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.

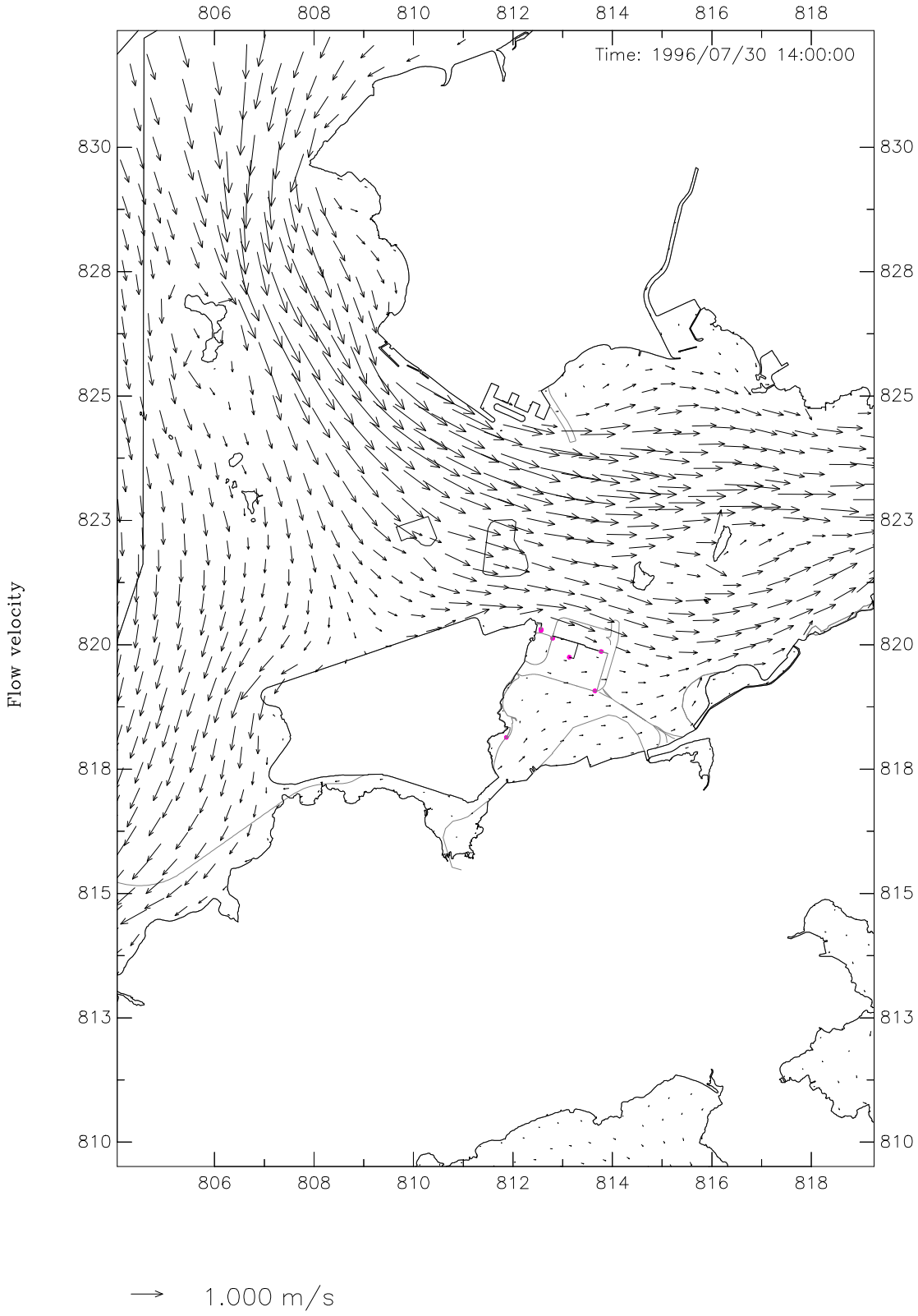
Table D6-1 Summary Table of Loss Reductions from Silt Curtain Configurations

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%	

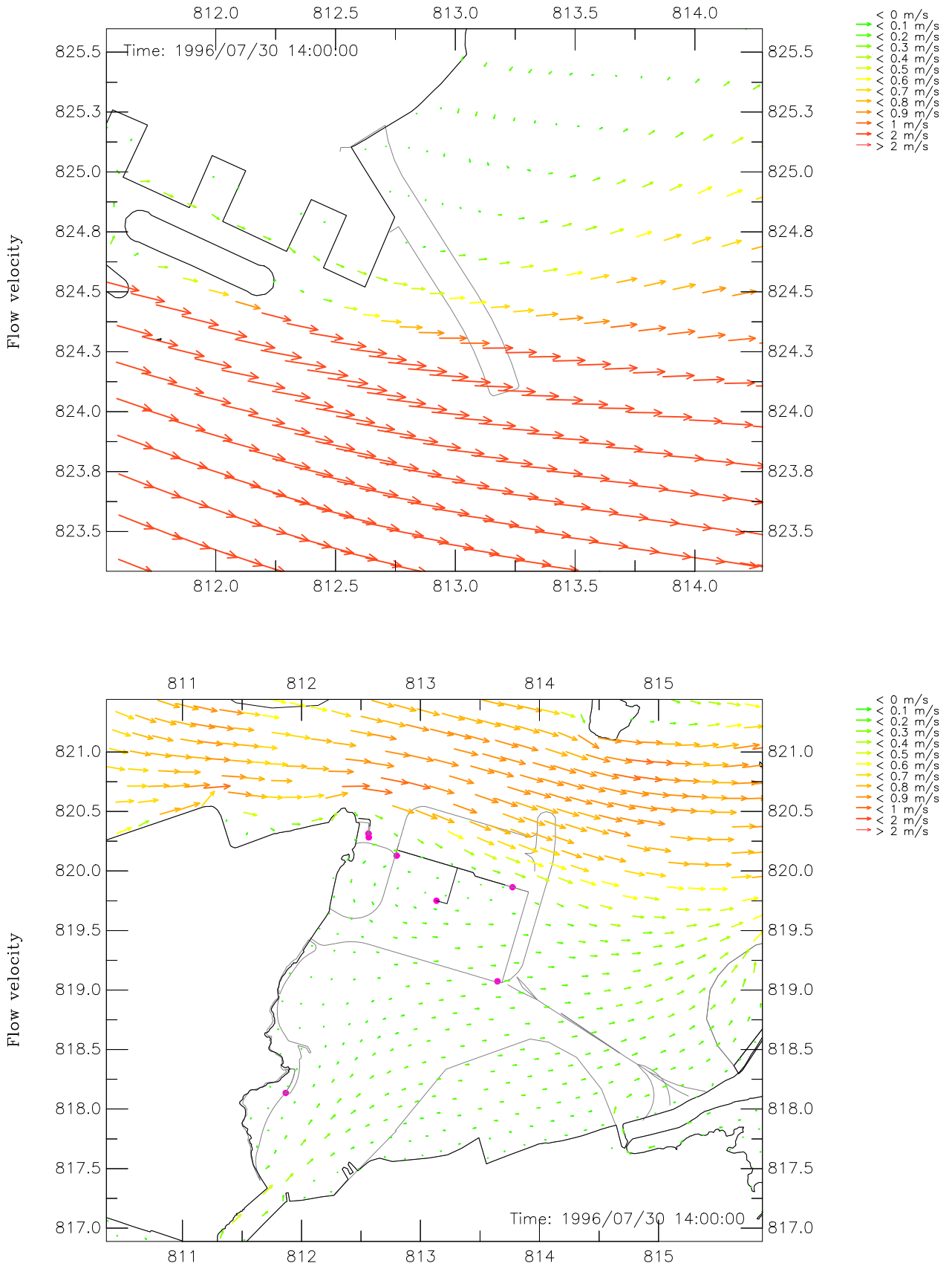
D6-3.2 The calculated reduction in sediment losses for these mitigation options are summarised in **Table D6-2** below.

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		

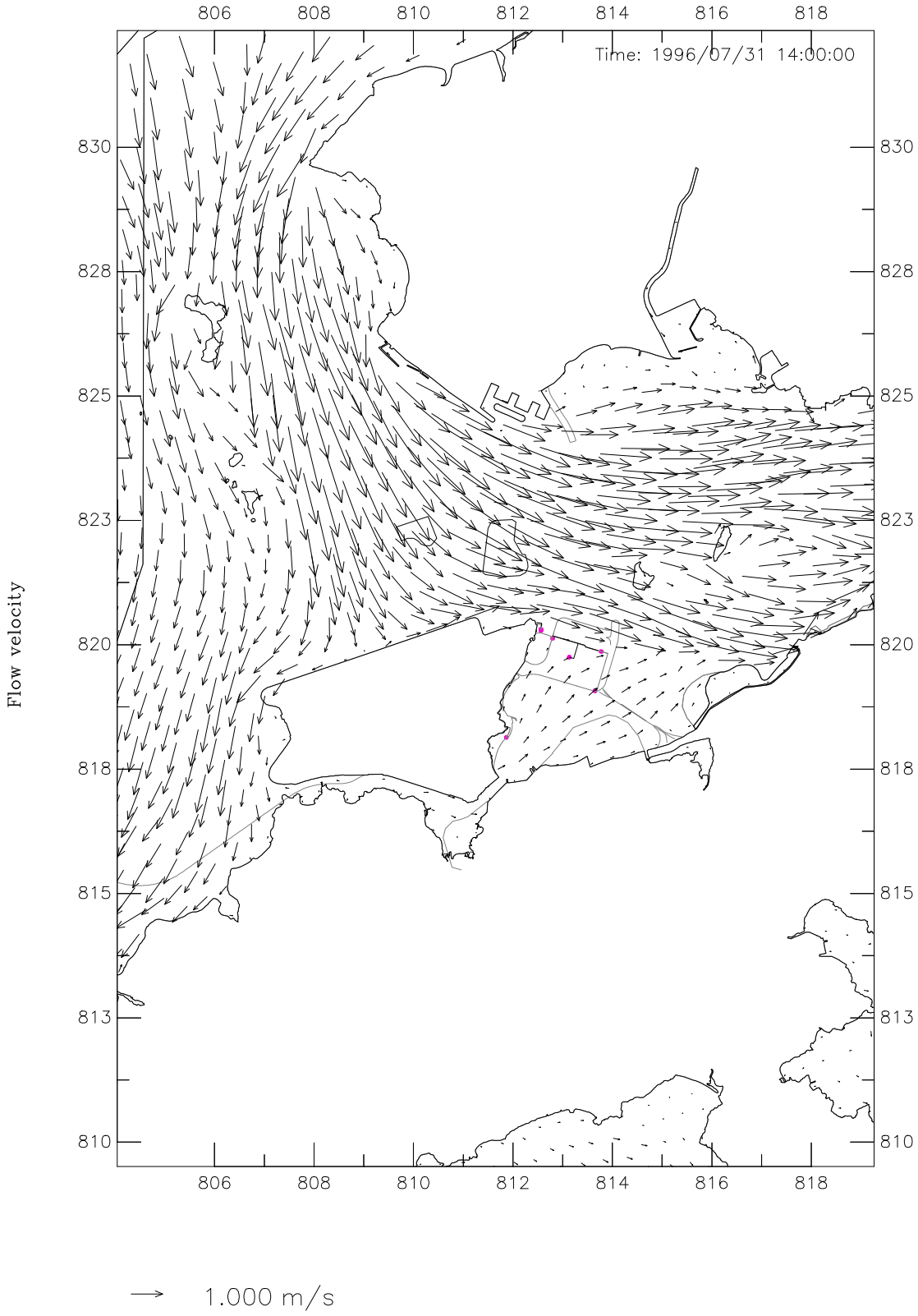


Year 2011
Dry Season Velocity Vector Plot at Ebb Tide – Surface Layer
(Top: Northern Reclamation; Bottom: Southern Reclamation)

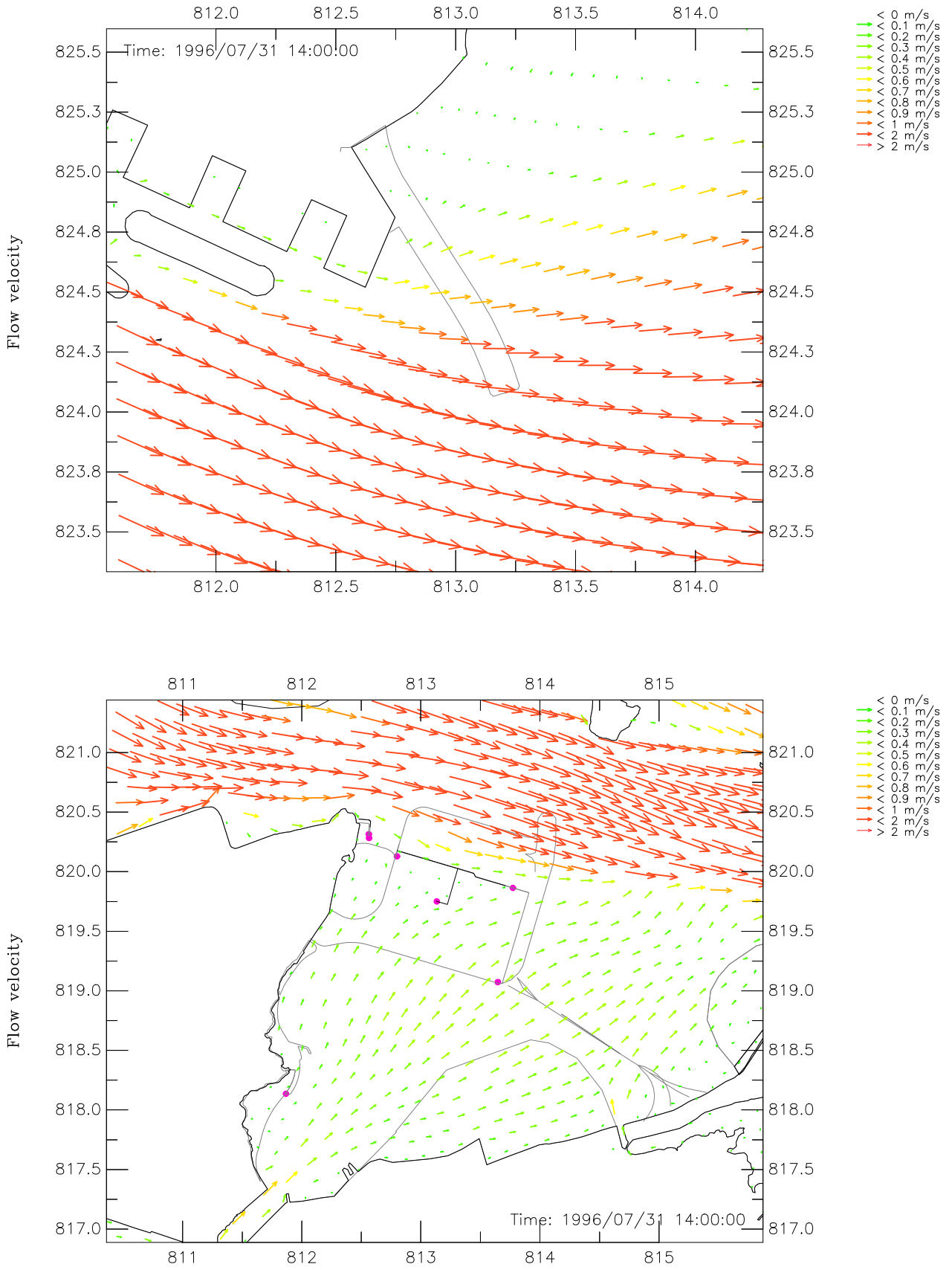
Apr 2009

Figure 014

MAUNSELL | AECOM



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

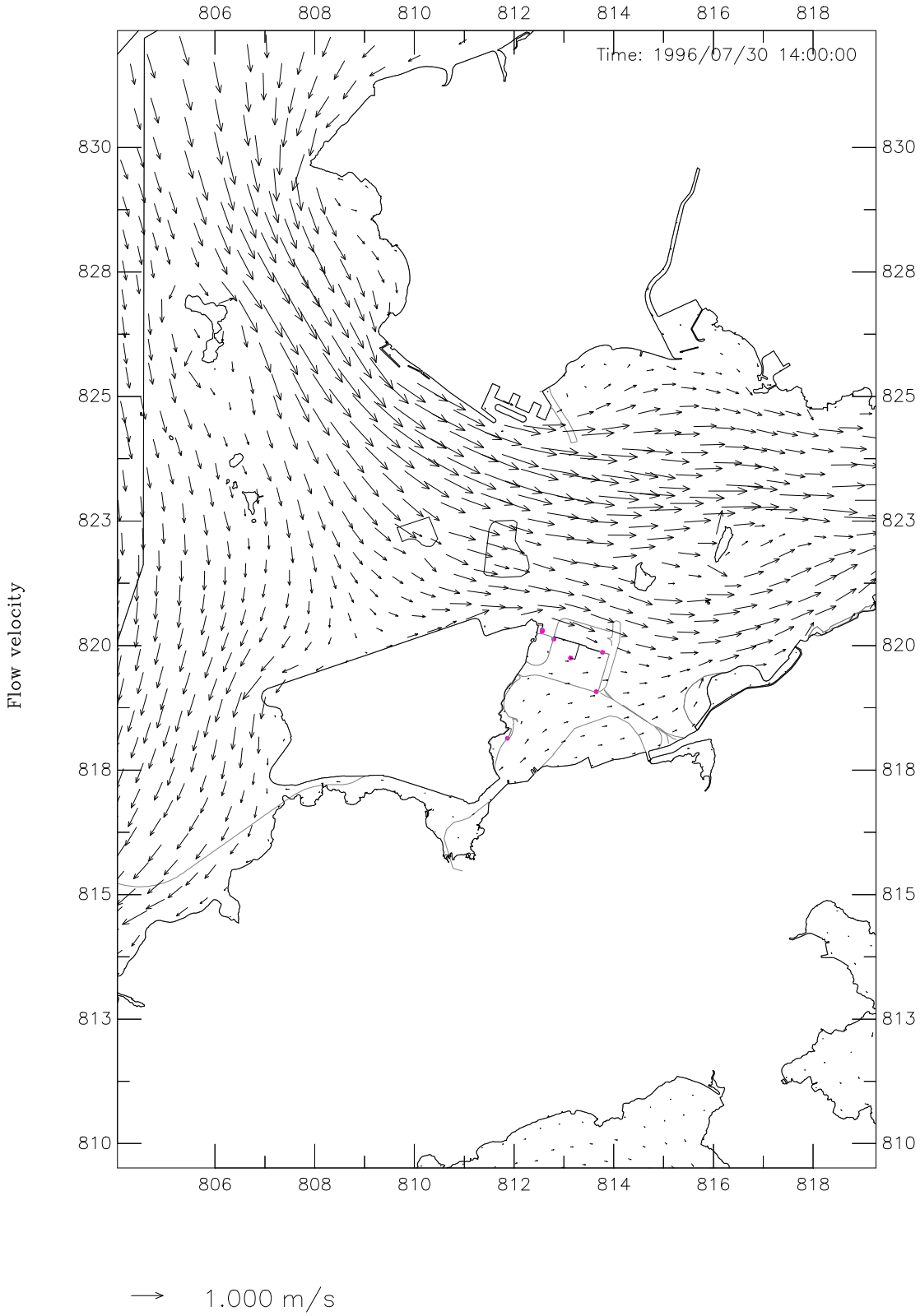


Year 2011
Wet Season Velocity Vector Plot at Ebb Tide – Surface Layer
(Top: Northern Reclamation; Bottom: Southern Reclamation)

