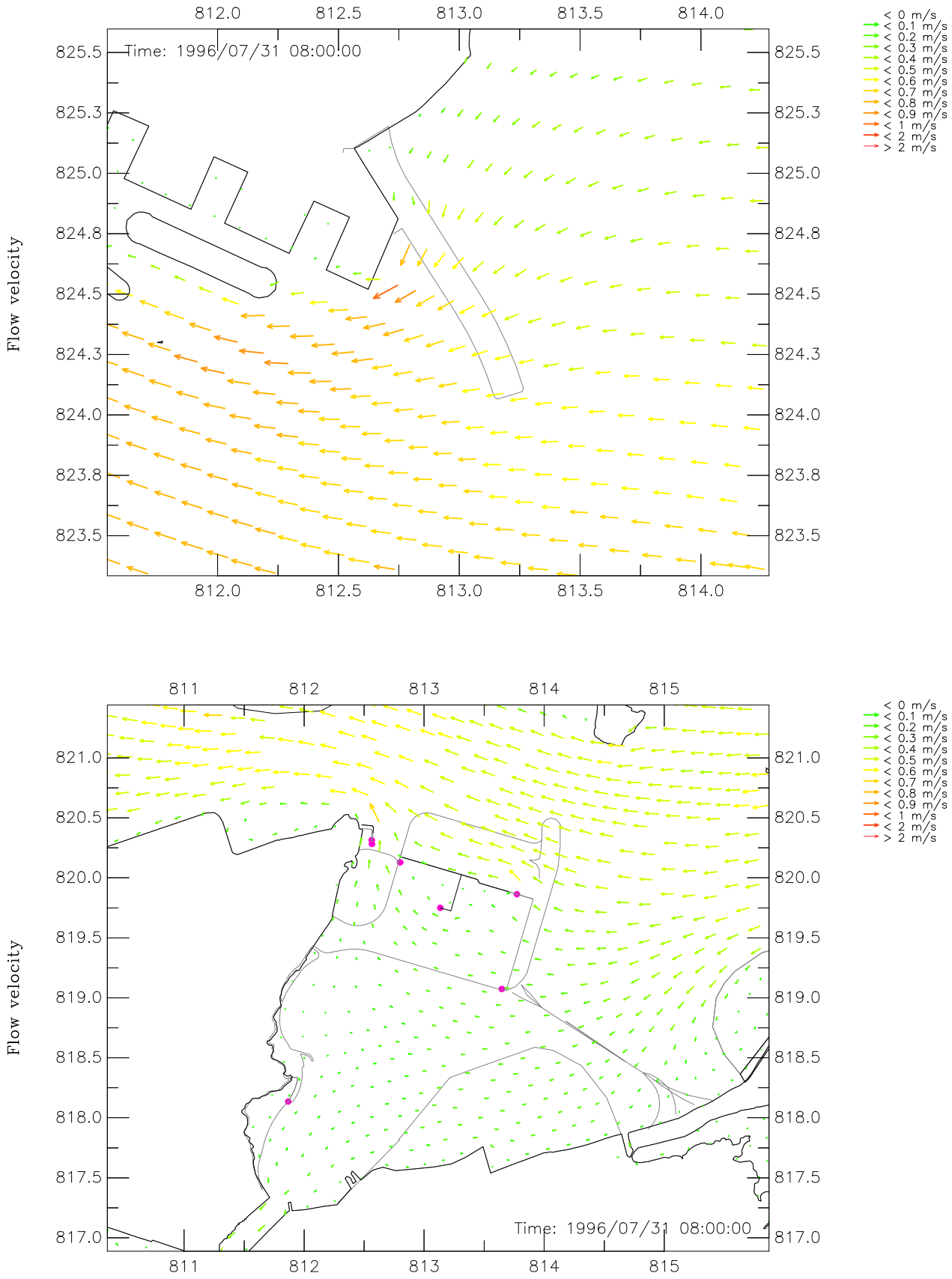
Year 2011 Wet Season Velocity Vector Plot at Flood Tide – Mid-Depth	Apr 2009	Figure 031
MAUNSELL | AECOM		



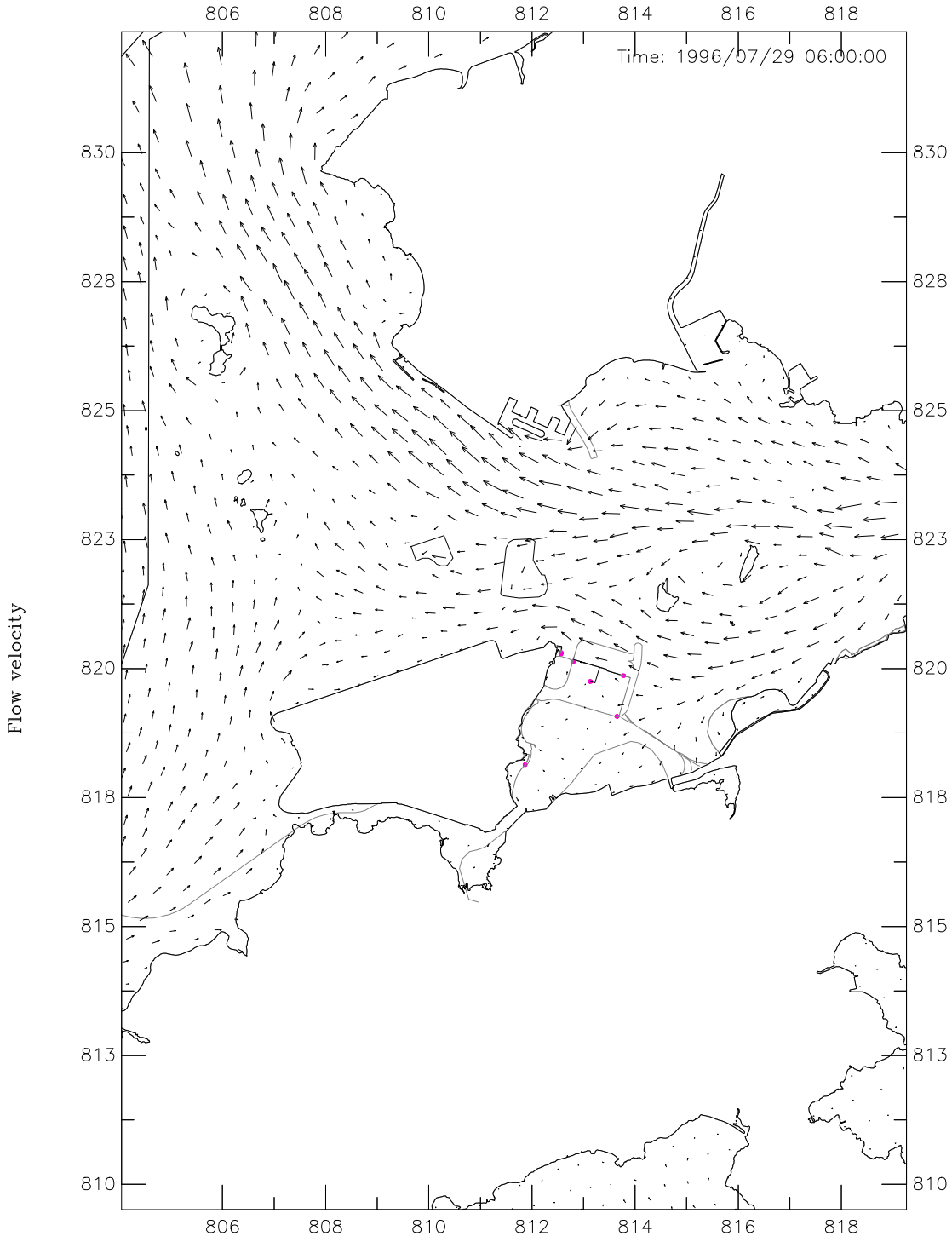
Year 2011 Wet Season Velocity Vector Plot at Flood Tide – Mid-Depth (Top: Northern Reclamation; Bottom: Southern Reclamation)	Apr 2009	Figure 032
MAUNSELL | AECOM		



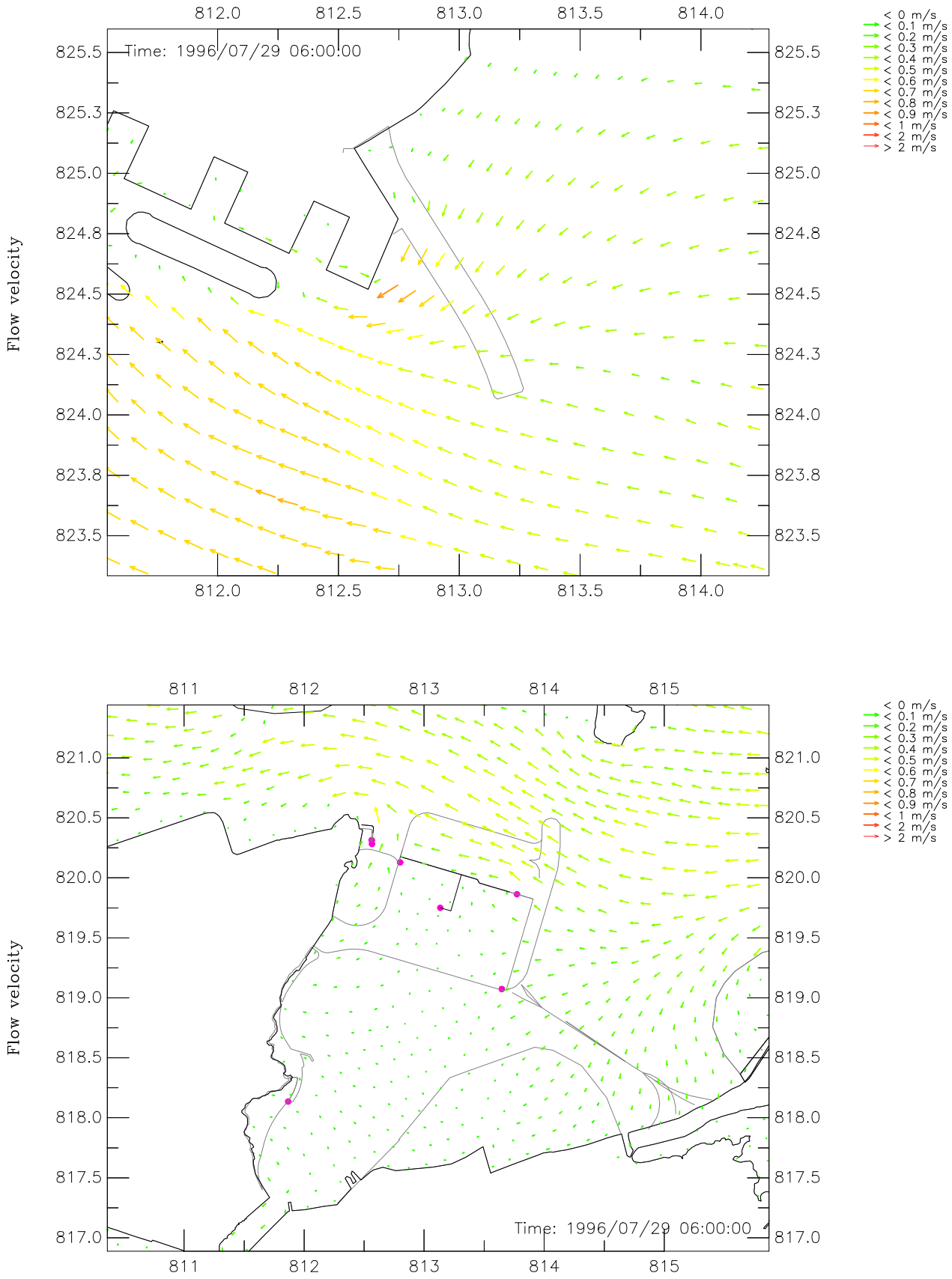
Year 2011 Dry Season Velocity Vector Plot at Flood Tide – Bottom Layer	Apr 2009	Figure 033
MAUNSELL | AECOM		



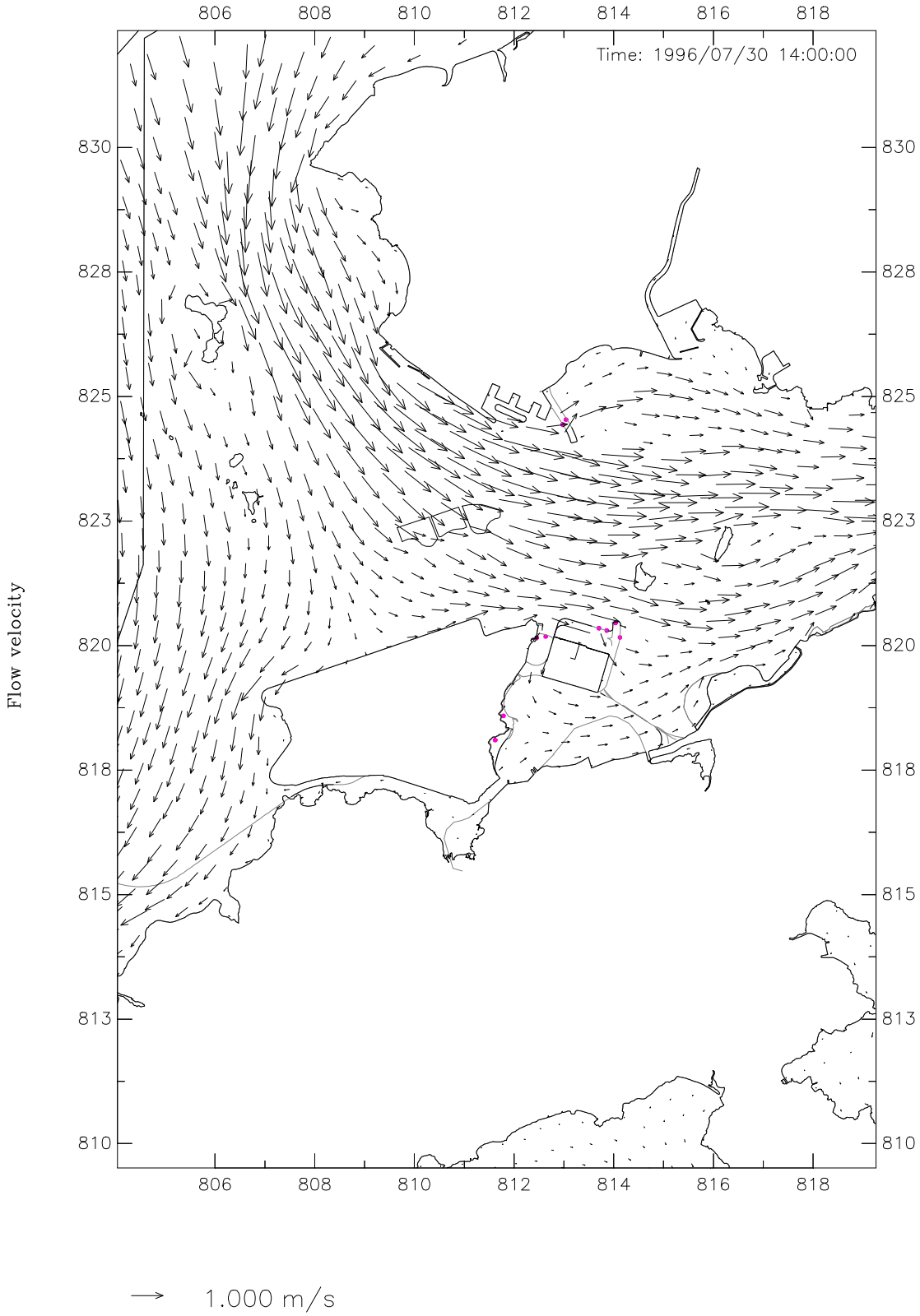
Year 2011 Dry Season Velocity Vector Plot at Flood Tide – Bottom Layer (Top: Northern Reclamation; Bottom: Southern Reclamation)	Apr 2009	Figure 034
MAUNSELL | AECOM		



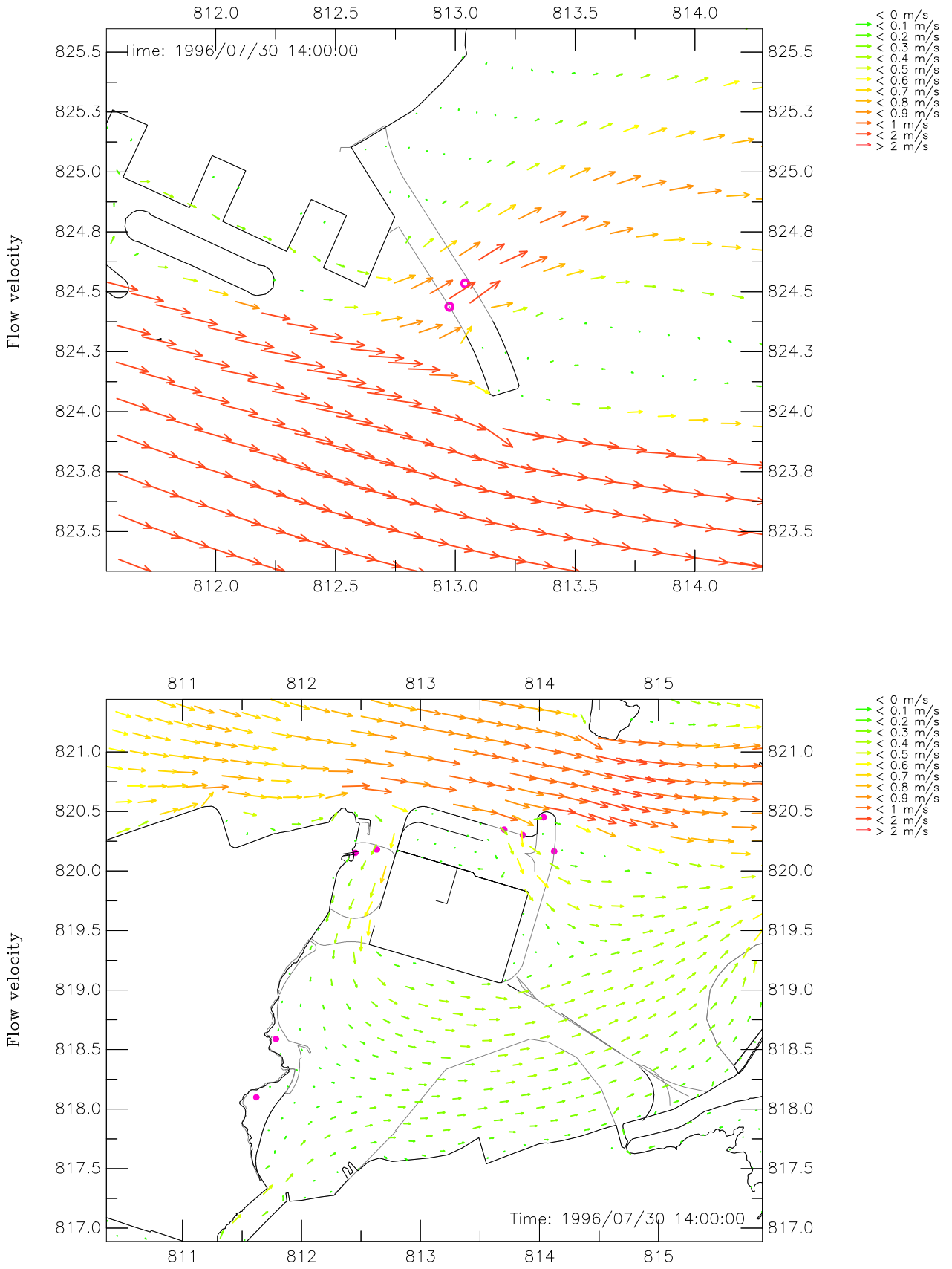
Year 2011 Wet Season Velocity Vector Plot at Flood Tide – Bottom Layer	Apr 2009	Figure 035
MAUNSELL | AECOM		



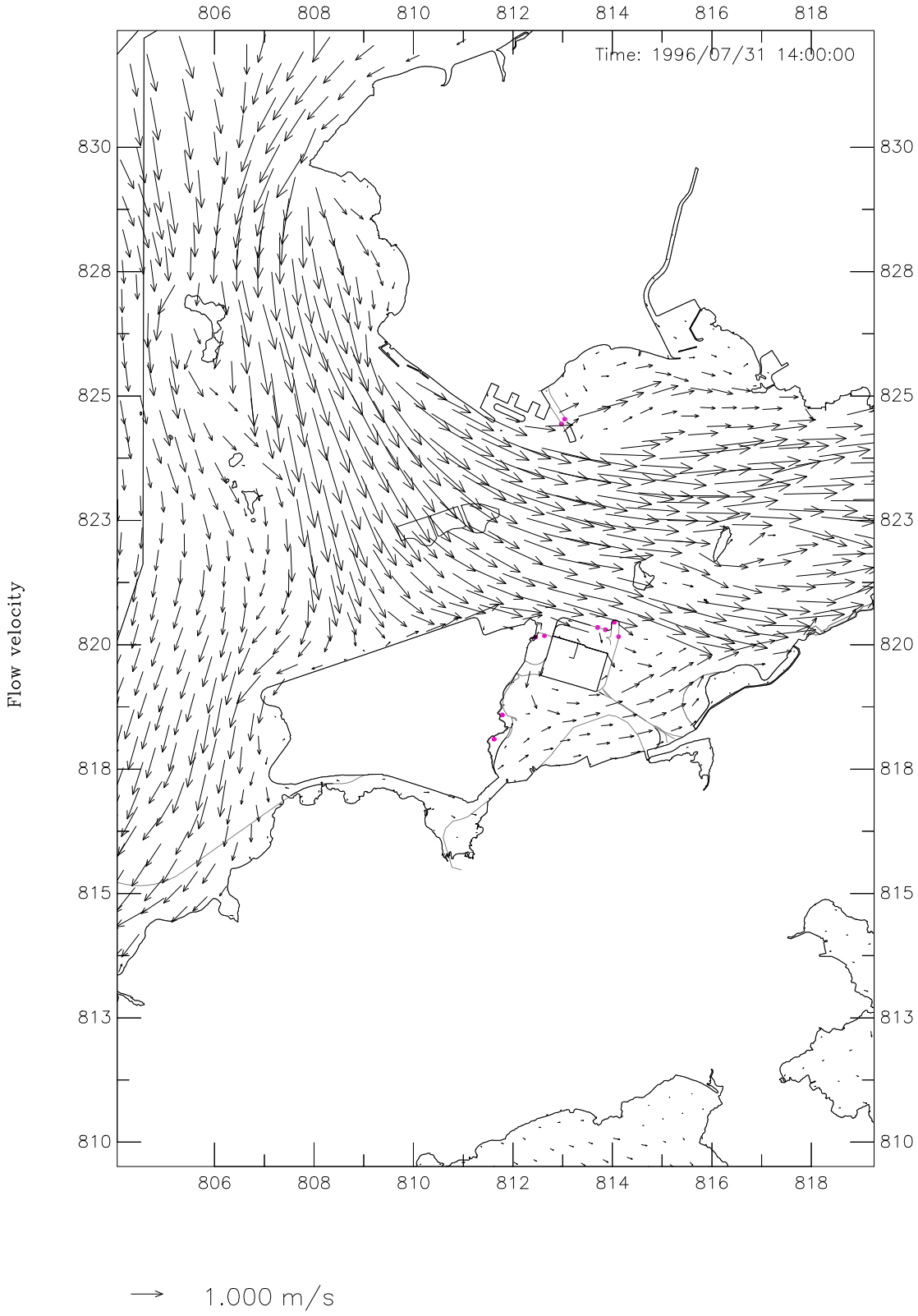
Year 2011 Wet Season Velocity Vector Plot at Flood Tide – Bottom Layer (Top: Northern Reclamation; Bottom: Southern Reclamation)	Apr 2009	Figure 036
MAUNSELL | AECOM		



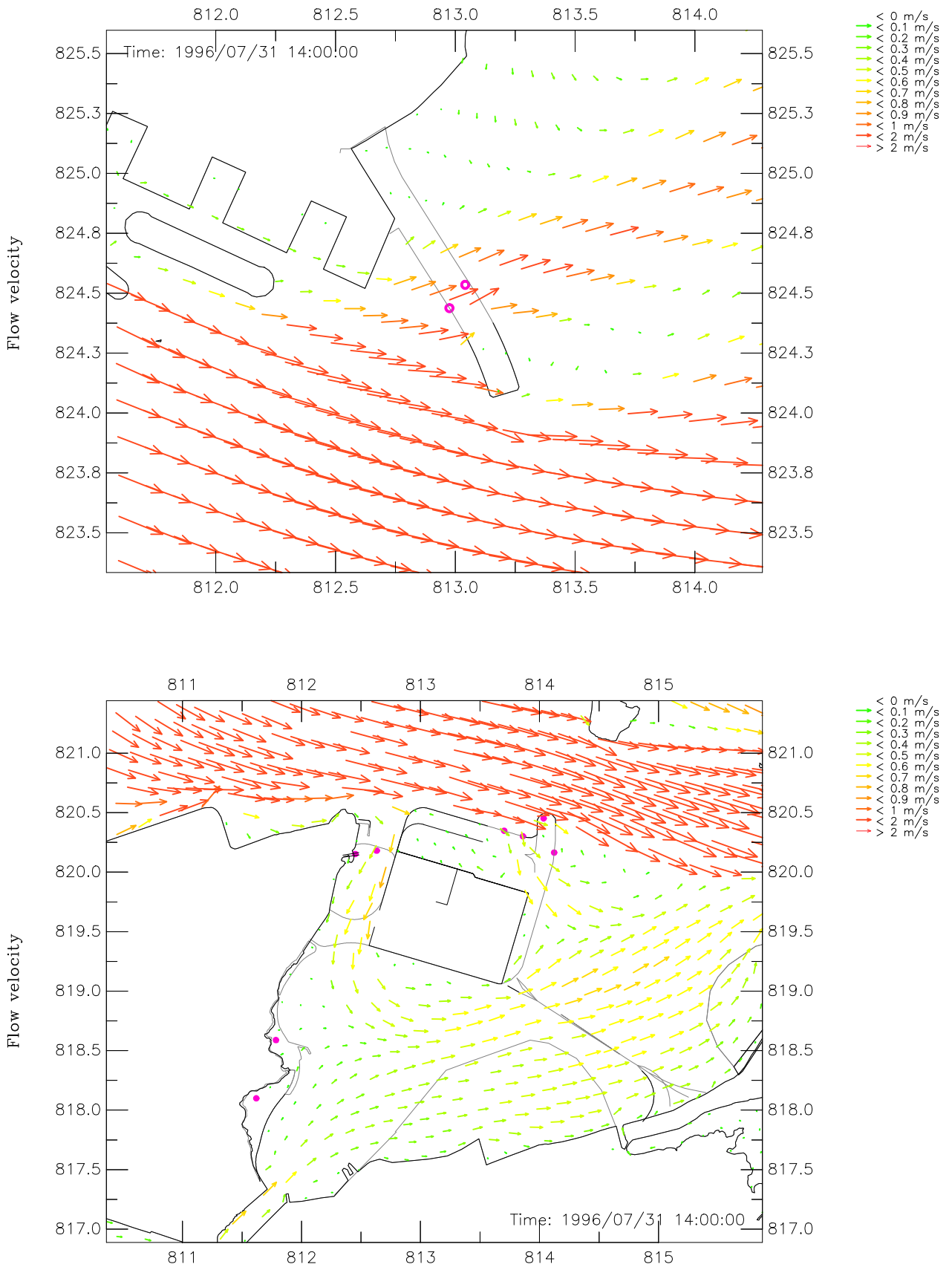
Year 2012 Dry Season Velocity Vector Plot at Ebb Tide – Surface Layer	Apr 2009	Figure 013
MAUNSELL | AECOM		



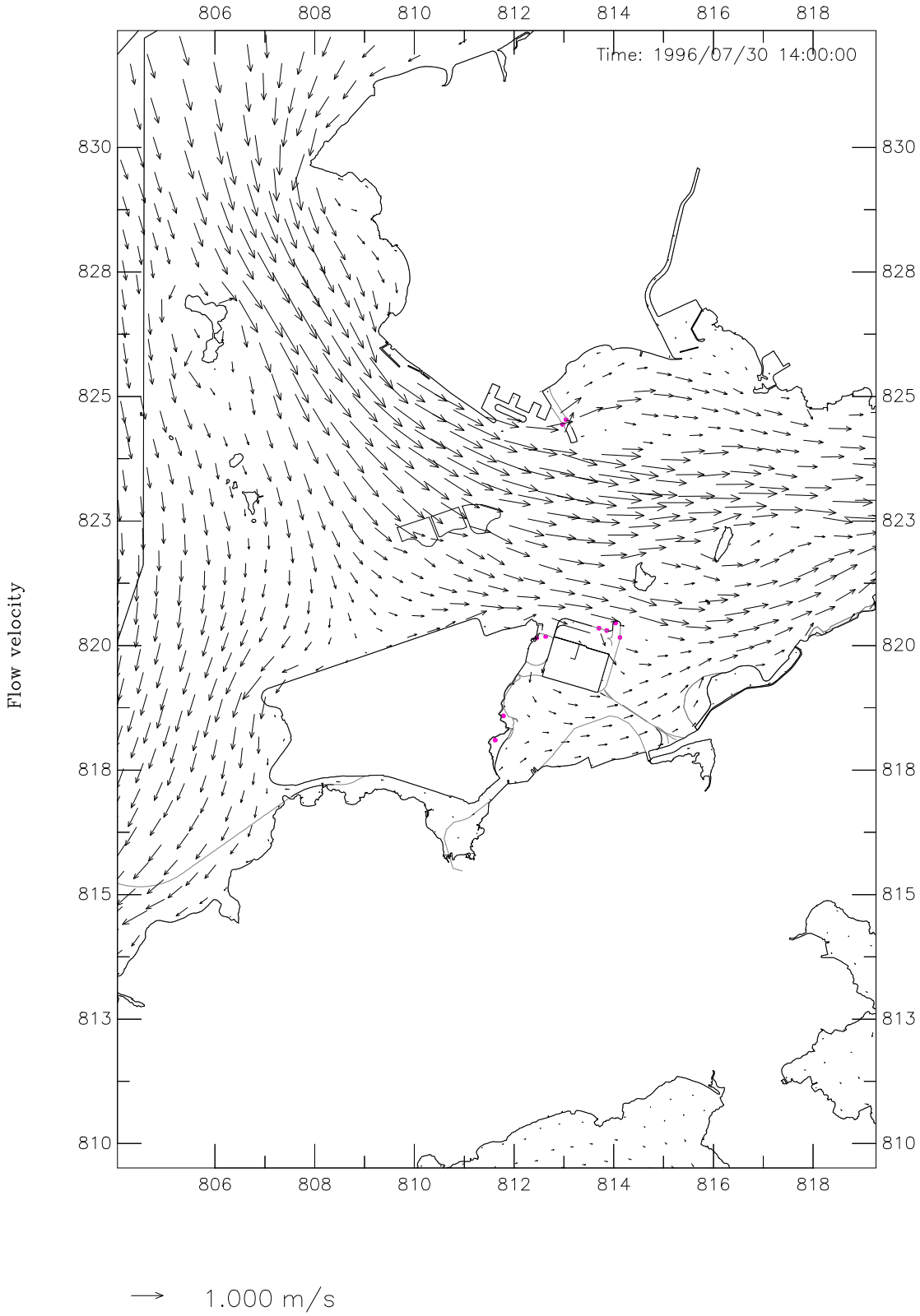
Year 2012 Dry Season Velocity Vector Plot at Ebb Tide – Surface Layer (Top: Northern Reclamation; Bottom: Southern Reclamation)	Apr 2009	Figure 014
MAUNSELL | AECOM		



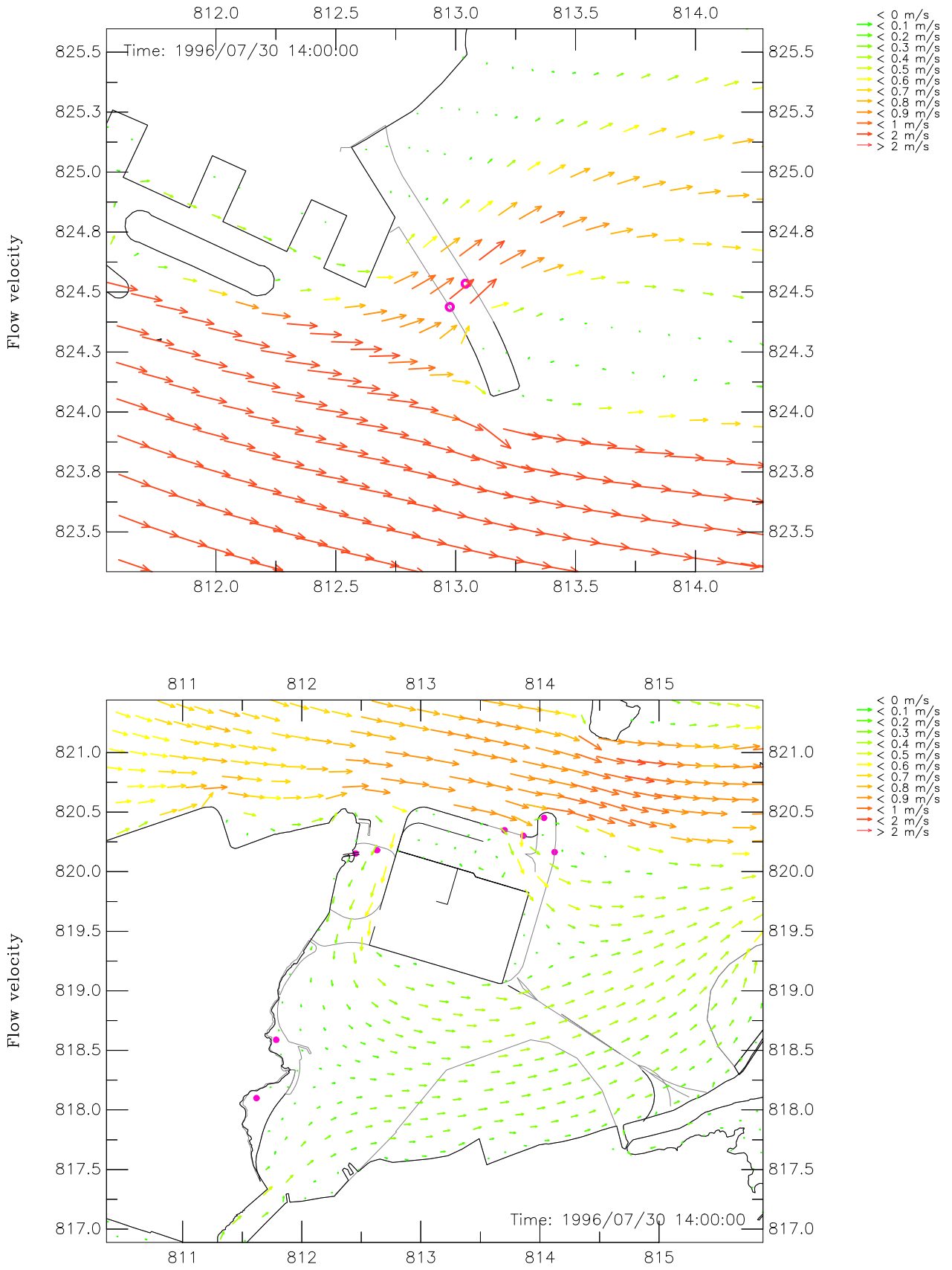
Year 2012 Wet Season Velocity Vector Plot at Ebb Tide – Surface Layer	Apr 2009	Figure 015
MAUNSELL | AECOM		