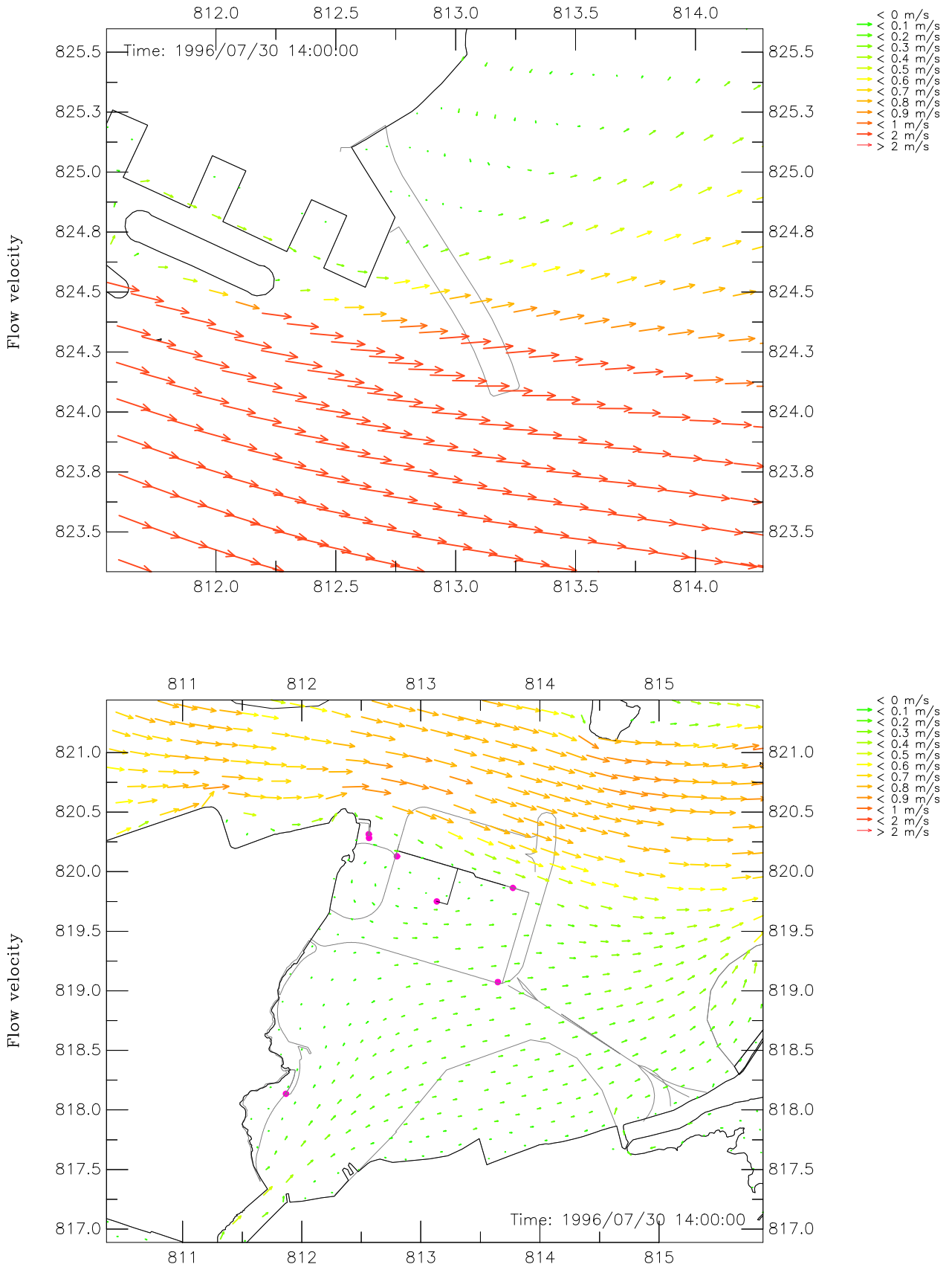
Apr 2009

Figure 016

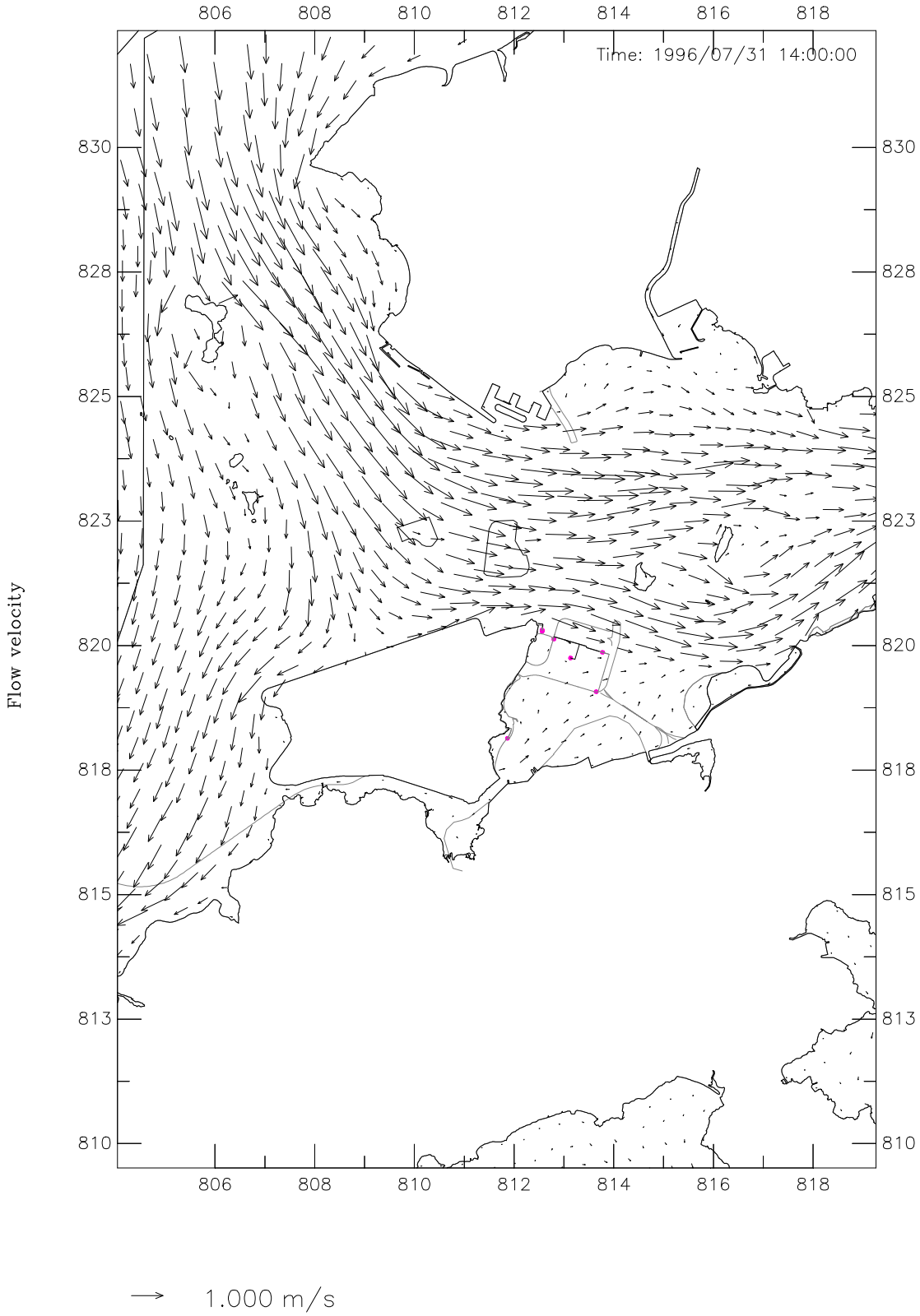
MAUNSELL | AECOM



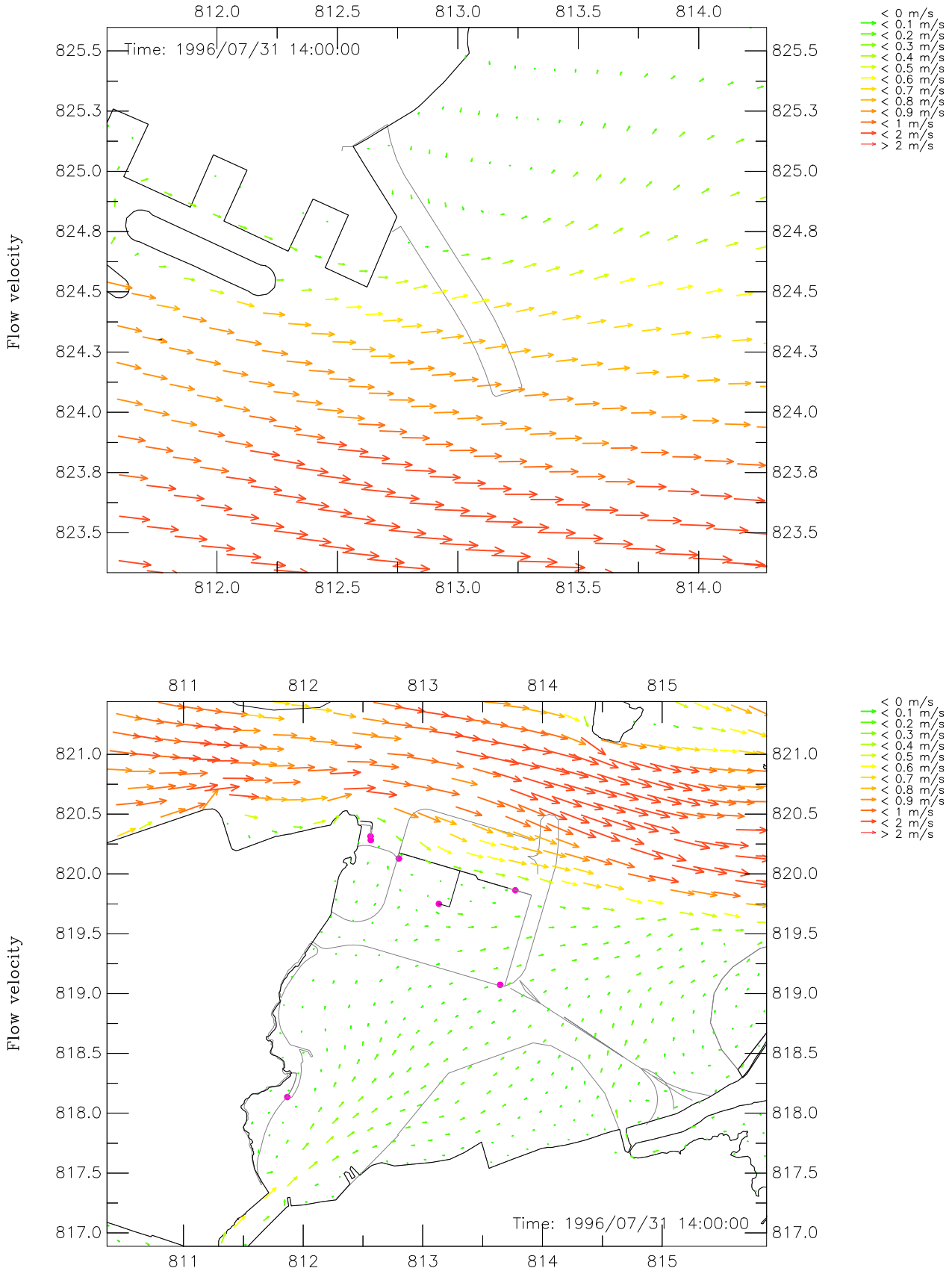
Year 2011 Dry Season Velocity Vector Plot at Ebb Tide – Mid–Depth	Apr 2009	Figure 017
MAUNSELL | AECOM		



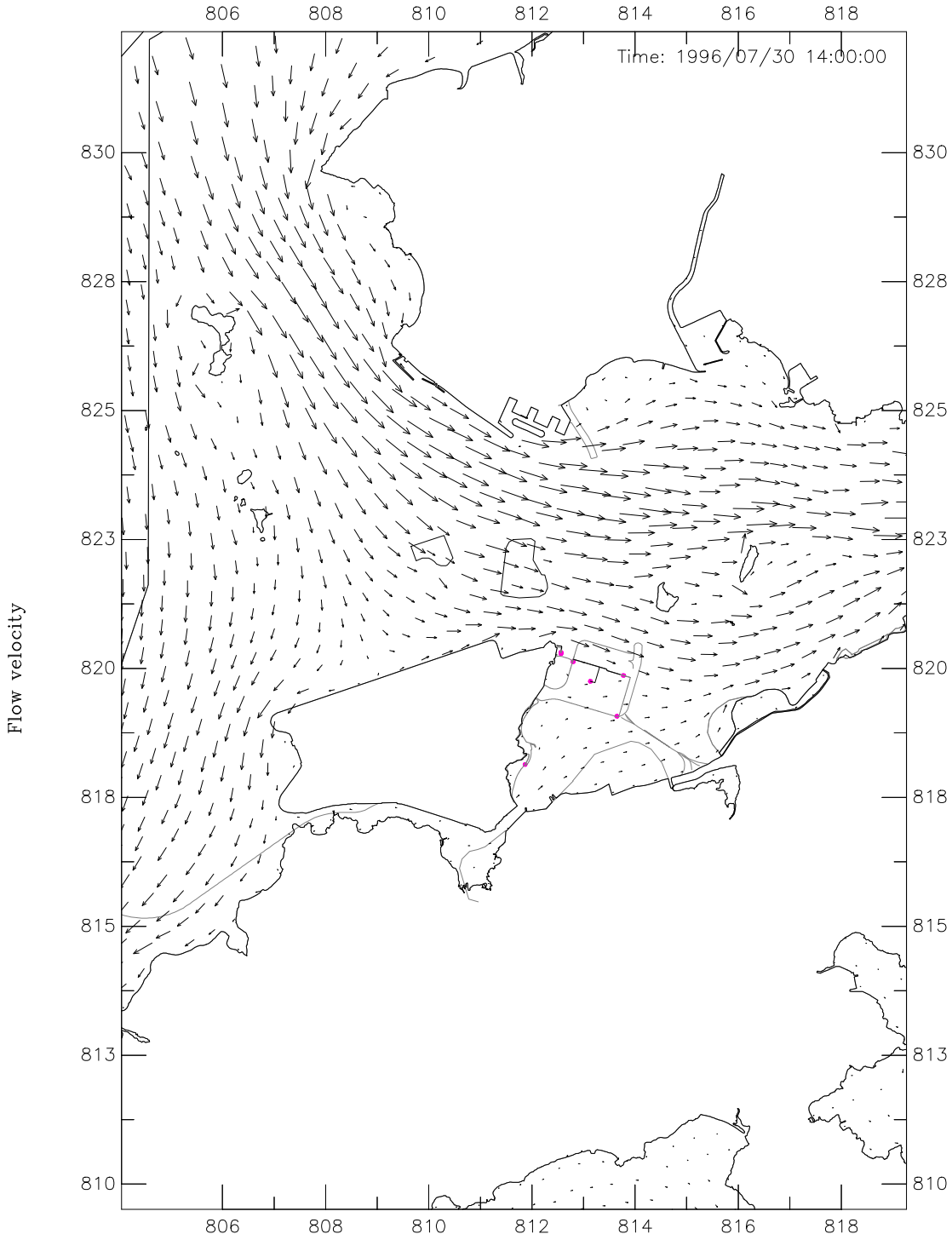
Year 2011 Dry Season Velocity Vector Plot at Ebb Tide – Mid-Depth (Top: Northern Reclamation; Bottom: Southern Reclamation)	Apr 2009	Figure 018
MAUNSELL | AECOM		



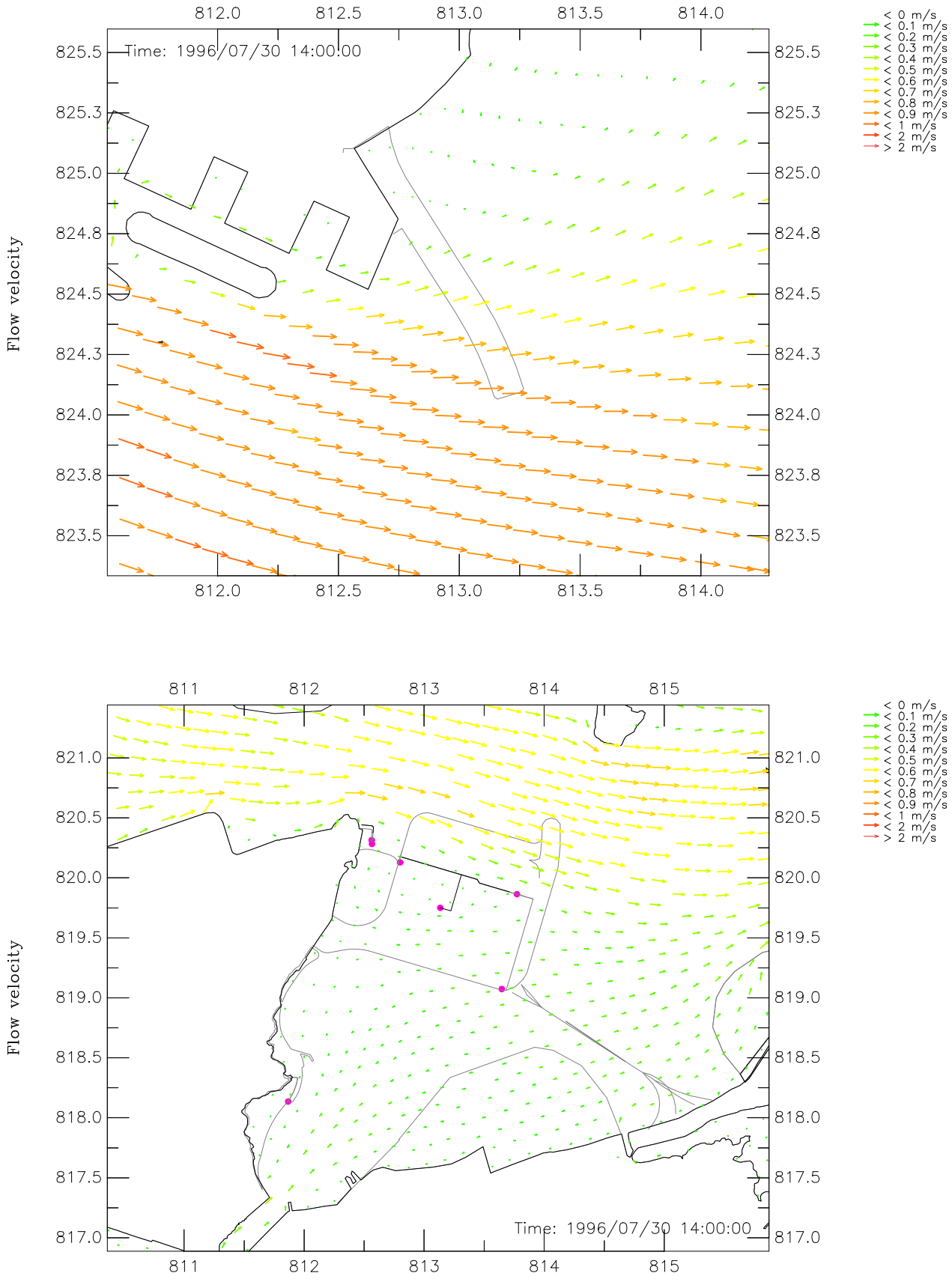
Year 2011 Wet Season Velocity Vector Plot at Ebb Tide – Mid–Depth	Apr 2009	Figure 019
MAUNSELL | AECOM		



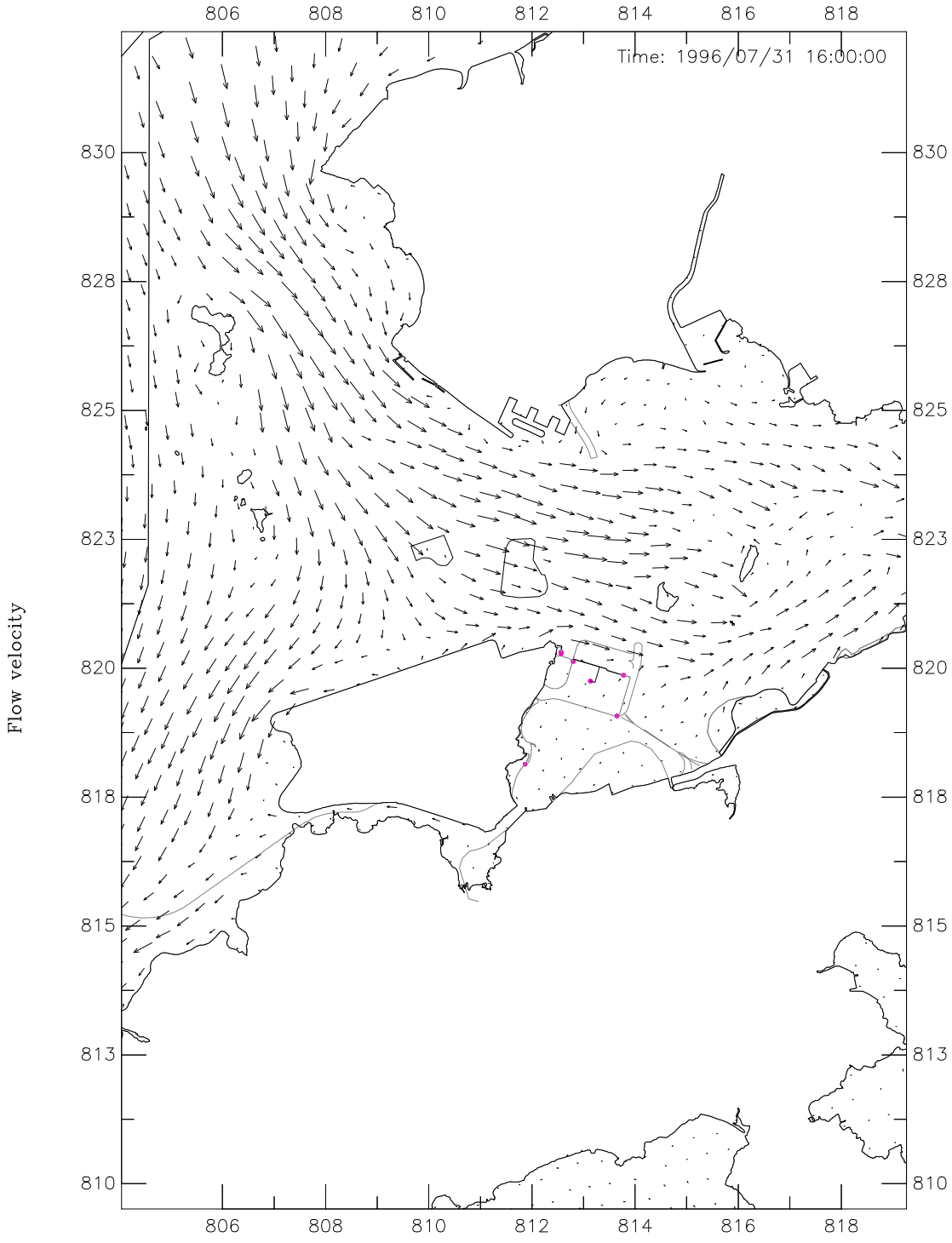
Year 2011 Wet Season Velocity Vector Plot at Ebb Tide – Mid-Depth (Top: Northern Reclamation; Bottom: Southern Reclamation)	Apr 2009	Figure 020
MAUNSELL | AECOM		