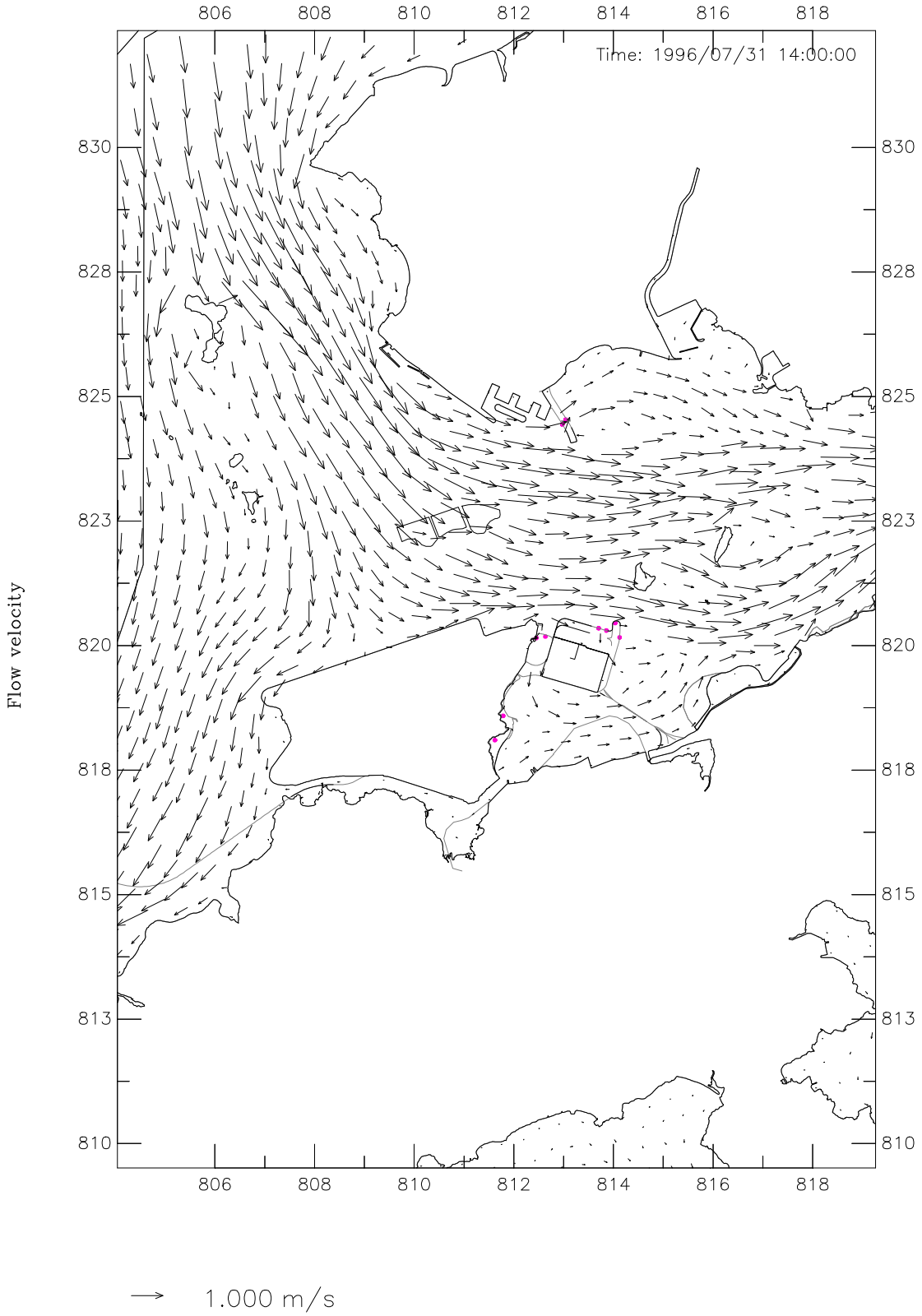
Year 2012 Wet Season Velocity Vector Plot at Ebb Tide – Surface Layer (Top: Northern Reclamation; Bottom: Southern Reclamation)	Apr 2009	Figure 016
MAUNSELL | AECOM		



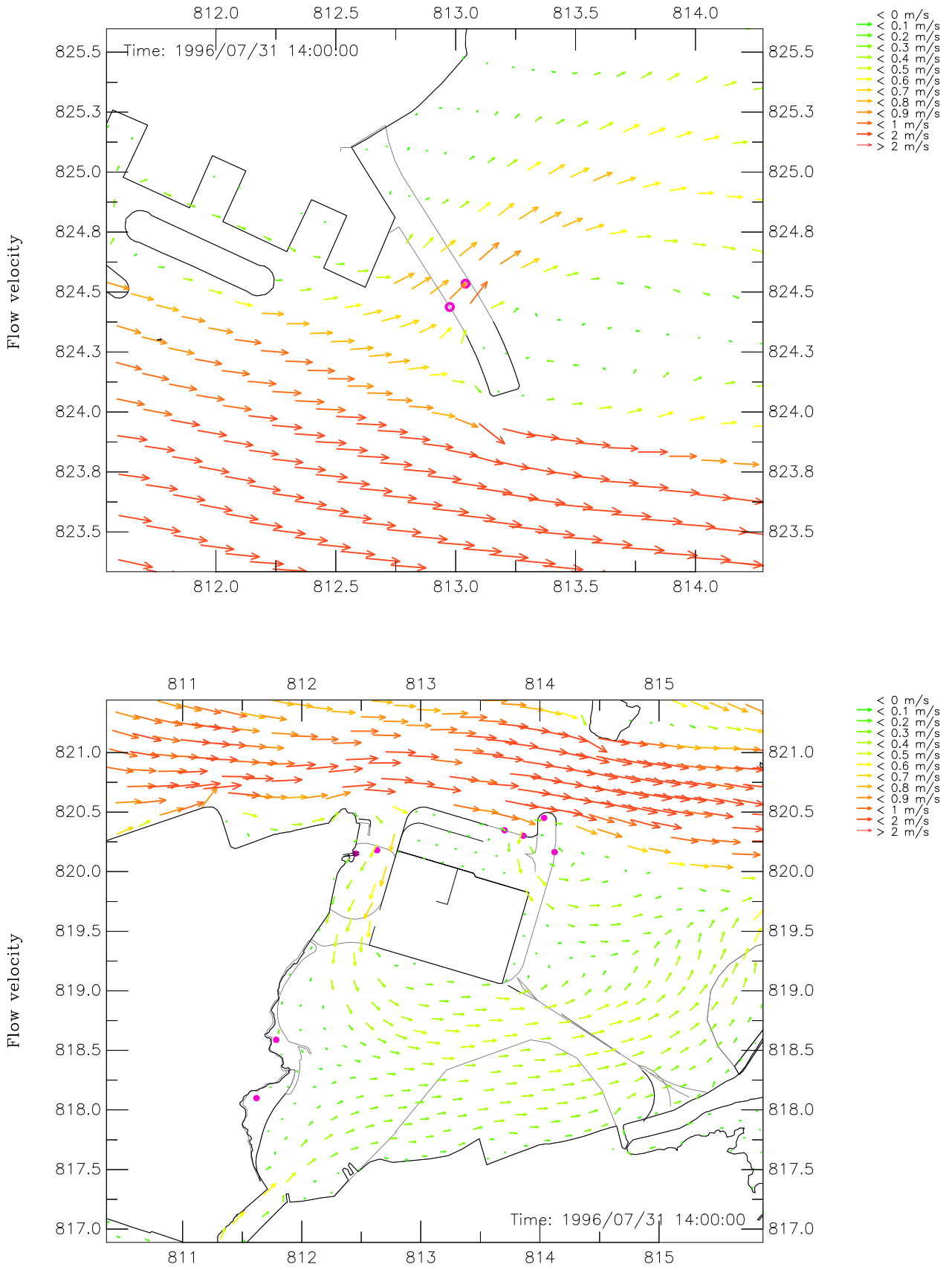
Year 2012 Dry Season Velocity Vector Plot at Ebb Tide – Mid–Depth	Apr 2009	Figure 017
MAUNSELL | AECOM		



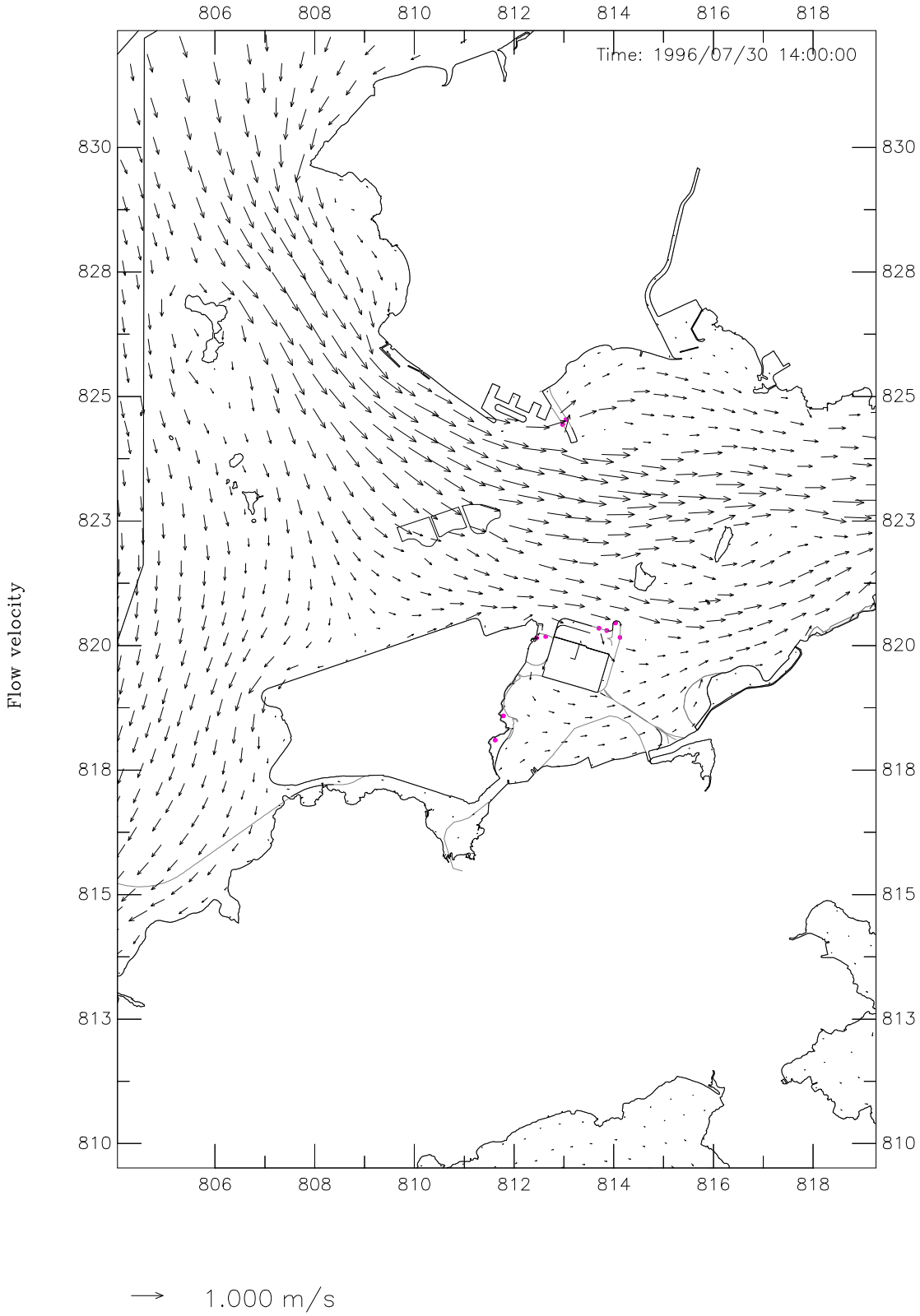
Year 2012 Dry Season Velocity Vector Plot at Ebb Tide – Mid–Depth (Top: Northern Reclamation; Bottom: Southern Reclamation)	Apr 2009	Figure 018
MAUNSELL | AECOM		



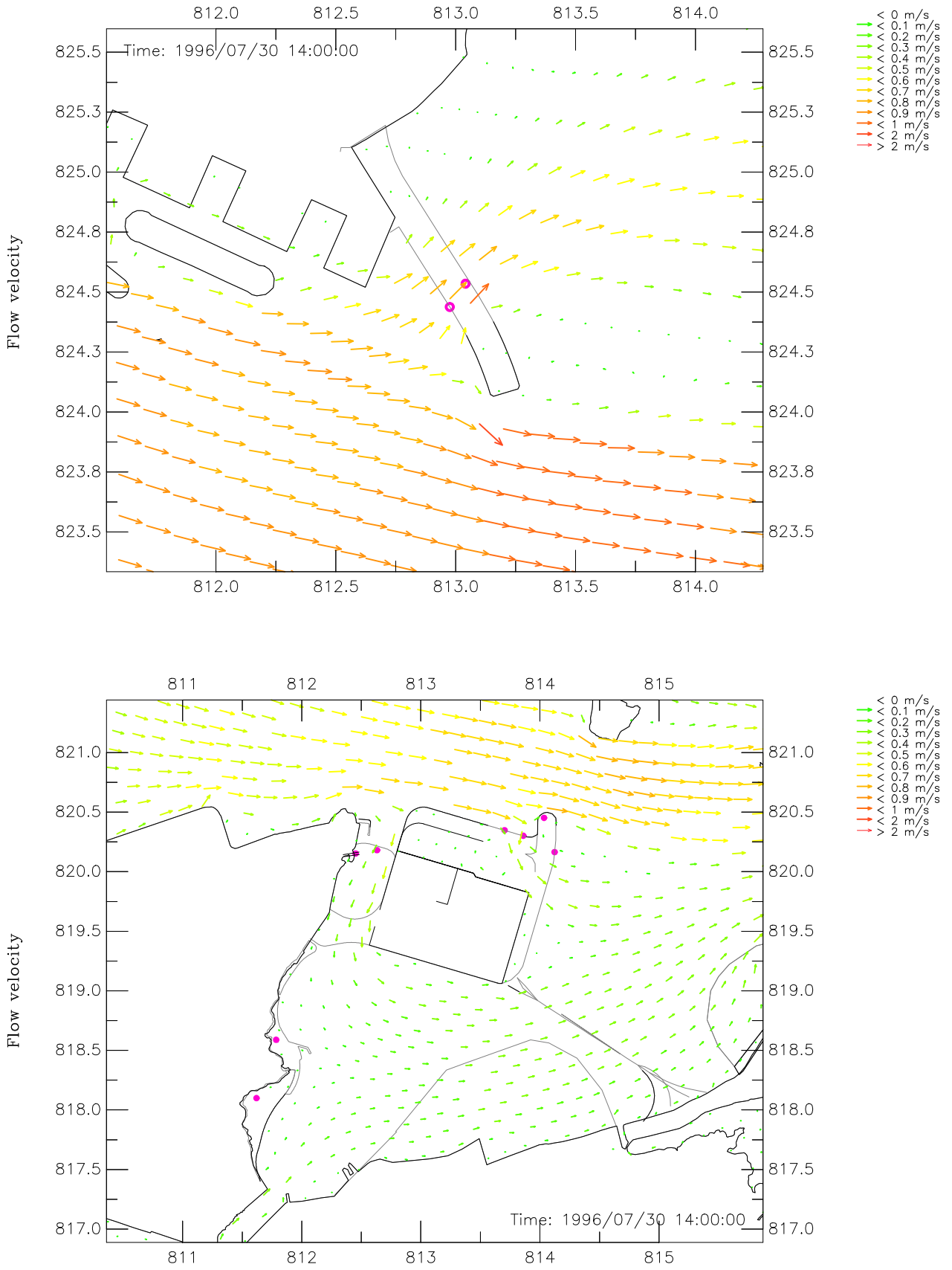
Year 2012 Wet Season Velocity Vector Plot at Ebb Tide – Mid–Depth	Apr 2009	Figure 019
MAUNSELL | AECOM		



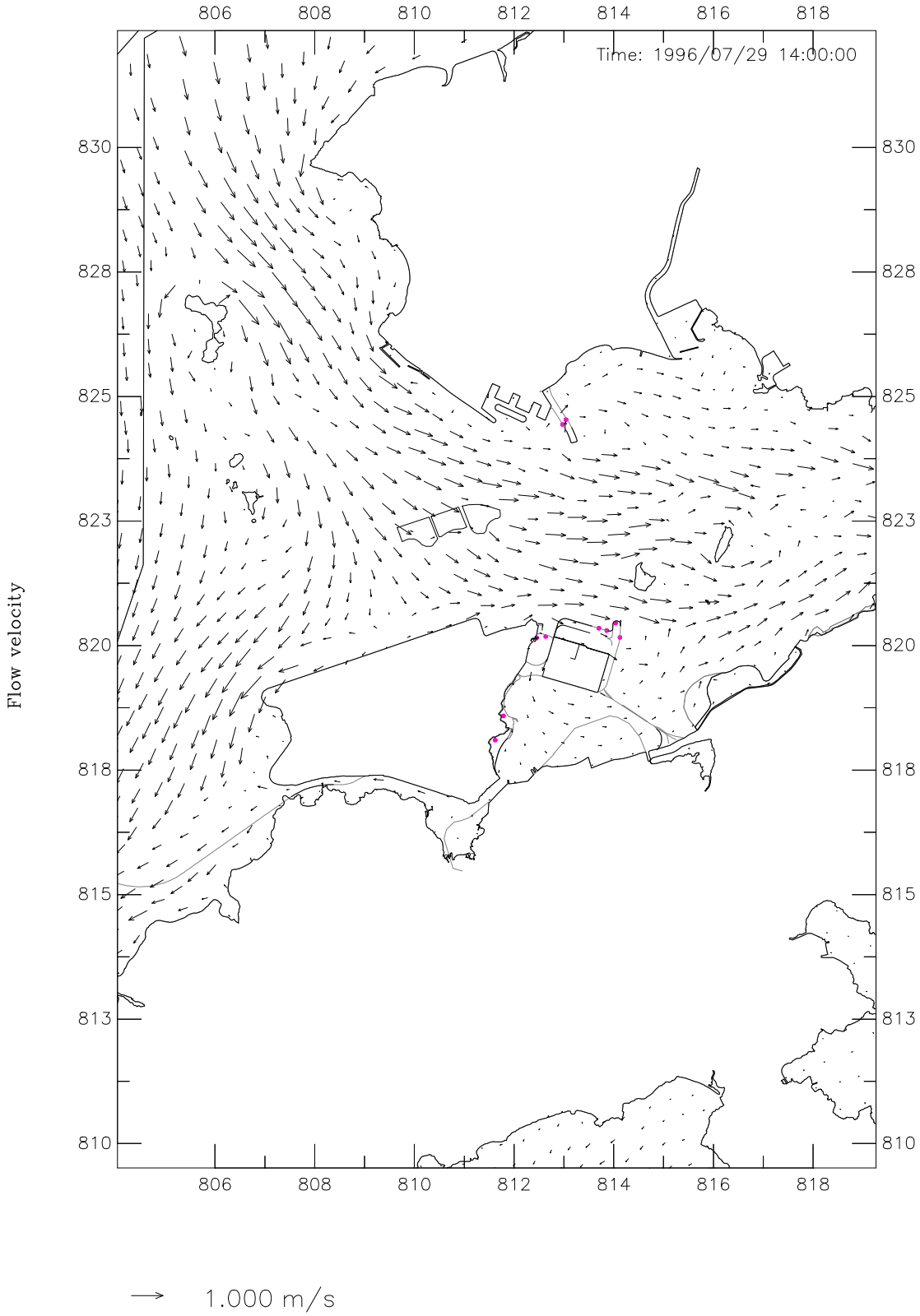
Year 2012 Wet Season Velocity Vector Plot at Ebb Tide – Mid-Depth (Top: Northern Reclamation; Bottom: Southern Reclamation)	Apr 2009	Figure 020
MAUNSELL | AECOM		



Year 2012 Dry Season Velocity Vector Plot at Ebb Tide – Bottom Layer	Apr 2009	Figure 021
MAUNSELL | AECOM		



Year 2012 Dry Season Velocity Vector Plot at Ebb Tide – Bottom Layer (Top: Northern Reclamation; Bottom: Southern Reclamation)	Apr 2009	Figure 022
MAUNSELL | AECOM		

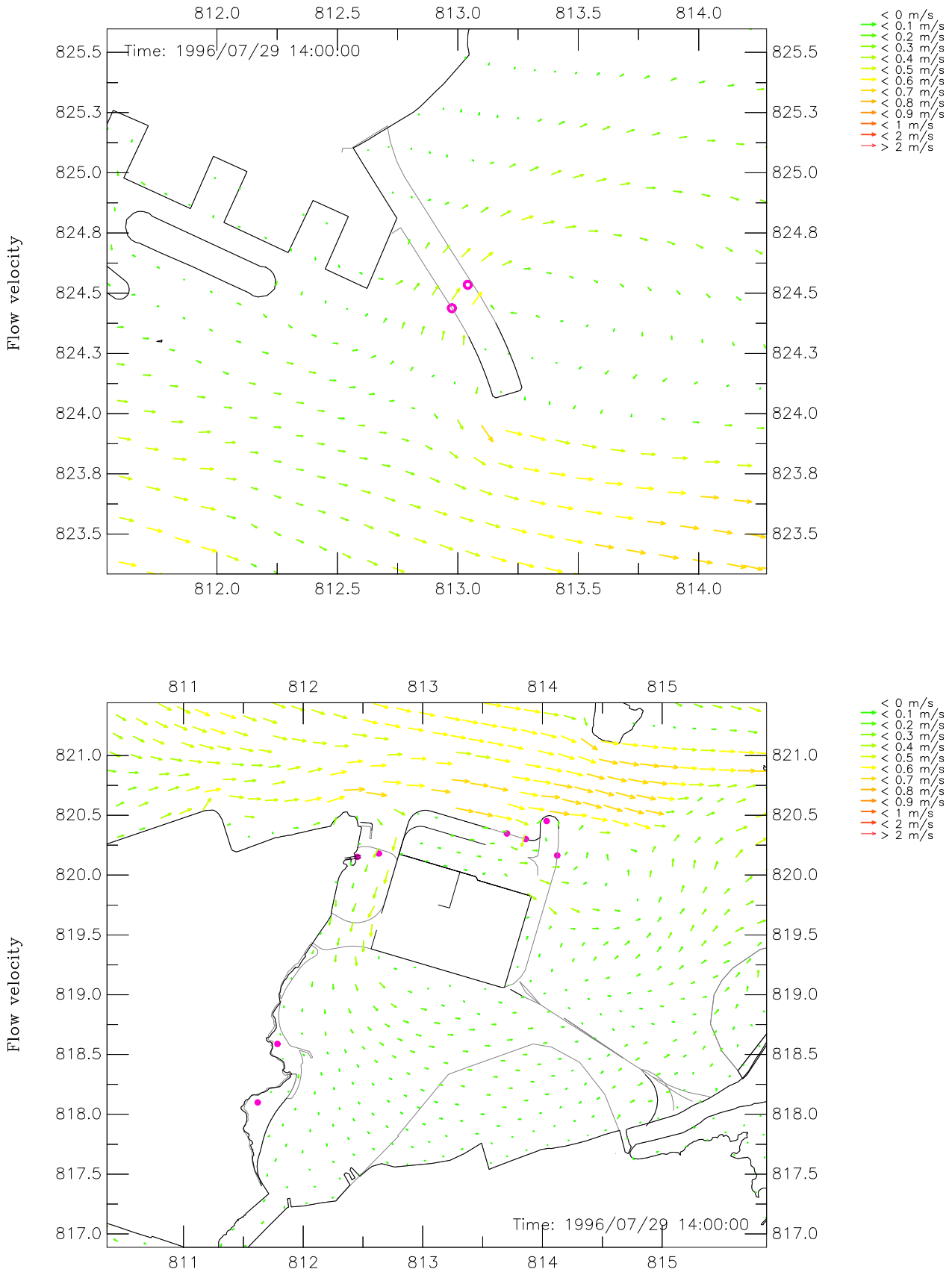


Year 2012
Wet Season Velocity Vector Plot at Ebb Tide – Bottom Layer

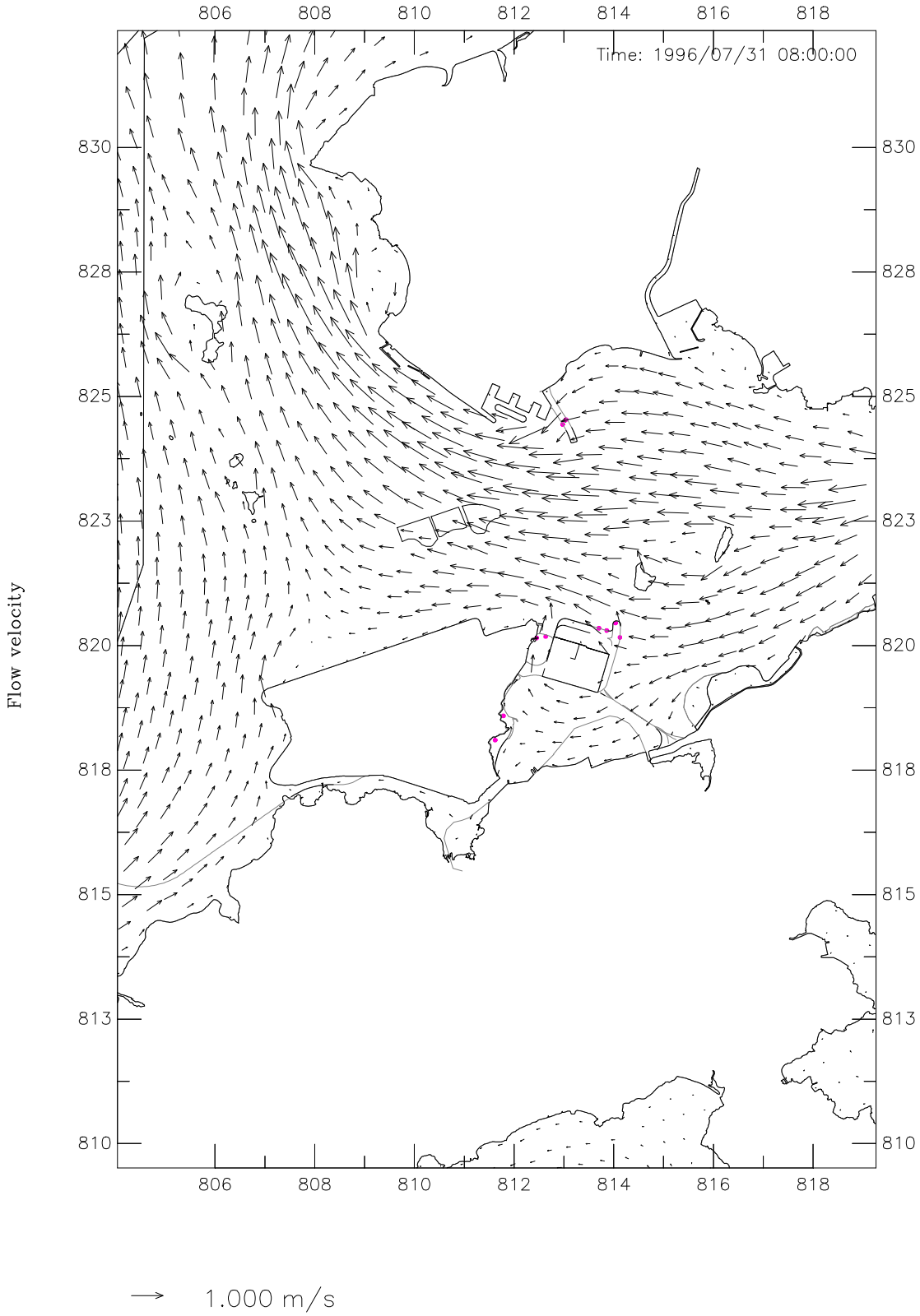
Apr 2009

Figure 023

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Year 2012 Wet Season Velocity Vector Plot at Ebb Tide – Bottom Layer (Top: Northern Reclamation; Bottom: Southern Reclamation)	Apr 2009	Figure 024
MAUNSELL | AECOM		

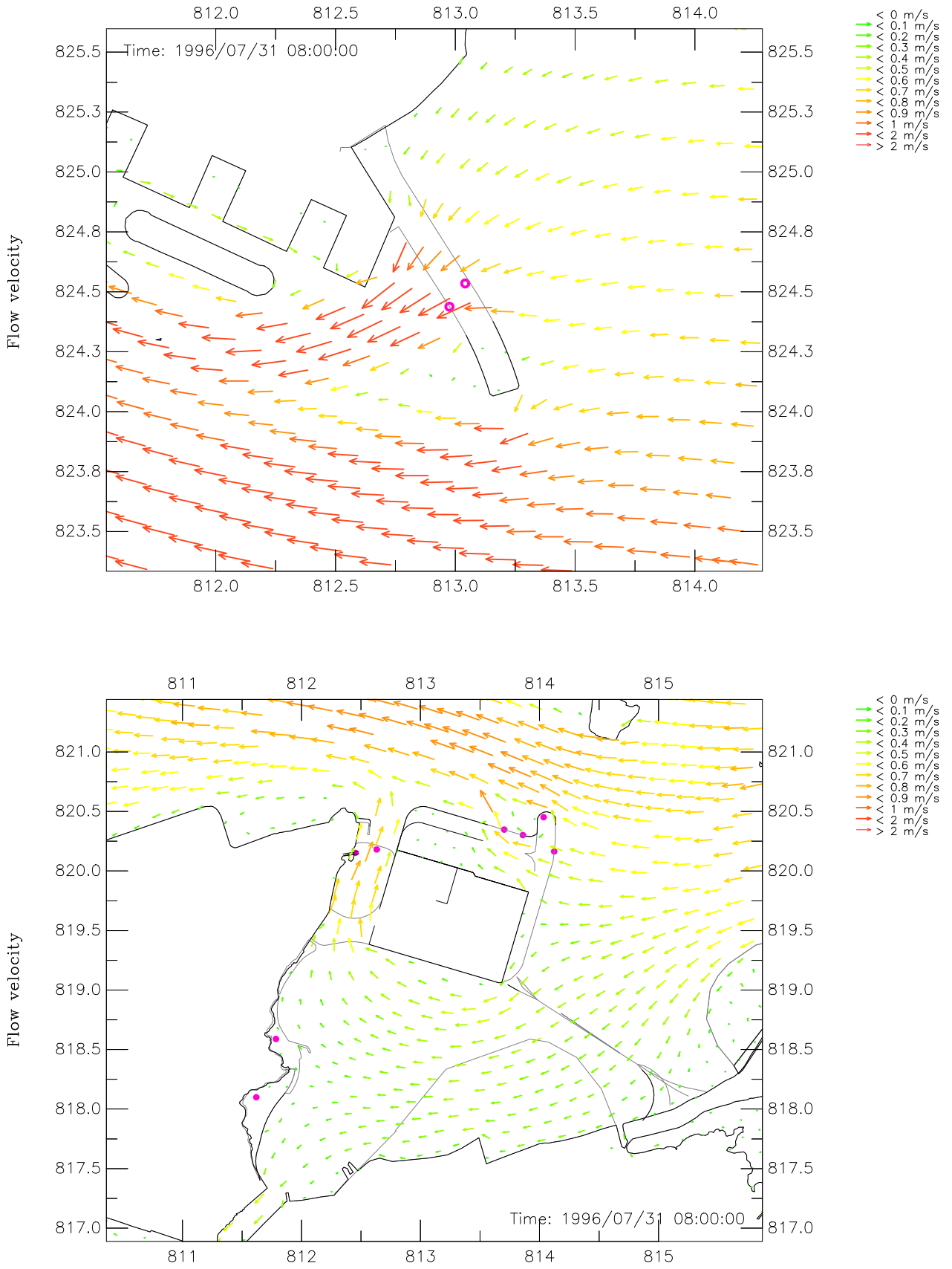


Year 2012
Dry Season Velocity Vector Plot at Flood Tide – Surface Layer

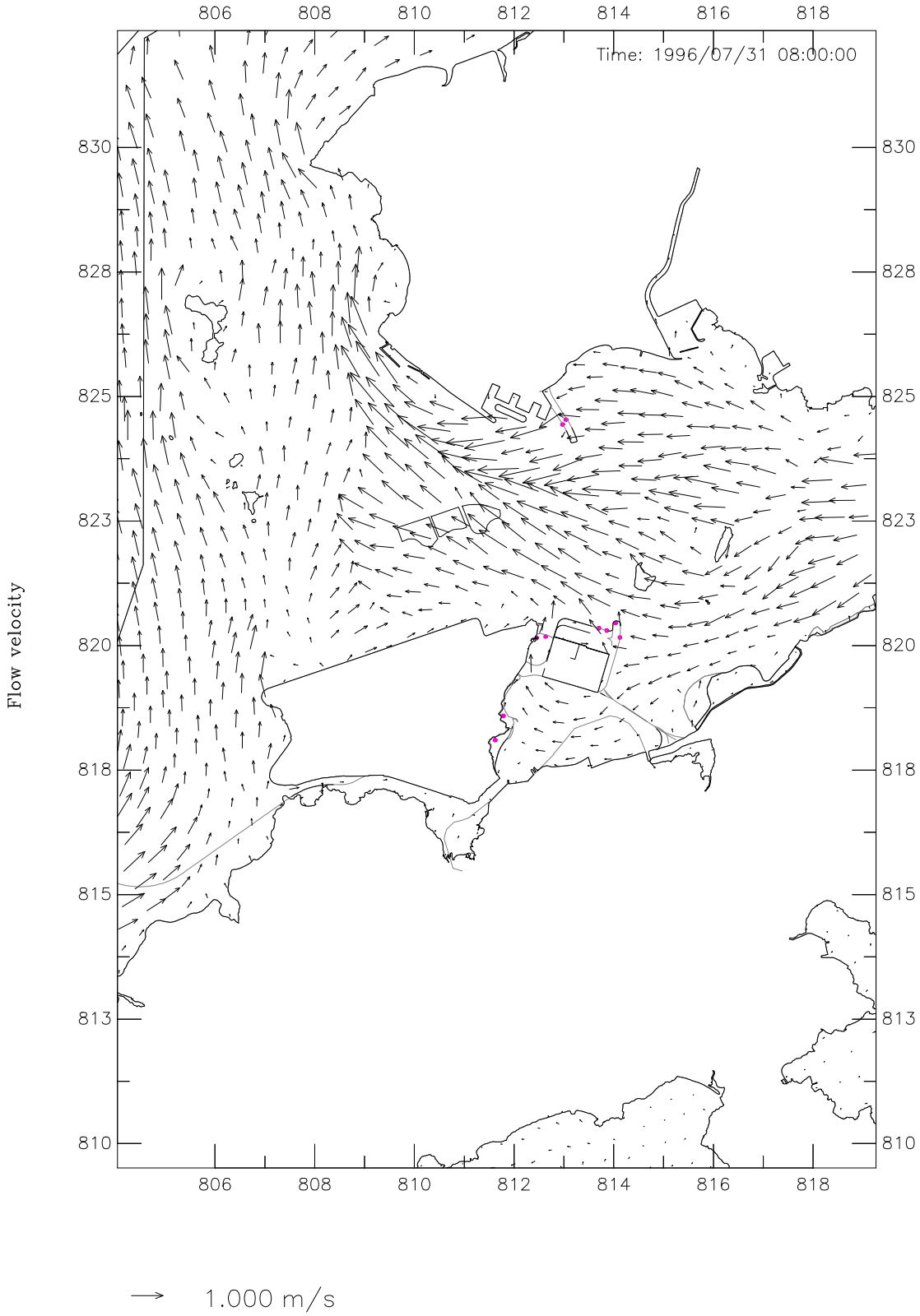
Apr 2009

Figure 025

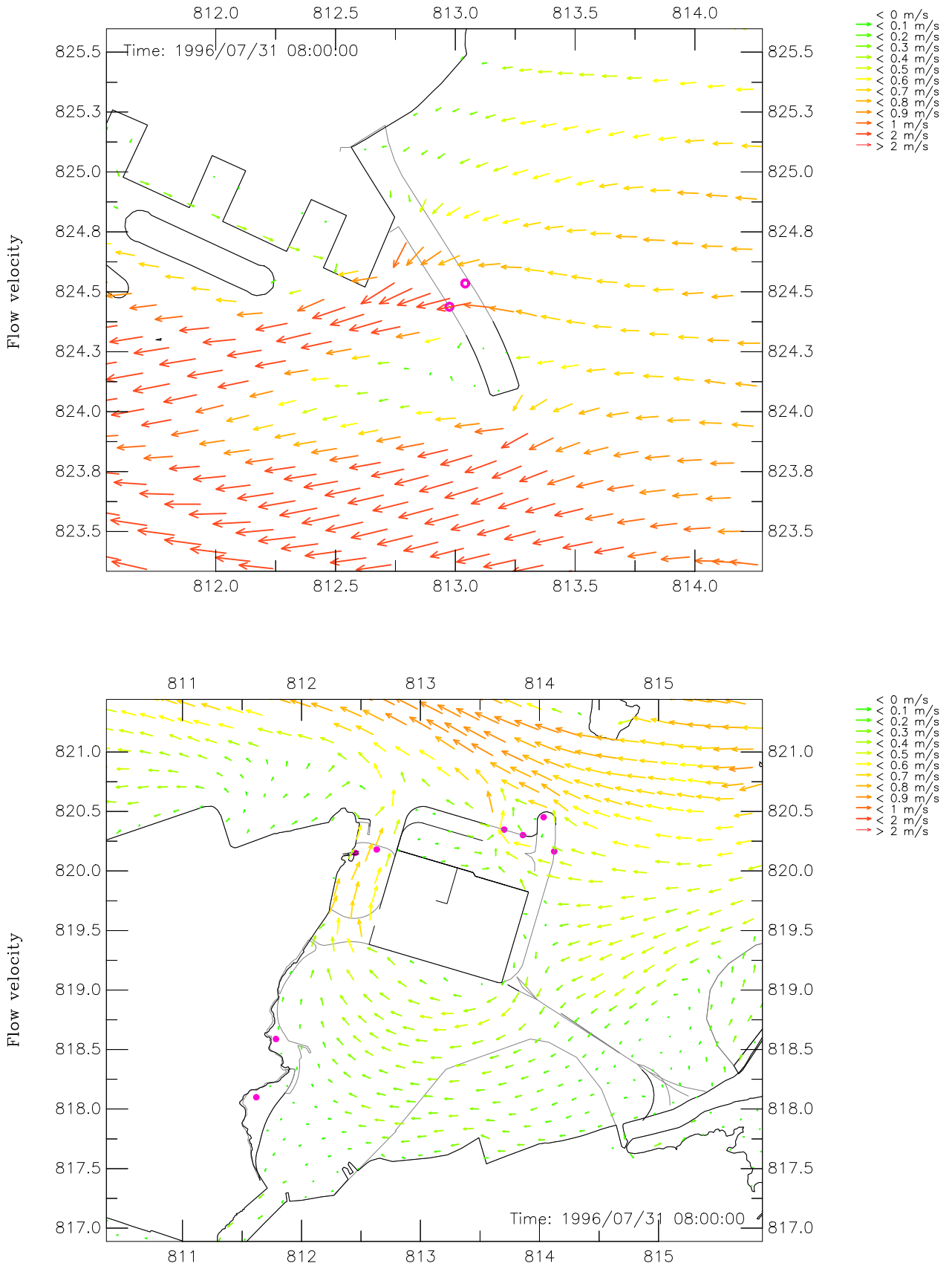
MAUNSELL | AECOM



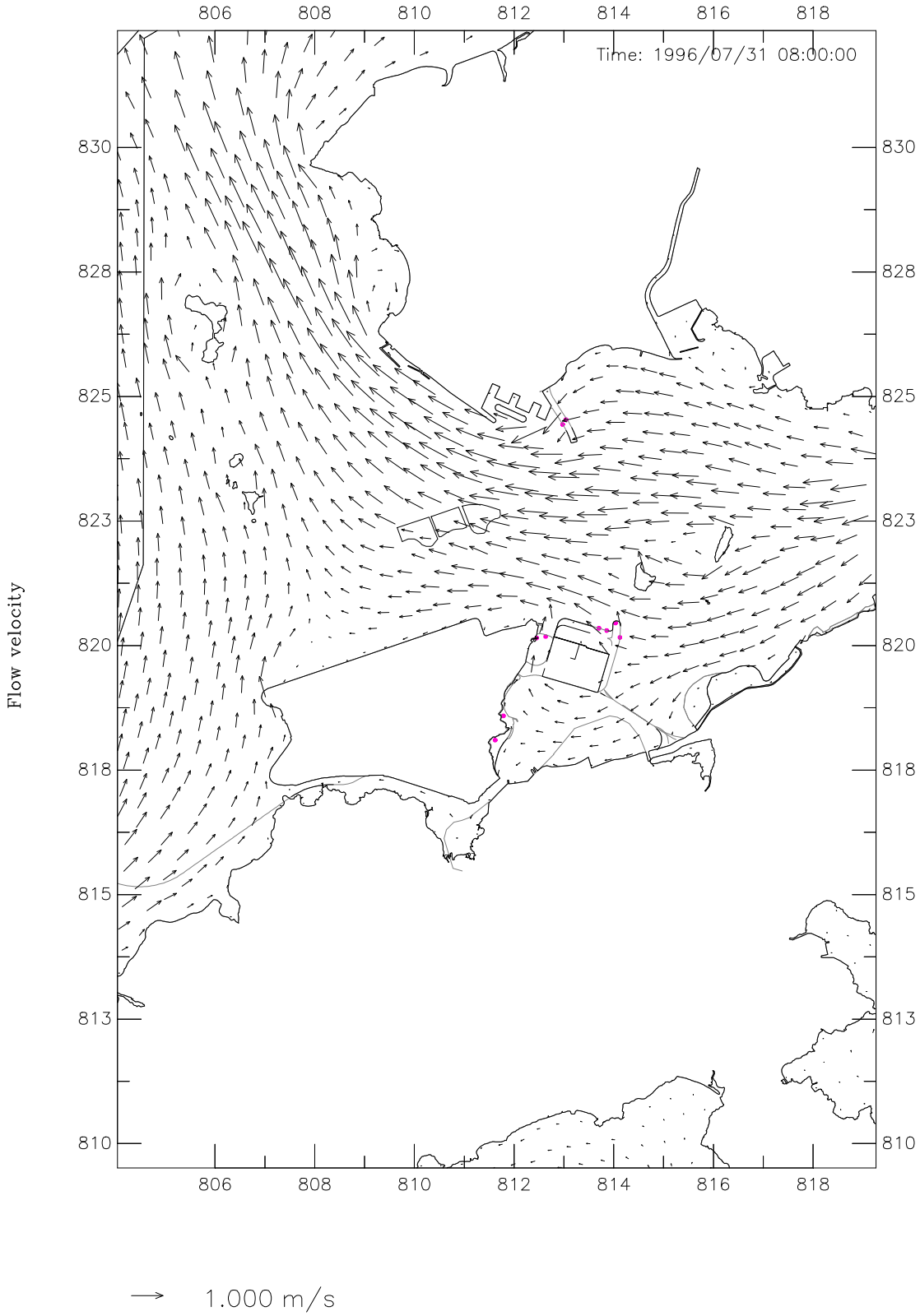
Year 2012 Dry Season Velocity Vector Plot at Flood Tide – Surface Layer (Top: Northern Reclamation; Bottom: Southern Reclamation)	Apr 2009	Figure 026
MAUNSELL | AECOM		



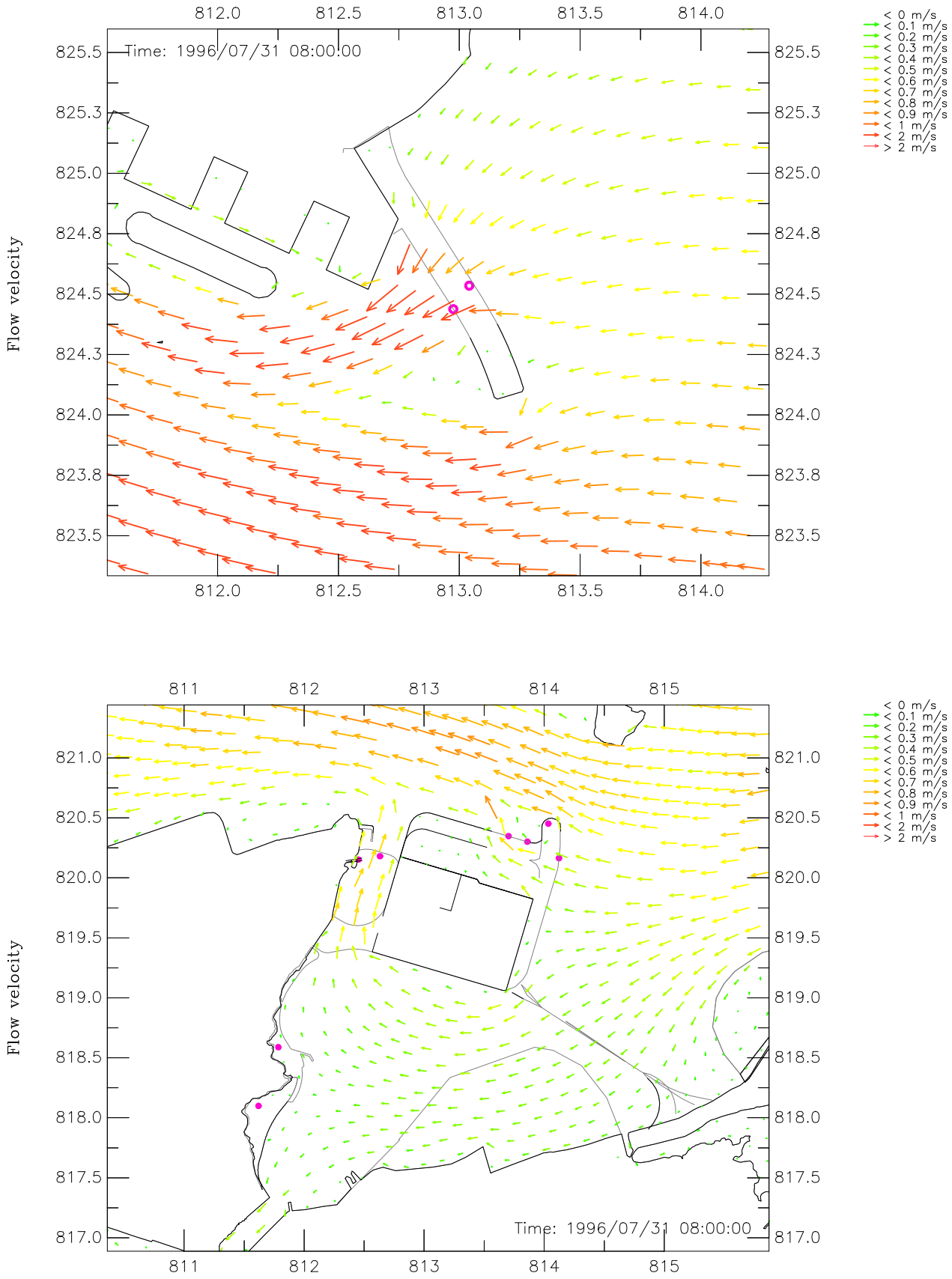
Year 2012 Wet Season Velocity Vector Plot at Flood Tide – Surface Layer	Apr 2009	Figure 027
MAUNSELL | AECOM		



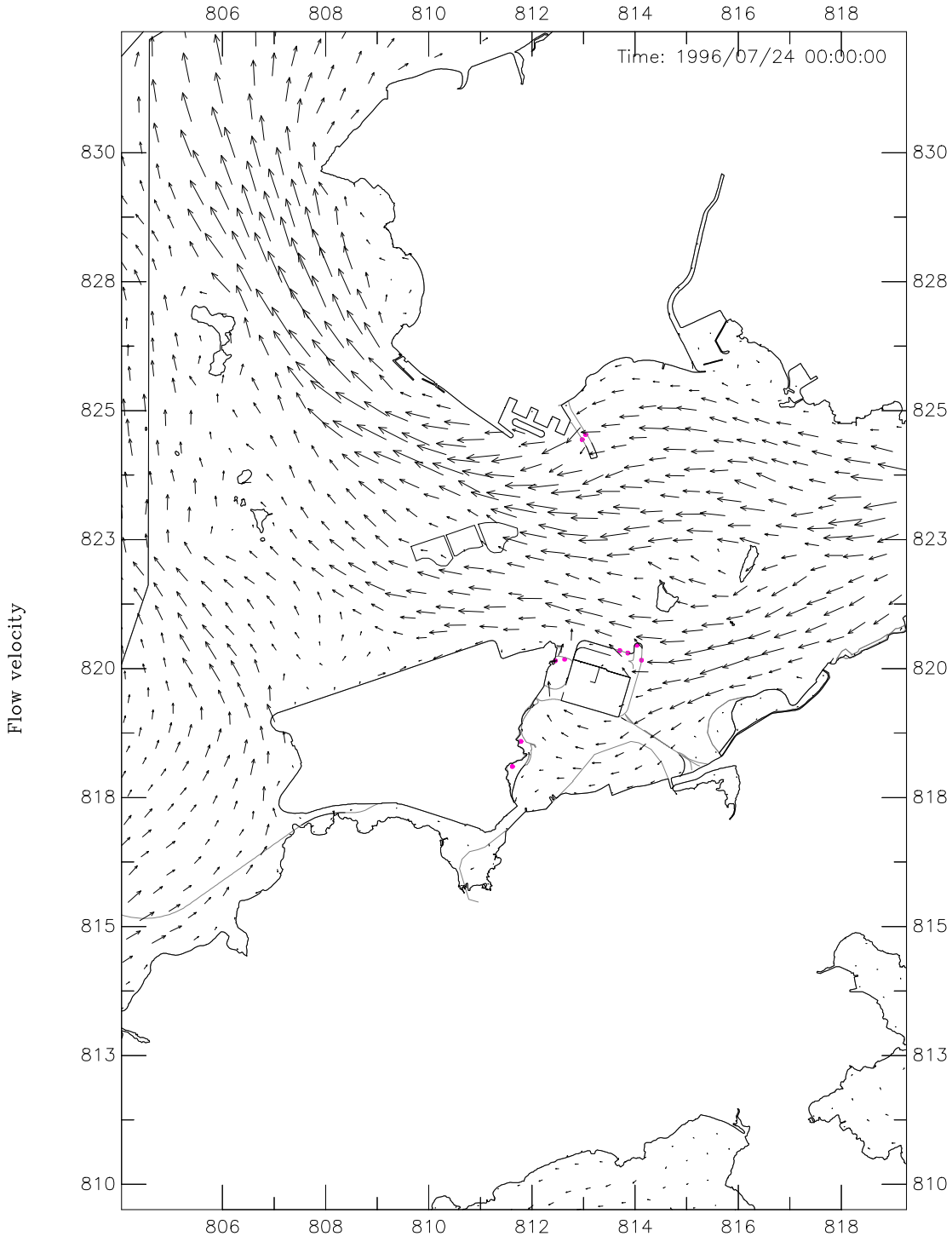
Year 2012 Wet Season Velocity Vector Plot at Flood Tide – Surface Layer (Top: Northern Reclamation; Bottom: Southern Reclamation)	Apr 2009	Figure 028
MAUNSELL | AECOM		



Year 2012 Dry Season Velocity Vector Plot at Flood Tide – Mid-Depth	Apr 2009	Figure 029
MAUNSELL | AECOM		



Year 2012 Dry Season Velocity Vector Plot at Flood Tide – Mid-Depth (Top: Northern Reclamation; Bottom: Southern Reclamation)	Apr 2009	Figure 030
MAUNSELL | AECOM		

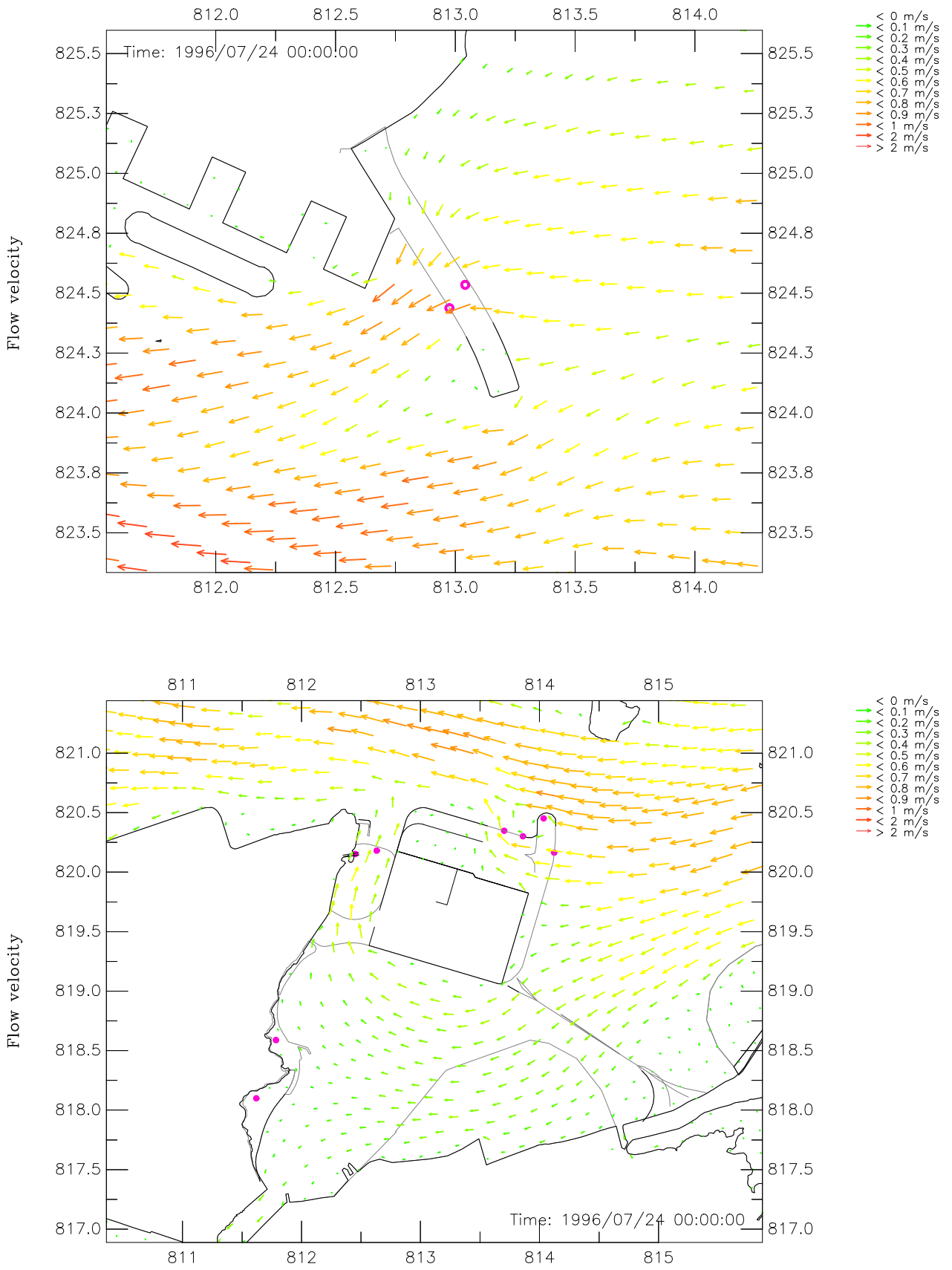


Year 2012
Wet Season Velocity Vector Plot at Flood Tide – Mid-Depth

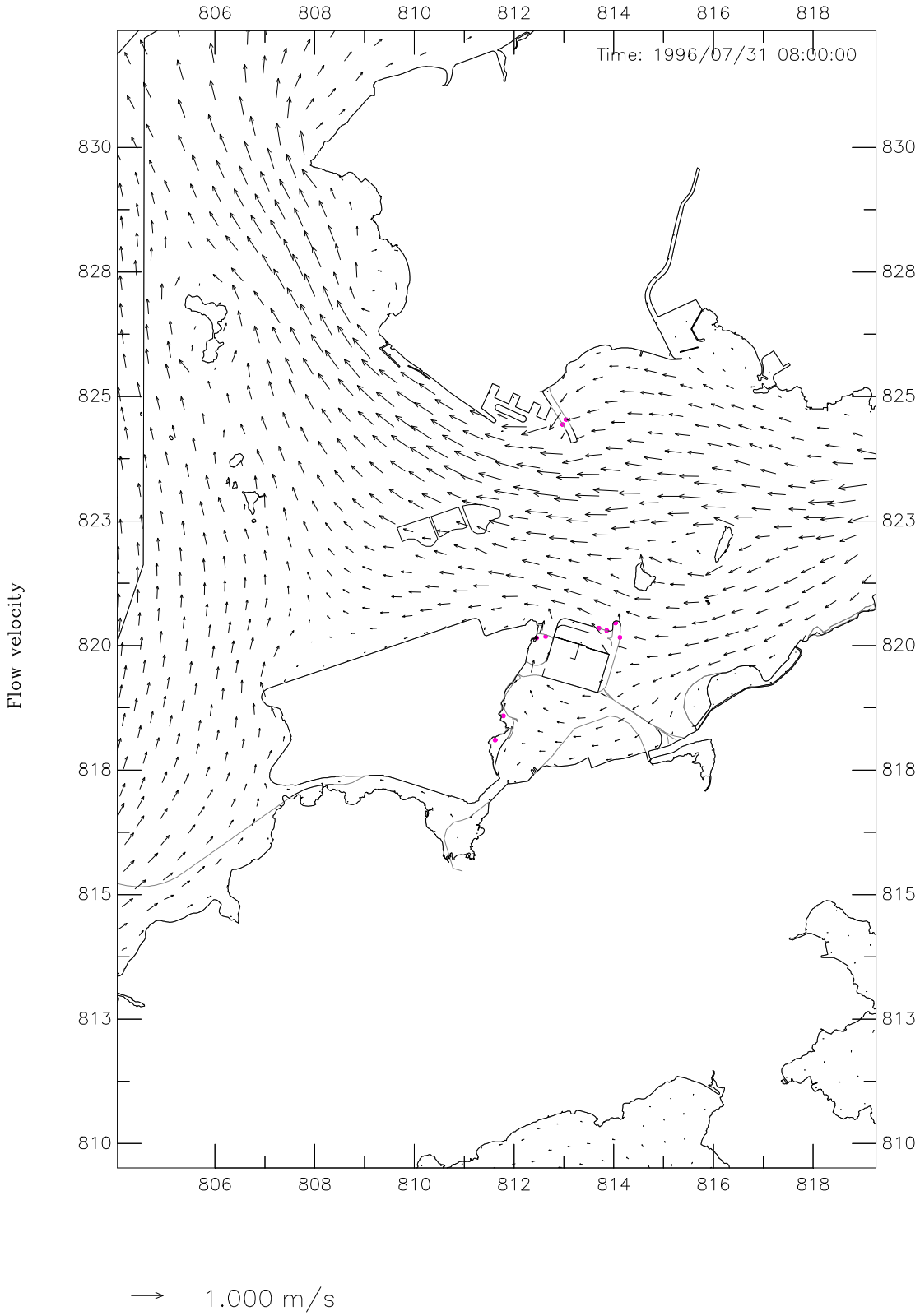
Apr 2009

Figure 031

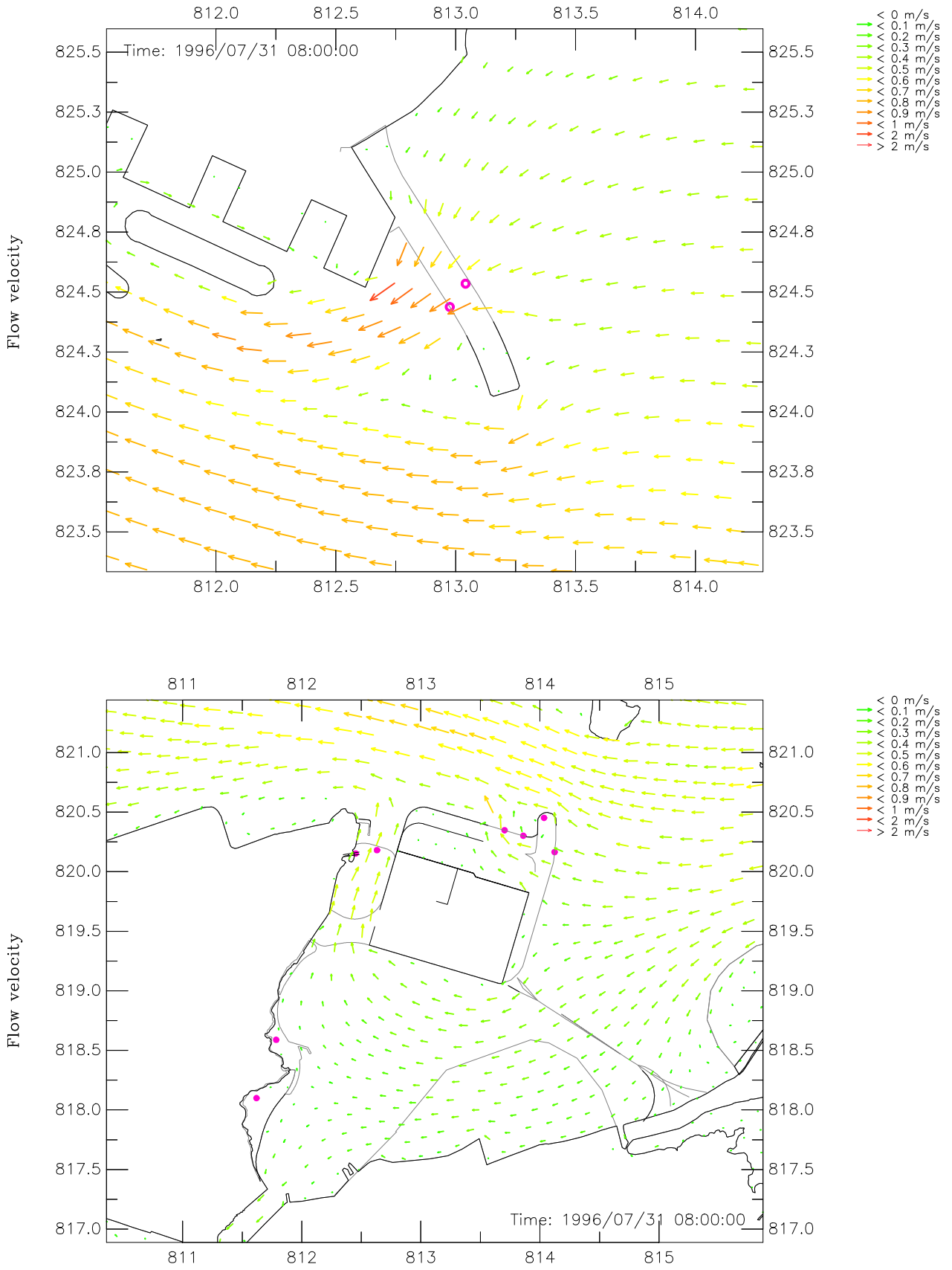
MAUNSELL | AECOM



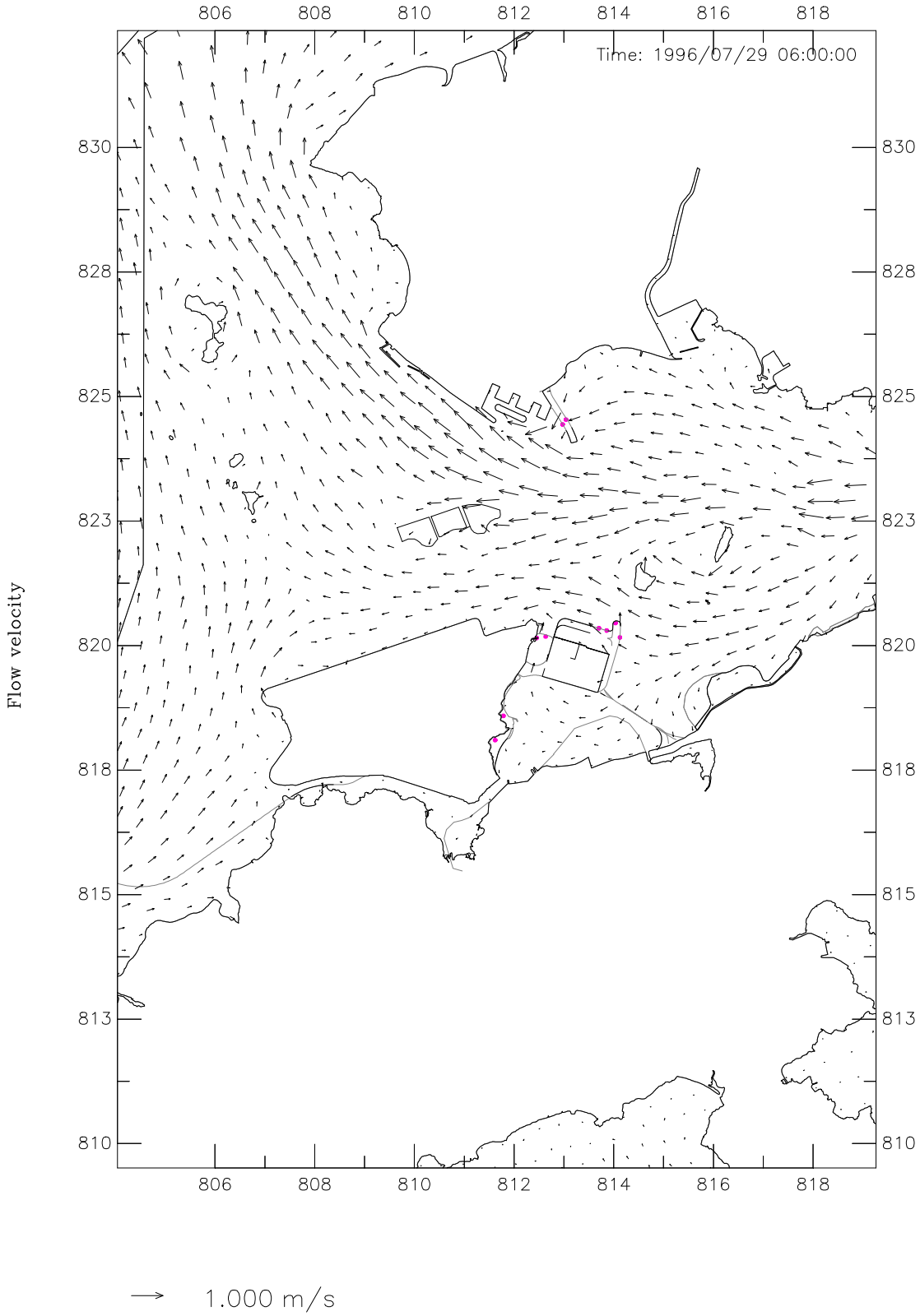
Year 2012 Wet Season Velocity Vector Plot at Flood Tide – Mid-Depth (Top: Northern Reclamation; Bottom: Southern Reclamation)	Apr 2009	Figure 032
MAUNSELL | AECOM		