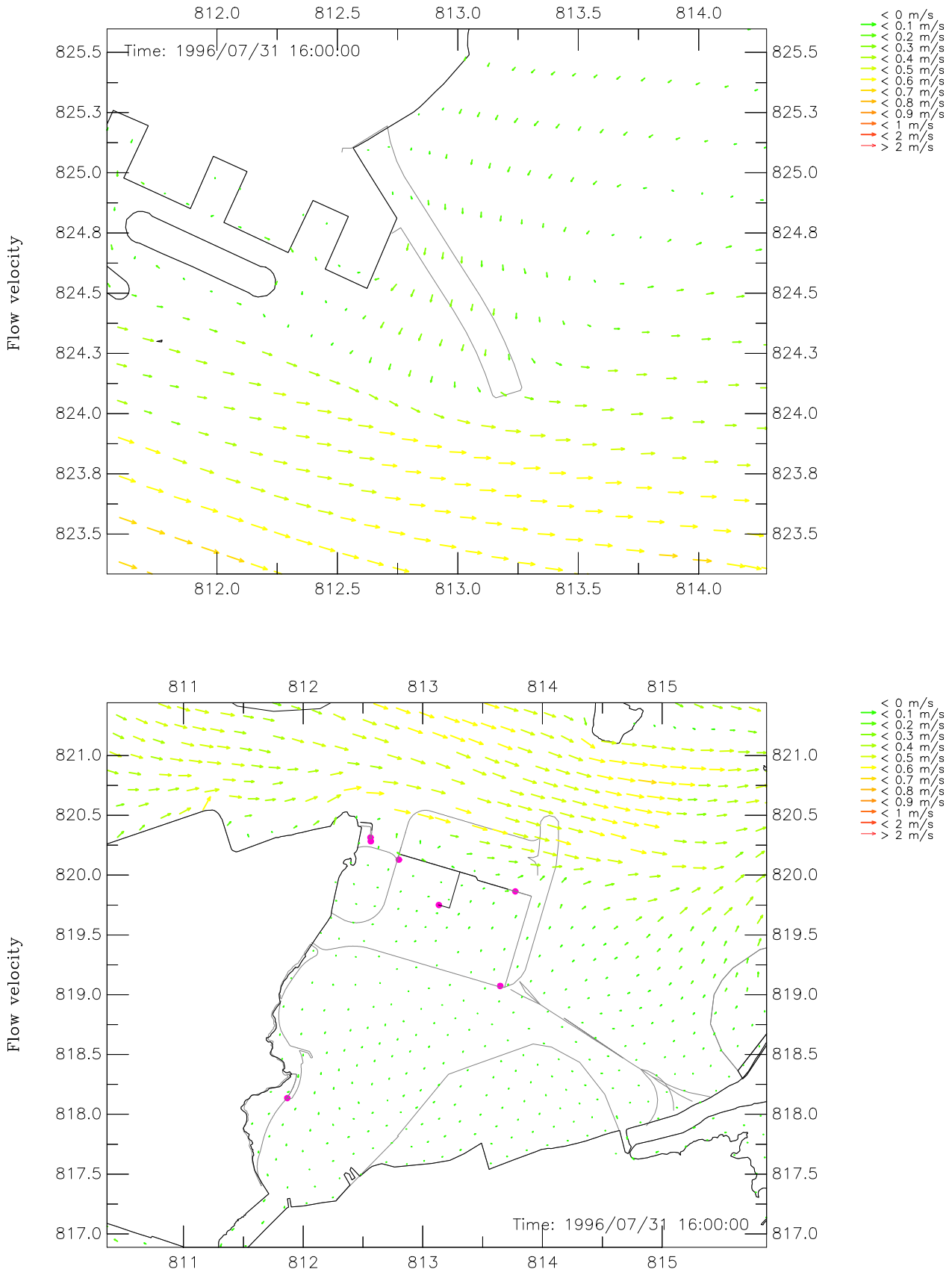
Year 2011 Dry Season Velocity Vector Plot at Ebb Tide – Bottom Layer	Apr 2009	Figure 021
MAUNSELL | AECOM		



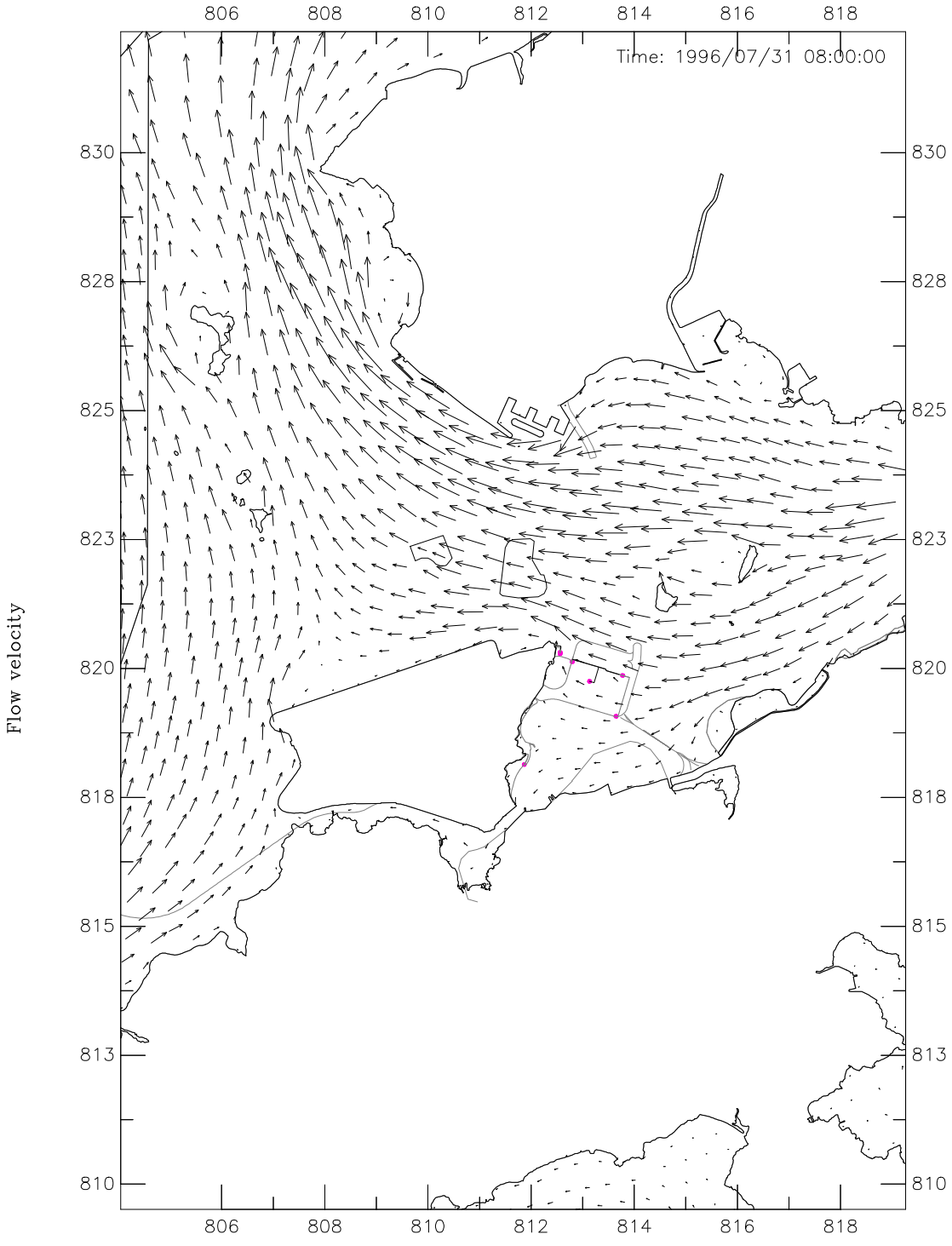
Year 2011 Dry Season Velocity Vector Plot at Ebb Tide – Bottom Layer (Top: Northern Reclamation; Bottom: Southern Reclamation)	Apr 2009	Figure 022
MAUNSELL | AECOM		



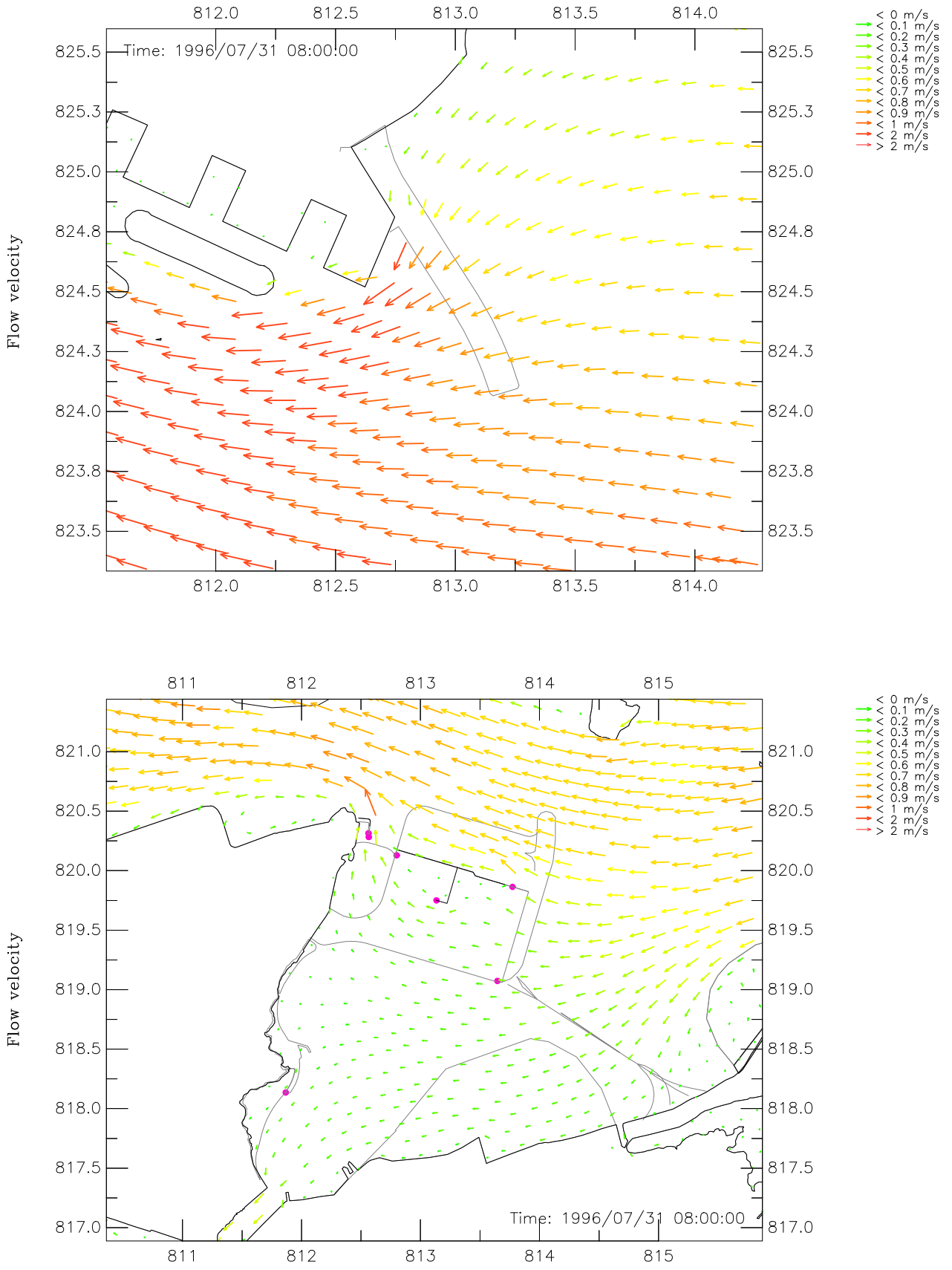
Year 2011 Wet Season Velocity Vector Plot at Ebb Tide – Bottom Layer	Apr 2009	Figure 023
MAUNSELL | AECOM		



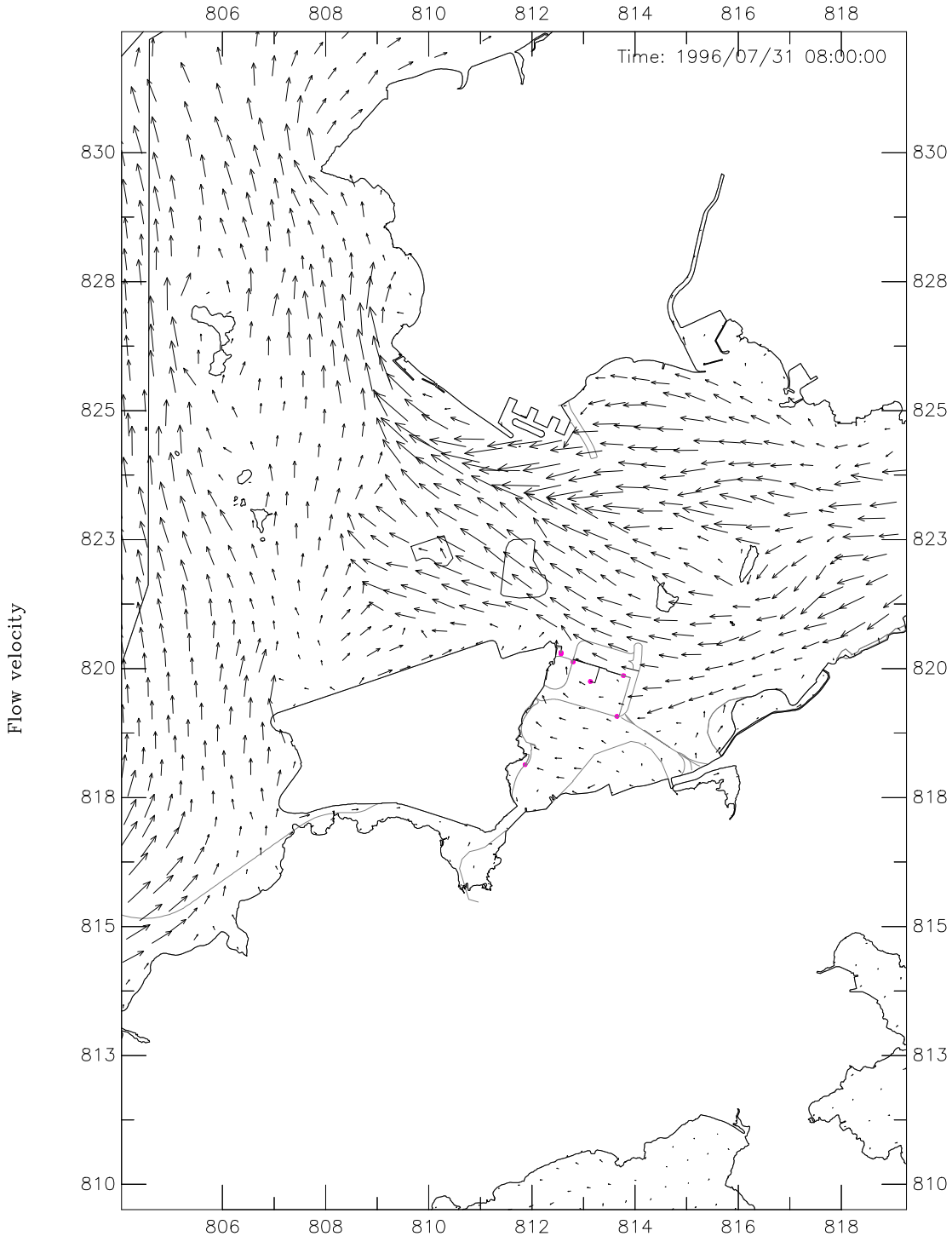
Year 2011 Wet Season Velocity Vector Plot at Ebb Tide – Bottom Layer (Top: Northern Reclamation; Bottom: Southern Reclamation)	Apr 2009	Figure 024
MAUNSELL | AECOM		



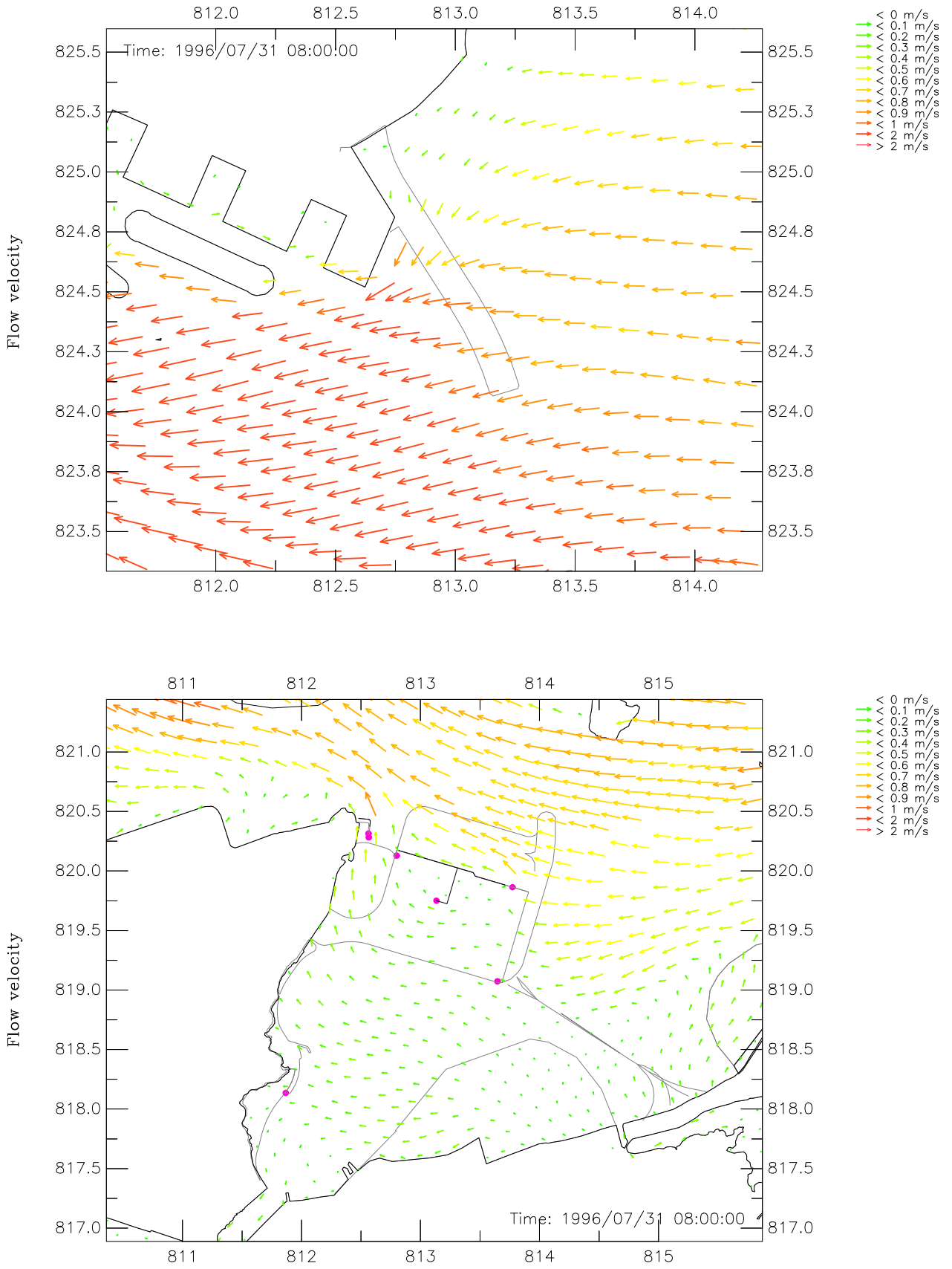
Year 2011 Dry Season Velocity Vector Plot at Flood Tide – Surface Layer	Apr 2009	Figure 025
MAUNSELL | AECOM		