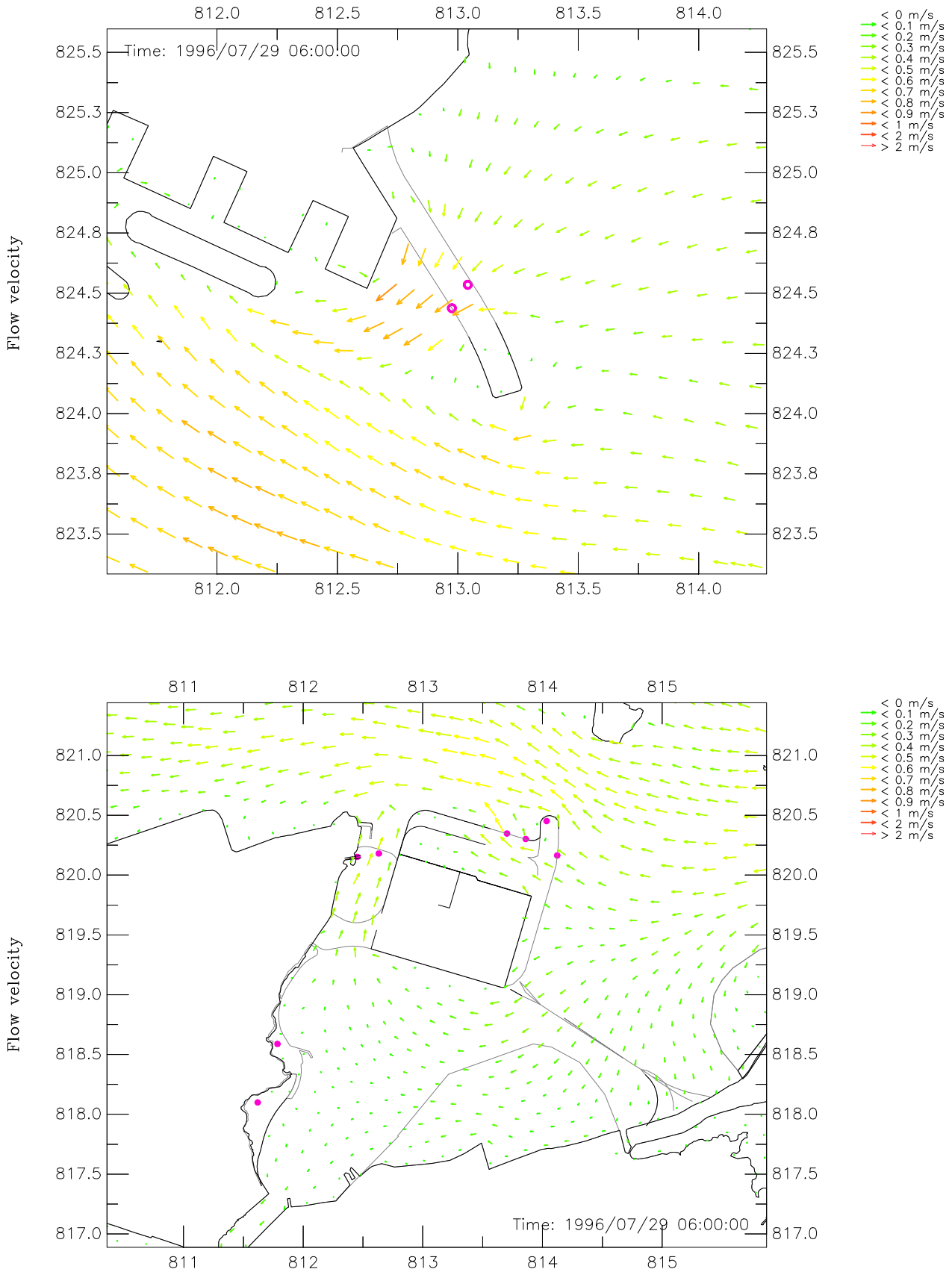
Year 2012 Dry Season Velocity Vector Plot at Flood Tide – Bottom Layer	Apr 2009	Figure 033
MAUNSELL | AECOM		



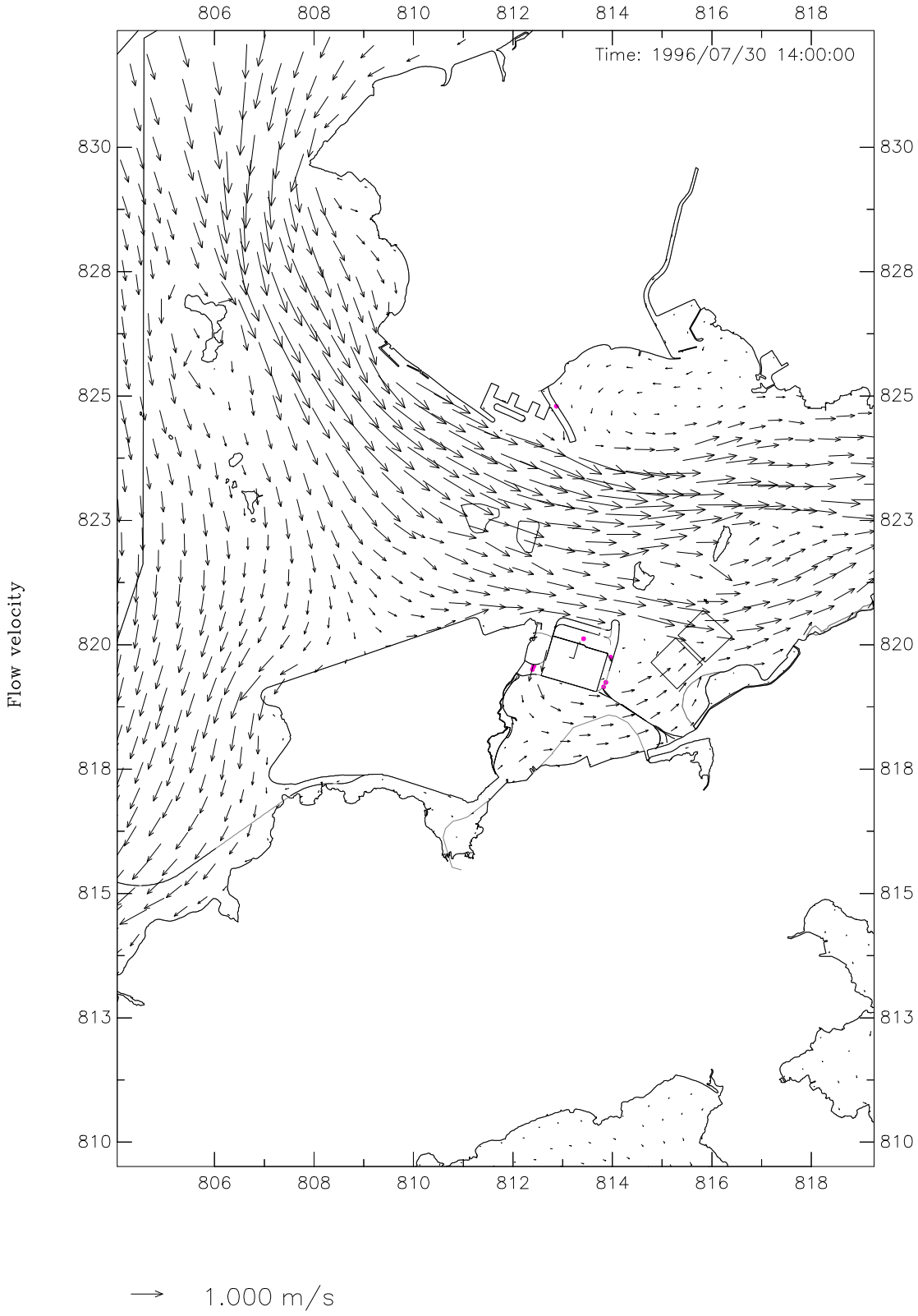
Year 2012 Dry Season Velocity Vector Plot at Flood Tide – Bottom Layer (Top: Northern Reclamation; Bottom: Southern Reclamation)	Apr 2009	Figure 034
MAUNSELL | AECOM		



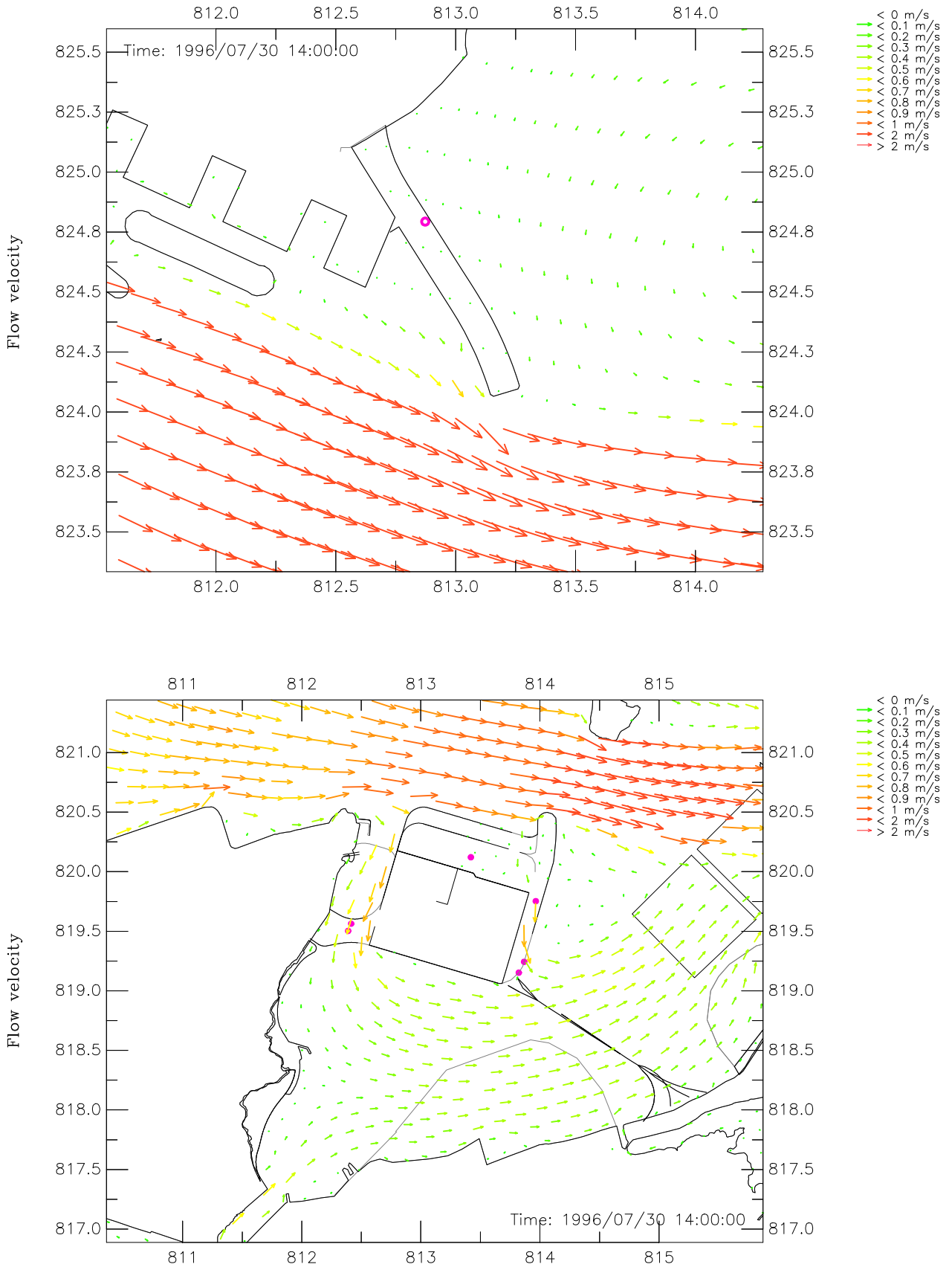
Year 2012 Wet Season Velocity Vector Plot at Flood Tide – Bottom Layer	Apr 2009	Figure 035
MAUNSELL | AECOM		



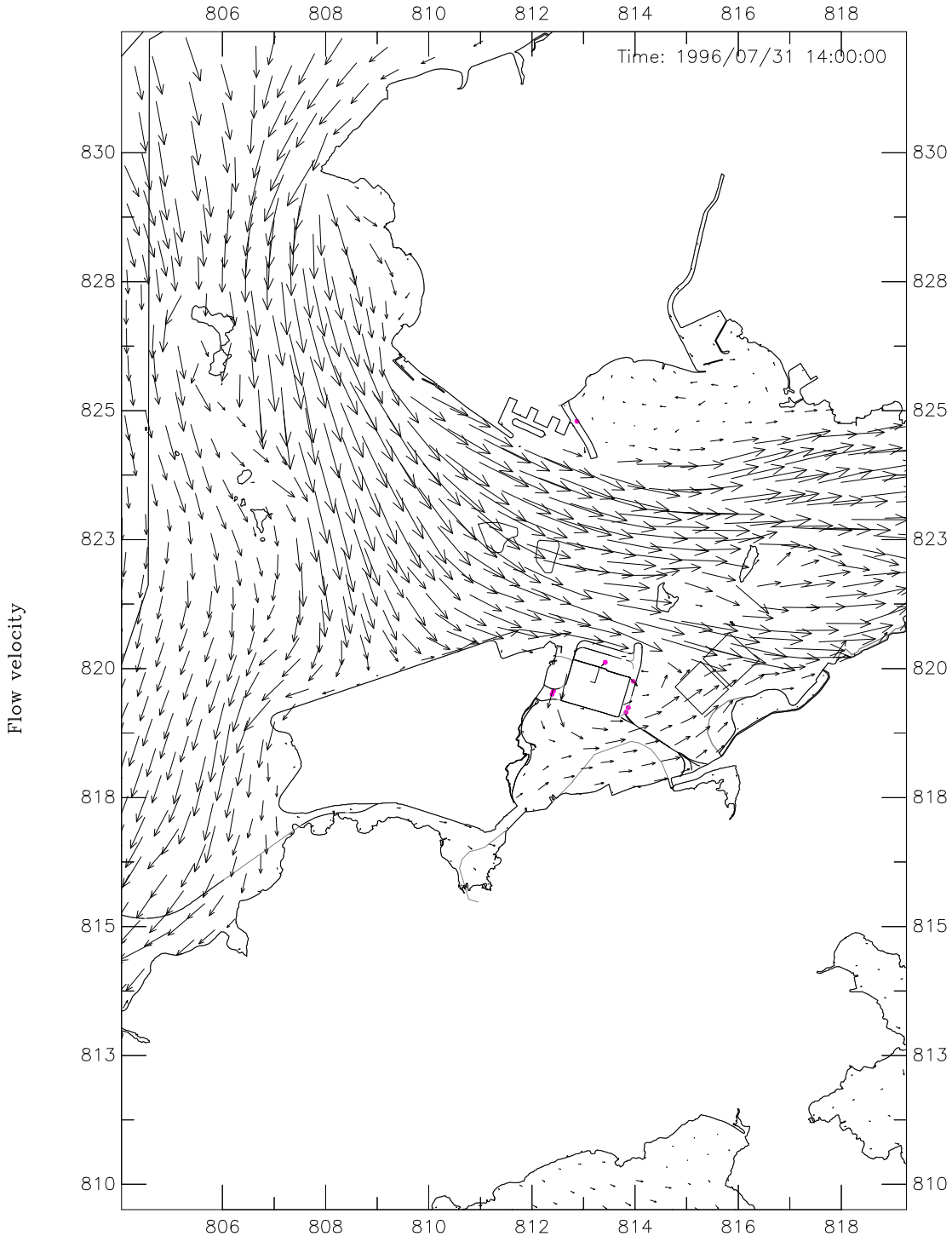
Year 2012 Wet Season Velocity Vector Plot at Flood Tide – Bottom Layer (Top: Northern Reclamation; Bottom: Southern Reclamation)	Apr 2009	Figure 036
MAUNSELL | AECOM		



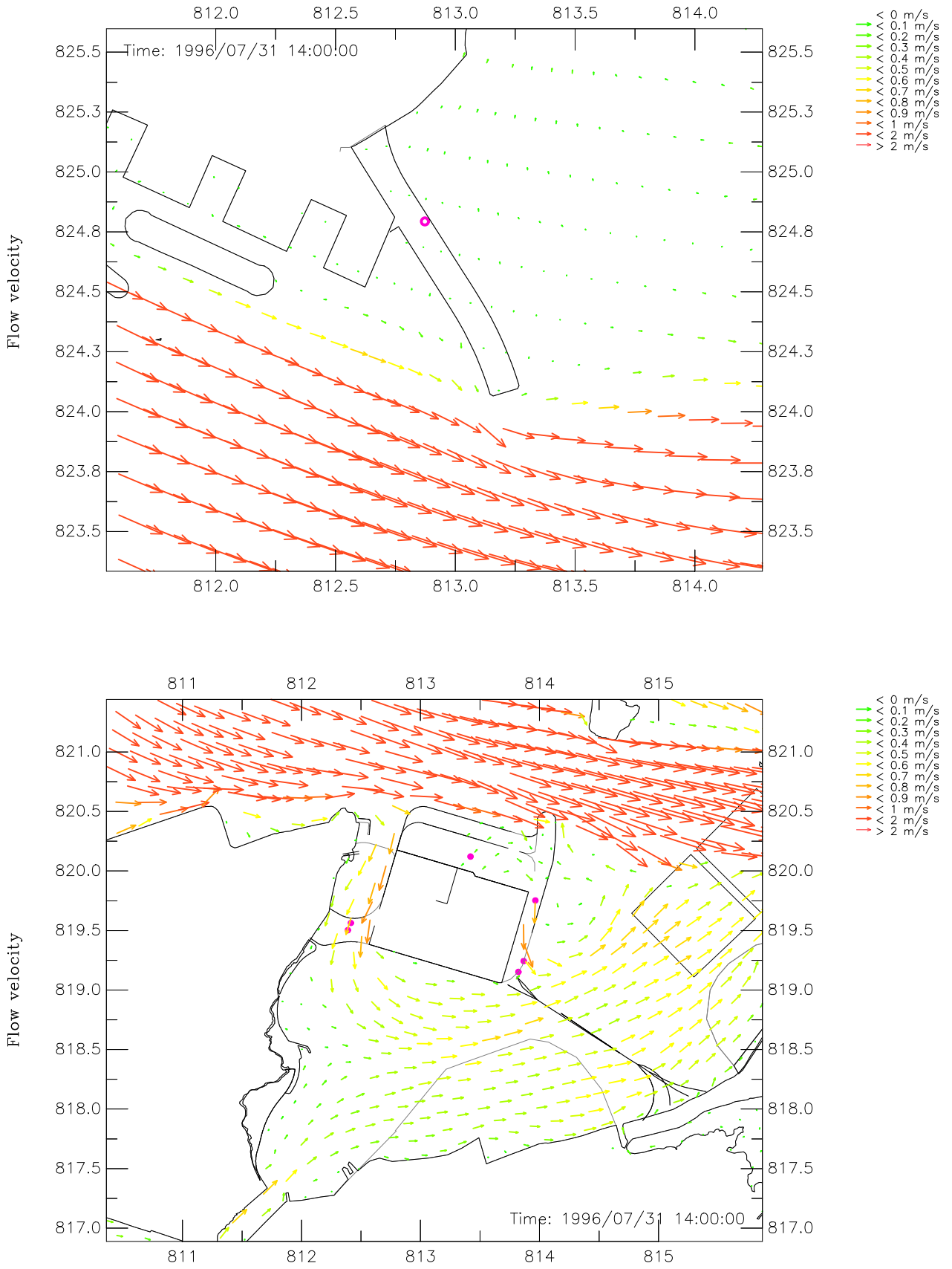
Year 2013 Dry Season Velocity Vector Plot at Ebb Tide – Surface Layer	Apr 2009	Figure 013
MAUNSELL | AECOM		



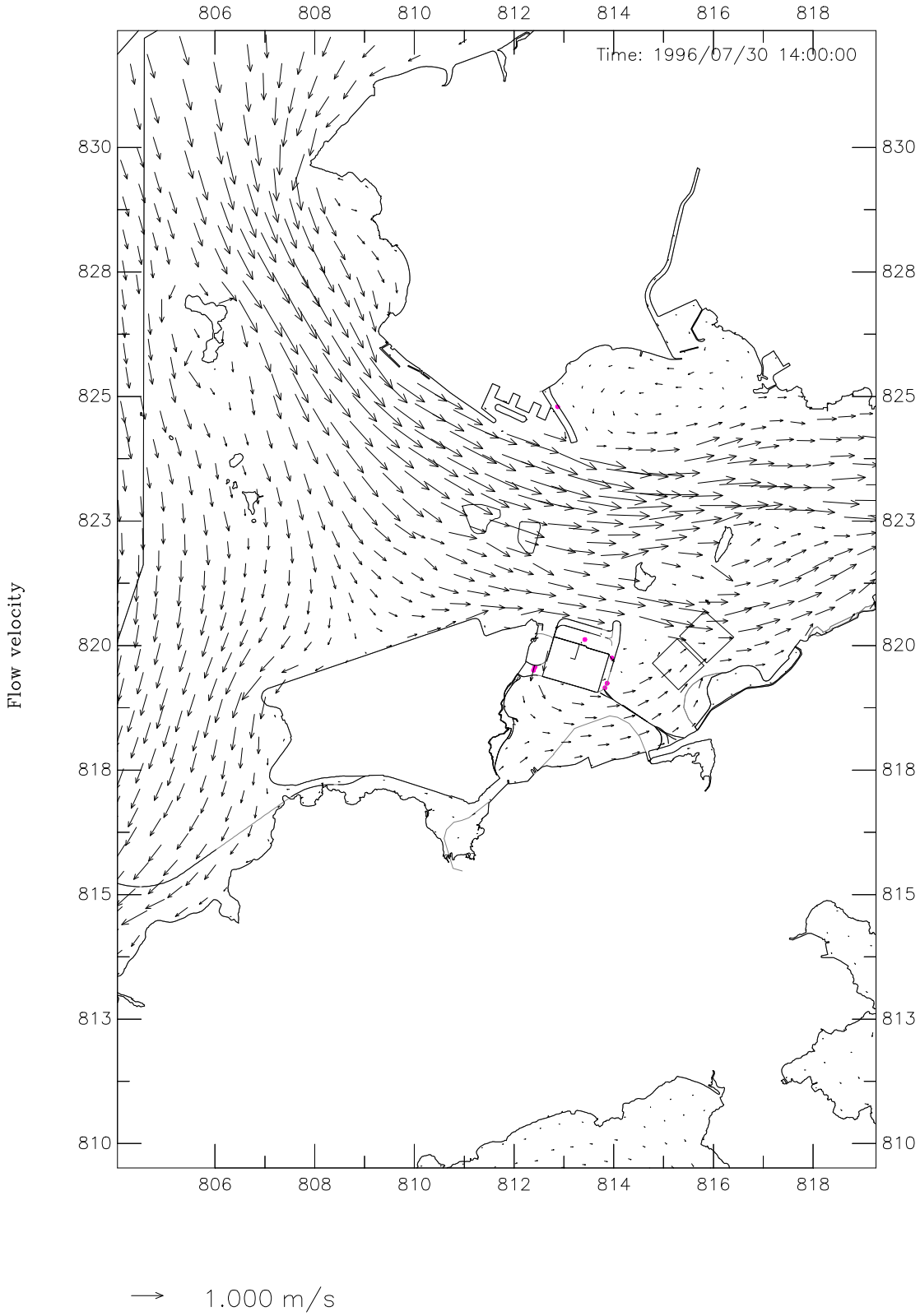
Year 2013 Dry Season Velocity Vector Plot at Ebb Tide – Surface Layer (Top: Northern Reclamation; Bottom: Southern Reclamation)	Apr 2009	Figure 014
MAUNSELL | AECOM		



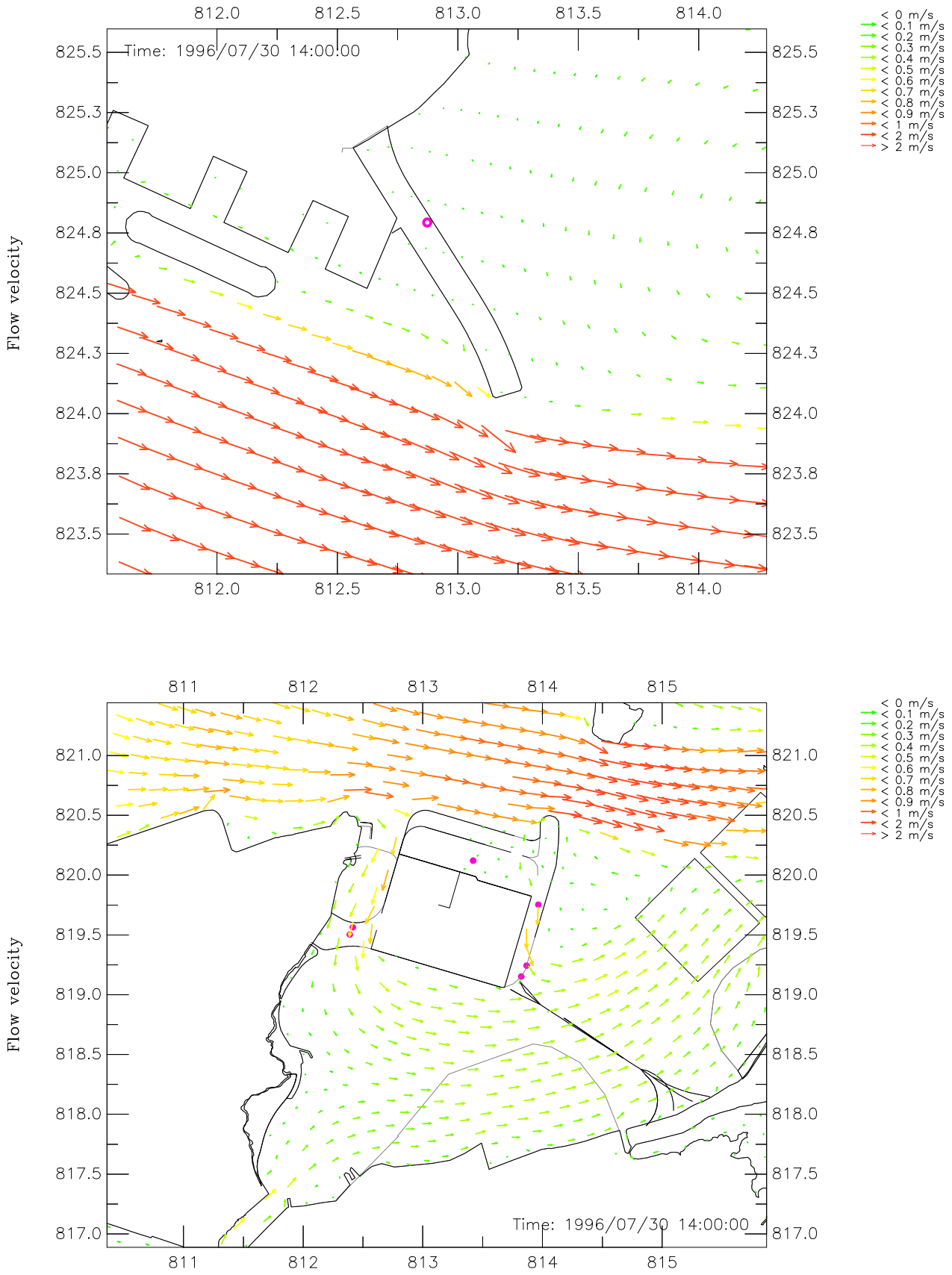
Year 2013 Wet Season Velocity Vector Plot at Ebb Tide – Surface Layer	Apr 2009	Figure 015
MAUNSELL | AECOM		



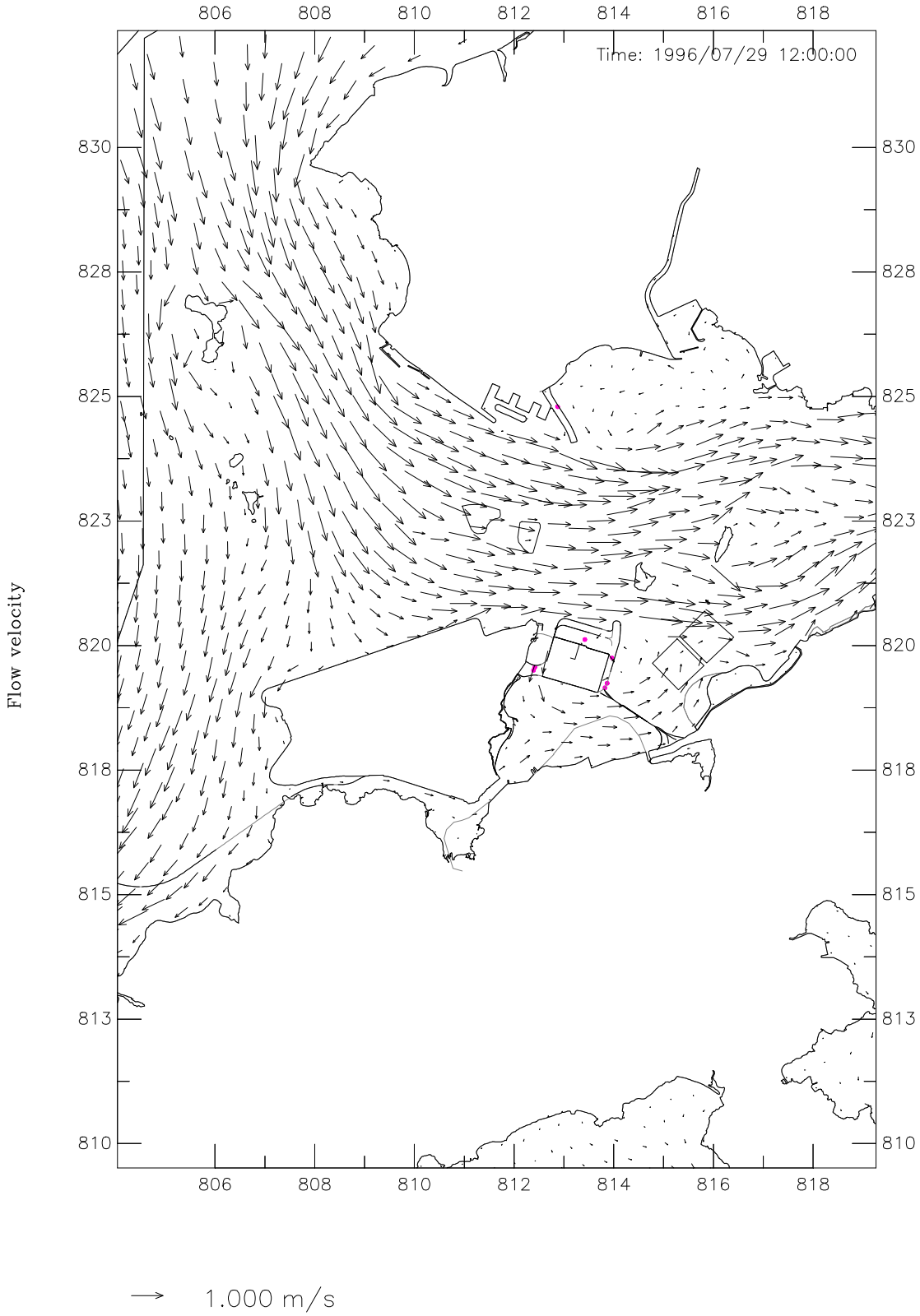
Year 2013 Wet Season Velocity Vector Plot at Ebb Tide – Surface Layer (Top: Northern Reclamation; Bottom: Southern Reclamation)	Apr 2009	Figure 016
MAUNSELL | AECOM		



Year 2013 Dry Season Velocity Vector Plot at Ebb Tide – Mid–Depth	Apr 2009	Figure 017
MAUNSELL | AECOM		



Year 2013 Dry Season Velocity Vector Plot at Ebb Tide – Mid-Depth (Top: Northern Reclamation; Bottom: Southern Reclamation)	Apr 2009	Figure 018
MAUNSELL | AECOM		