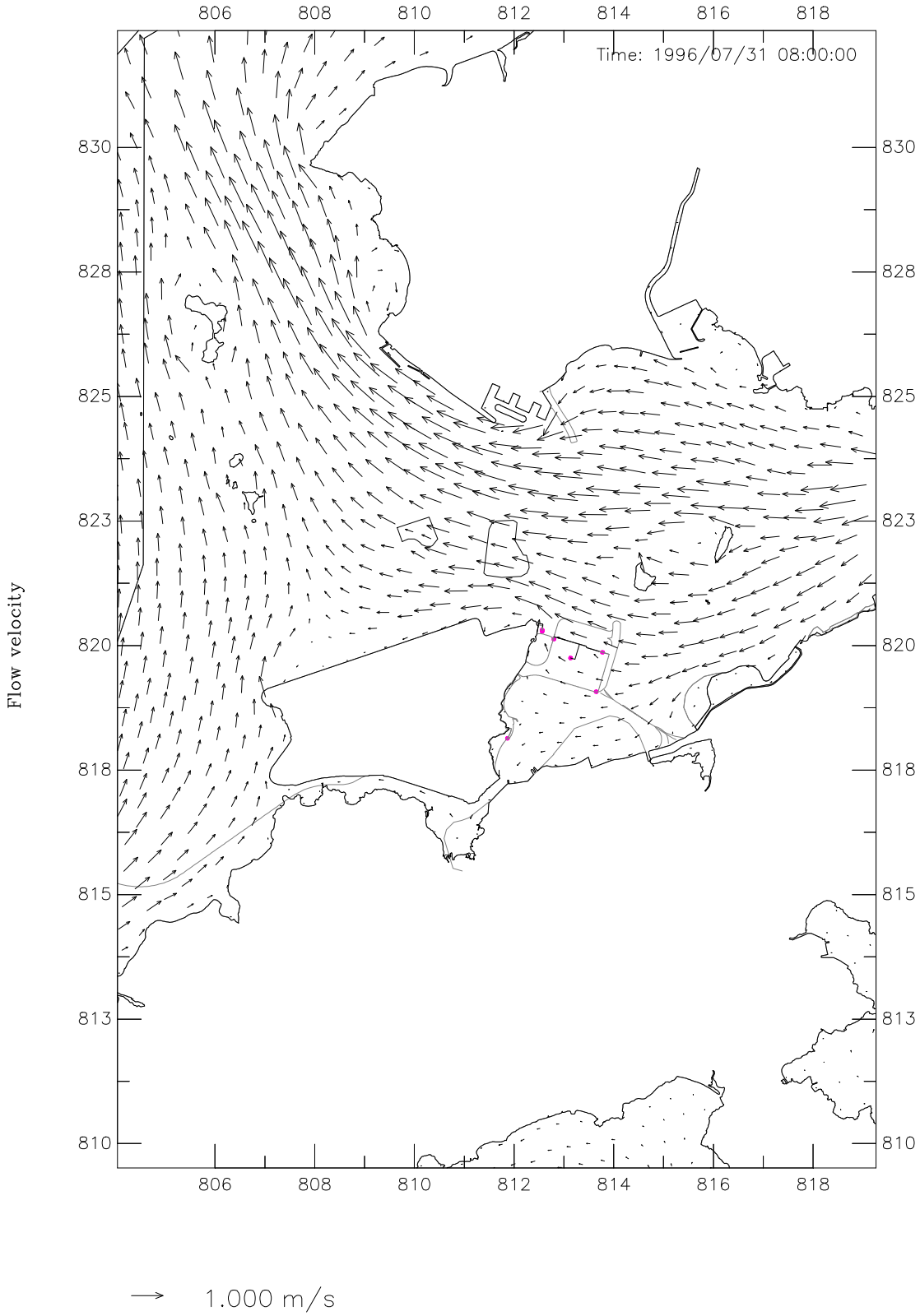
Year 2011 Dry Season Velocity Vector Plot at Flood Tide – Surface Layer (Top: Northern Reclamation; Bottom: Southern Reclamation)	Apr 2009	Figure 026
MAUNSELL | AECOM		



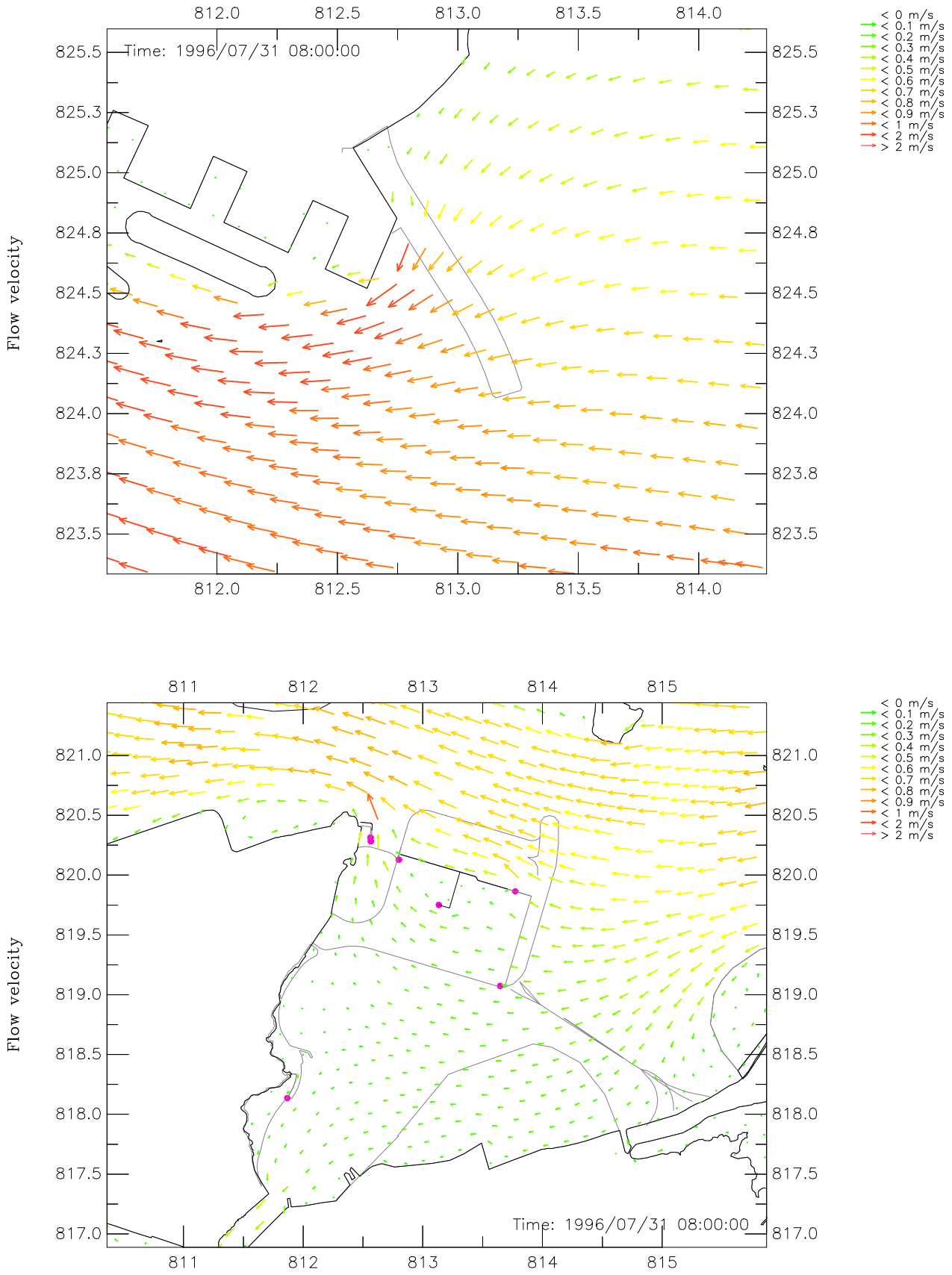
Year 2011 Wet Season Velocity Vector Plot at Flood Tide – Surface Layer	Apr 2009	Figure 027
MAUNSELL | AECOM		



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



Year 2011 Dry Season Velocity Vector Plot at Flood Tide – Mid-Depth	Apr 2009	Figure 029
MAUNSELL | AECOM		

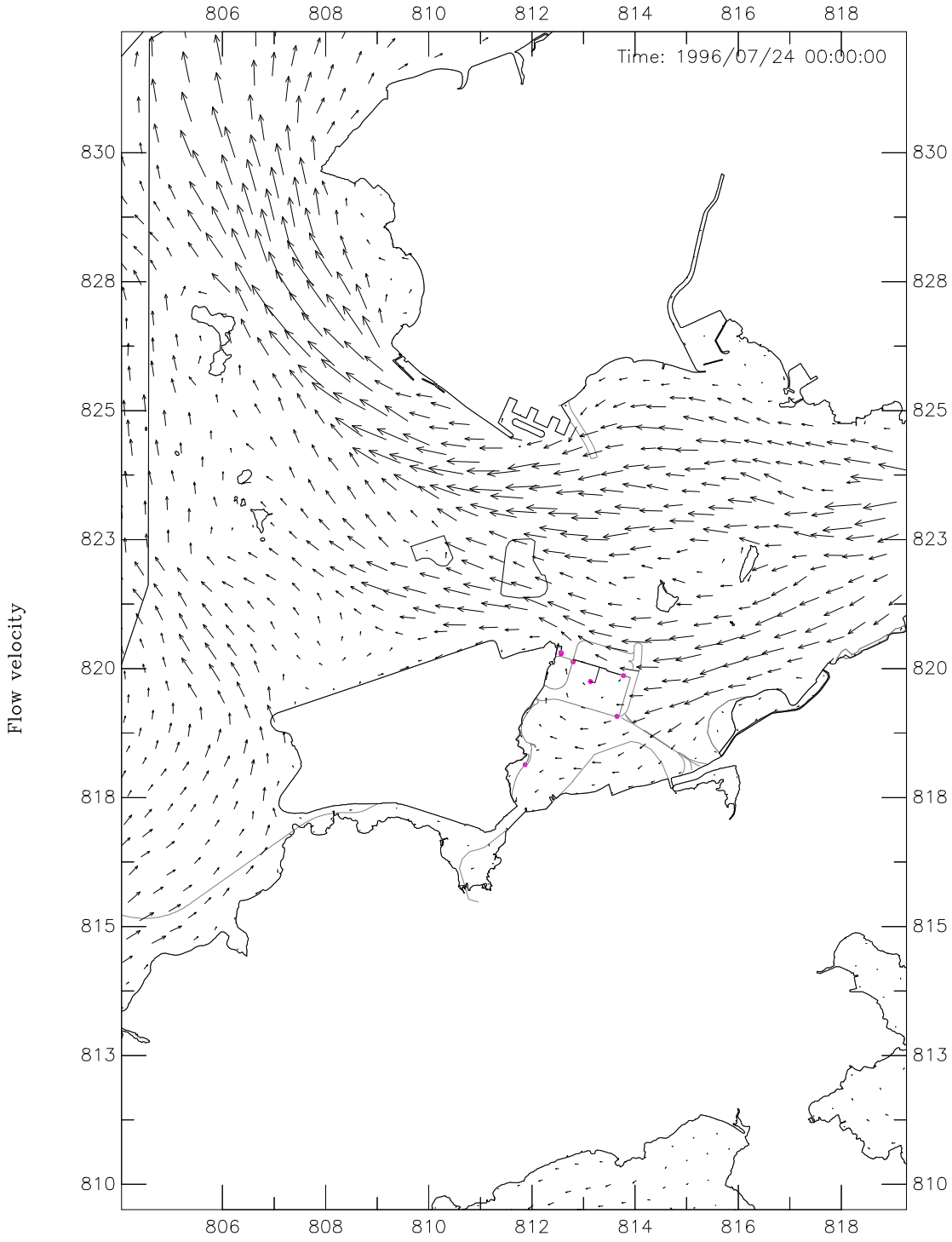


Year 2011
Dry Season Velocity Vector Plot at Flood Tide – Mid-Depth
(Top: Northern Reclamation; Bottom: Southern Reclamation)

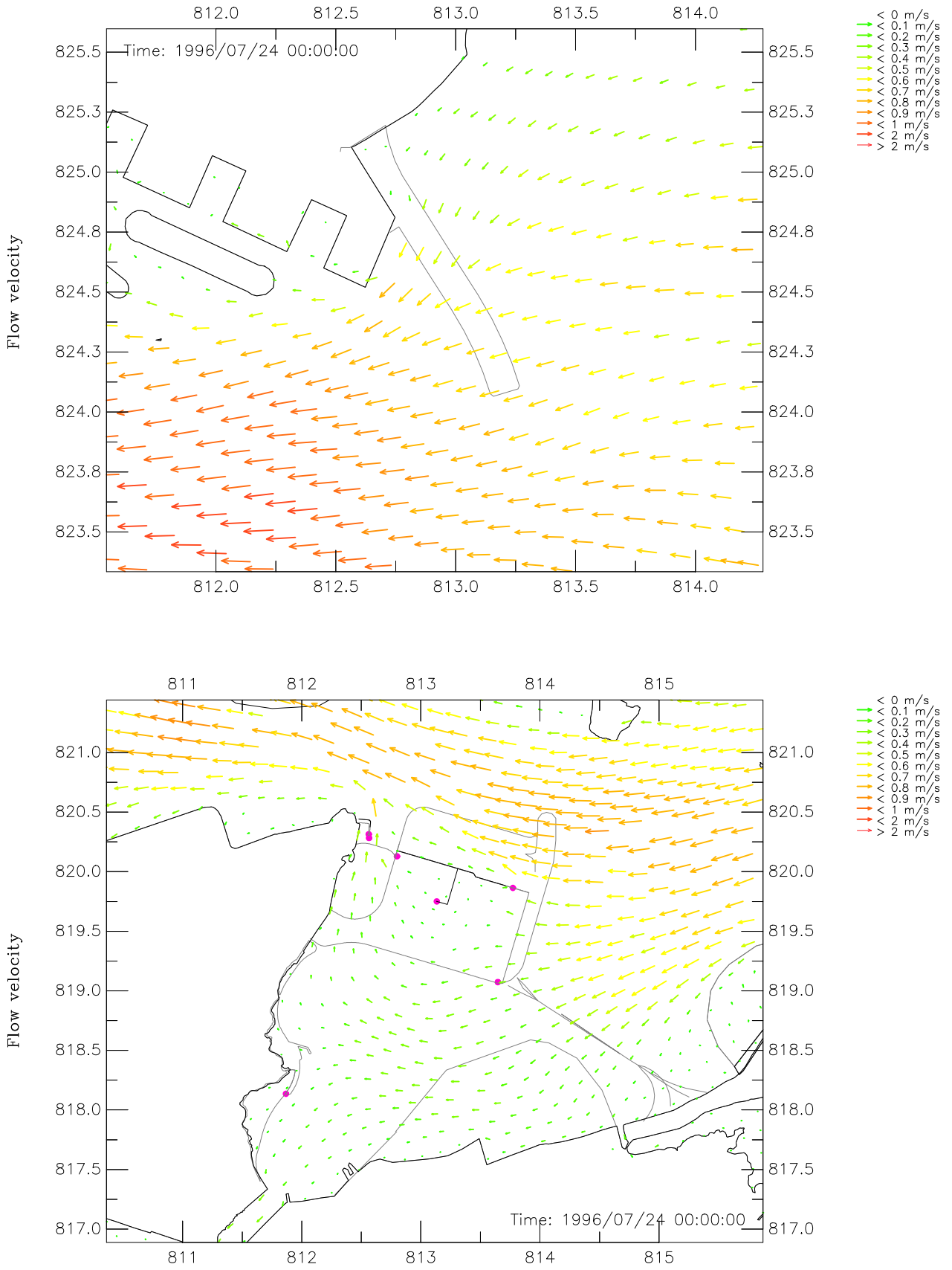
Apr 2009

Figure 030

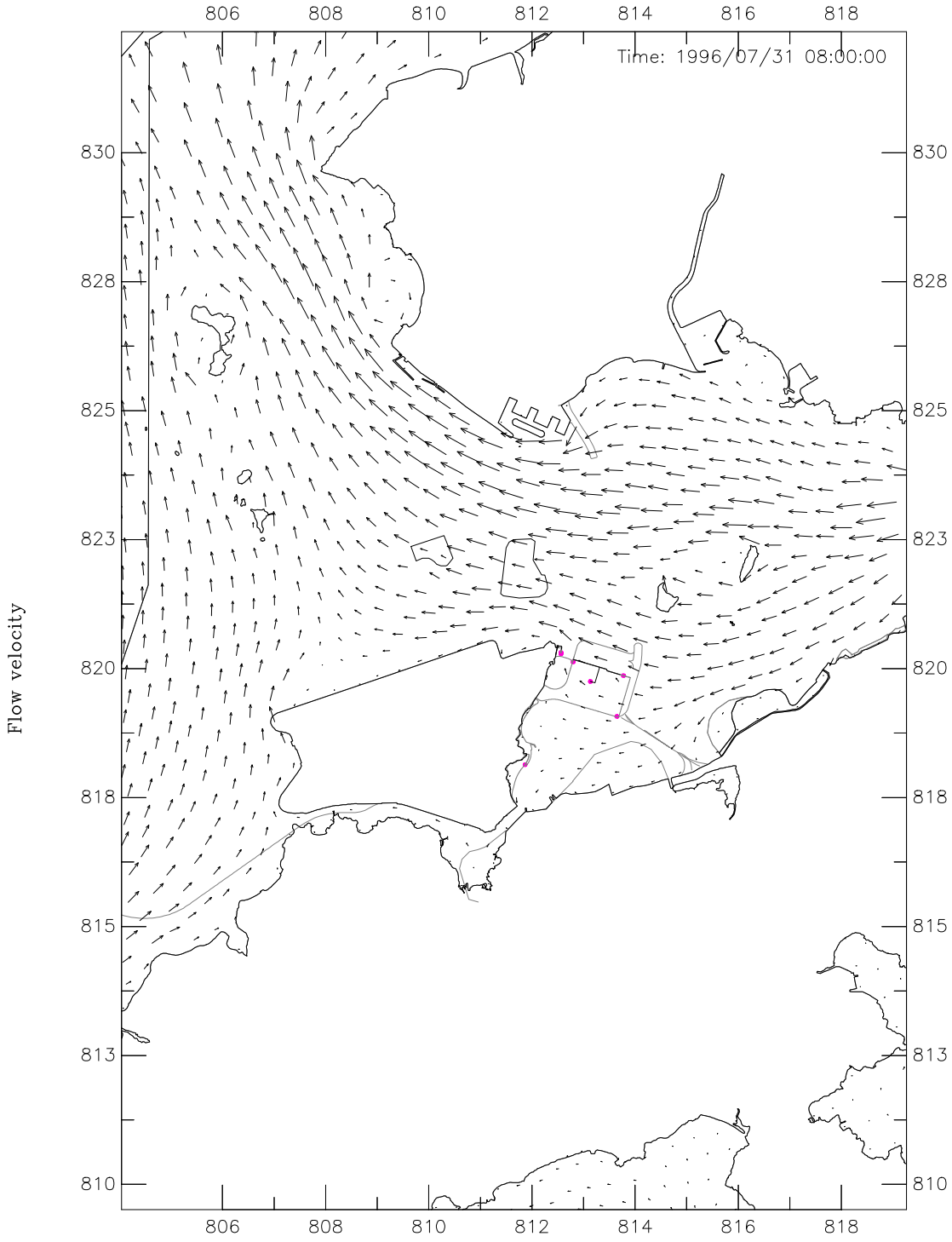
MAUNSELL | AECOM



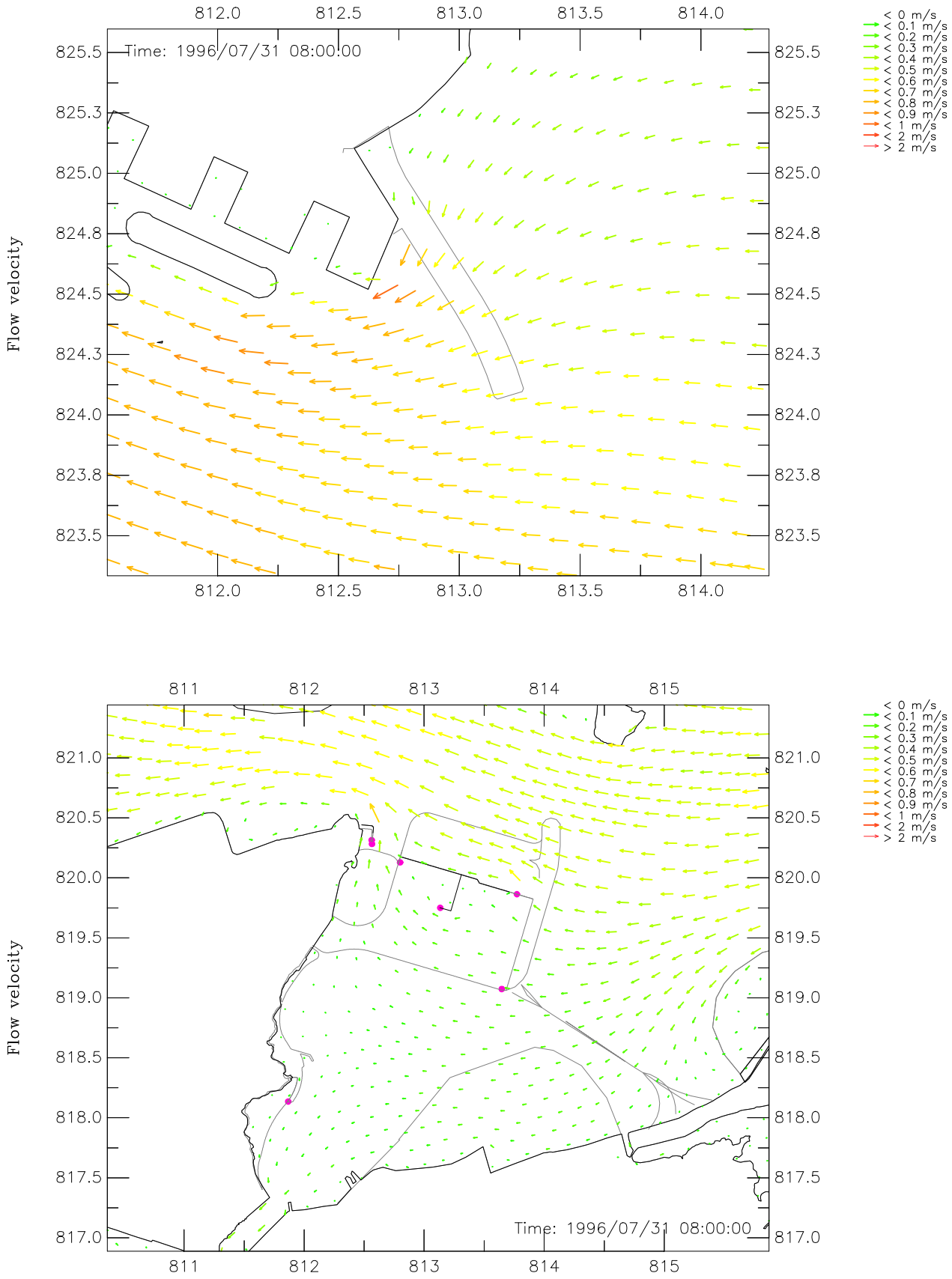
Year 2011 Wet Season Velocity Vector Plot at Flood Tide – Mid-Depth	Apr 2009	Figure 031
MAUNSELL | AECOM		



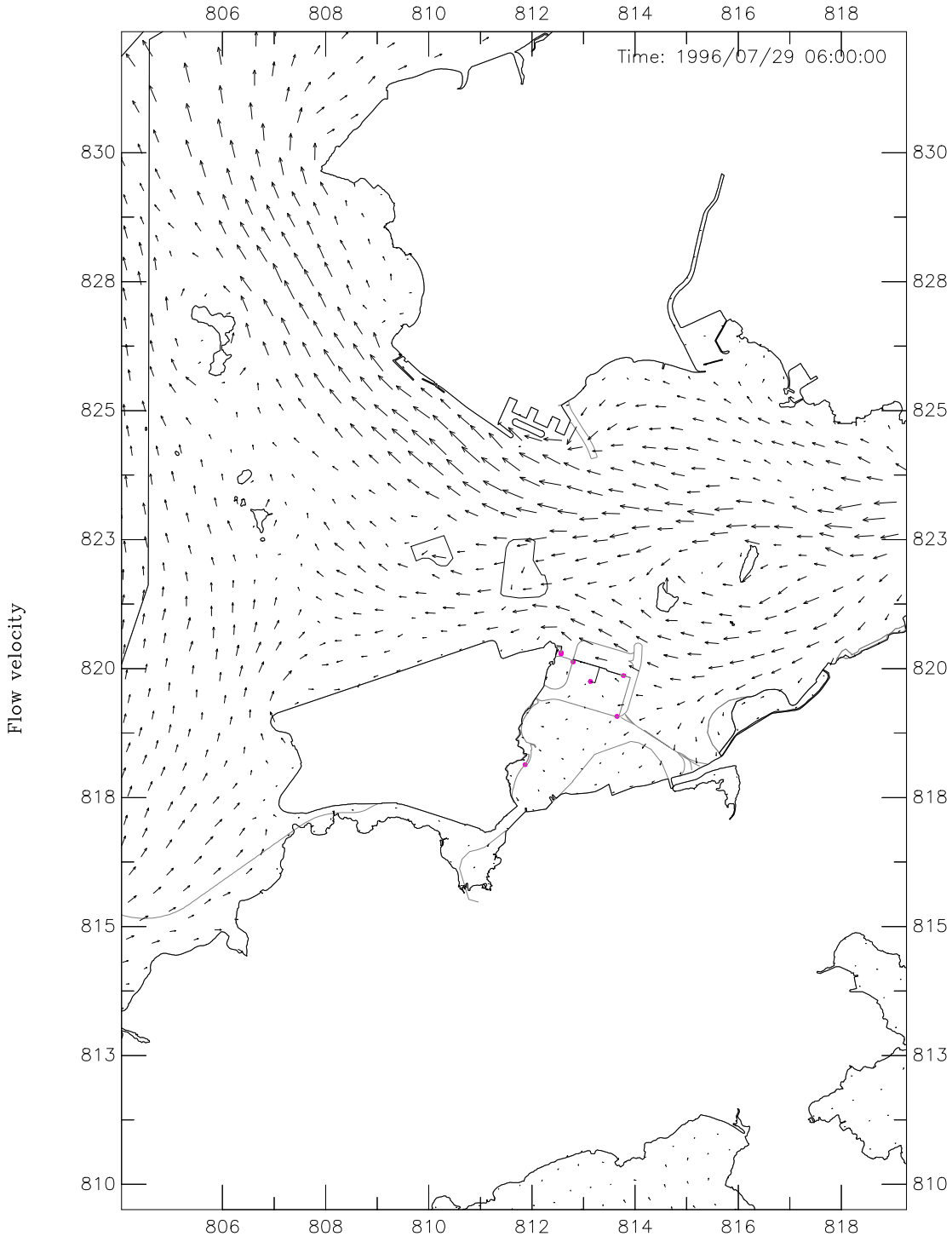
Year 2011 Wet Season Velocity Vector Plot at Flood Tide – Mid-Depth (Top: Northern Reclamation; Bottom: Southern Reclamation)	Apr 2009	Figure 032
MAUNSELL | AECOM		



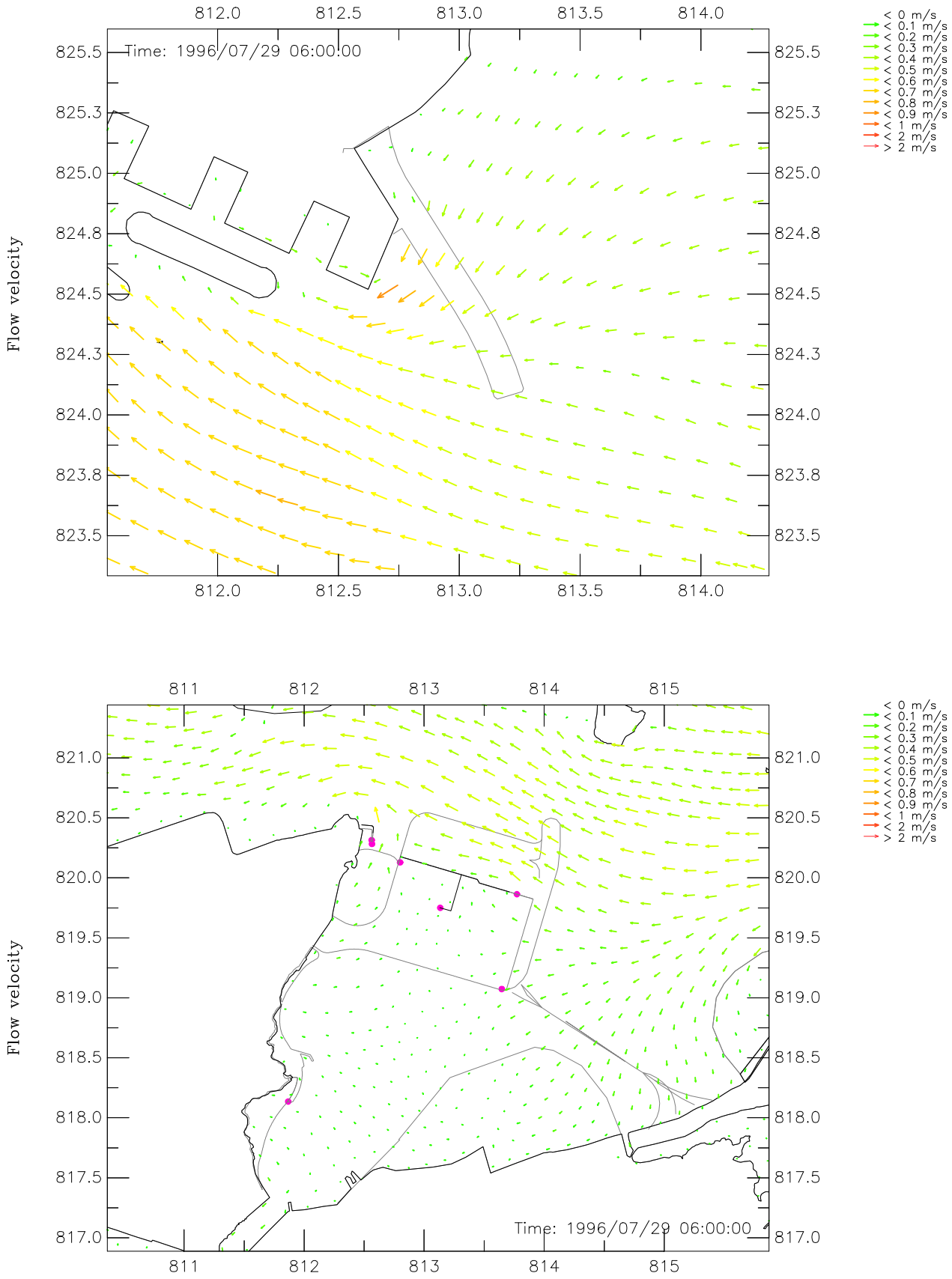
Year 2011 Dry Season Velocity Vector Plot at Flood Tide – Bottom Layer	Apr 2009	Figure 033
MAUNSELL | AECOM		



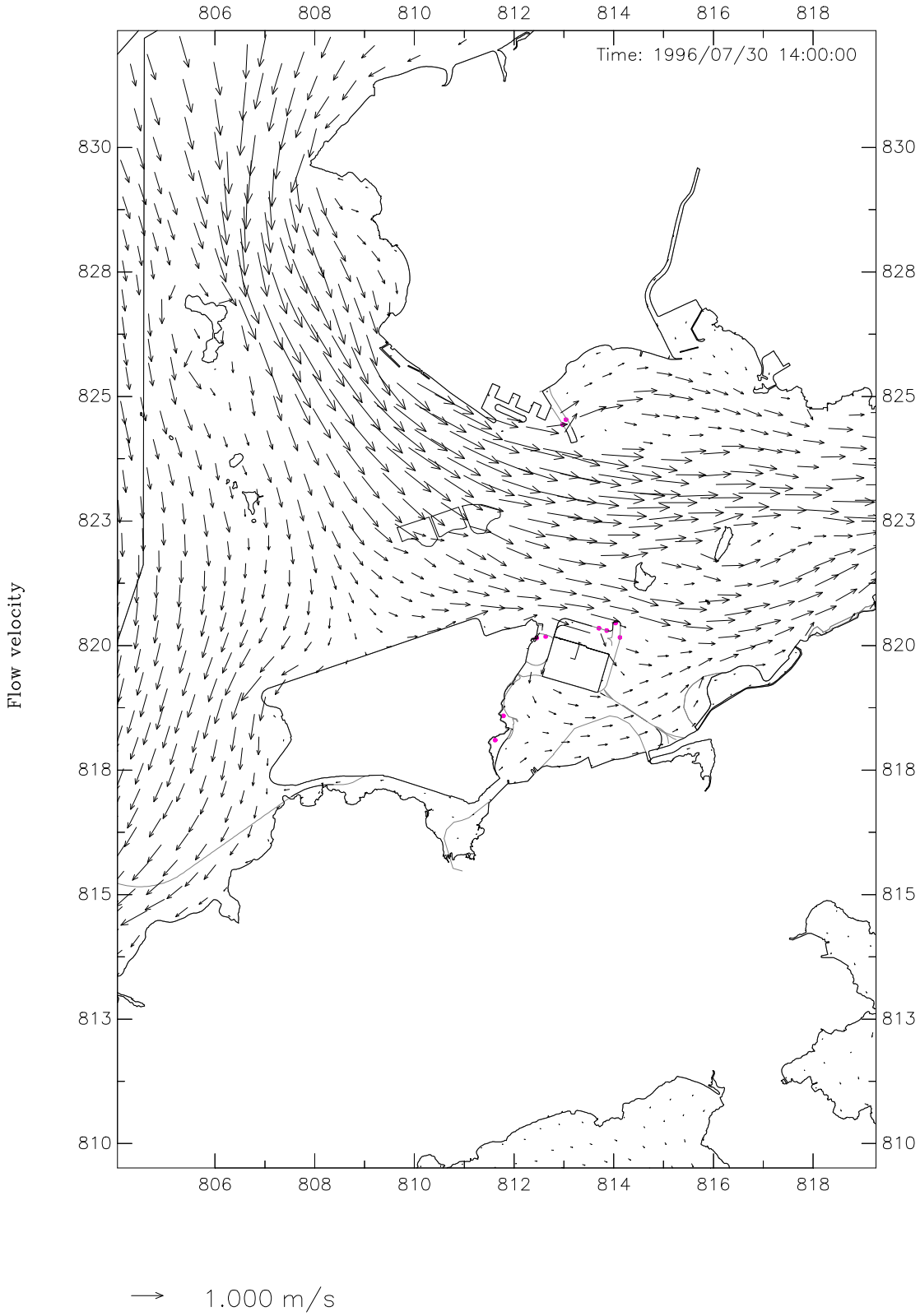
Year 2011 Dry Season Velocity Vector Plot at Flood Tide – Bottom Layer (Top: Northern Reclamation; Bottom: Southern Reclamation)	Apr 2009	Figure 034
MAUNSELL | AECOM		



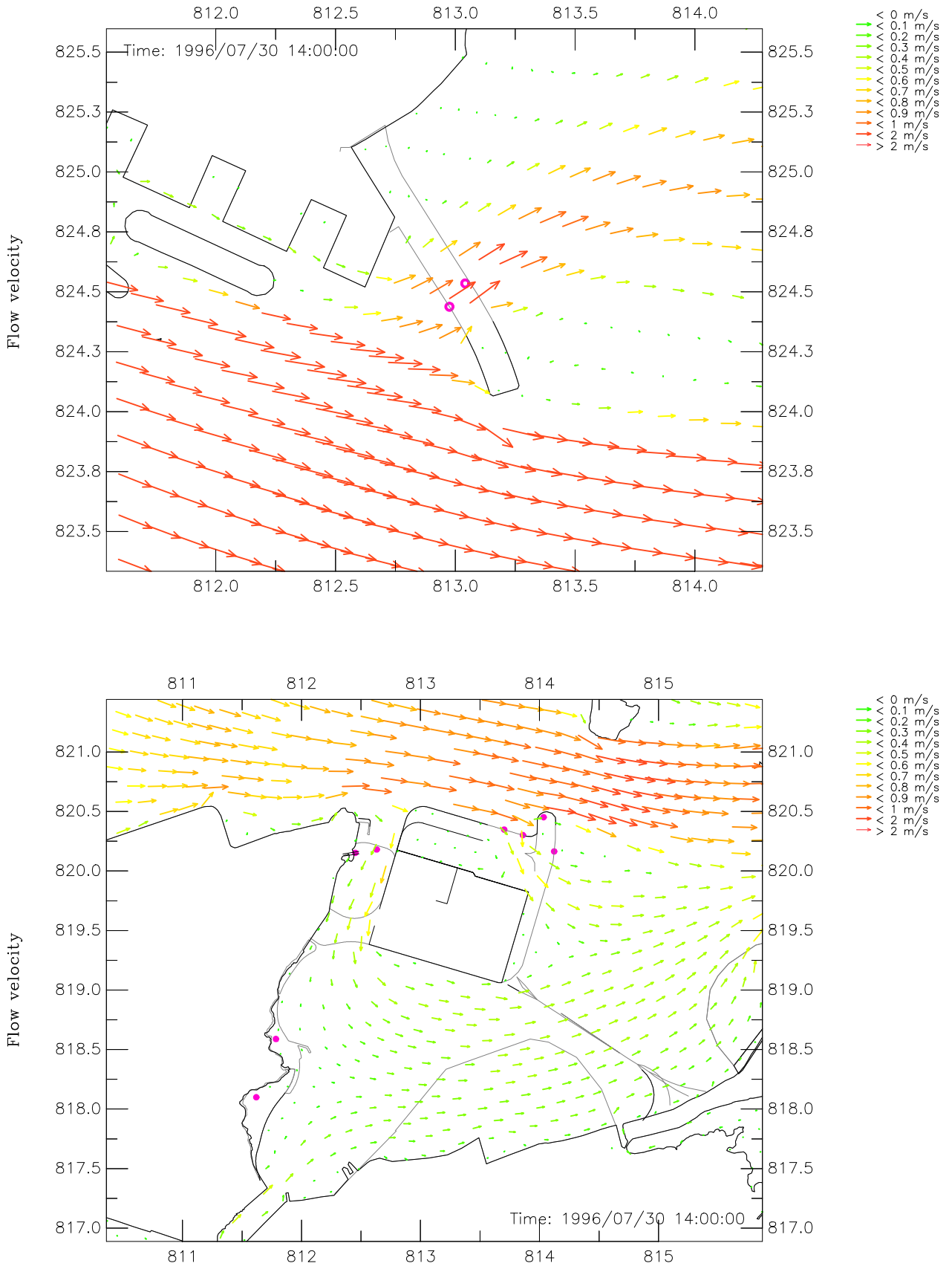
Year 2011 Wet Season Velocity Vector Plot at Flood Tide – Bottom Layer	Apr 2009	Figure 035
MAUNSELL | AECOM		



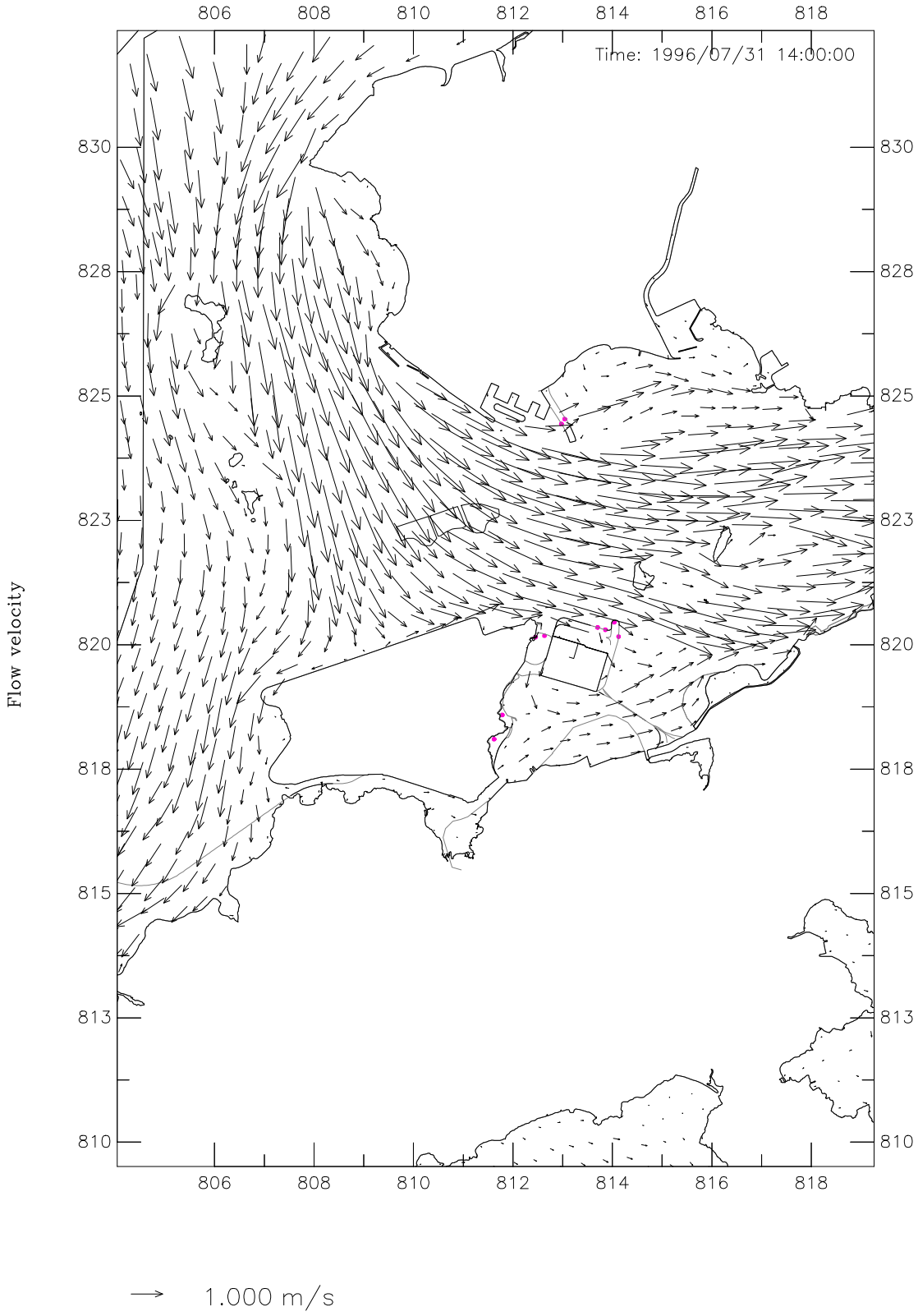
Year 2011 Wet Season Velocity Vector Plot at Flood Tide – Bottom Layer (Top: Northern Reclamation; Bottom: Southern Reclamation)	Apr 2009	Figure 036
MAUNSELL | AECOM		