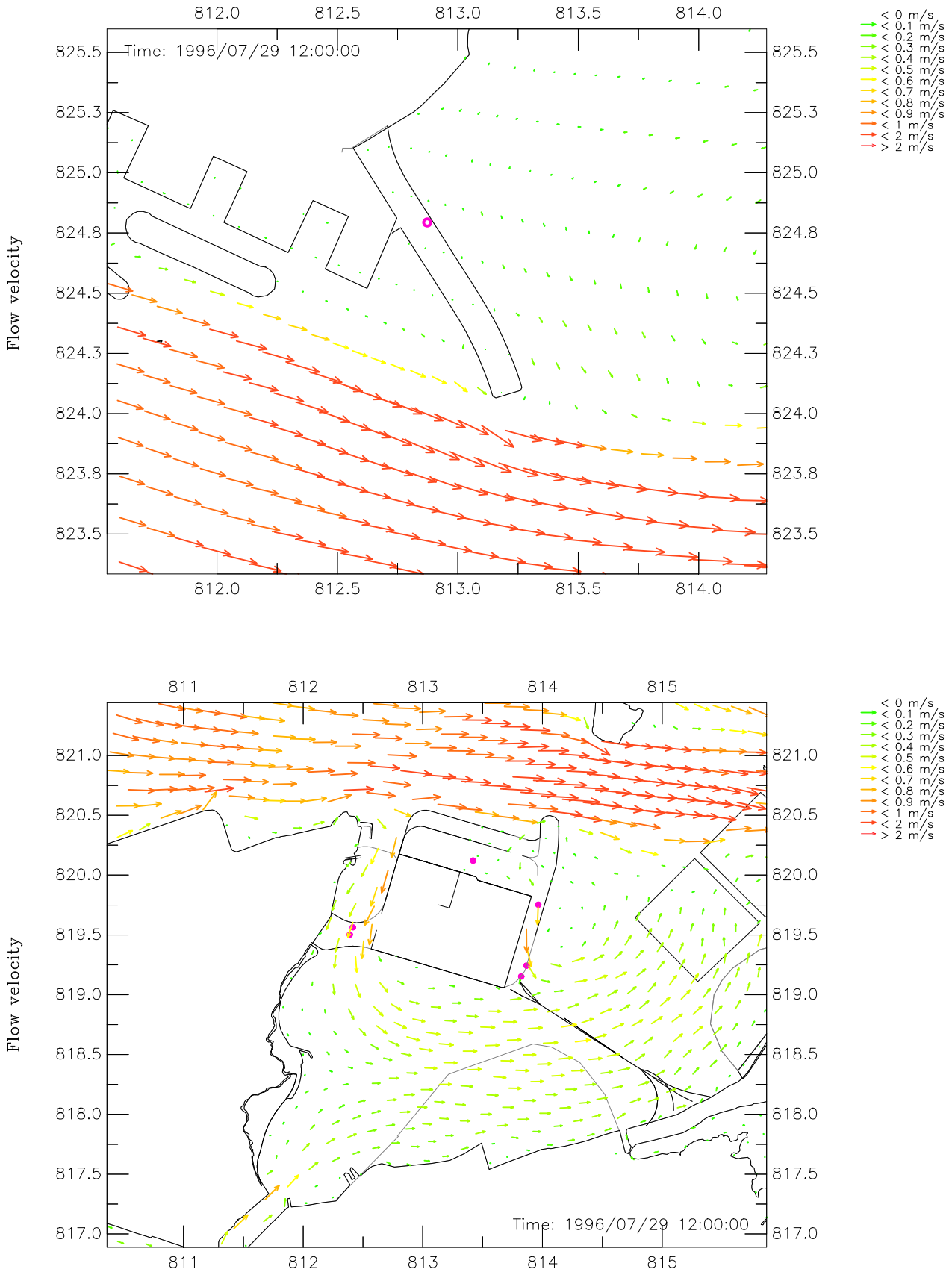


Year 2013
Wet Season Velocity Vector Plot at Ebb Tide – Mid–Depth

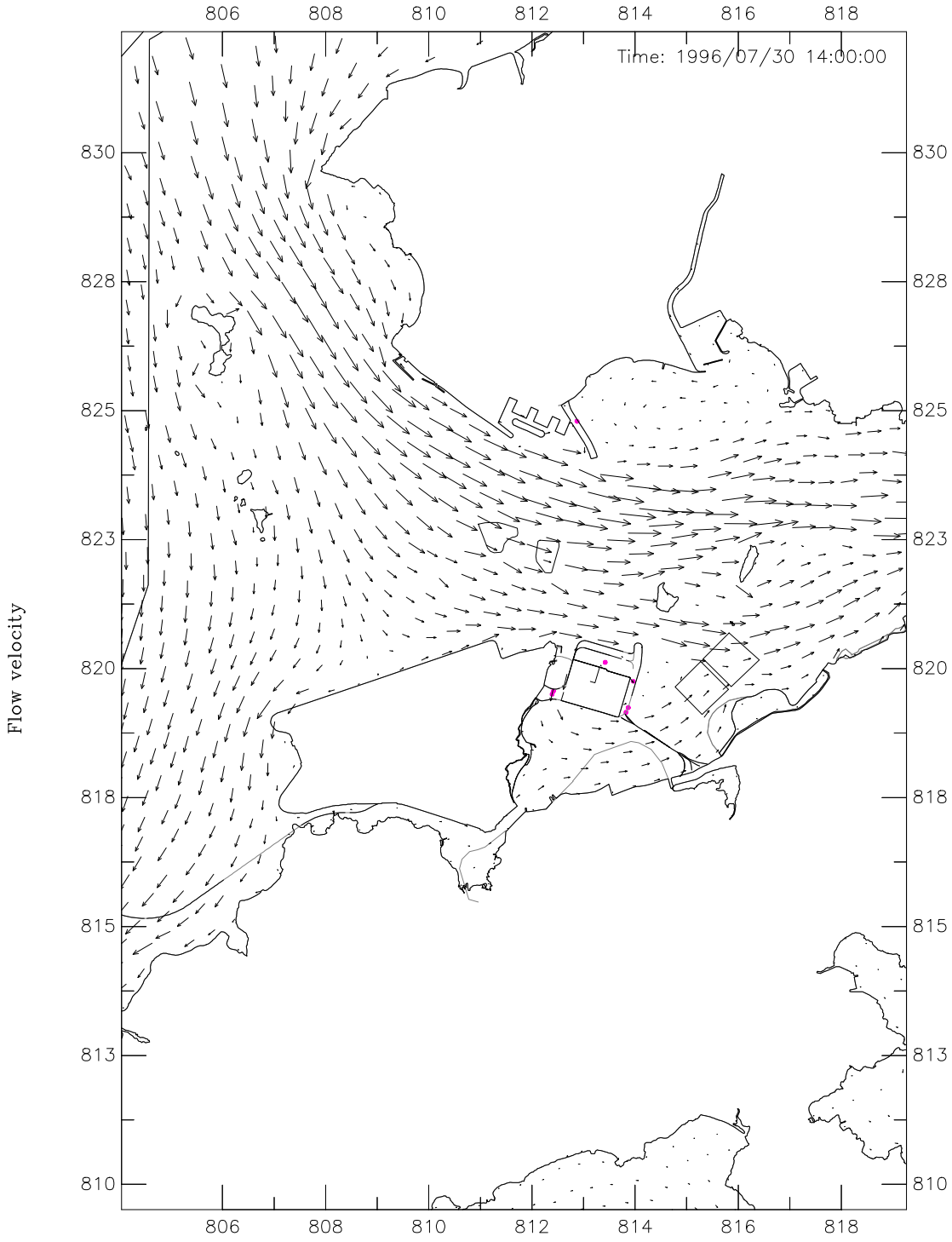
Apr 2009

Figure 019

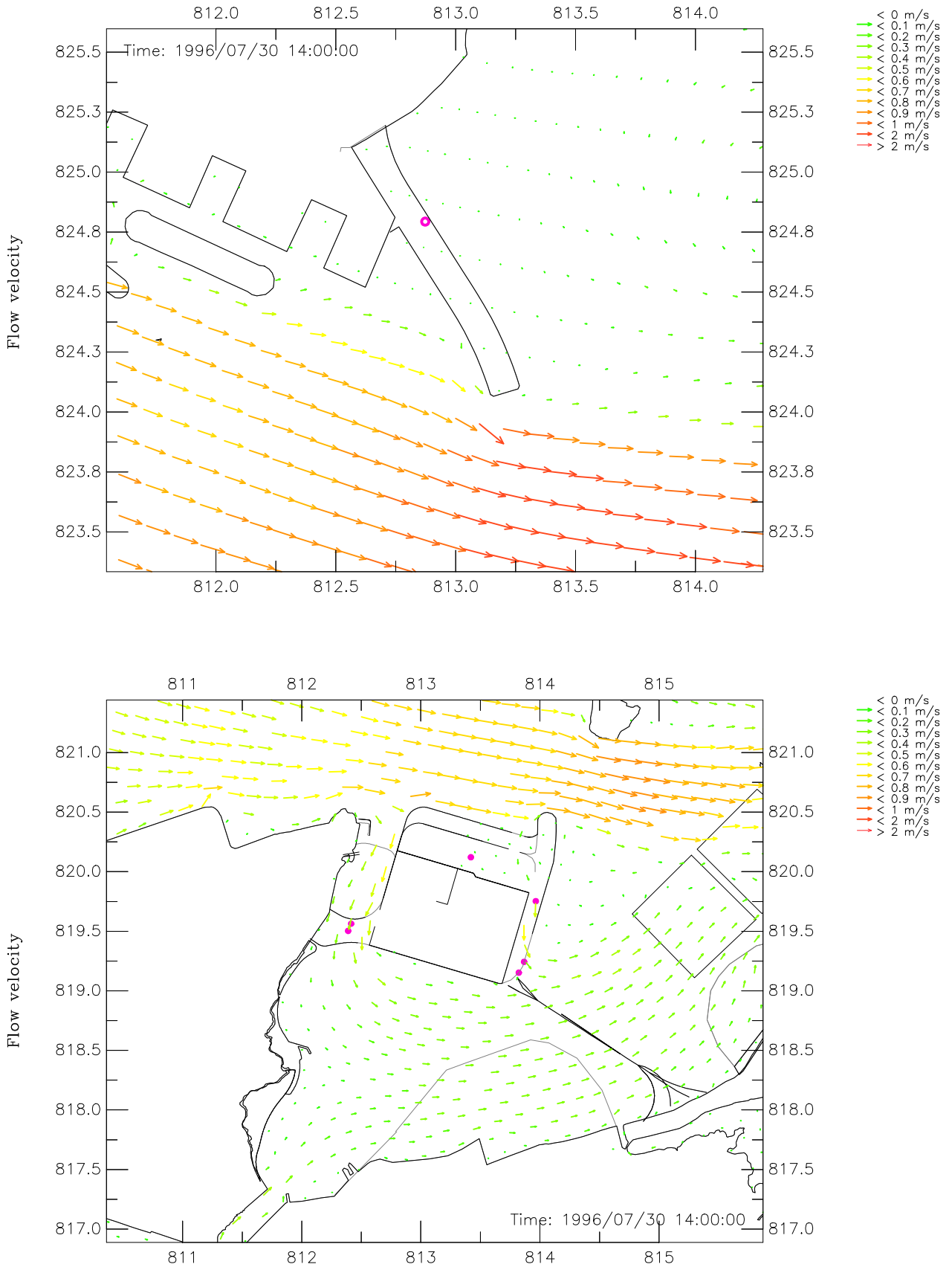
MAUNSELL | AECOM



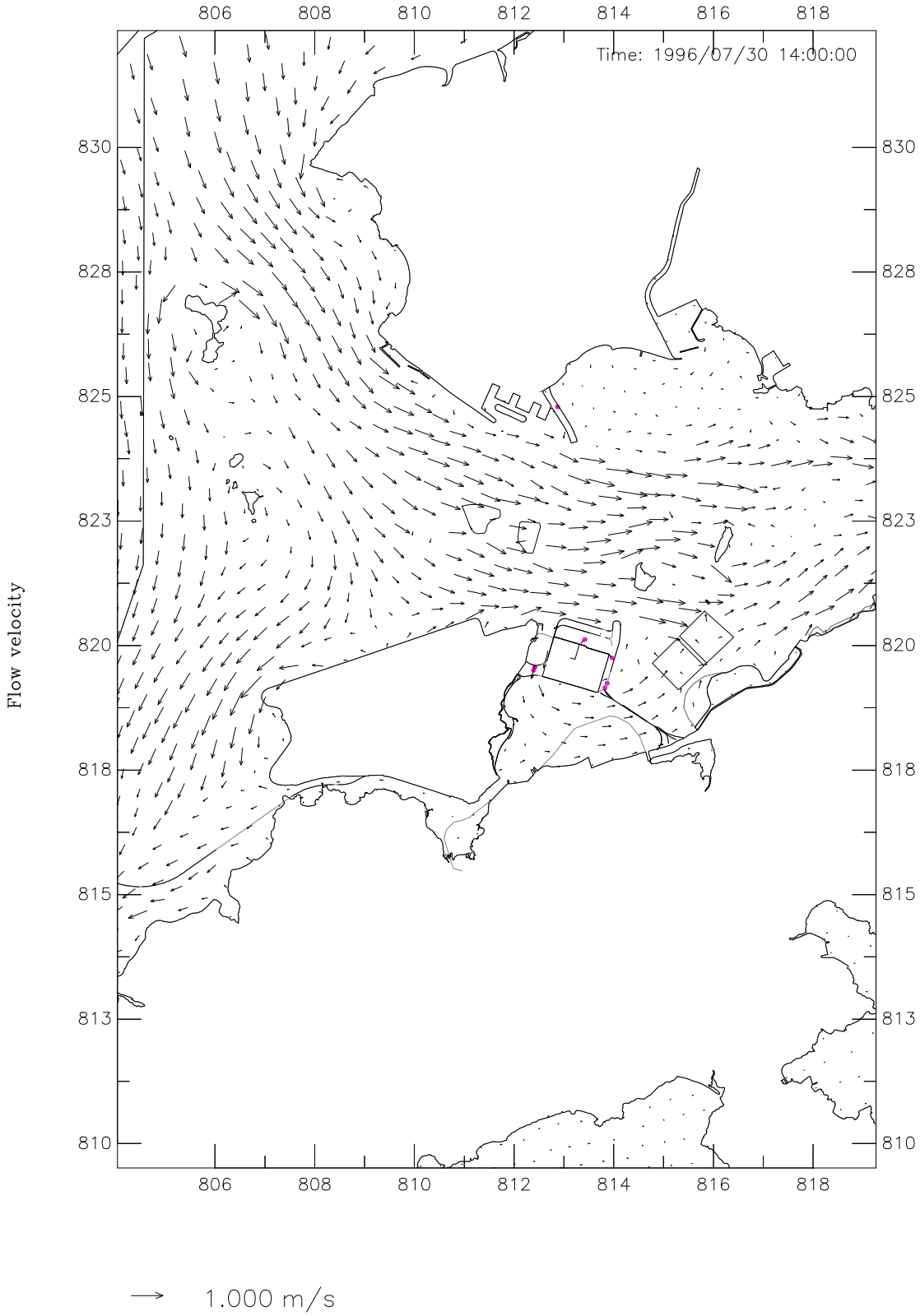
Year 2013 Wet Season Velocity Vector Plot at Ebb Tide – Mid-Depth (Top: Northern Reclamation; Bottom: Southern Reclamation)	Apr 2009	Figure 020
MAUNSELL | AECOM		



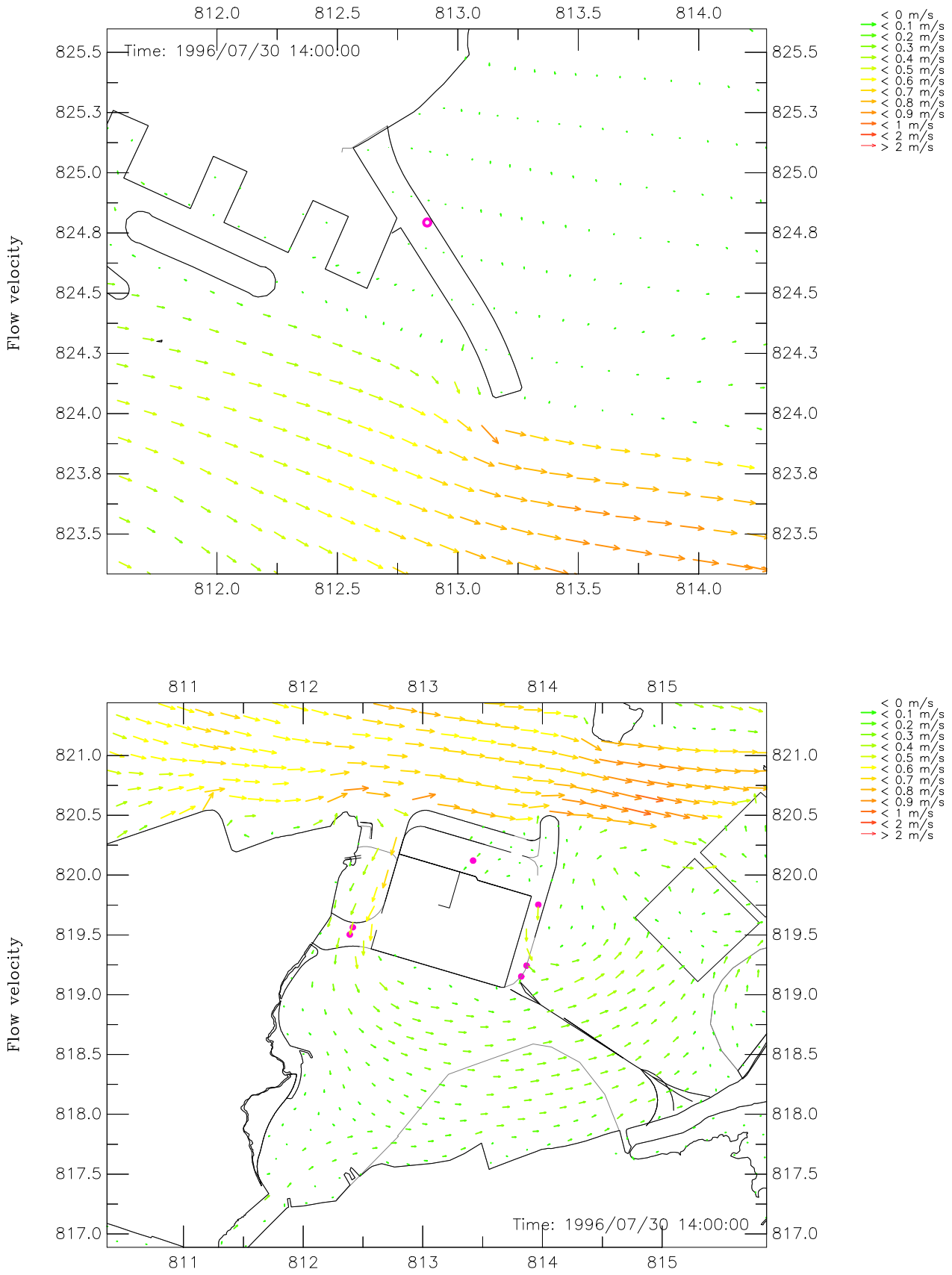
Year 2013 Dry Season Velocity Vector Plot at Ebb Tide – Bottom Layer	Apr 2009	Figure 021
MAUNSELL | AECOM		



Year 2013 Dry Season Velocity Vector Plot at Ebb Tide – Bottom Layer (Top: Northern Reclamation; Bottom: Southern Reclamation)	Apr 2009	Figure 022
MAUNSELL | AECOM		



Year 2013 Wet Season Velocity Vector Plot at Ebb Tide – Bottom Layer	Apr 2009	Figure 023
MAUNSELL | AECOM		

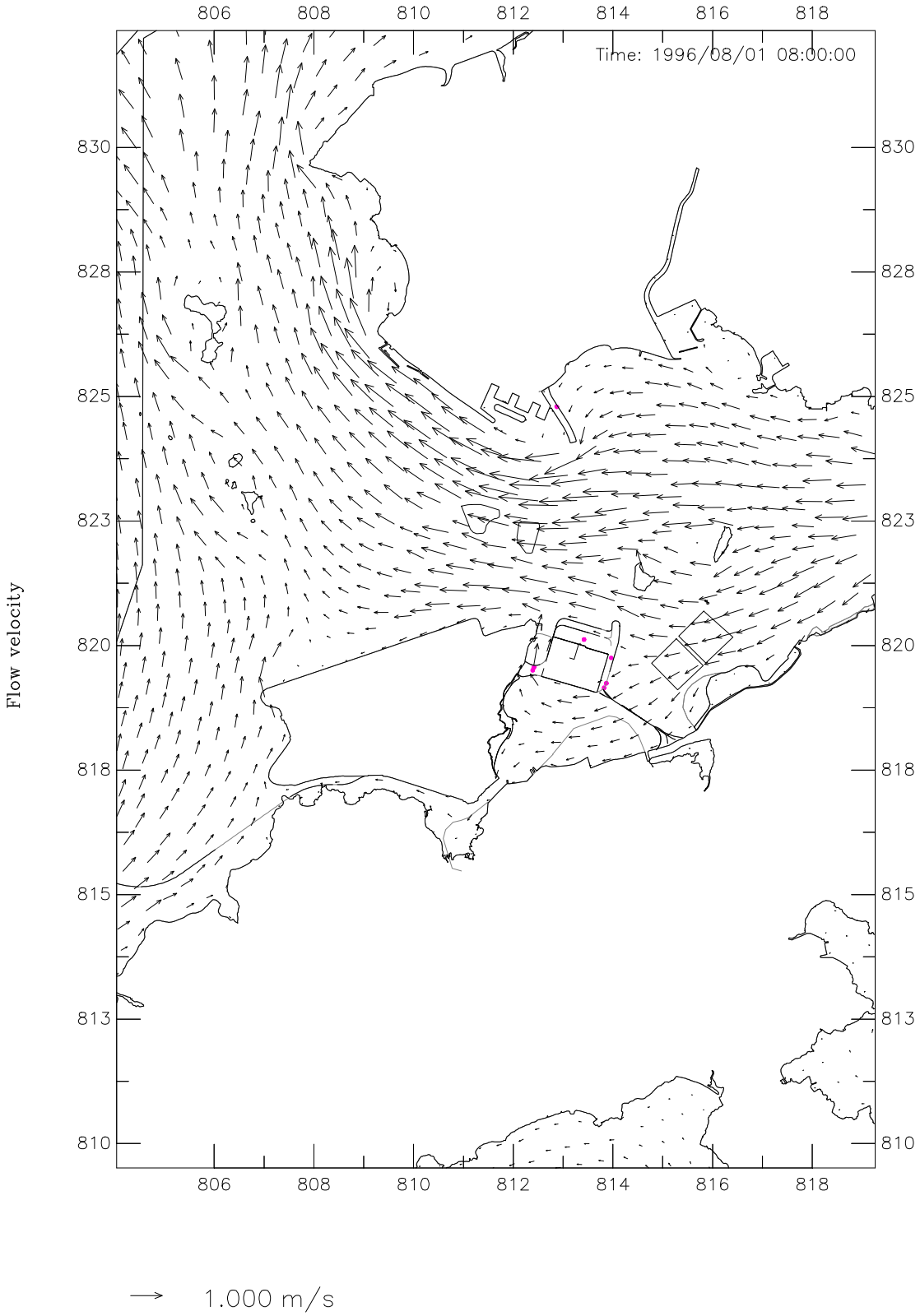


Year 2013
Wet Season Velocity Vector Plot at Ebb Tide – Bottom Layer
(Top: Northern Reclamation; Bottom: Southern Reclamation)

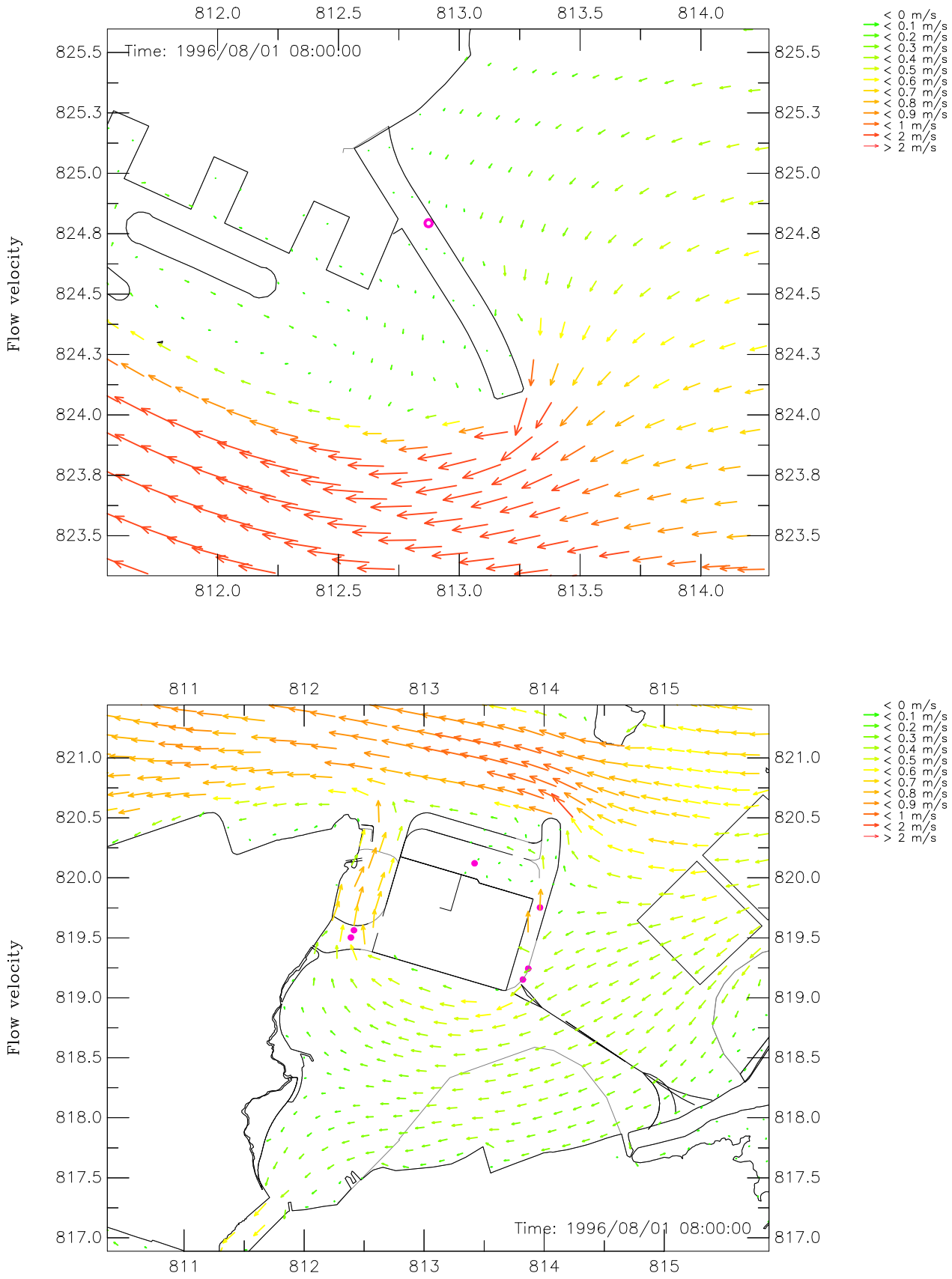
Apr 2009

Figure 024

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Year 2013 Dry Season Velocity Vector Plot at Flood Tide – Surface Layer	Apr 2009	Figure 025
MAUNSELL | AECOM		

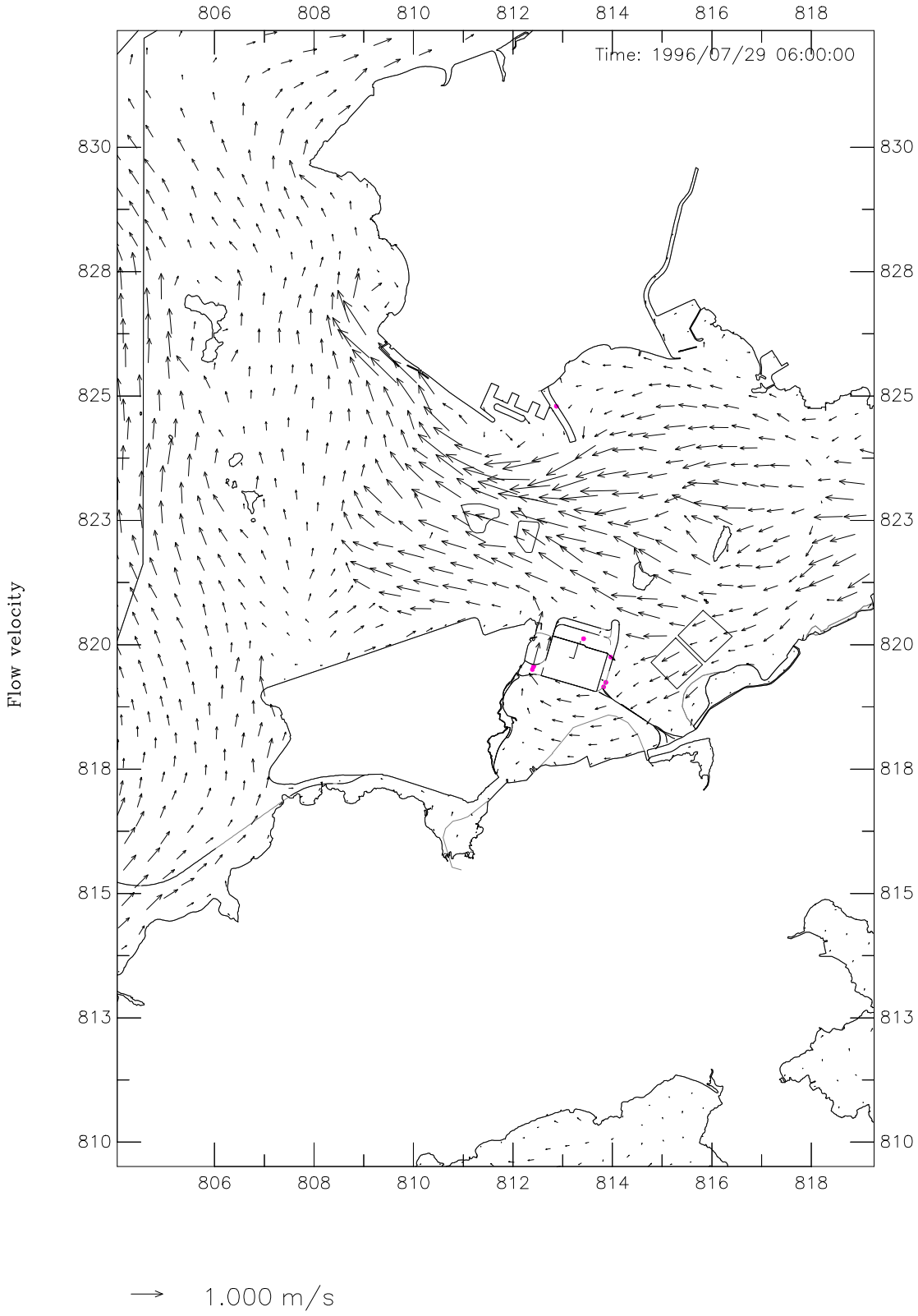


Year 2013
Dry Season Velocity Vector Plot at Flood Tide – Surface Layer
(Top: Northern Reclamation; Bottom: Southern Reclamation)

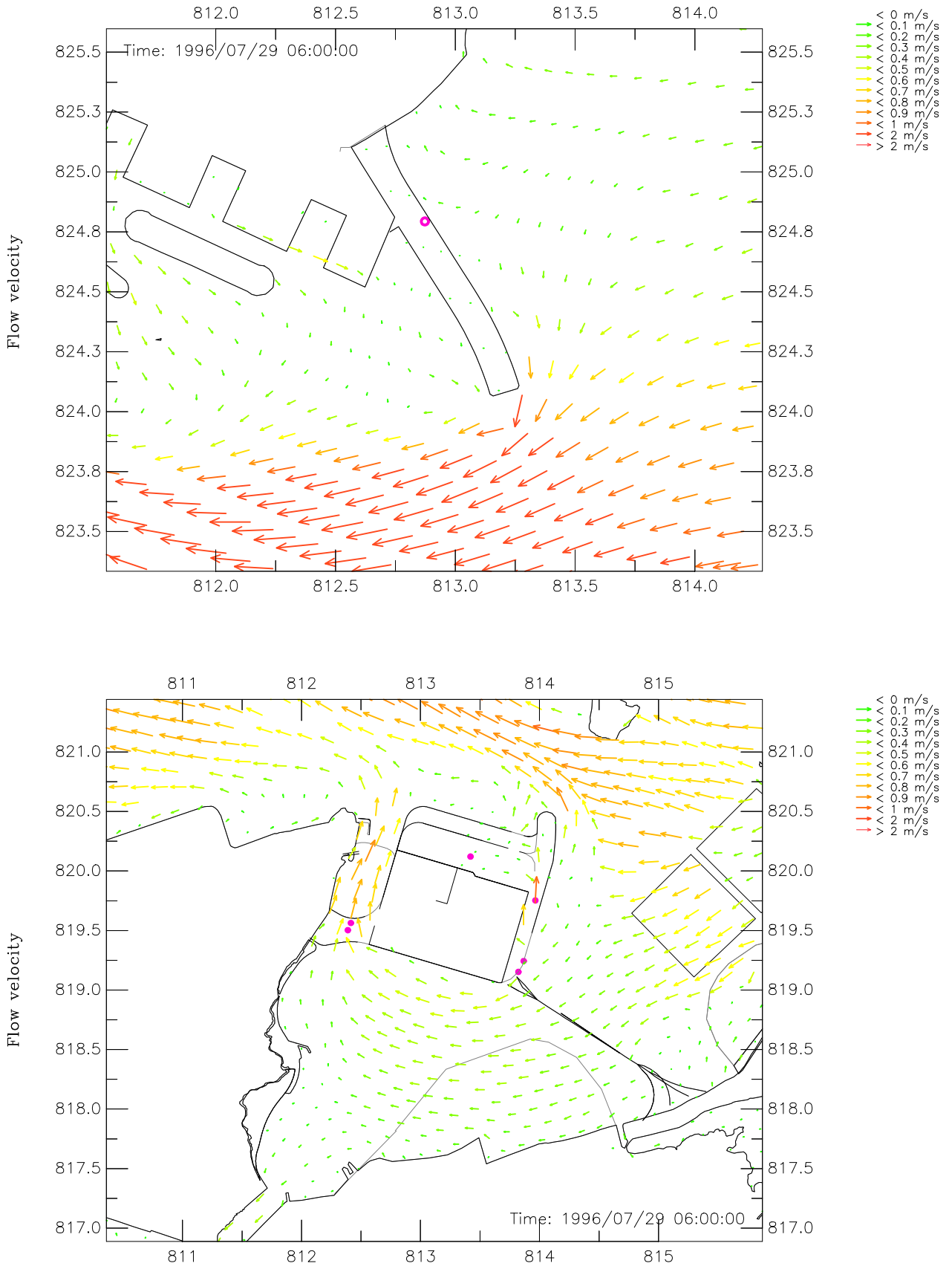
Apr 2009

Figure 026

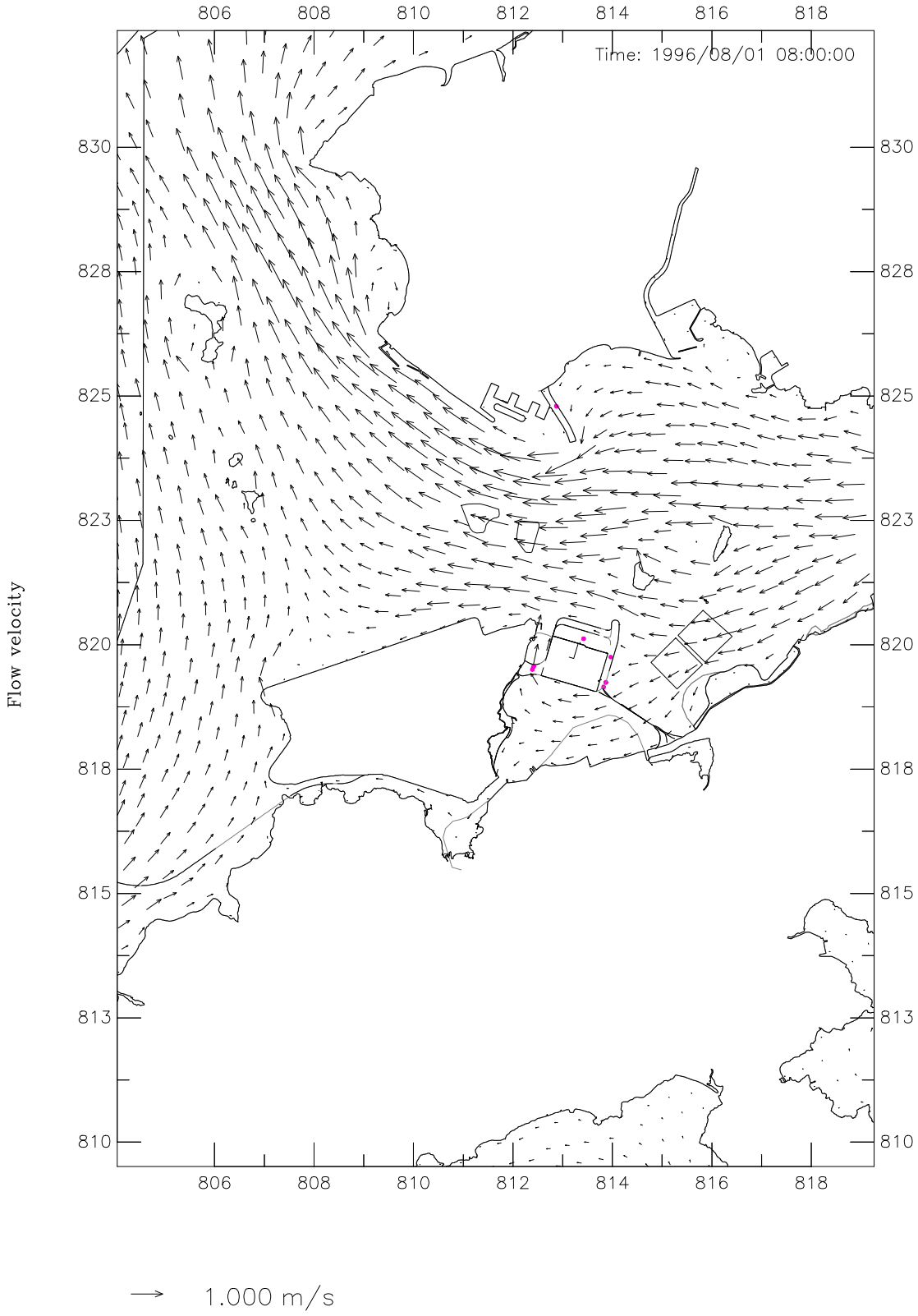
MAUNSELL | AECOM



Year 2013 Wet Season Velocity Vector Plot at Flood Tide – Surface Layer	Apr 2009	Figure 027
MAUNSELL | AECOM		



Year 2013 Wet Season Velocity Vector Plot at Flood Tide – Surface Layer (Top: Northern Reclamation; Bottom: Southern Reclamation)	Apr 2009	Figure 028
MAUNSELL | AECOM		

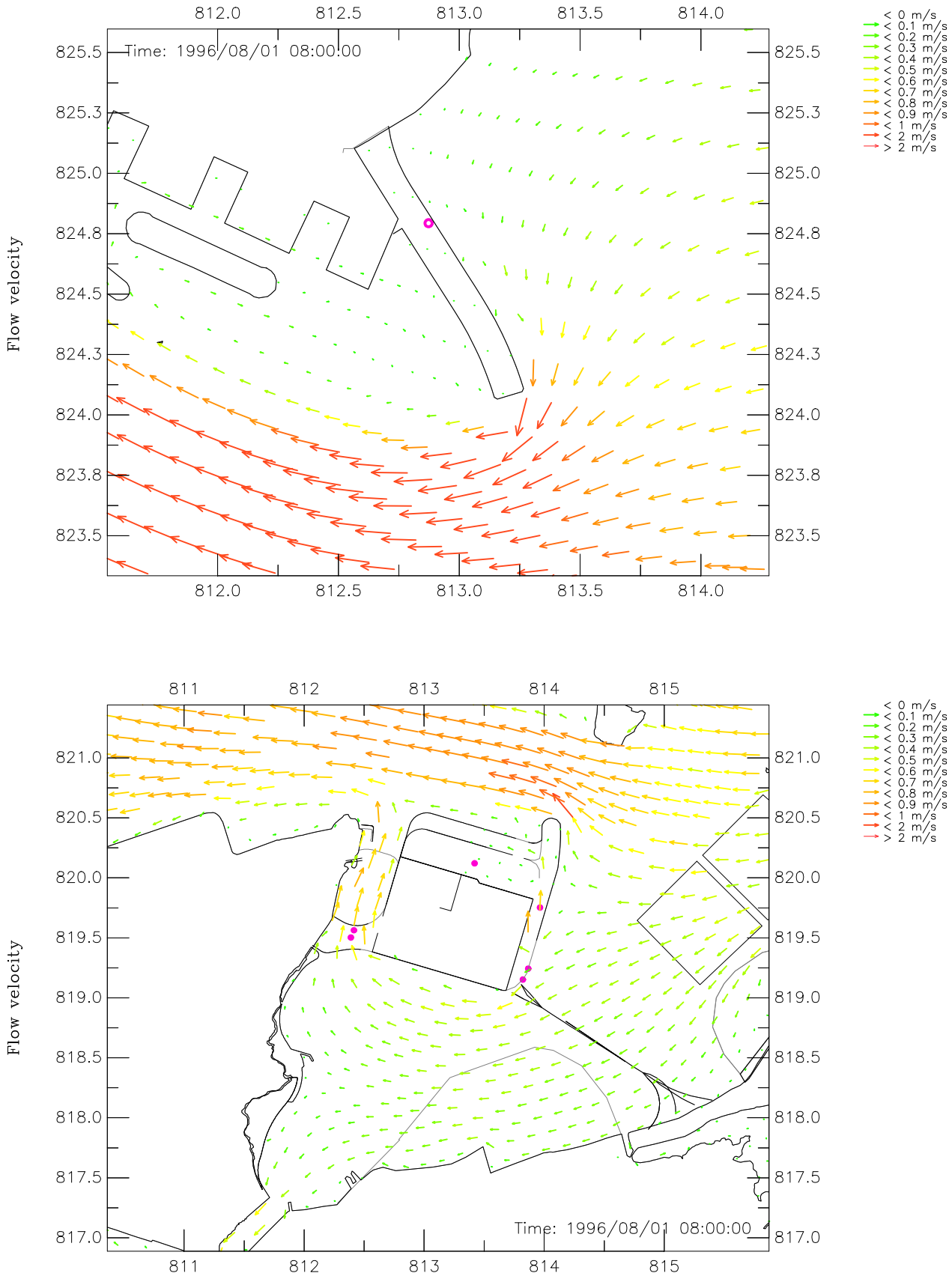


Year 2013
Dry Season Velocity Vector Plot at Flood Tide – Mid-Depth

Apr 2009

Figure 029

MAUNSELL | AECOM

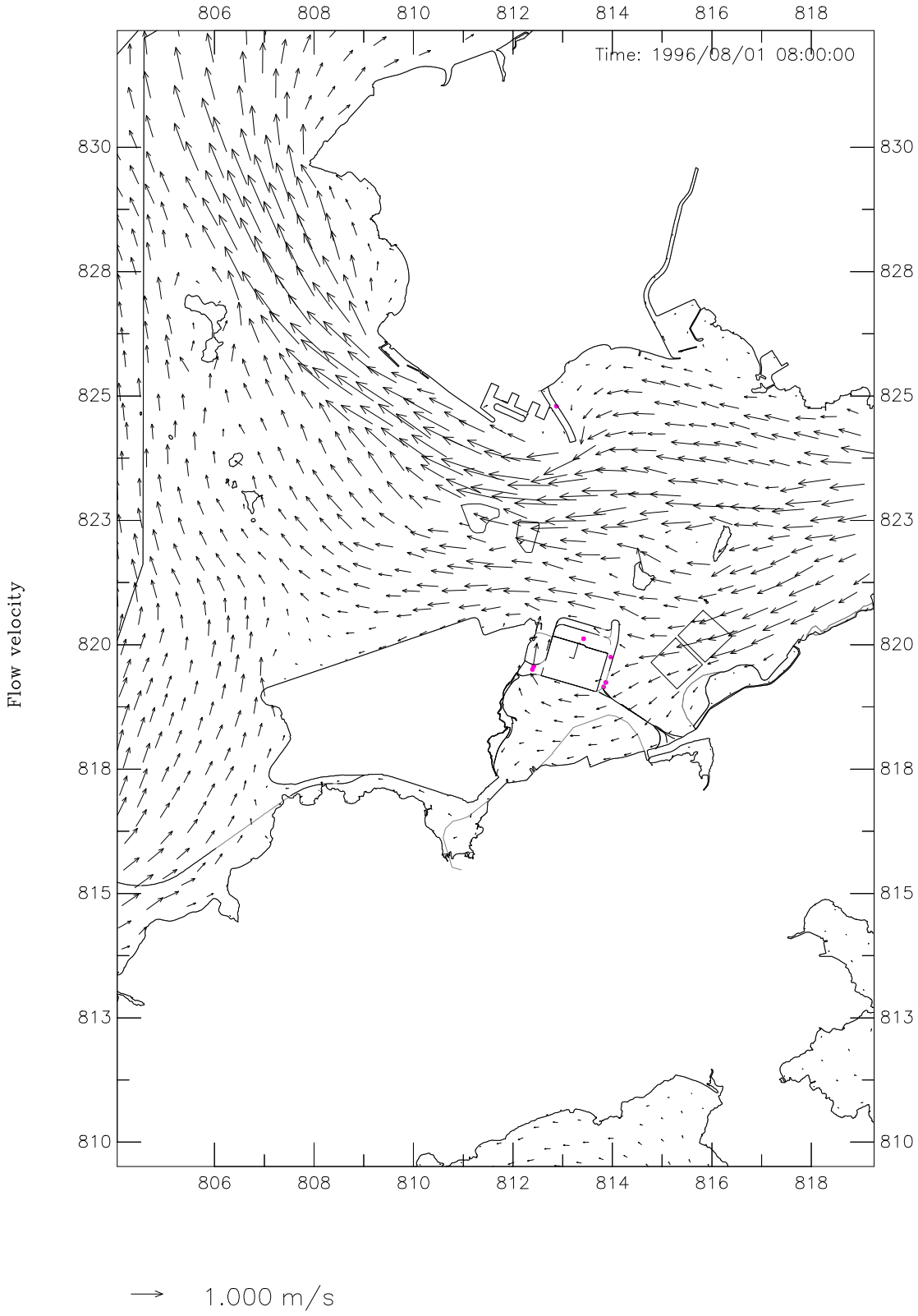


Year 2013
Dry Season Velocity Vector Plot at Flood Tide – Mid-Depth
(Top: Northern Reclamation; Bottom: Southern Reclamation)

Apr 2009

Figure 030

MAUNSELL | AECOM

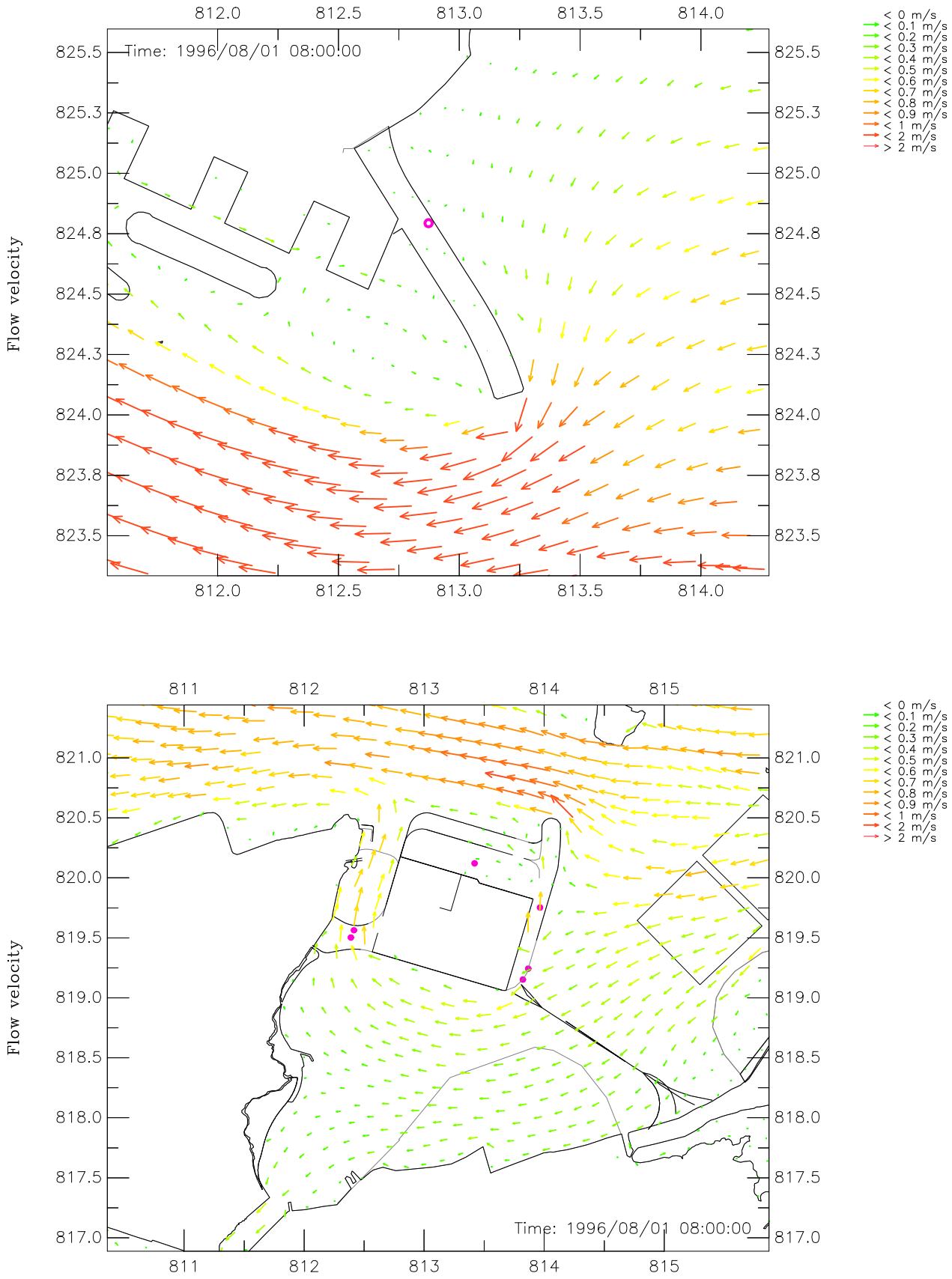


Year 2013
Wet Season Velocity Vector Plot at Flood Tide – Mid-Depth

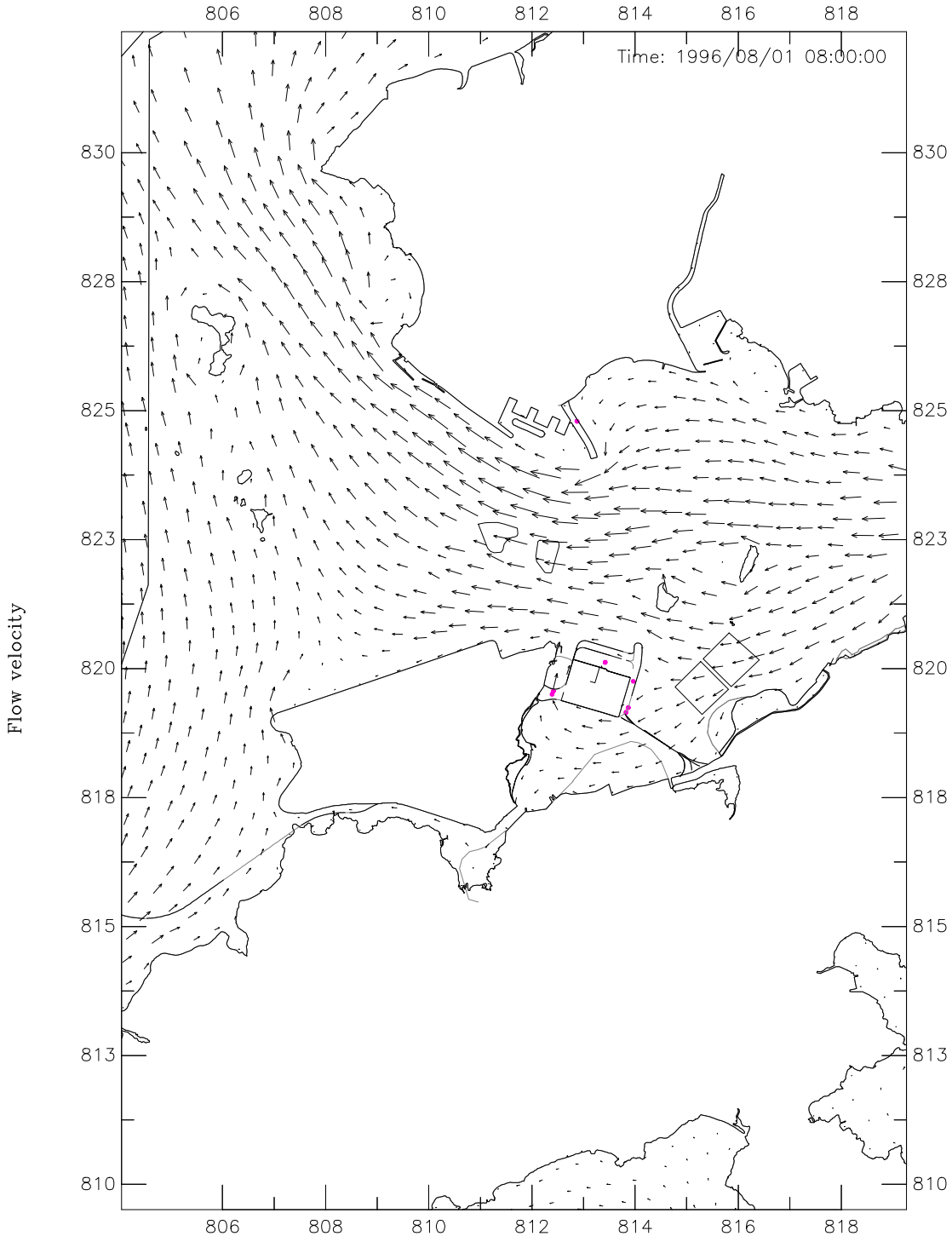
Apr 2009

Figure 031

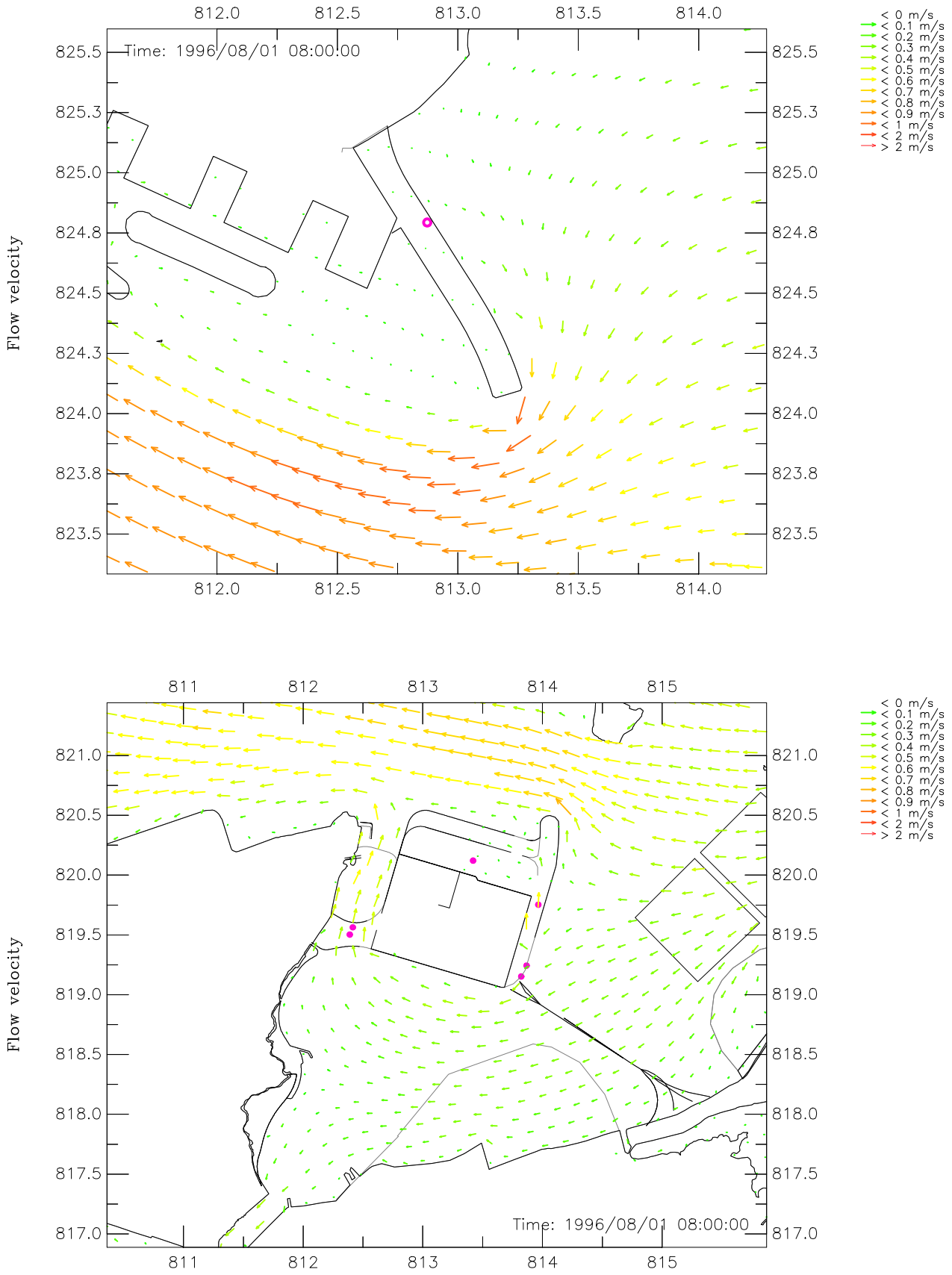
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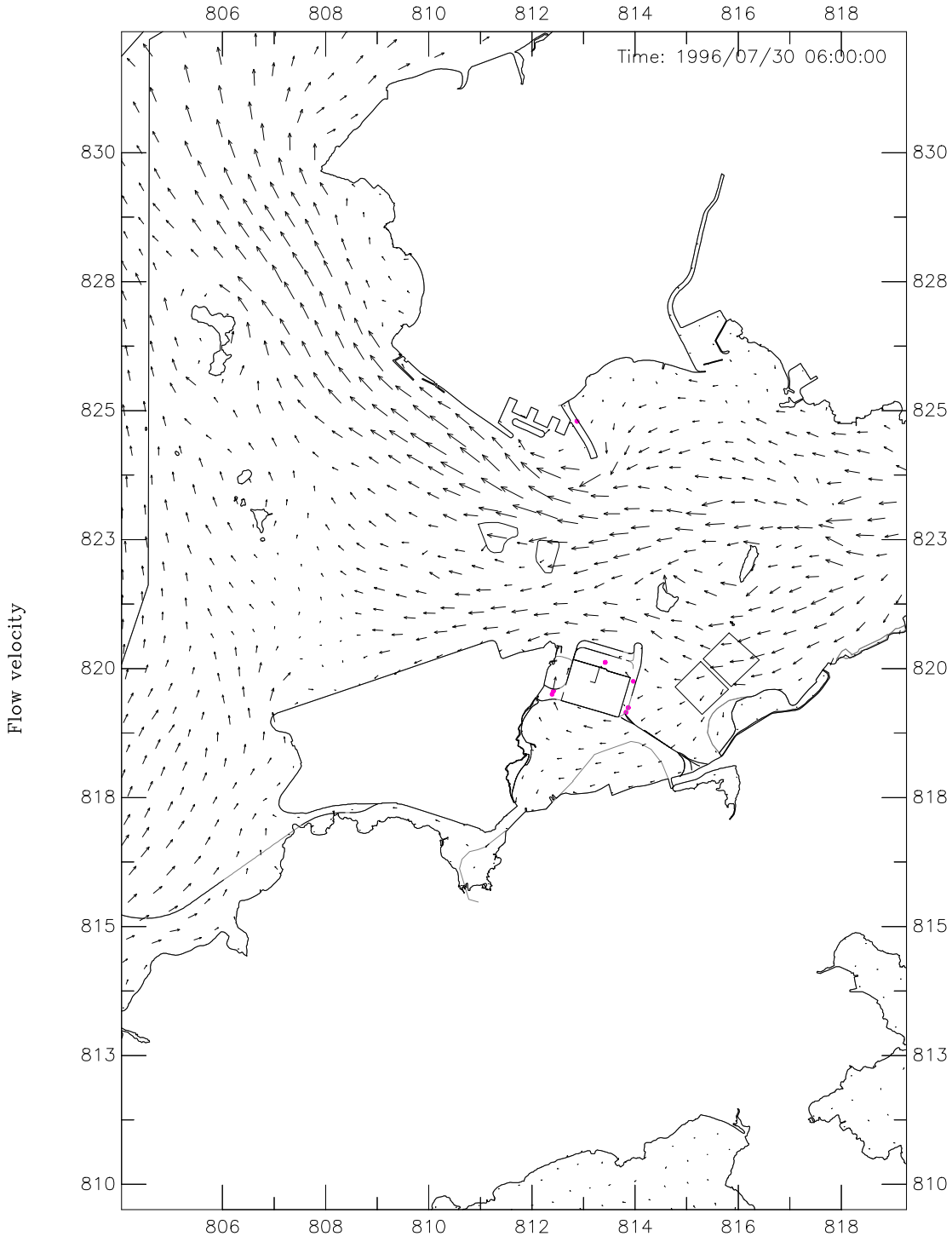
Year 2013 Wet Season Velocity Vector Plot at Flood Tide – Mid-Depth (Top: Northern Reclamation; Bottom: Southern Reclamation)	Apr 2009	Figure 032
MAUNSELL | AECOM		



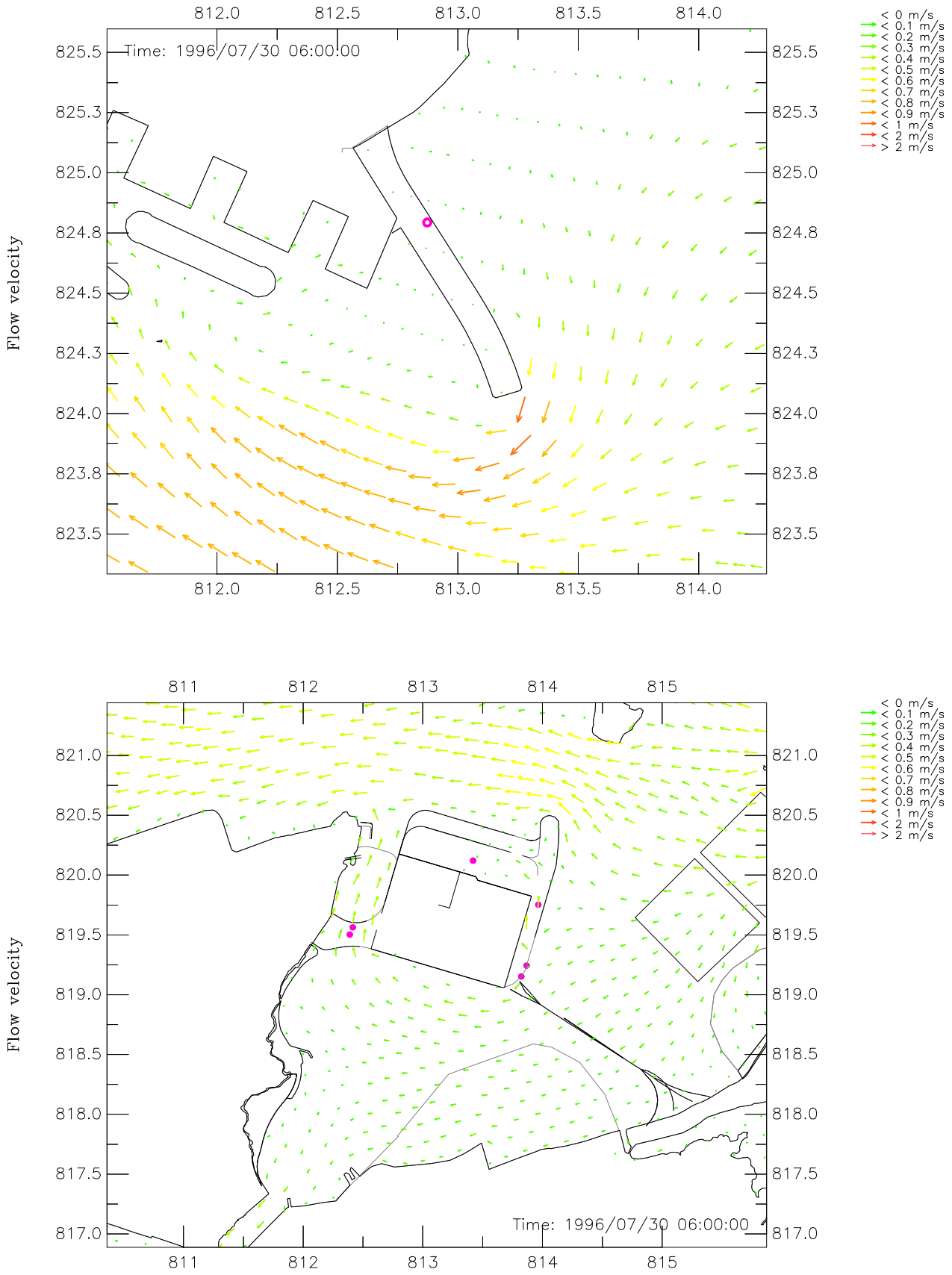
Year 2013 Dry Season Velocity Vector Plot at Flood Tide – Bottom Layer	Apr 2009	Figure 033
MAUNSELL | AECOM		



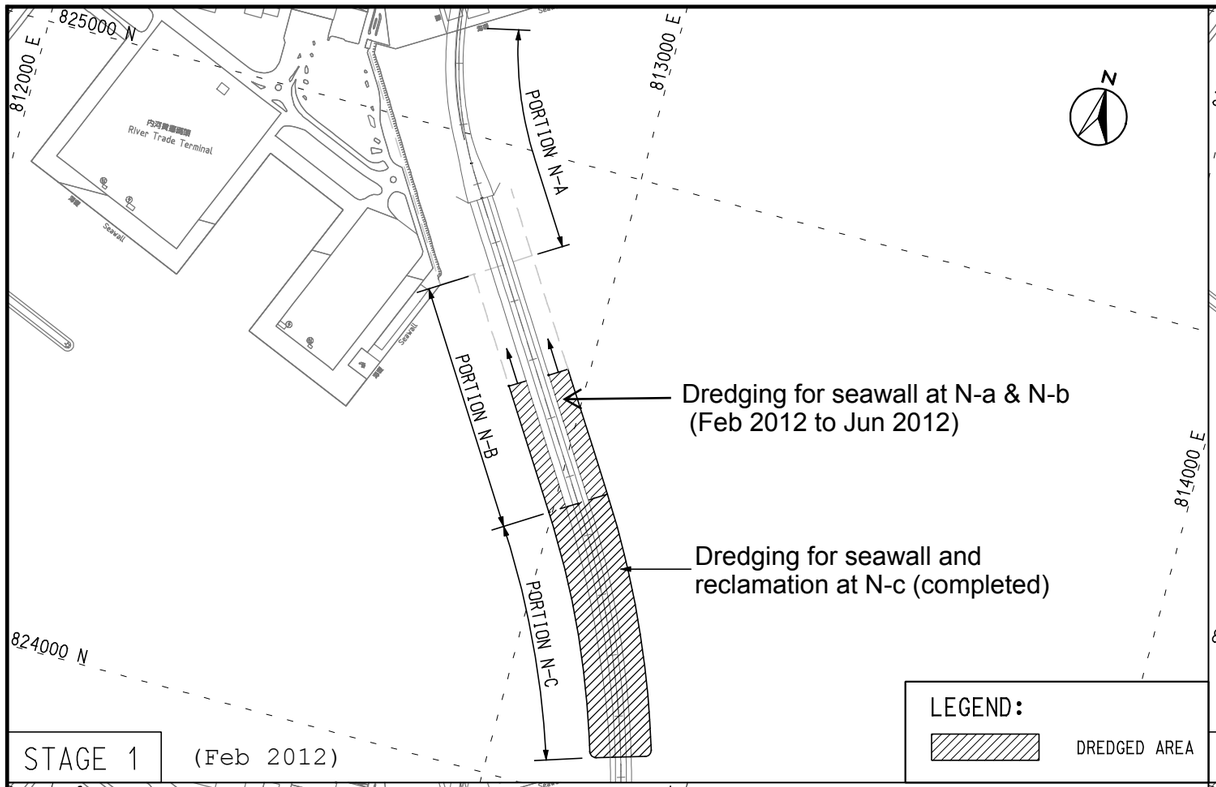
Year 2013 Dry Season Velocity Vector Plot at Flood Tide – Bottom Layer (Top: Northern Reclamation; Bottom: Southern Reclamation)	Apr 2009	Figure 034
MAUNSELL | AECOM		