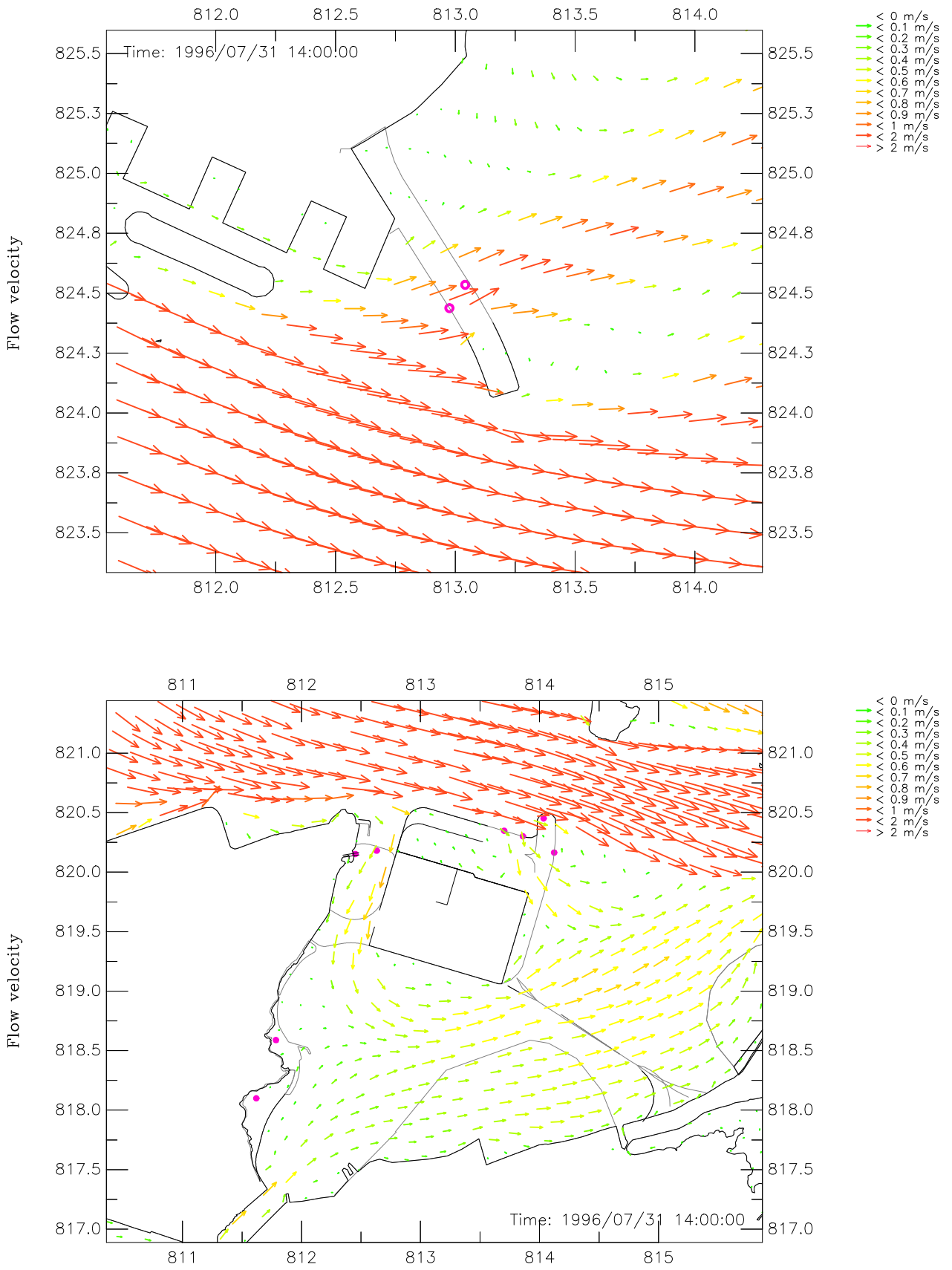
Year 2012 Dry Season Velocity Vector Plot at Ebb Tide – Surface Layer	Apr 2009	Figure 013
MAUNSELL | AECOM		



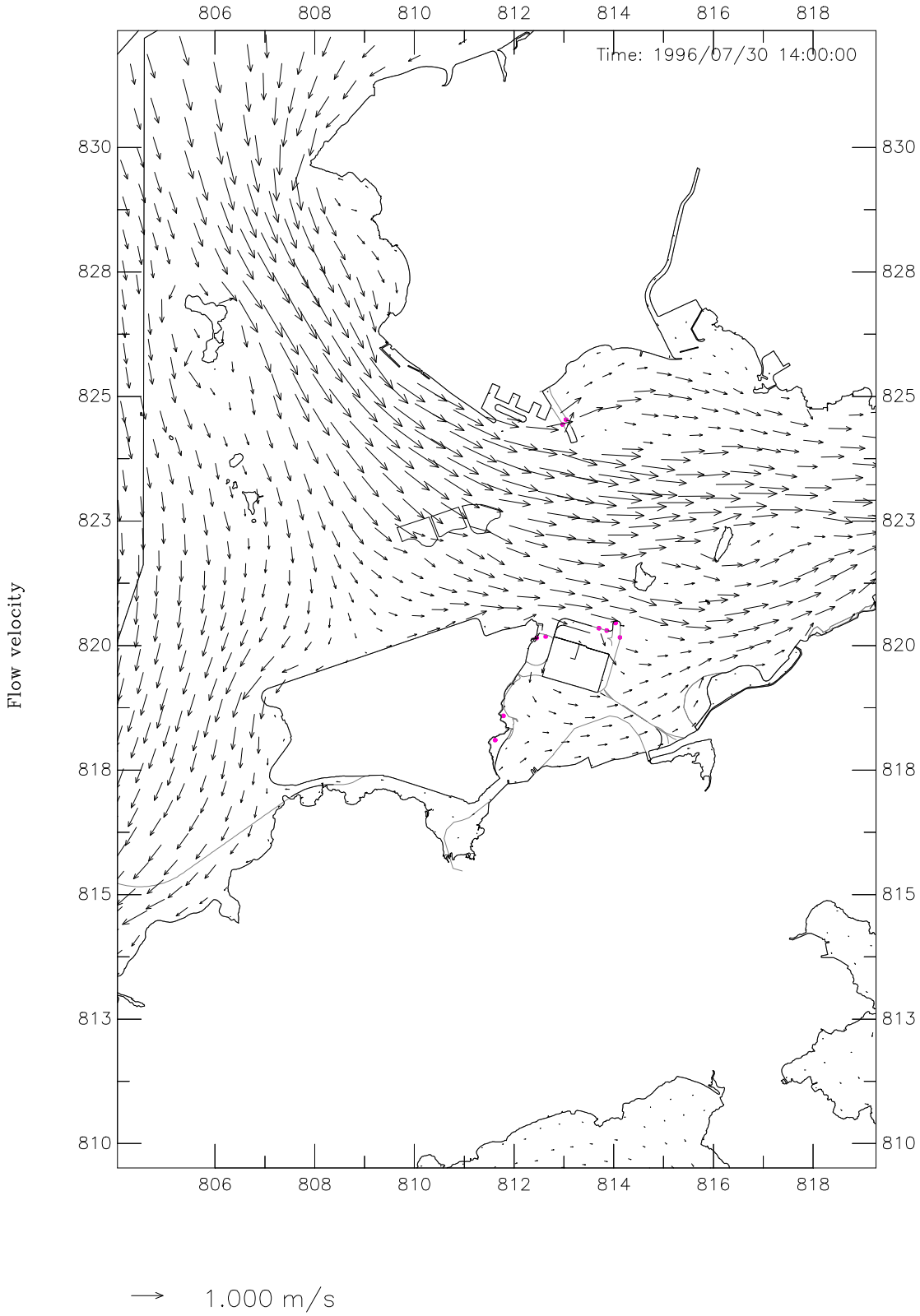
Year 2012 Dry Season Velocity Vector Plot at Ebb Tide – Surface Layer (Top: Northern Reclamation; Bottom: Southern Reclamation)	Apr 2009	Figure 014
MAUNSELL | AECOM		



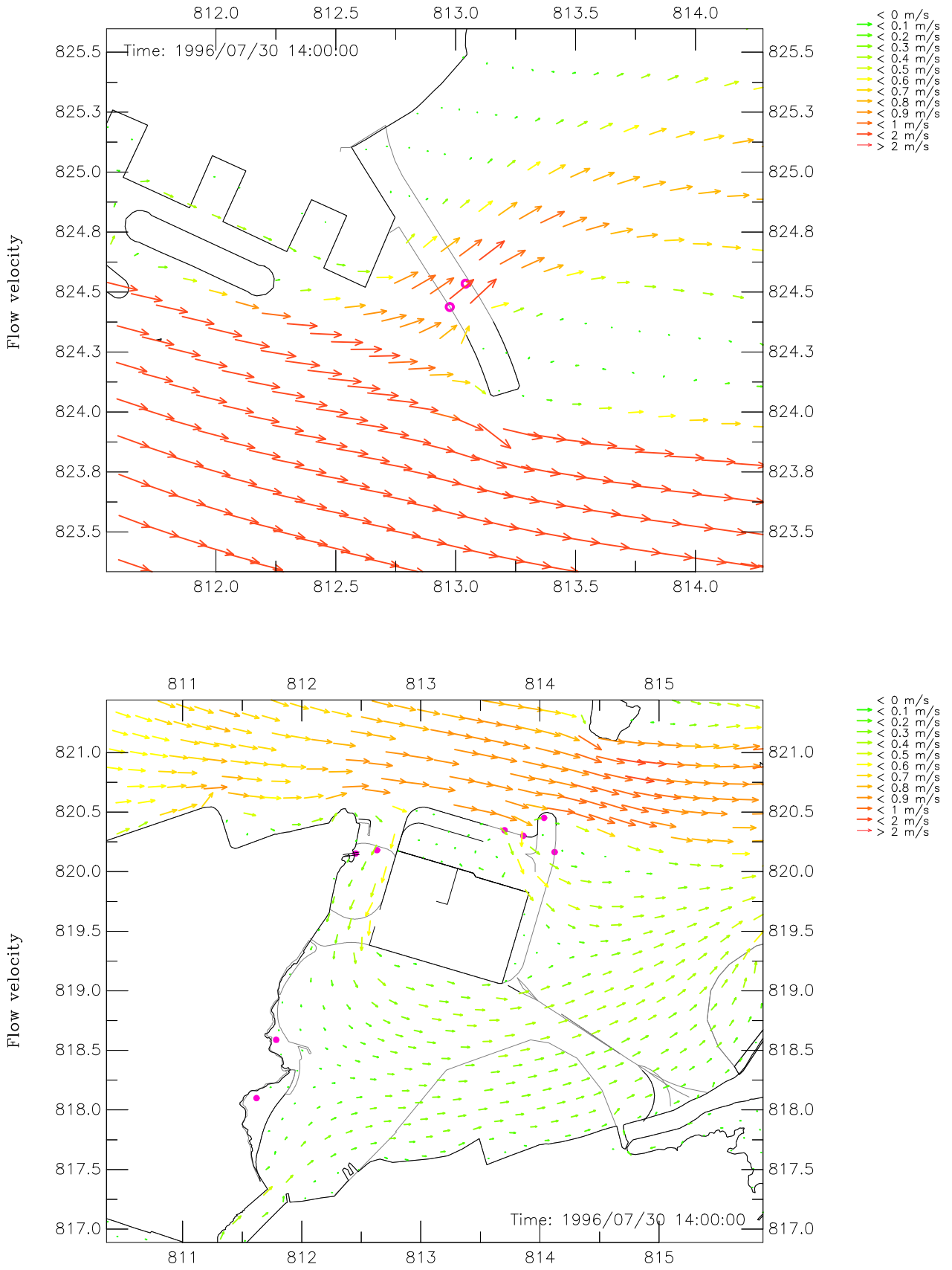
Year 2012 Wet Season Velocity Vector Plot at Ebb Tide – Surface Layer	Apr 2009	Figure 015
MAUNSELL | AECOM		



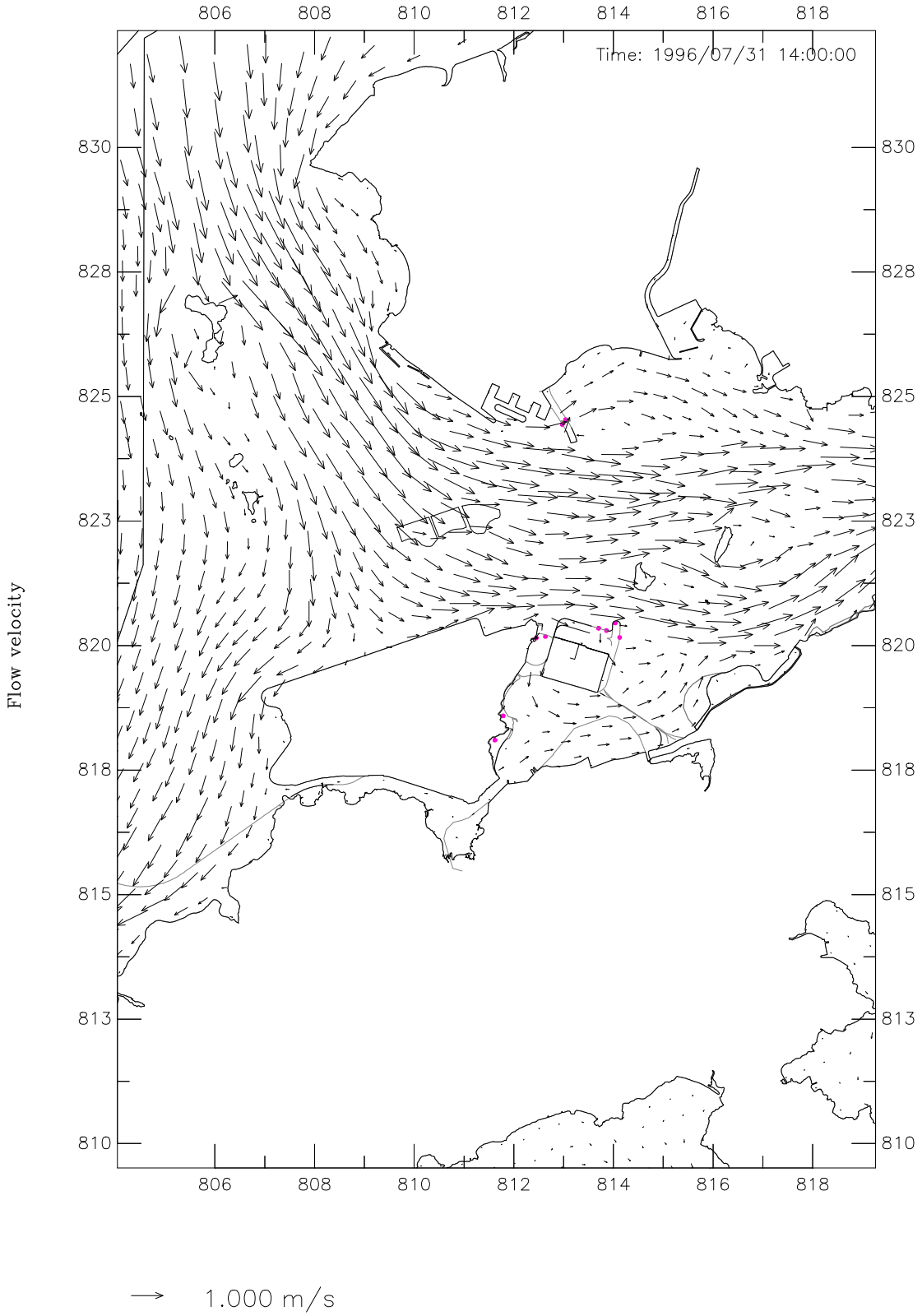
Year 2012 Wet Season Velocity Vector Plot at Ebb Tide – Surface Layer (Top: Northern Reclamation; Bottom: Southern Reclamation)	Apr 2009	Figure 016
MAUNSELL | AECOM		



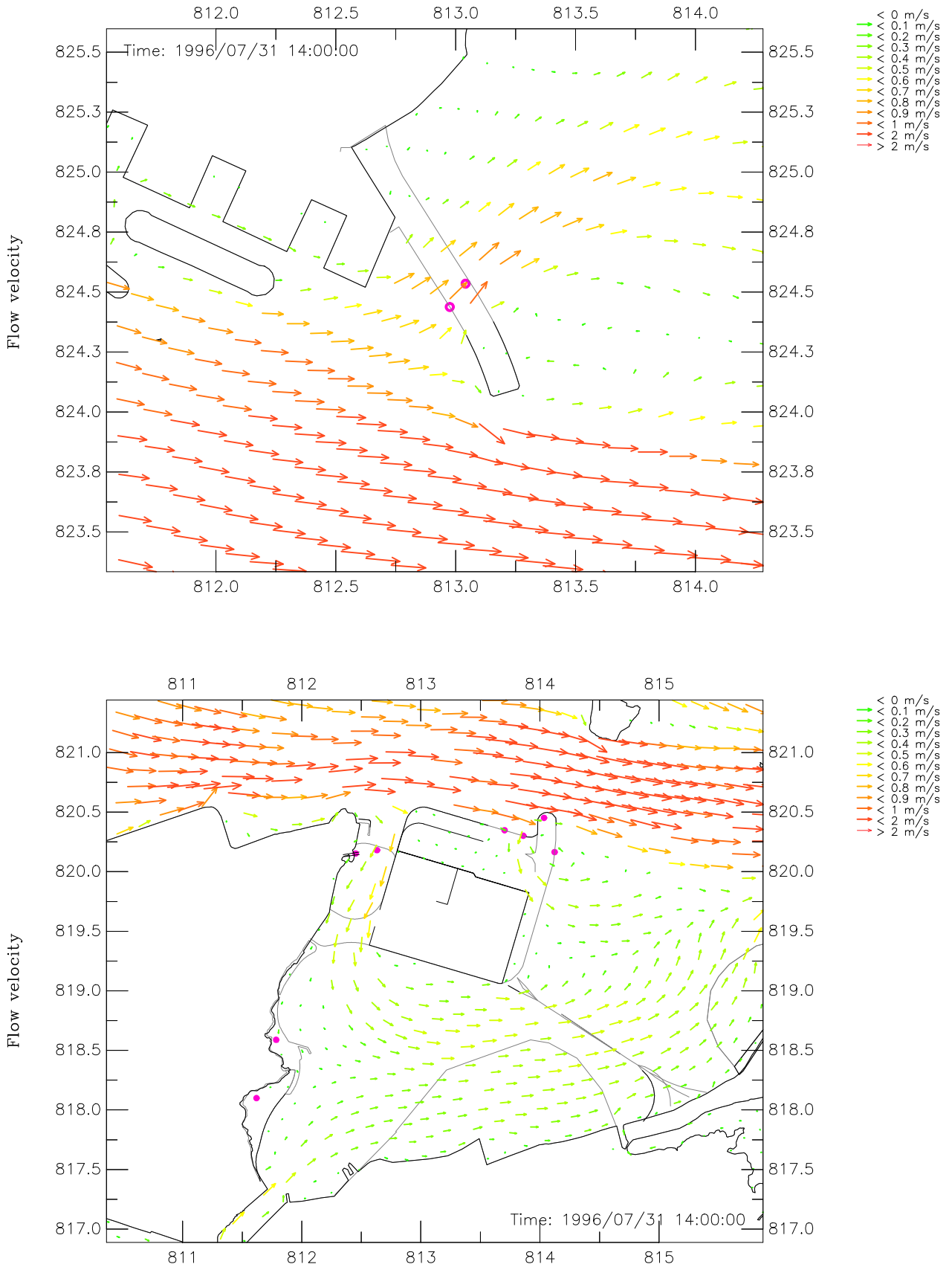
Year 2012 Dry Season Velocity Vector Plot at Ebb Tide – Mid–Depth	Apr 2009	Figure 017
MAUNSELL | AECOM		