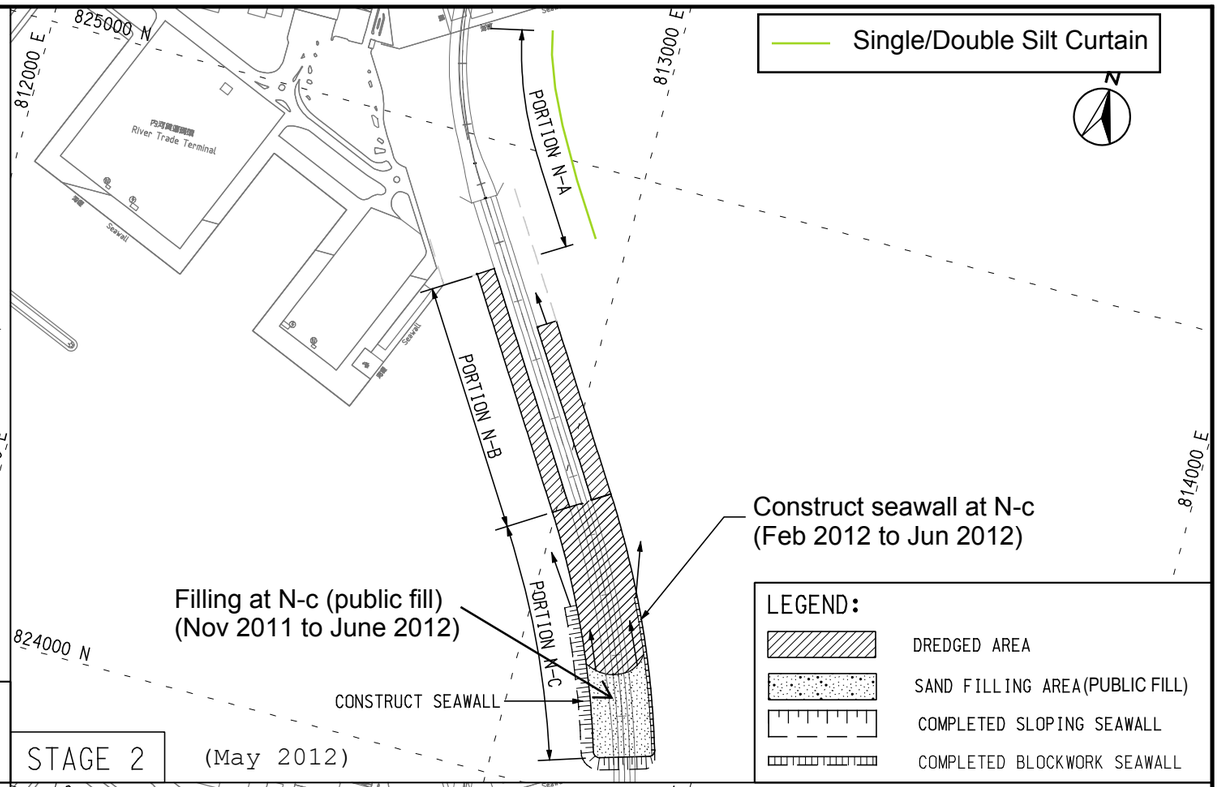
Year 2013 Wet Season Velocity Vector Plot at Flood Tide – Bottom Layer	Apr 2009	Figure 035
MAUNSELL | AECOM		



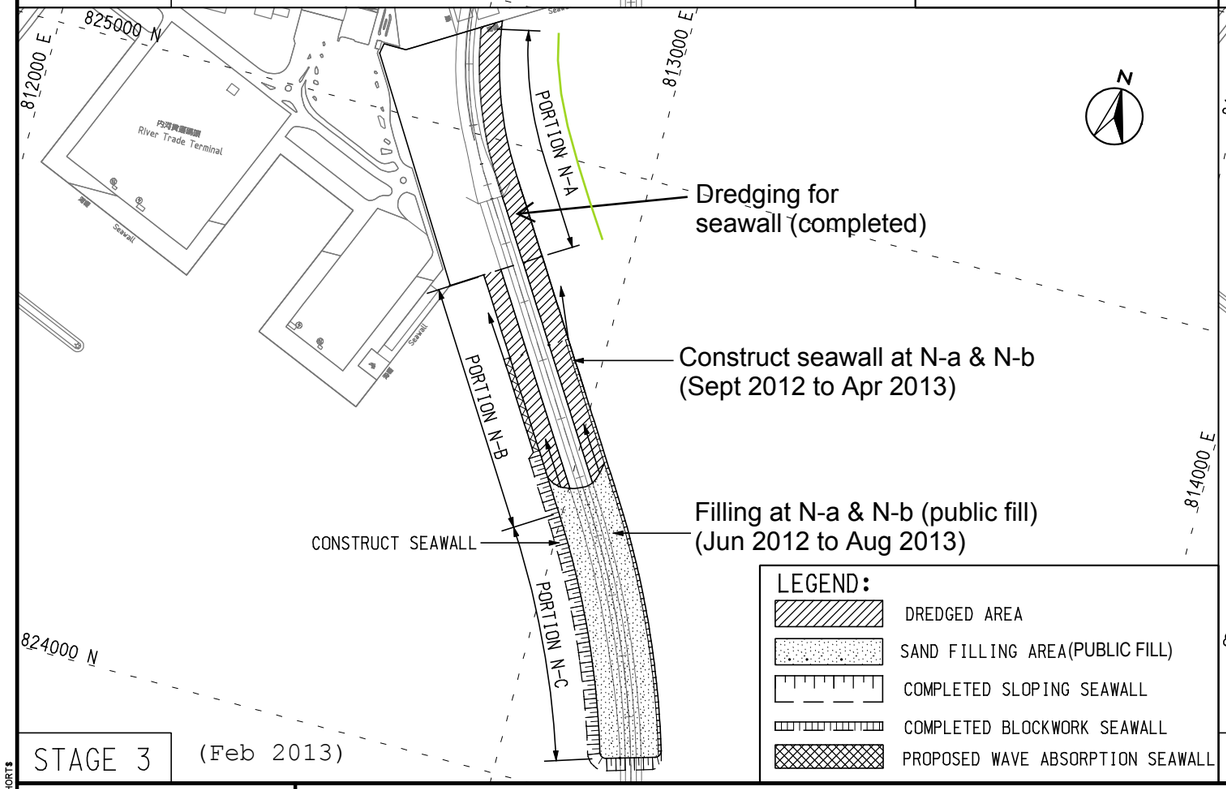
Year 2013 Wet Season Velocity Vector Plot at Flood Tide – Bottom Layer (Top: Northern Reclamation; Bottom: Southern Reclamation)	Apr 2009	Figure 036
MAUNSELL | AECOM		



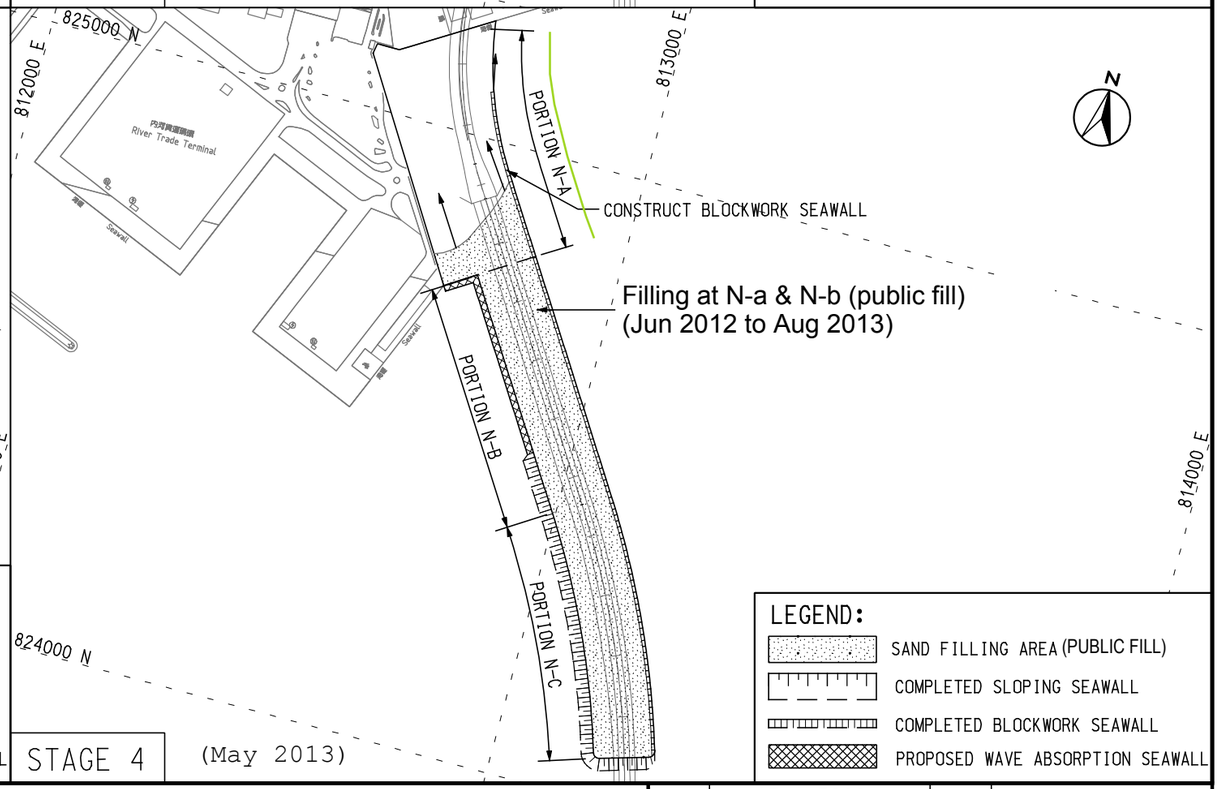
STAGE 1 (Feb 2012)



STAGE 2 (May 2012)



STAGE 3 (Feb 2013)



STAGE 4 (May 2013)

Plotting By: 2009-3-23
PLOT SCALE: $SCALESHORT$

MAUNSELL AECOM
Maunsell Consultants Asia Ltd

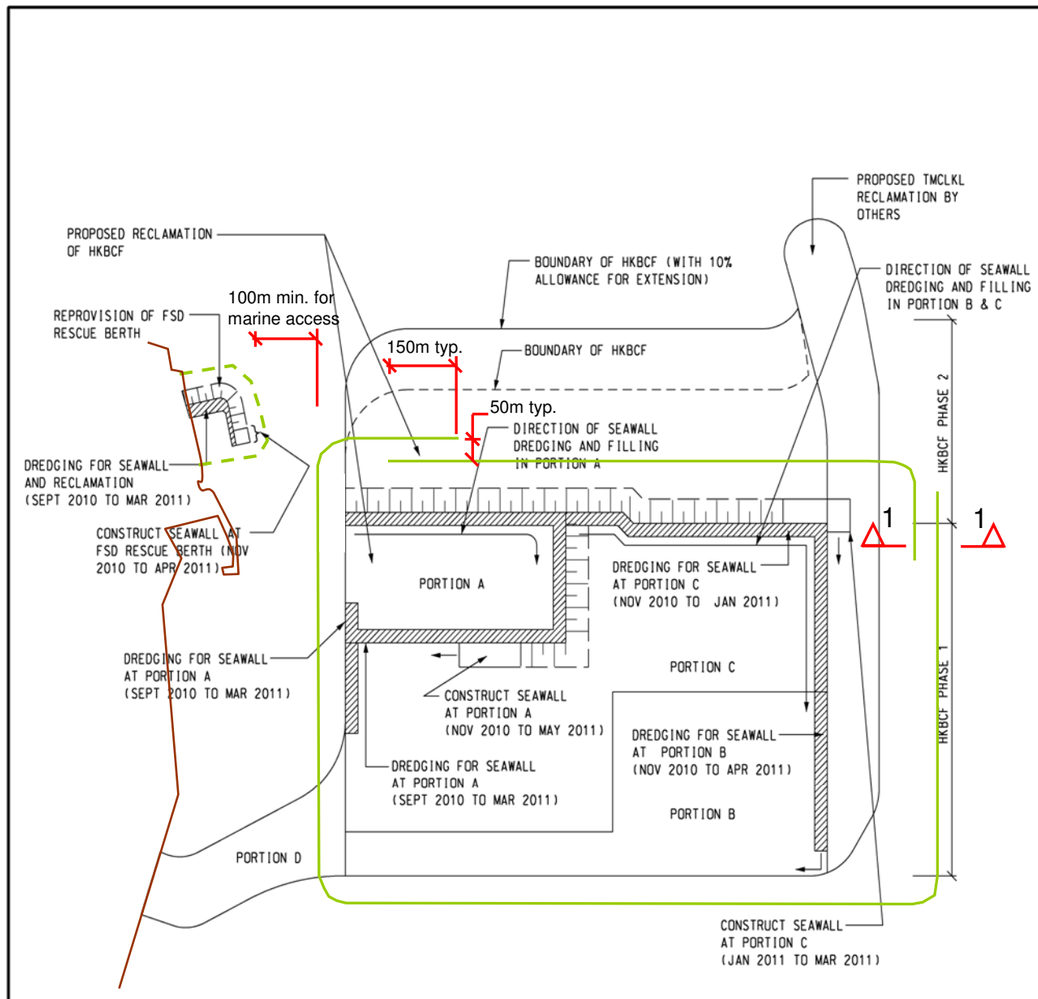
AGREEMENT NO. CE 52/2007(HY)
TUEN MUN – CHEK LAP KOK LINK – INVESTIGATION

Anticipated Construction Sequence of TM-CLKL

SHEET 1 OF 1

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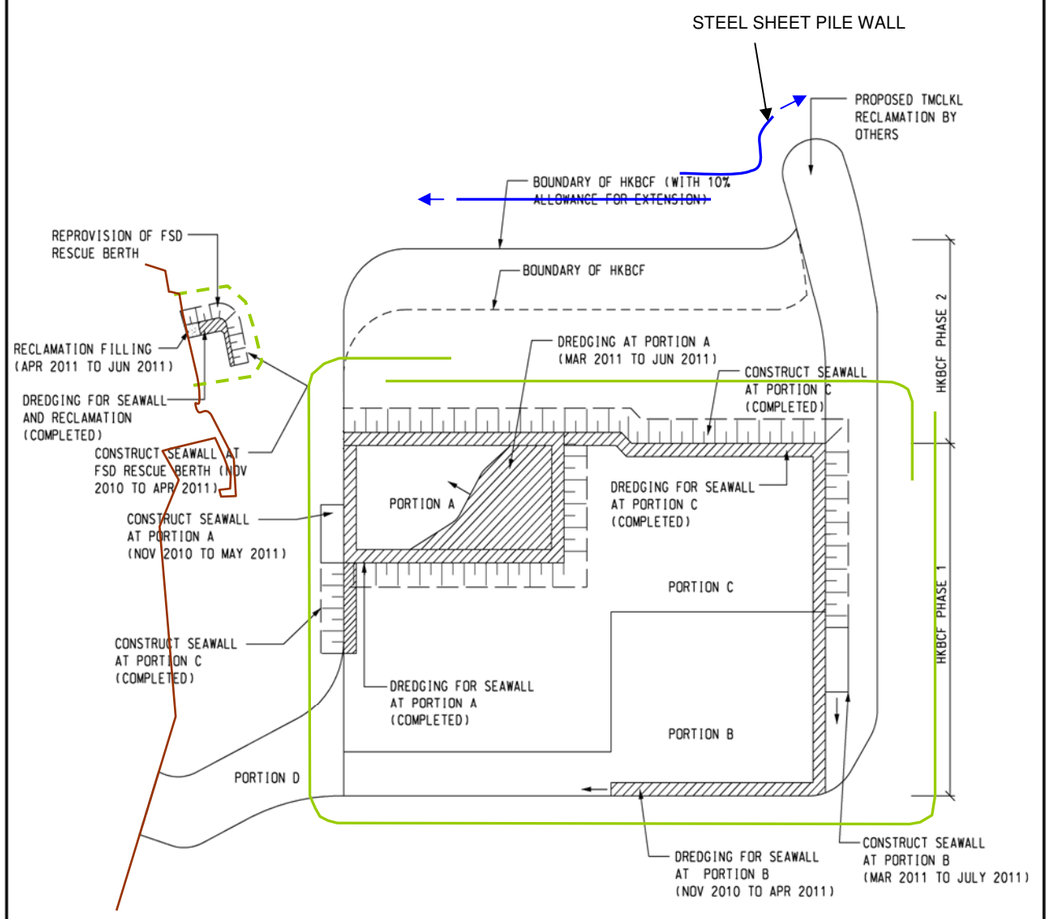
FIRST MEASURE: FRAME TYPE SILT CURTAIN FOR ALL GRAB DREDGERS (SEE TYPICAL SECTION ATTACHED)

SECOND MEASURE: SINGLE/DOUBLE SILT CURTAIN AROUND THE SITE (SEE TYPICAL SECTION ATTACHED)

LEGEND:

- SINGLE/ DOUBLE SILT CURTAIN
- DREDGED AREA
- COMPLETED SLOPING SEAWALL

STAGE 1 (ON FEB 2011)



NOTE:

FIRST MEASURE: FRAME TYPE SILT CURTAIN FOR ALL GRAB DREDGERS (SEE TYPICAL SECTION ATTACHED)

SECOND MEASURE: SINGLE/DOUBLE SILT CURTAIN AROUND THE SITE (SEE TYPICAL SECTION ATTACHED)

LEGEND:

- STEEL SHEET PILE WALL
- SINGLE/ DOUBLE SILT CURTAIN
- DREDGED AREA
- COMPLETED SLOPING SEAWALL
- RECLAMATION FILLING AREA

STAGE 2 (ON APRIL 2011)

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Hong Kong Project Management Office

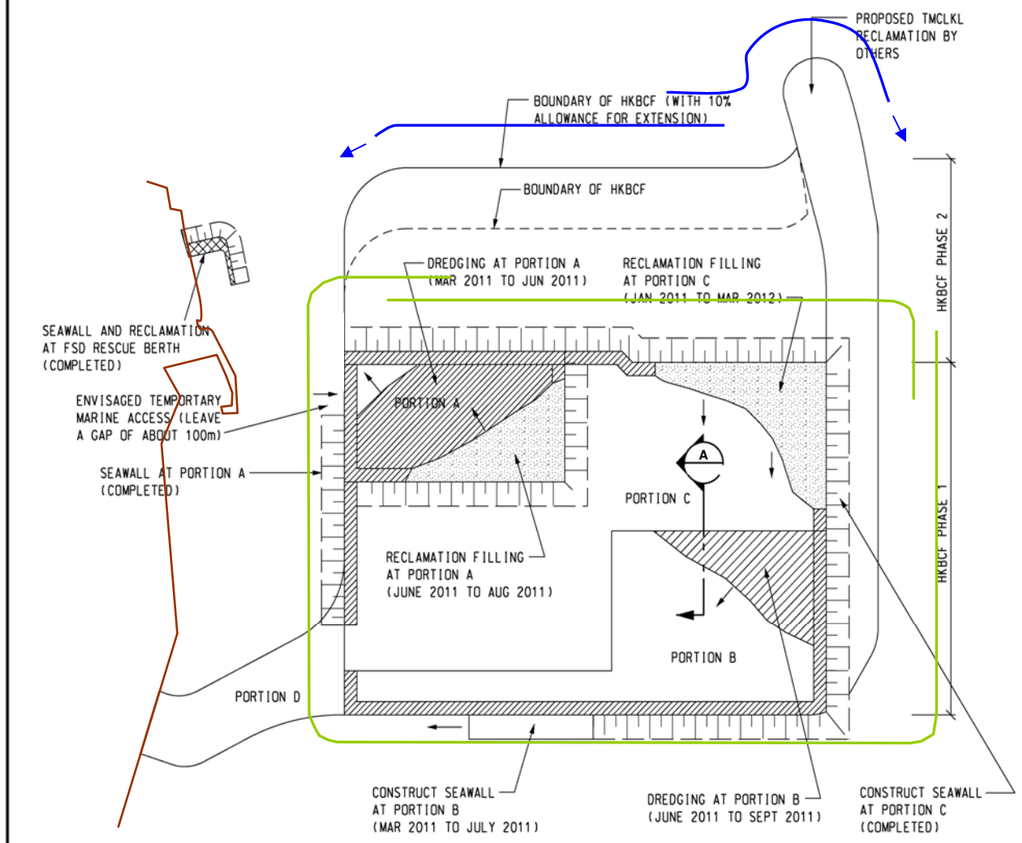
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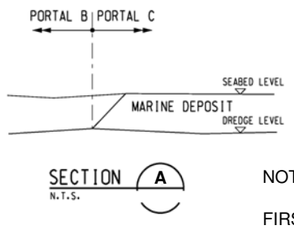
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Hong Kong-Zhuhai-Macao Bridge Hong Kong Boundary Crossing Facilities – Investigation

Drawing Title: ANTICIPATED CONSTRUCTION SEQUENCE OF HKBCF

Rev.	Description	Date
A	FIRST ISSUE	02/09

Drawn: CN	Date: 02/09
Checked: SK	Approved: AK
Scale: 1:12500 on A3	
Drawing No.: 25308/041/301	
Status: PRELIMINARY	Rev.: A





NOTE:

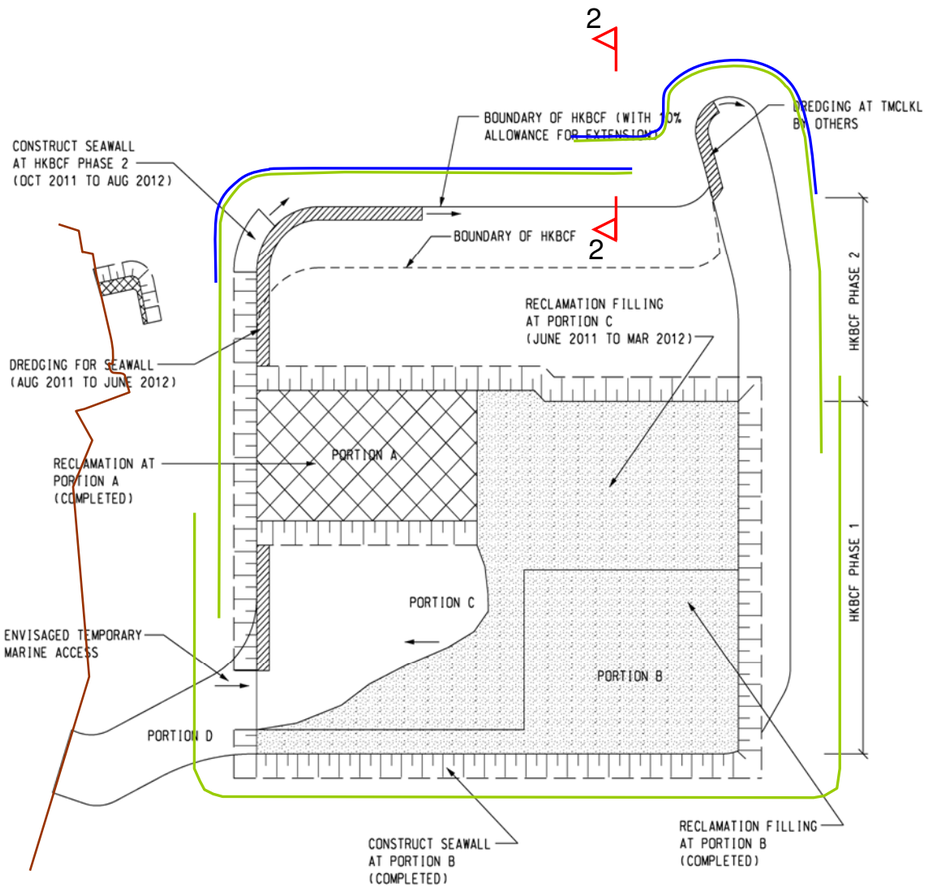
FIRST MEASURE: FRAME TYPE SILT CURTAIN FOR ALL GRAB DREDGERS (SEE TYPICAL SECTION ATTACHED)

SECOND MEASURE: SINGLE/DOUBLE SILT CURTAIN AROUND THE SITE (SEE TYPICAL SECTION ATTACHED)

LEGEND:

- SINGLE/ DOUBLE SILT CURTAIN
- DREDGED AREA
- COMPLETED SLOPING SEAWALL
- RECLAMATION WORKS COMPLETED
- RECLAMATION FILLING AREA

STAGE 3 (ON JUNE 2011)



NOTE:

FIRST MEASURE: FRAME TYPE SILT CURTAIN FOR ALL GRAB DREDGERS (SEE TYPICAL SECTION ATTACHED)

SECOND MEASURE: SINGLE/DOUBLE SILT CURTAIN AROUND THE SITE (SEE TYPICAL SECTION ATTACHED)

LEGEND:

- SINGLE/ DOUBLE SILT CURTAIN
- DREDGED AREA
- COMPLETED SLOPING SEAWALL
- RECLAMATION WORKS COMPLETED
- RECLAMATION FILLING AREA

STAGE 4 (ON DEC 2011)

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Hong Kong - Zhuhai - Macao Bridge
Hong Kong Project Management Office

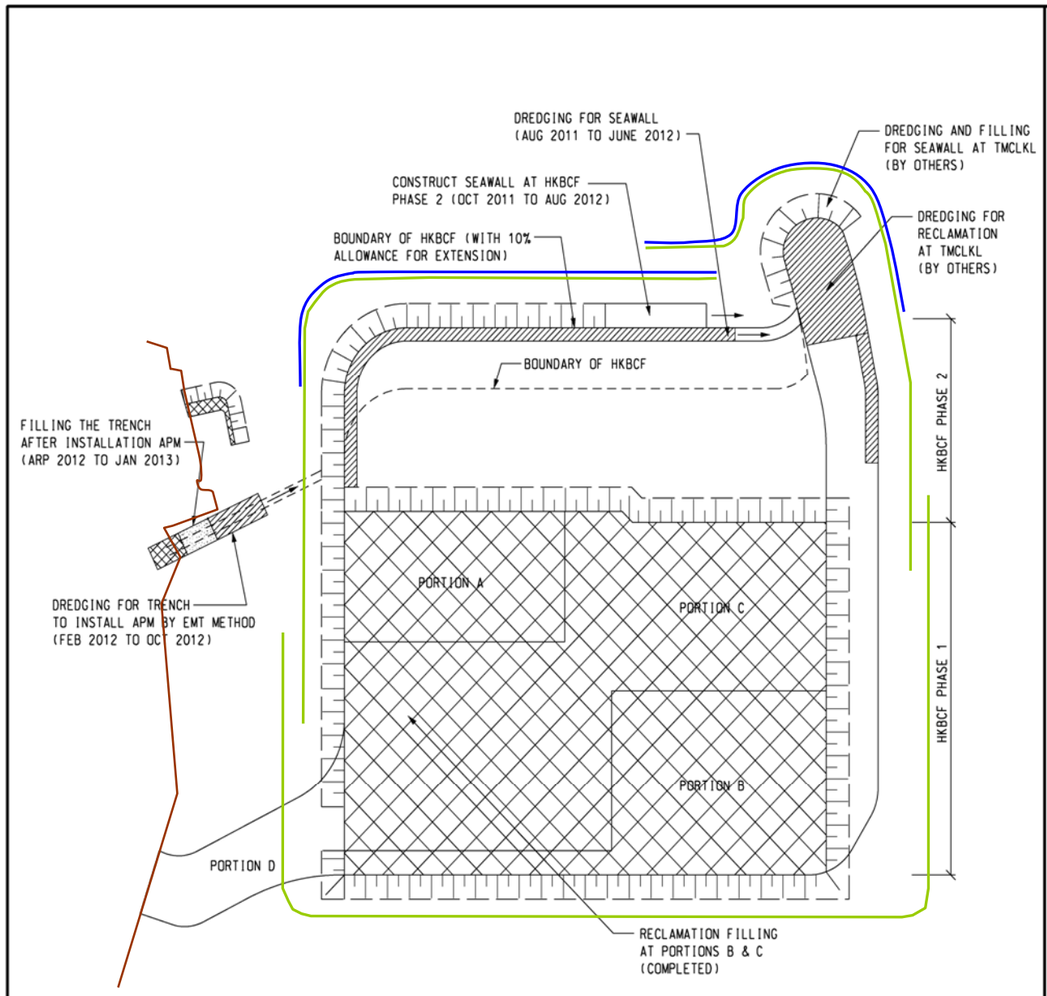
ARUP Ove Arup & Partners Hong Kong Limited

Job Title: Agreement No. CE 14/2008 (CE)
Hong Kong-Zhuhai-Macao Bridge Hong Kong Boundary Crossing Facilities – Investigation

Drawing Title: ANTICIPATED CONSTRUCTION SEQUENCE OF HKBCF

Rev.	Description	Date
A	FIRST ISSUE	02/09

Drawn	Date	Drawing No.
CN	02/09	25308/041/302
Checked: SK	Approved: AK	
Scale: 1:12500 on A3	Status: PRELIMINARY	Rev. A



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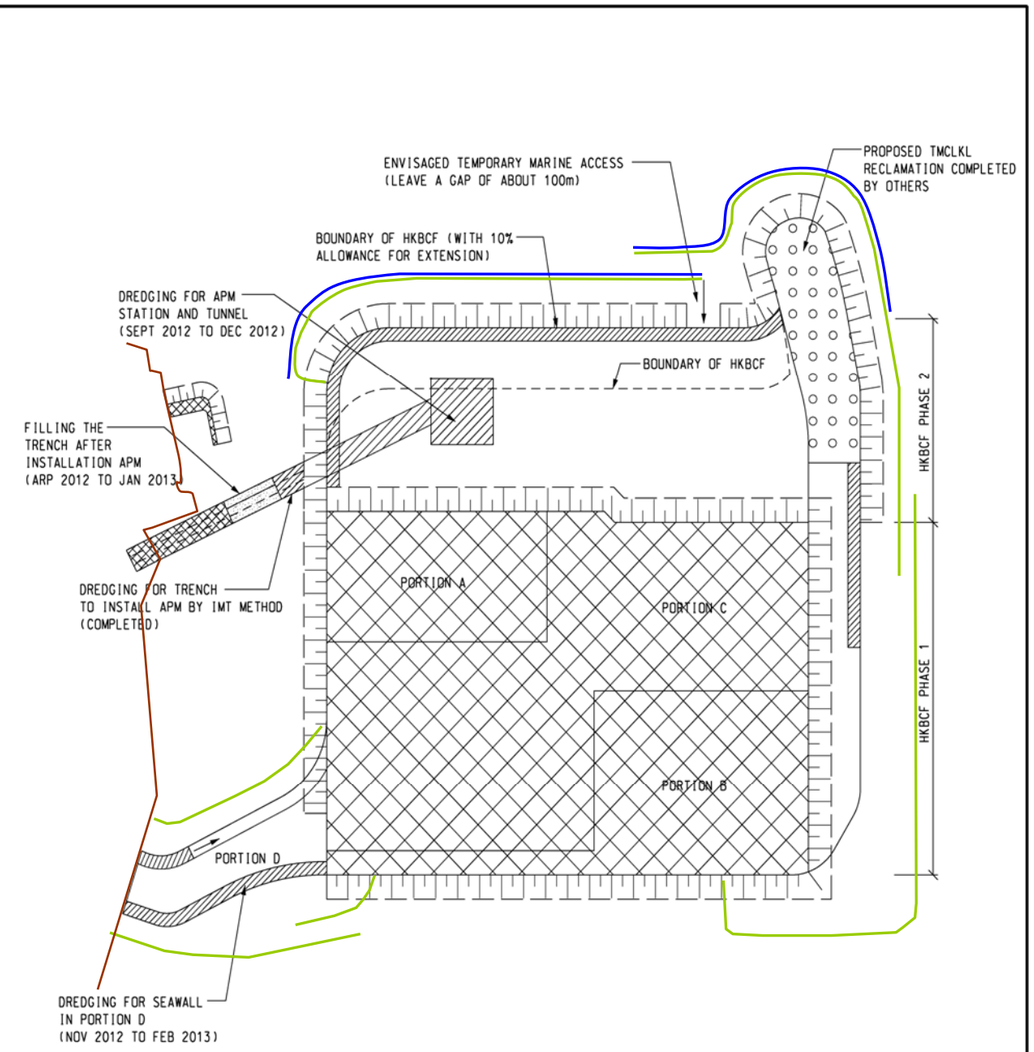
FIRST MEASURE: FRAME TYPE SILT CURTAIN FOR ALL GRAB DREDGERS (SEE TYPICAL SECTION ATTACHED)

SECOND MEASURE: SINGLE/DOUBLE SILT CURTAIN AROUND THE SITE (SEE TYPICAL SECTION ATTACHED)

LEGEND:

- STEEL SHEET PILE WALL
- SINGLE/ DOUBLE SILT CURTAIN
- DREDGED AREA
- COMPLETED SLOPING SEAWALL
- RECLAMATION WORKS COMPLETED
- RECLAMATION FILLING AREA

STAGE 5 (ON APR 2012)



NOTE:

FIRST MEASURE: FRAME TYPE SILT CURTAIN FOR ALL GRAB DREDGERS (SEE TYPICAL SECTION ATTACHED)

SECOND MEASURE: SINGLE/DOUBLE SILT CURTAIN AROUND THE SITE (SEE TYPICAL SECTION ATTACHED)

LEGEND:

- STEEL SHEET PILE WALL
- SINGLE/ DOUBLE SILT CURTAIN
- DREDGED AREA
- COMPLETED SLOPING SEAWALL
- RECLAMATION WORKS COMPLETED
- RECLAMATION FILLING AREA
- COMPLETE TMCLKL RECLAMATION BY OTHERS

STAGE 6 (ON DEC 2012)