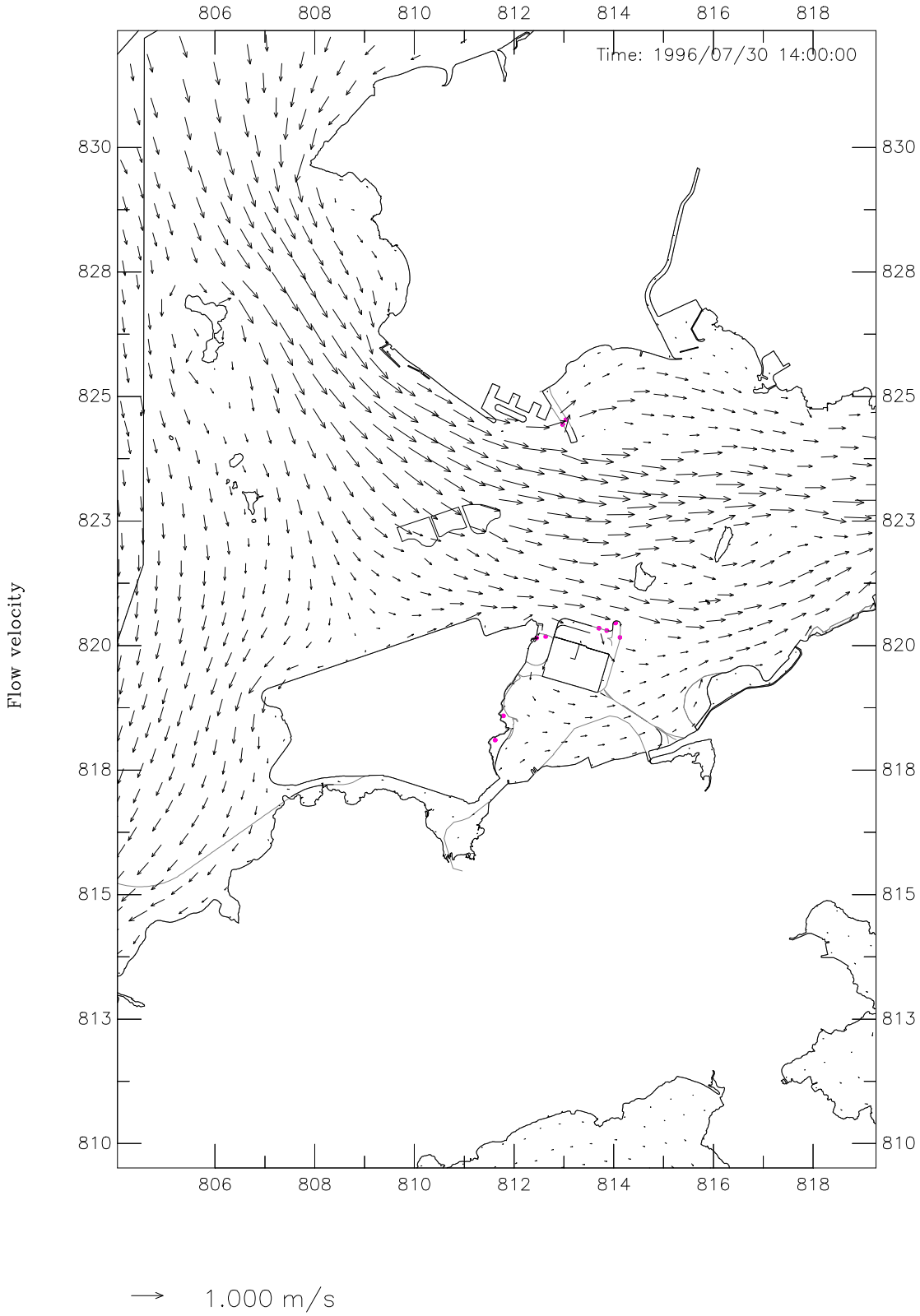
Year 2012 Dry Season Velocity Vector Plot at Ebb Tide – Mid–Depth (Top: Northern Reclamation; Bottom: Southern Reclamation)	Apr 2009	Figure 018
MAUNSELL | AECOM		



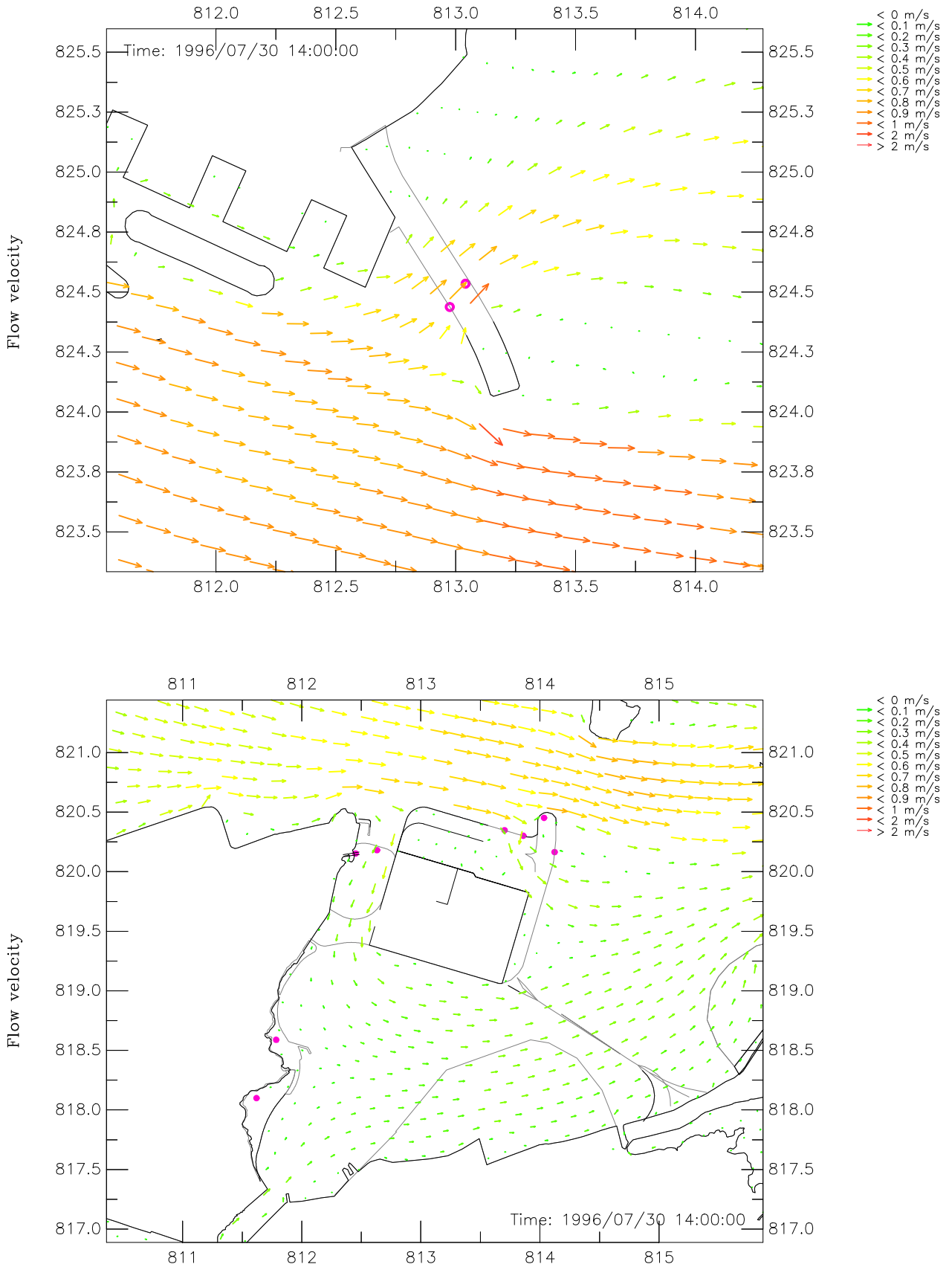
Year 2012 Wet Season Velocity Vector Plot at Ebb Tide – Mid–Depth	Apr 2009	Figure 019
MAUNSELL | AECOM		



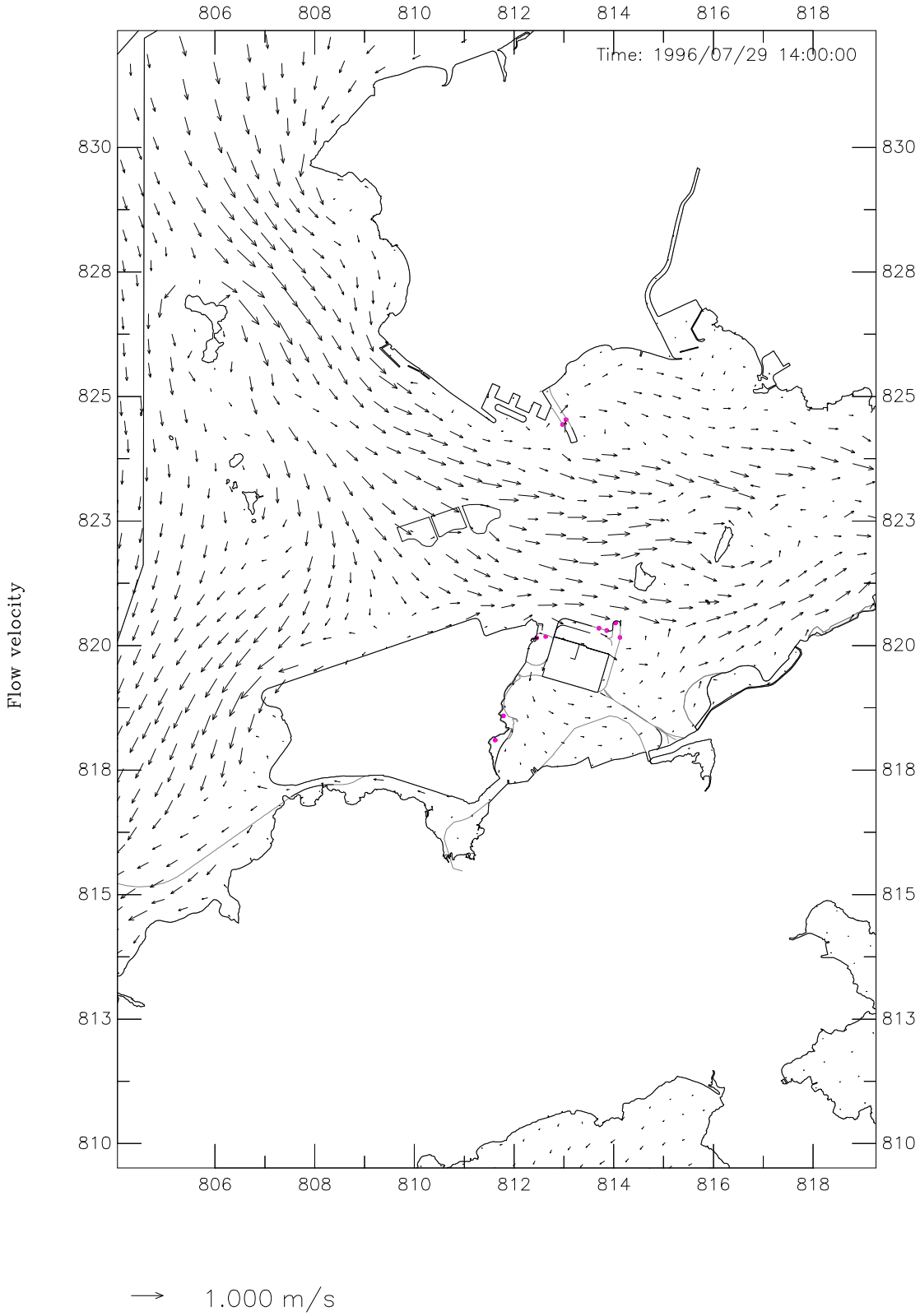
Year 2012 Wet Season Velocity Vector Plot at Ebb Tide – Mid-Depth (Top: Northern Reclamation; Bottom: Southern Reclamation)	Apr 2009	Figure 020
MAUNSELL | AECOM		