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Hong Kong - Zhuhai - Macao Bridge
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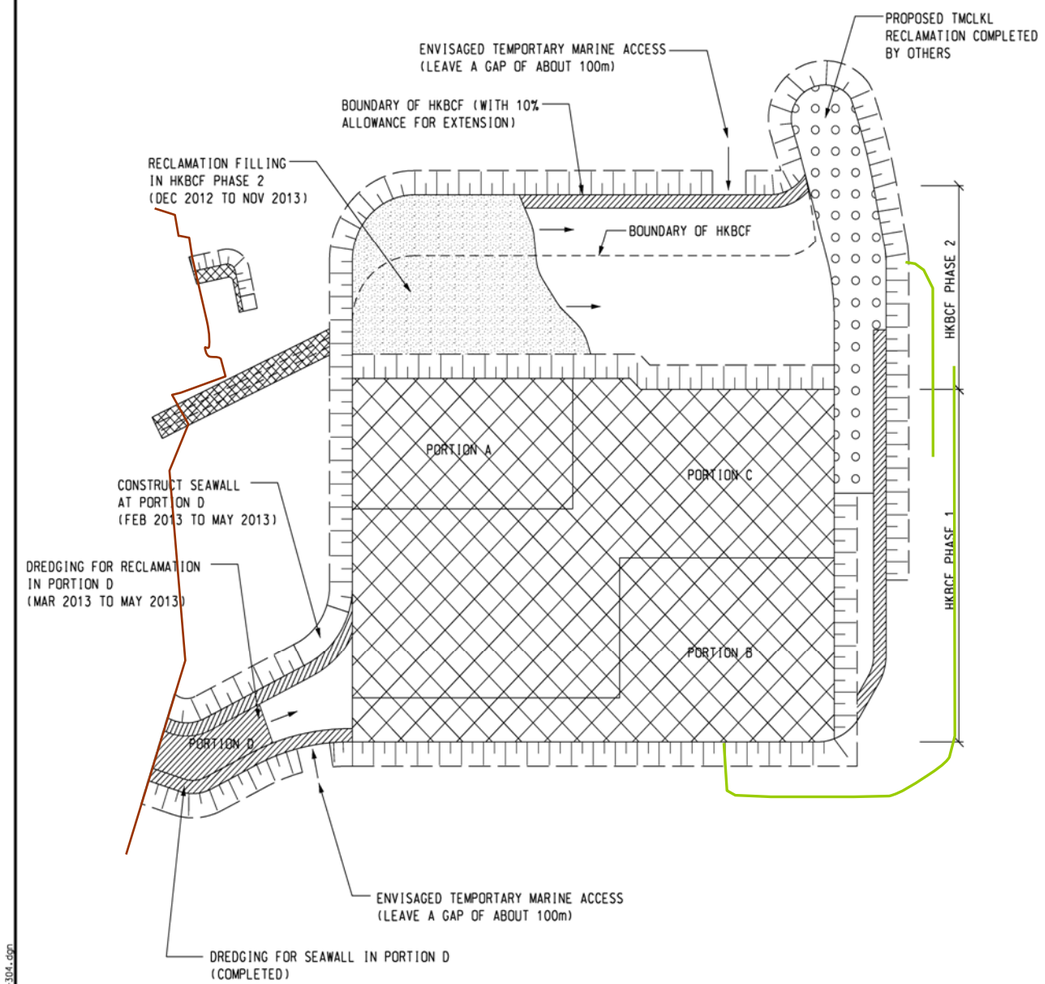
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Checked: SK | Approved: AK
Scale: 1:12500 on A3
Drawing No.: 25308/041/303
Status: PRELIMINARY | Rev.: A



NOTE:

FIRST MEASURE: FRAME TYPE SILT CURTAIN FOR ALL GRAB DREDGERS (SEE TYPICAL SECTION ATTACHED)

SECOND MEASURE: SINGLE/DOUBLE SILT CURTAIN AROUND THE SITE (SEE TYPICAL SECTION ATTACHED)

LEGEND:

- SINGLE / DOUBLE SILT CURTAIN
- DREDGED AREA
- COMPLETED SLOPING SEAWALL
- RECLAMATION WORKS COMPLETED
- RECLAMATION FILLING AREA
- COMPLETE TMCLKL RECLAMATION BY OTHERS

STAGE 7 (ON APR 2013)

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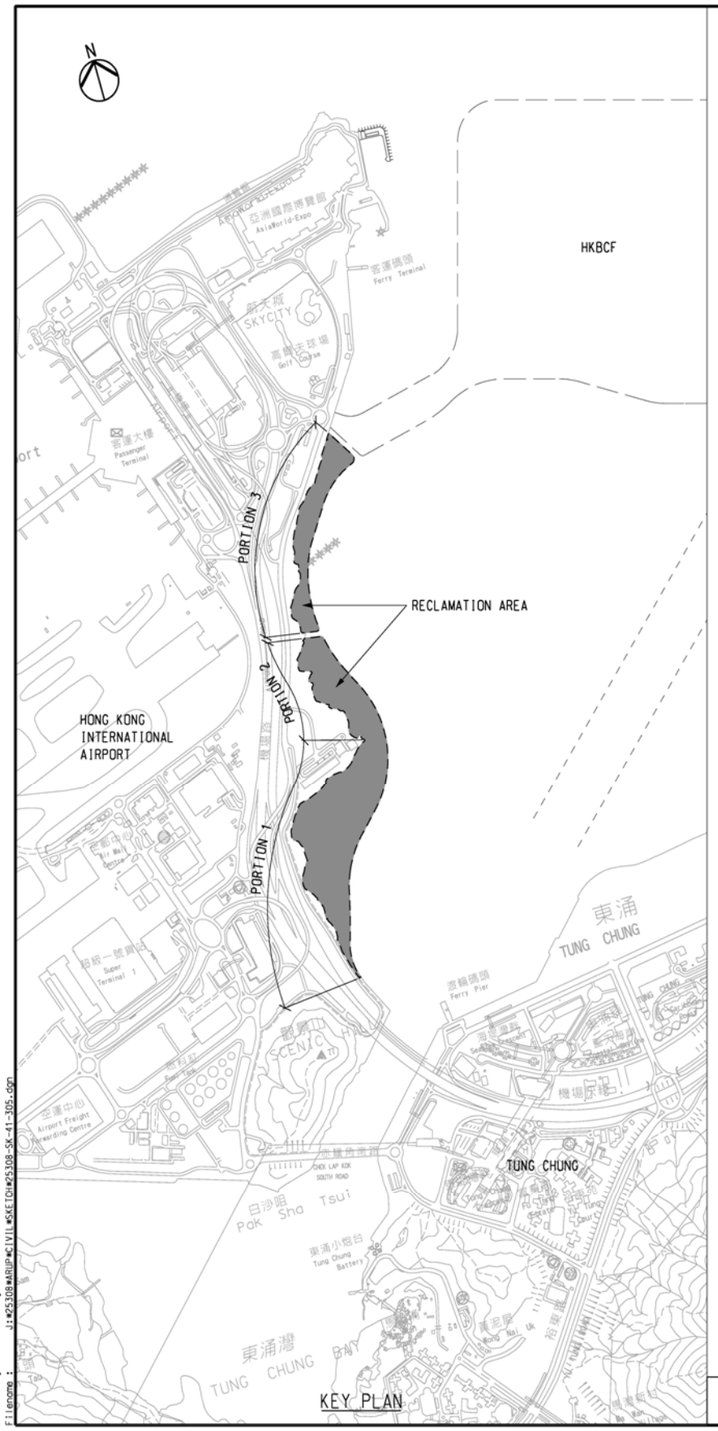
ARUP Ove Arup & Partners Hong Kong Limited

Job Title: Agreement No. CE 14/2008 (CE) Hong Kong-Zhuhai-Macao Bridge Hong Kong Boundary Crossing Facilities – Investigation

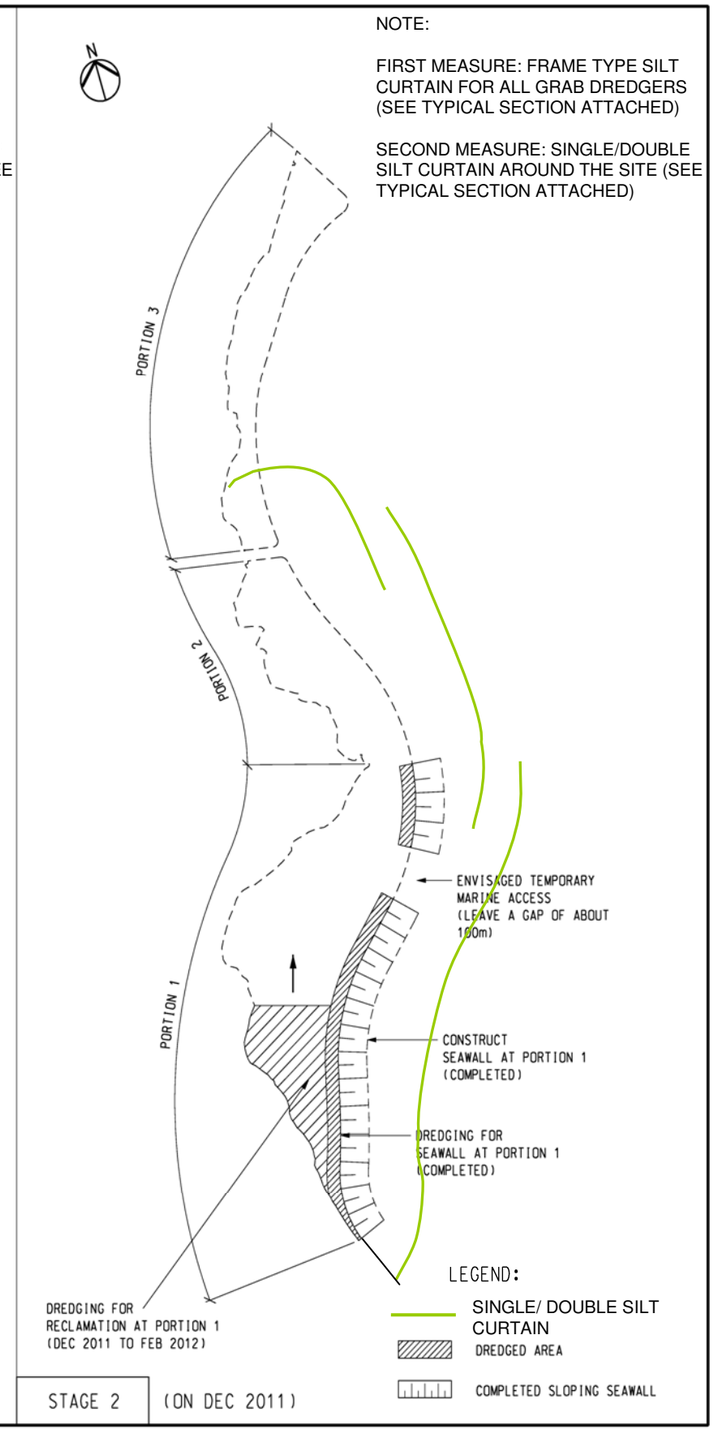
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Rev.	Description	Date
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Drawn: CN | Date: 02/09
Checked: SK | Approved: AK
Scale: 1:12500 on A3
Drawing No.: 25308/041/304
Status: PRELIMINARY | Rev.: A







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路政署
HIGHWAYS DEPARTMENT
港珠澳大橋香港工程管理處
Hong Kong - Zhuhai - Macao Bridge
Hong Kong Project Management Office

ARUP Ove Arup & Partners Hong Kong Limited

Job Title
Agreement No. CE 14/2008 (CE)
Hong Kong-Zhuhai-Macao Bridge Hong Kong Boundary Crossing Facilities – Investigation

Drawing Title
ANTICIPATED CONSTRUCTION SEQUENCE OF HKLR

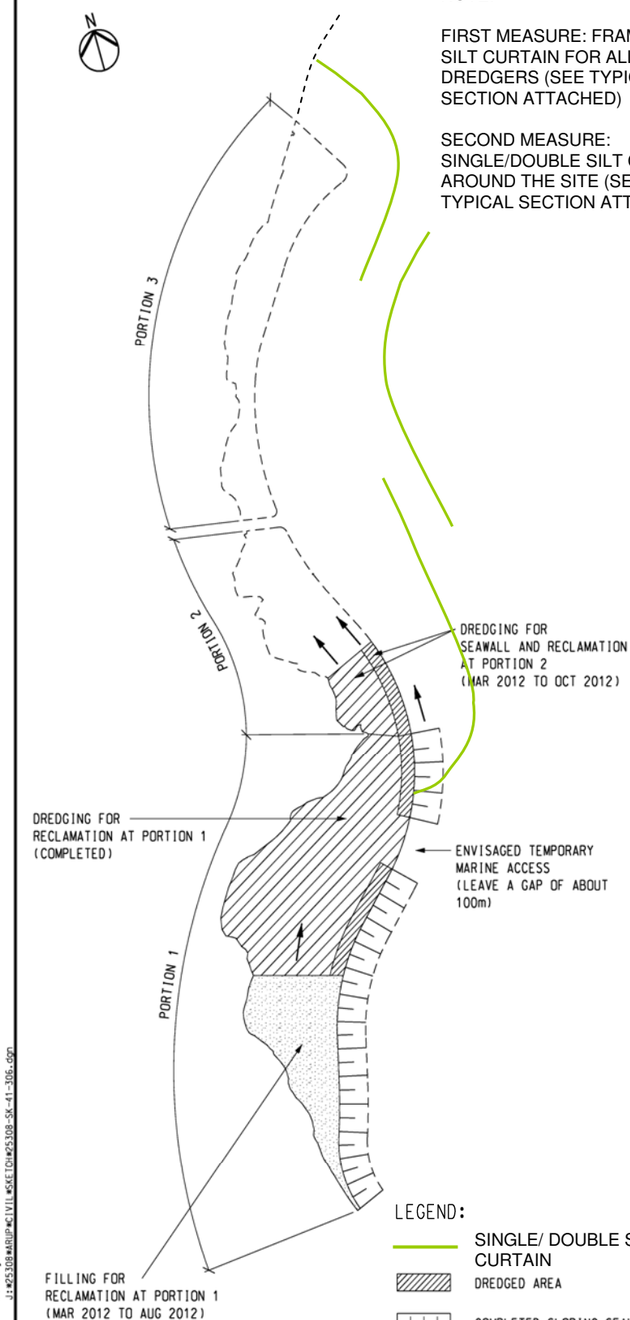
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Drawn	AL
Date	02/09
Checked	SK
Approved	AK
Scale	1:10000 on A3
Drawing No.	25308/041/305
Status	PRELIMINARY
Rev.	A

NOTE:

FIRST MEASURE: FRAME TYPE SILT CURTAIN FOR ALL GRAB DREDGERS (SEE TYPICAL SECTION ATTACHED)

SECOND MEASURE: SINGLE/DOUBLE SILT CURTAIN AROUND THE SITE (SEE TYPICAL SECTION ATTACHED)



LEGEND:

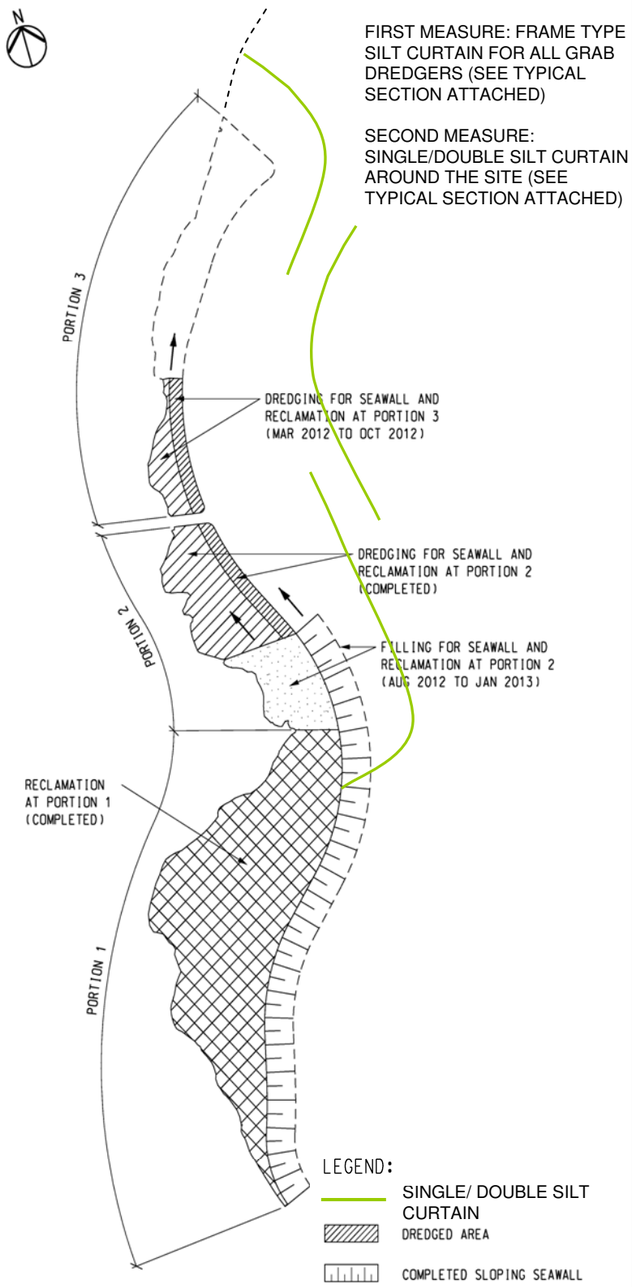
- SINGLE/ DOUBLE SILT CURTAIN
- DREDGED AREA
- COMPLETED SLOPING SEAWALL
- RECLAMATION FILLING AREA

STAGE 3 (ON APR 2012)

NOTE:

FIRST MEASURE: FRAME TYPE SILT CURTAIN FOR ALL GRAB DREDGERS (SEE TYPICAL SECTION ATTACHED)

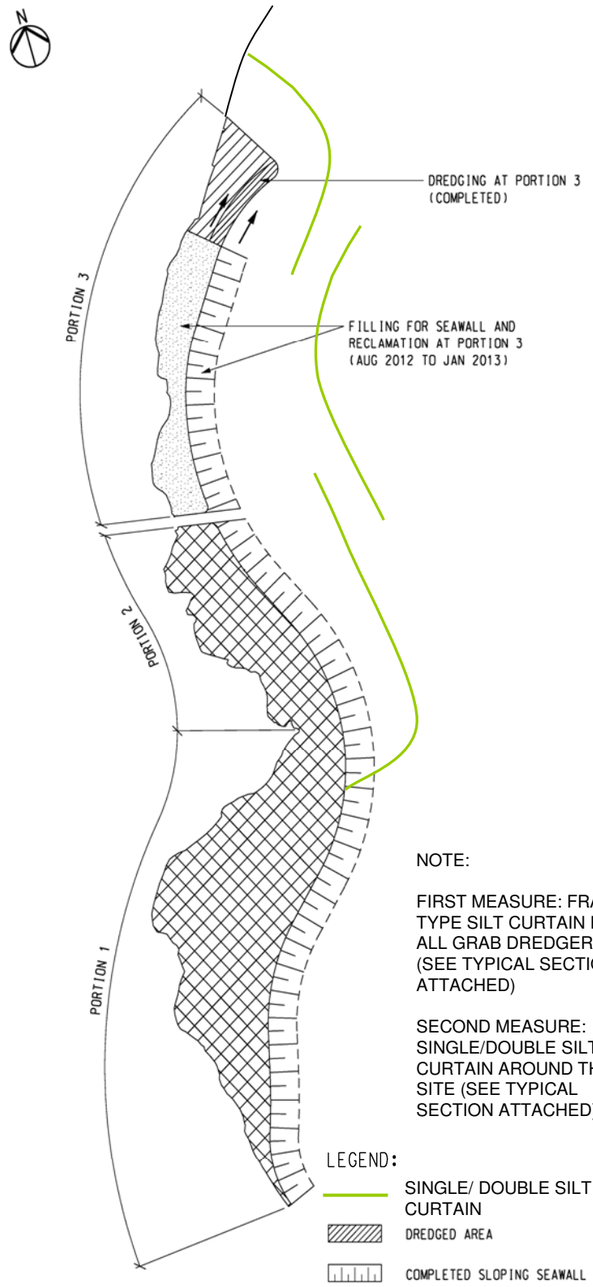
SECOND MEASURE: SINGLE/DOUBLE SILT CURTAIN AROUND THE SITE (SEE TYPICAL SECTION ATTACHED)



LEGEND:

- SINGLE/ DOUBLE SILT CURTAIN
- DREDGED AREA
- COMPLETED SLOPING SEAWALL
- RECLAMATION WORKS COMPLETED
- RECLAMATION FILLING AREA

STAGE 4 (ON AUG 2012)



NOTE:

FIRST MEASURE: FRAME TYPE SILT CURTAIN FOR ALL GRAB DREDGERS (SEE TYPICAL SECTION ATTACHED)

SECOND MEASURE: SINGLE/DOUBLE SILT CURTAIN AROUND THE SITE (SEE TYPICAL SECTION ATTACHED)

LEGEND:

- SINGLE/ DOUBLE SILT CURTAIN
- DREDGED AREA
- COMPLETED SLOPING SEAWALL
- RECLAMATION WORKS COMPLETED
- RECLAMATION FILLING AREA

STAGE 5 (ON DEC 2012)

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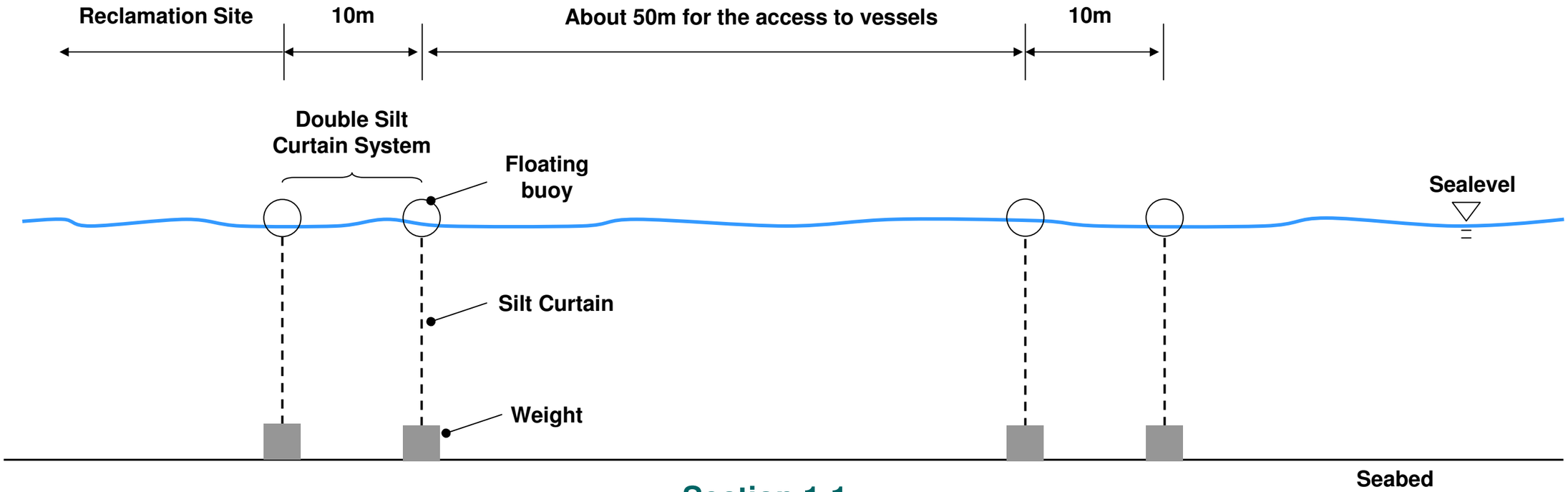
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Boundary Crossing Facilities – Investigation

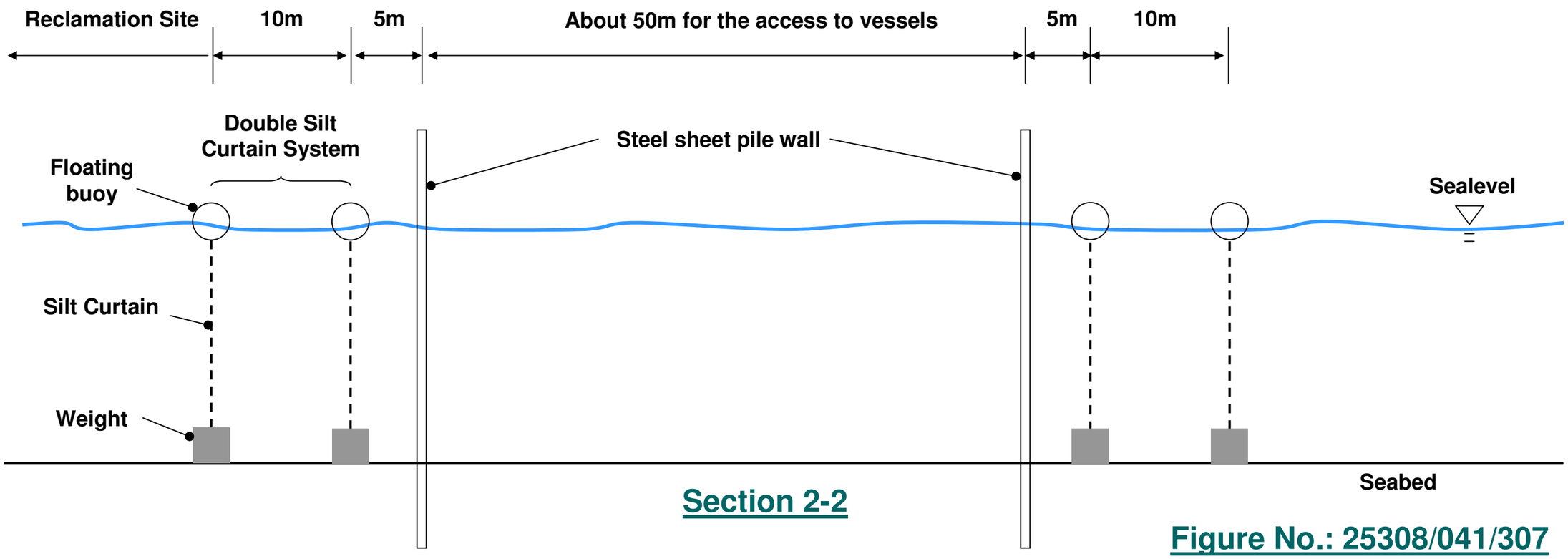
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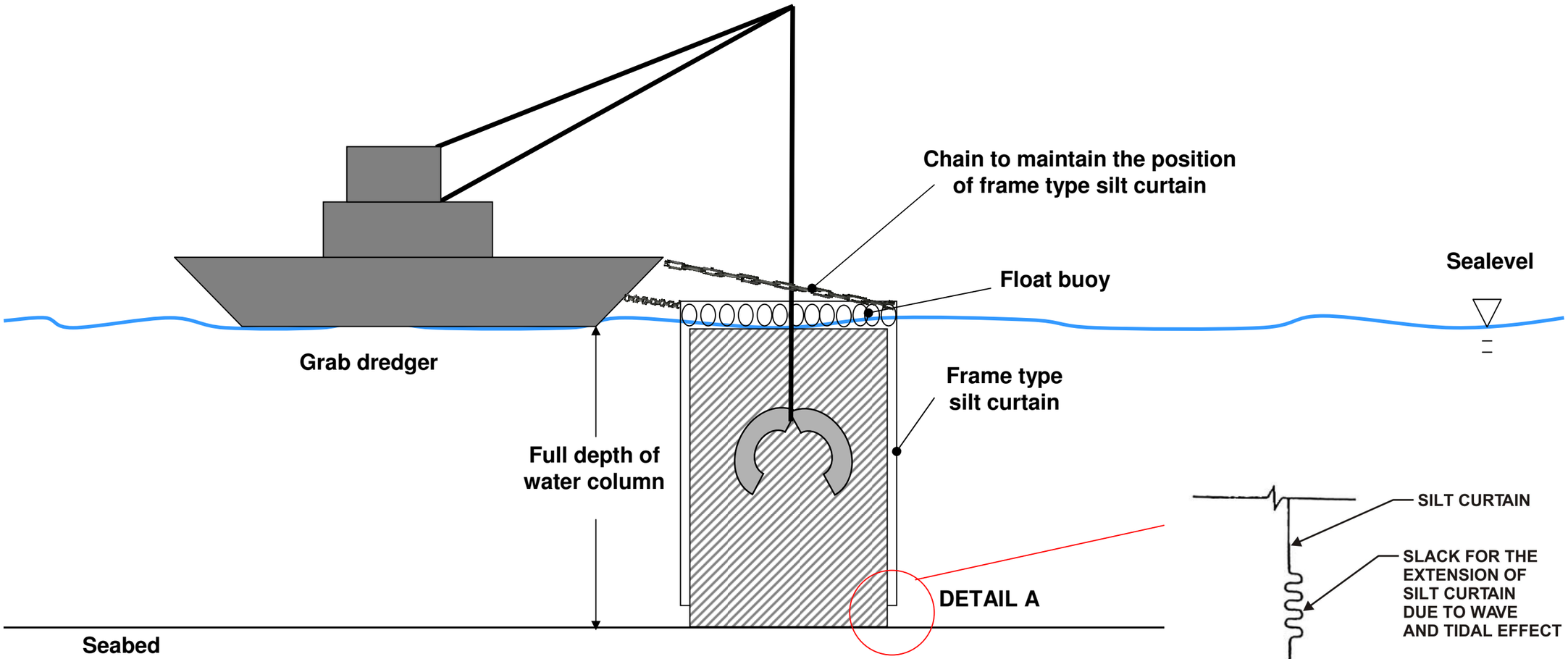


Section 1-1



Section 2-2

Figure No.: 25308/041/307



Additional Frame Type Silt Curtain for Grab Dredgers

Figure No.: 25308/041/308

Mak/Max

SILT PROTECTOR®



PREVENT DIFFUSION OF SILT IN WATER

TAIYO KOGYO CORPORATION

Mak/Max

G AND E COMPANY LTD
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TOKYO OFFICE
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Tel: +81-33714-3368 Fax: +81-33714-3326

Models and Features

The Silt Protector consists of several types that are individually subdivided into some ranks so that the user is able to select units best suited to specific site conditions and work items. The Silt Protector can be used individually or separately, or by combining the units.

●Fixed Hanging Type Silt Protector

This type is used the most frequently. It basically consists of floats on the surface and curtain and weight chain below the surface. One span of this product is 20m long. It is moored to the bottom through anchor ropes and anchors at every 19.5m point.
The anchor ropes are steel wire type or synthetic fiber type, and anchors are concrete blocks, usually.

When this product is used under high wave conditions, the curtain with the vertical length of 10m or less is used and standing type is used together in many cases. When wave is low, the curtain of 20m long or more may be used.

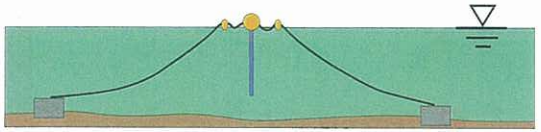
The fixed hanging type Silt Protector is classified into four ranks, A, B, C and D so that a type best suited to a specific application can be identified.









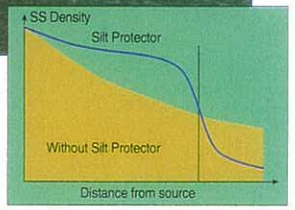


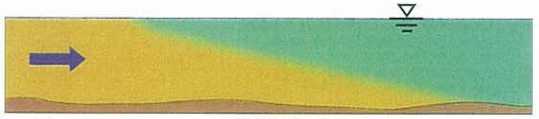
●General site condition for hanging fixed type

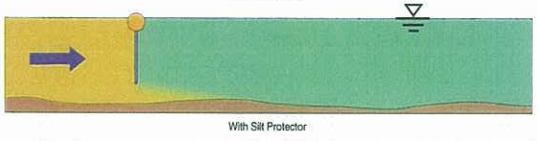
Rank	Suitable site conditions	Standard specifications			
		Float dia (mm)	Float type	Curtain tensile strength (kgf/3cm)	Chain weight (kg/m)
A	Area outside of breakwater ◆Wave height : 1.5m or less ◆Velocity of current : 0.5m/sec or less	600	Unspaced	800 or 500	10
B	Wide area inside of breakwater, or inside of inlet that is sheltered by the natural submarine topography ◆Wave height : 1.0m or less ◆Velocity of current : 0.2m/sec or less	400	Unspaced	500 or 300	5
C	Area with medium extent inside of breakwater ◆Wave height : 0.8m or less ◆Velocity of current : 0.1m/sec or less	300	Unspaced	500 or 300	5
D	Lakes, or well sheltered area as calm as lakes ◆Wave height : 0.5m or less ◆Velocity of current : 0.05m/sec or less	300	Spaced	300	3

●**Remarks** ★Standard unit length is 20m.
★Anchor is not included in the unit.









EFFECT

Silt Protector generally provides the following effects on prevention of diffusion of pollution in the sea.

●Acceleration of settlement of silt by interference of particles

Installation of the Silt Protector suppresses diffusion of the pollution and make the soil particles interfere with each other to accelerate their settlement.

●Reduction of distance required to settle the silt

Installation of the Silt Protector as shown narrows the settlement range, resulting in minimizing the diffusion of pollution after the unit.

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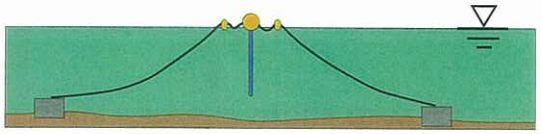
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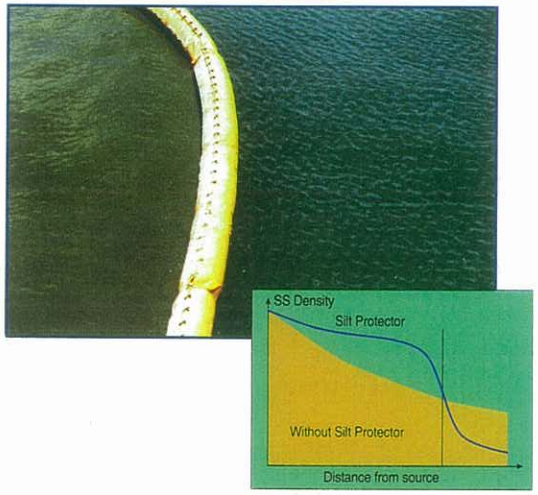


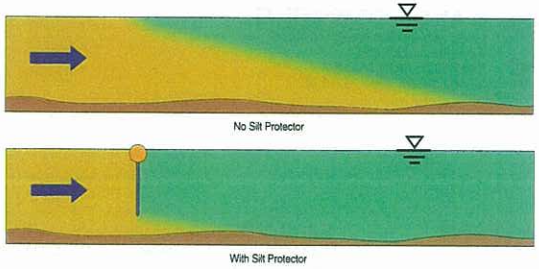


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