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		

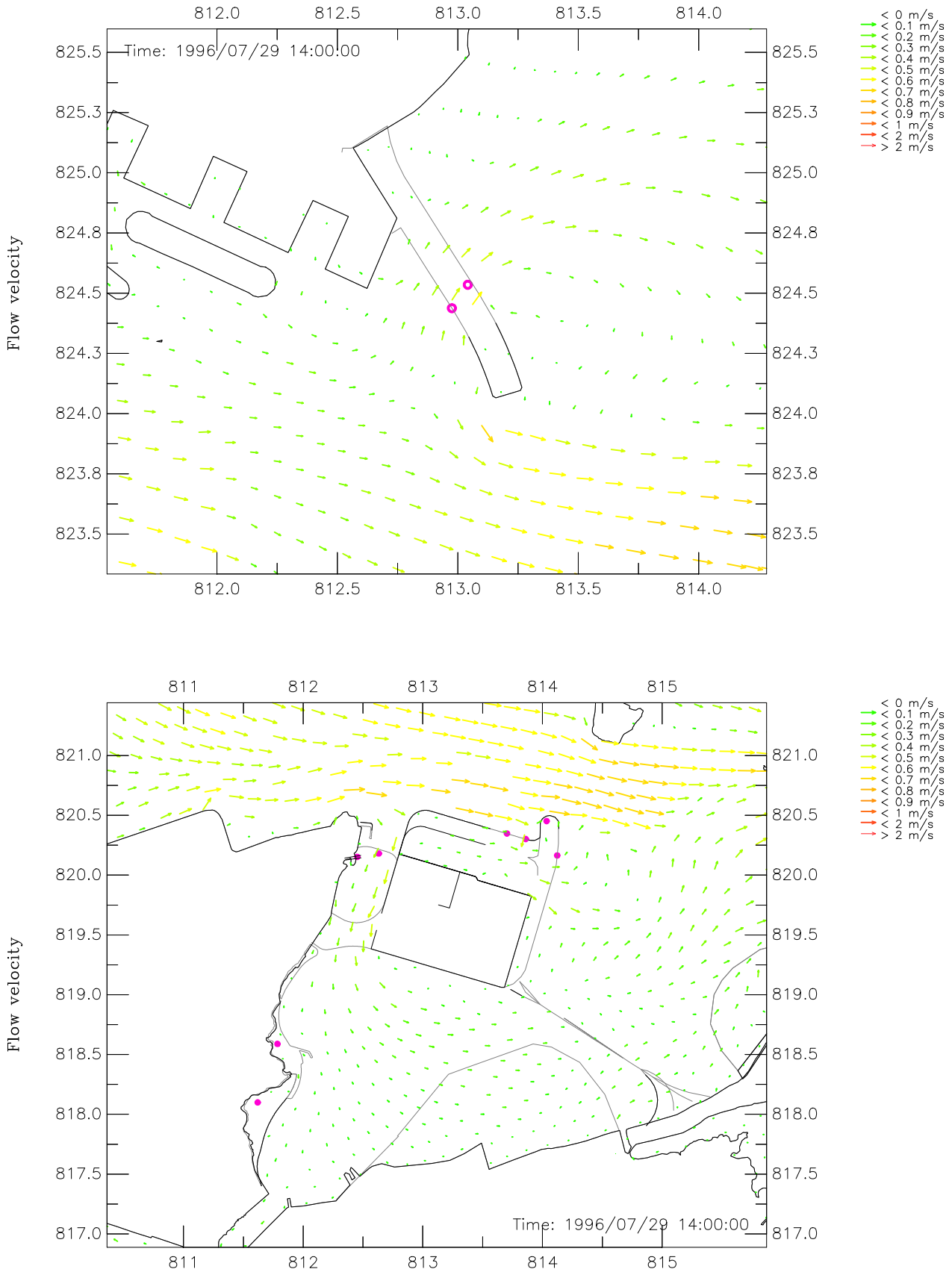


Year 2012
Wet Season Velocity Vector Plot at Ebb Tide – Bottom Layer

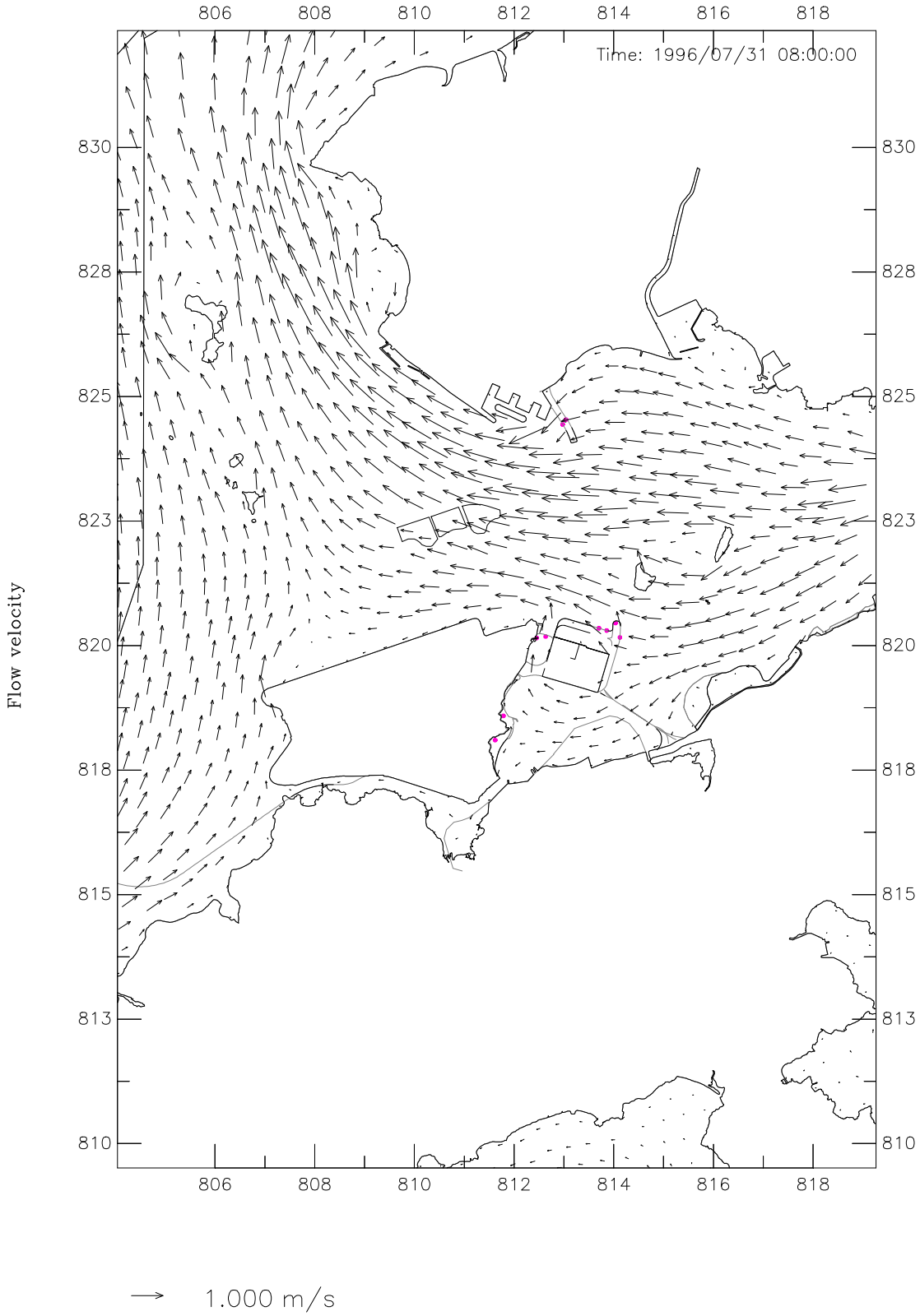
Apr 2009

Figure 023

MAUNSELL | AECOM



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

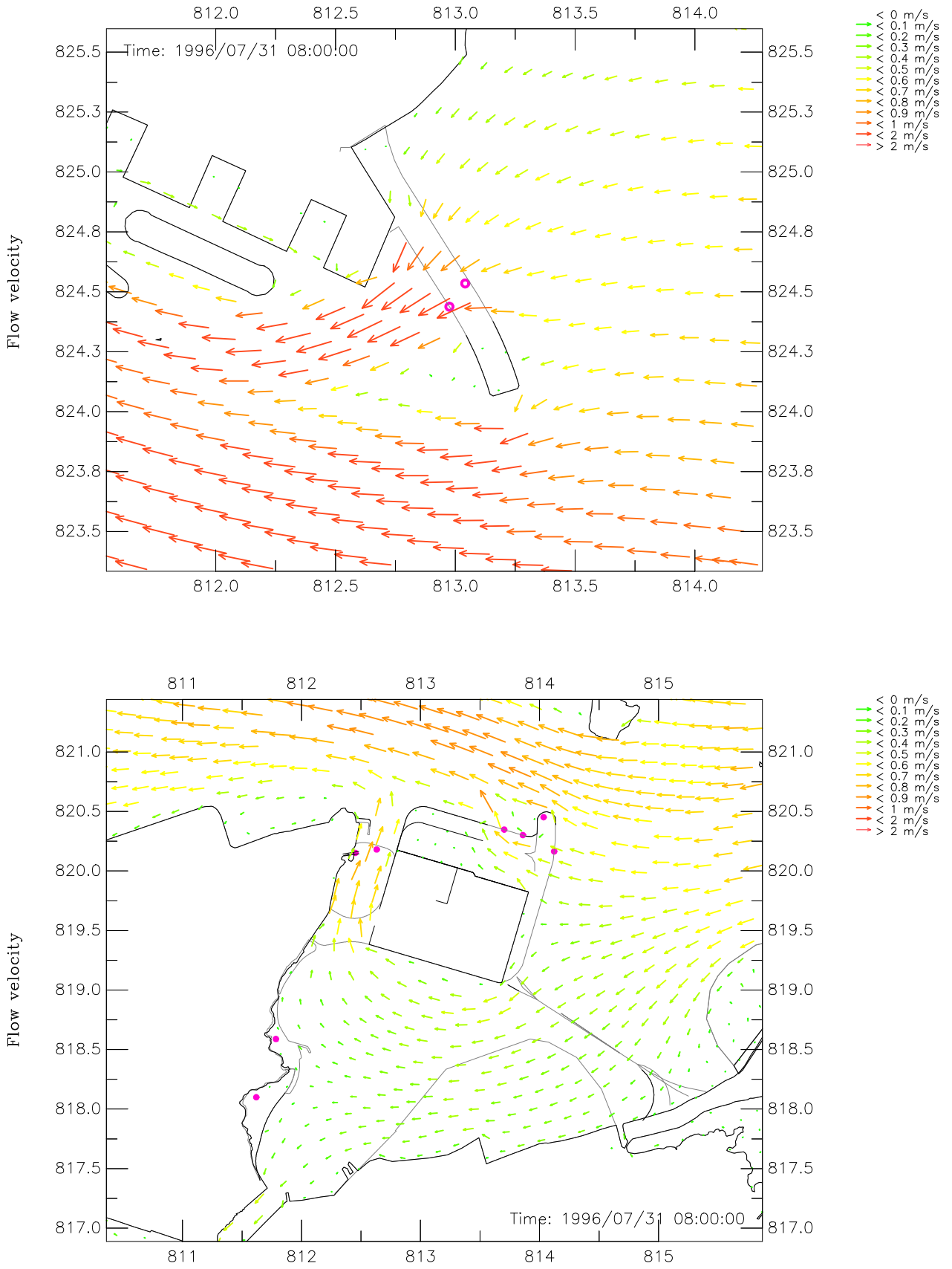


Year 2012
Dry Season Velocity Vector Plot at Flood Tide – Surface Layer

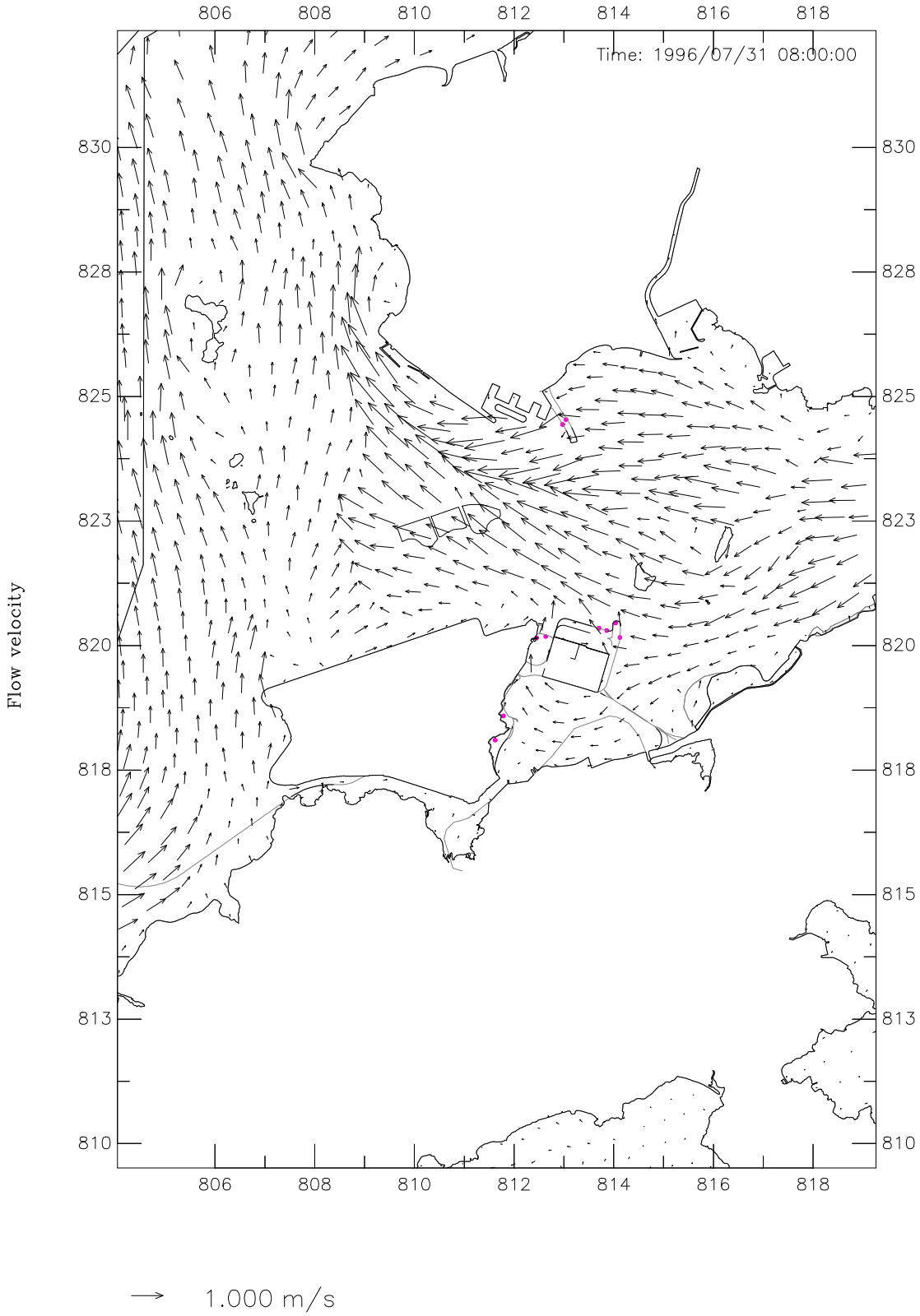
Apr 2009

Figure 025

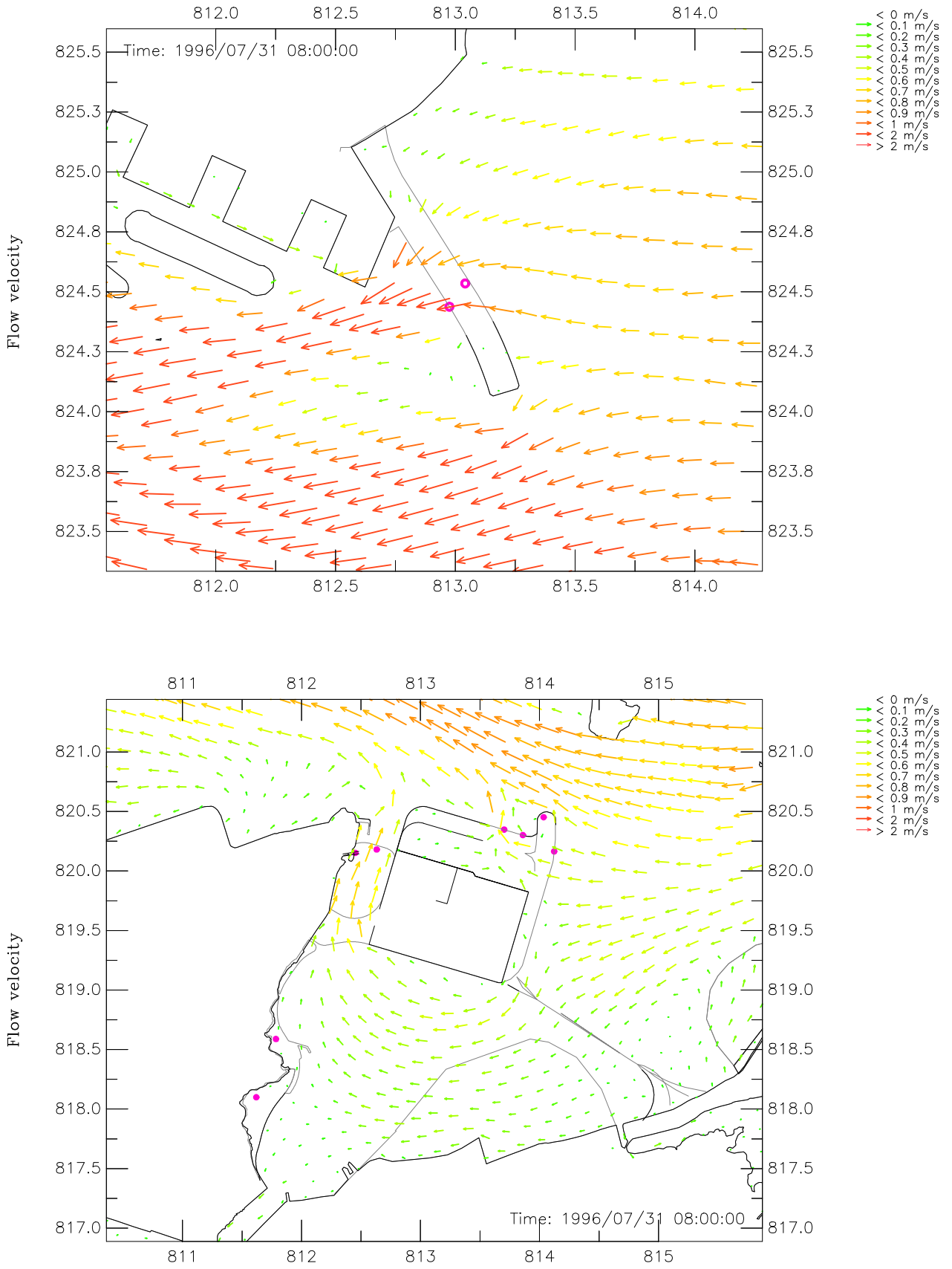
MAUNSELL | AECOM



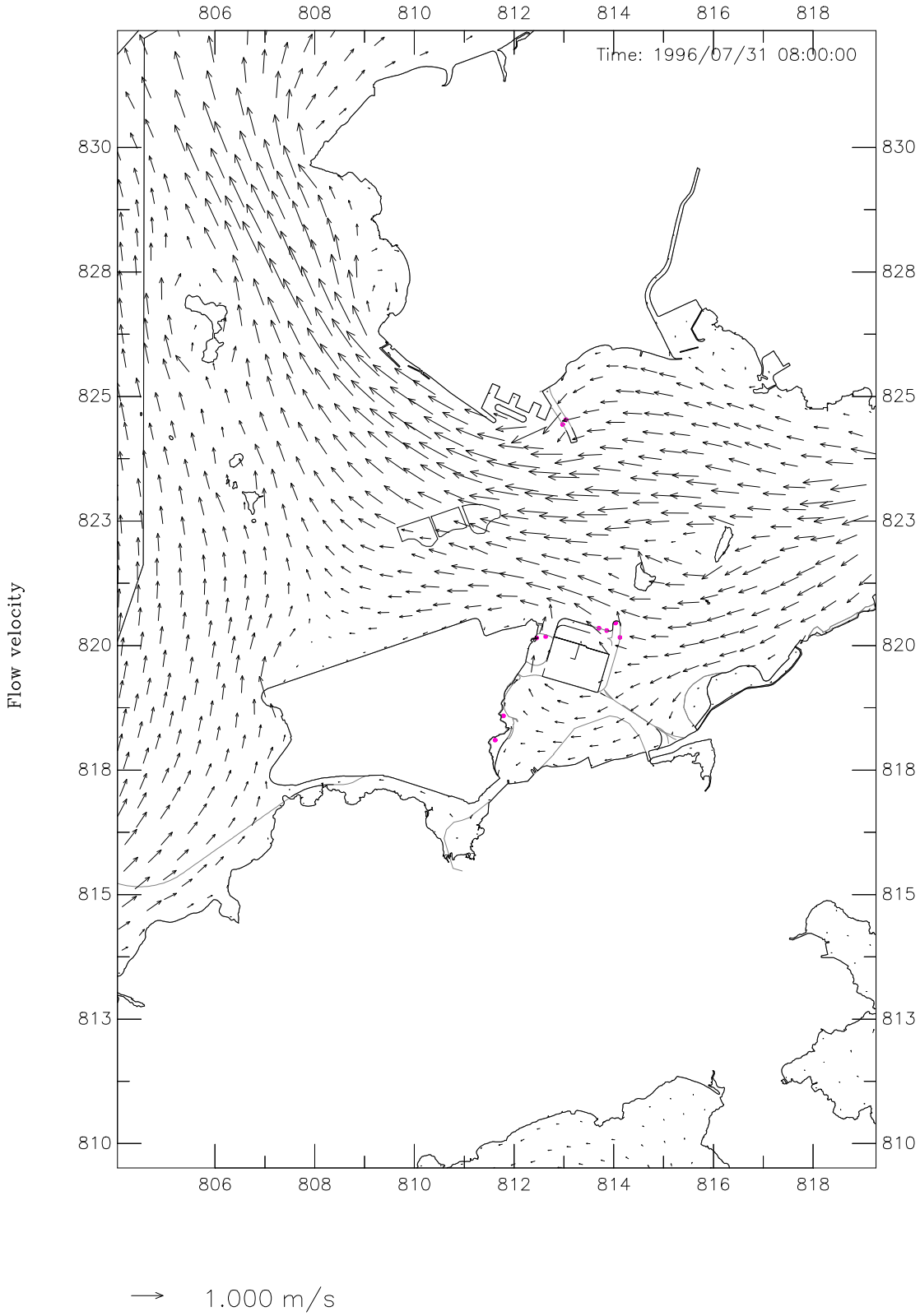
Year 2012 Dry Season Velocity Vector Plot at Flood Tide – Surface Layer (Top: Northern Reclamation; Bottom: Southern Reclamation)	Apr 2009	Figure 026
MAUNSELL | AECOM		



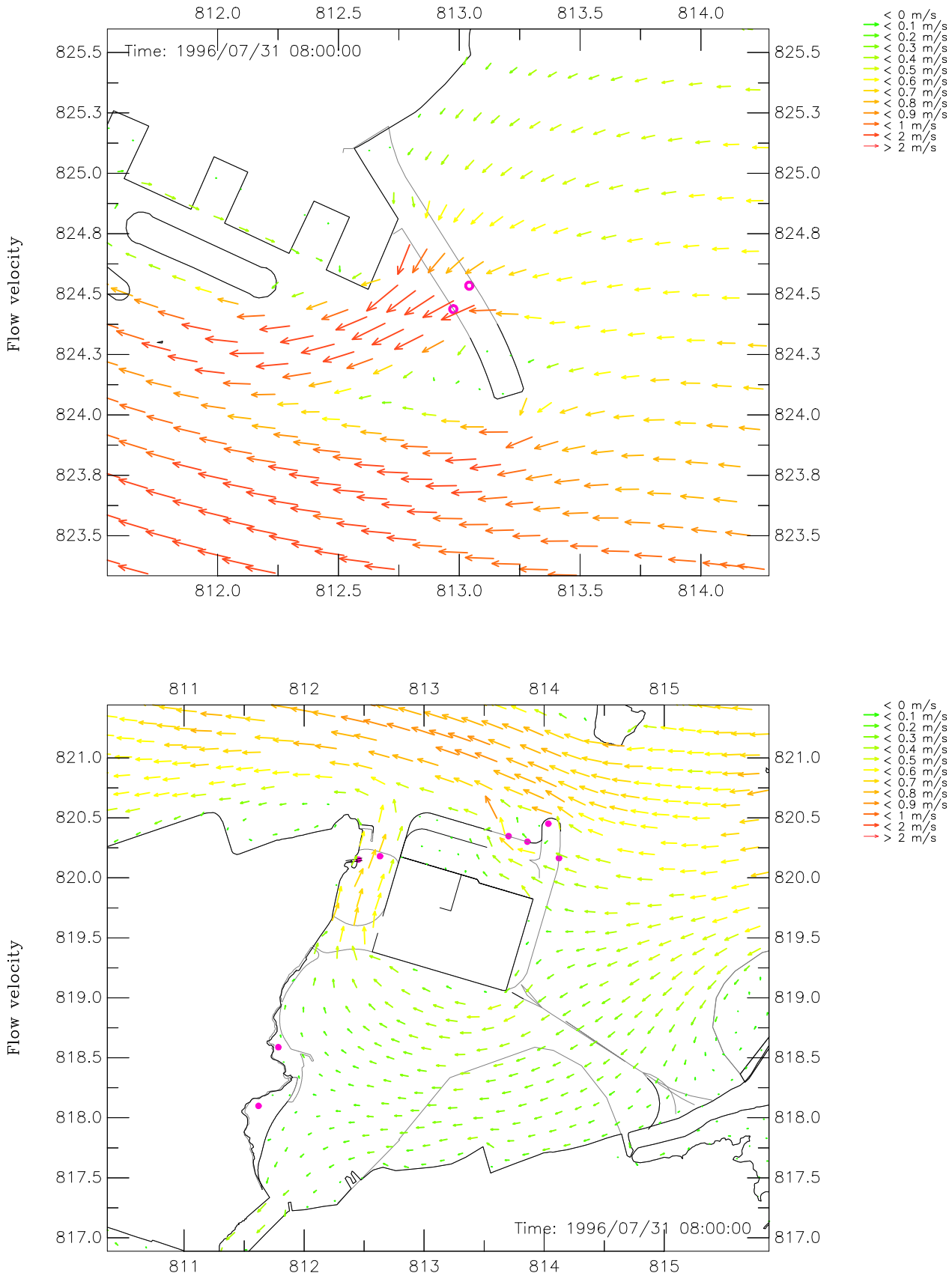
Year 2012 Wet Season Velocity Vector Plot at Flood Tide – Surface Layer	Apr 2009	Figure 027
MAUNSELL | AECOM		



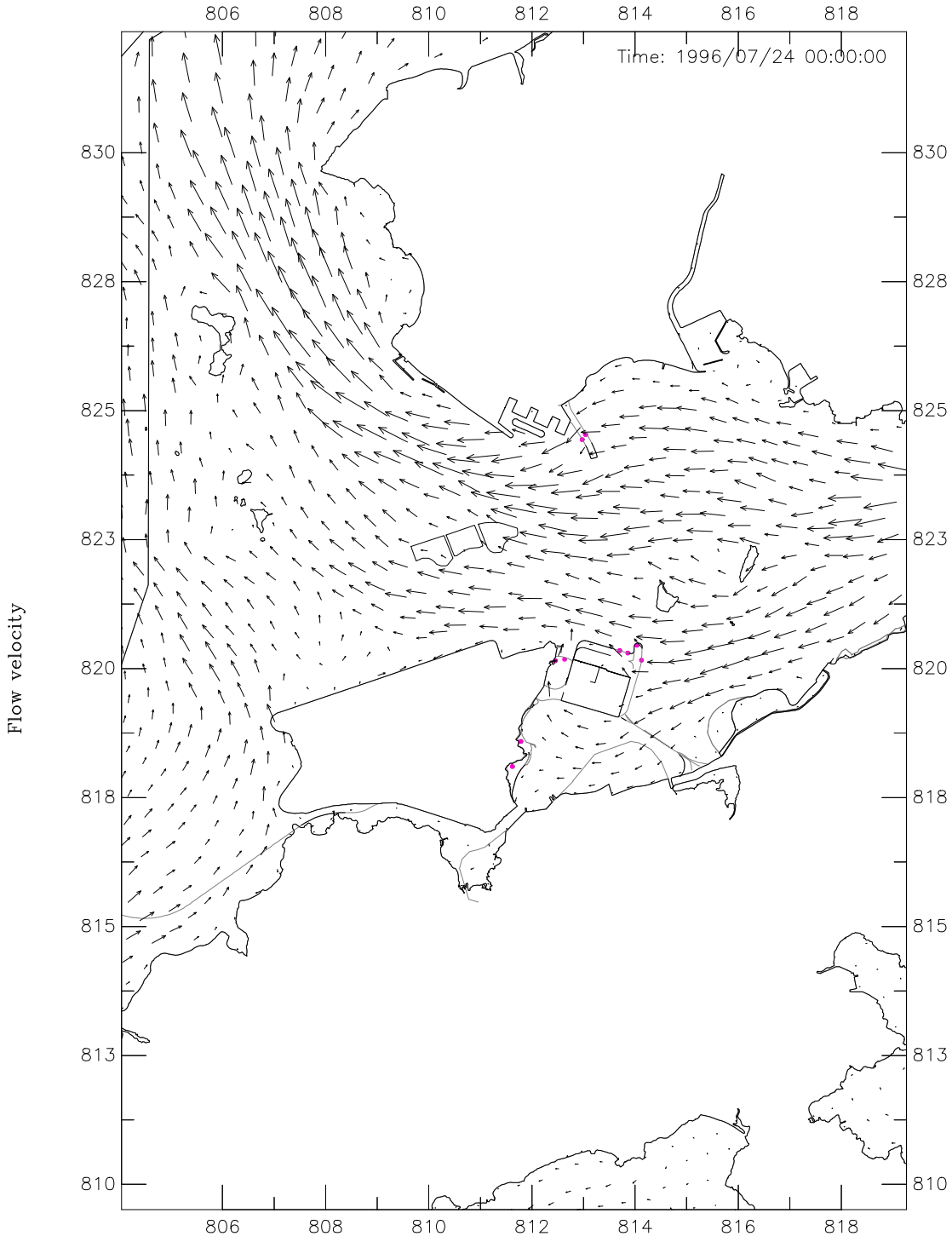
Year 2012 Wet Season Velocity Vector Plot at Flood Tide – Surface Layer (Top: Northern Reclamation; Bottom: Southern Reclamation)	Apr 2009	Figure 028
MAUNSELL | AECOM		



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		

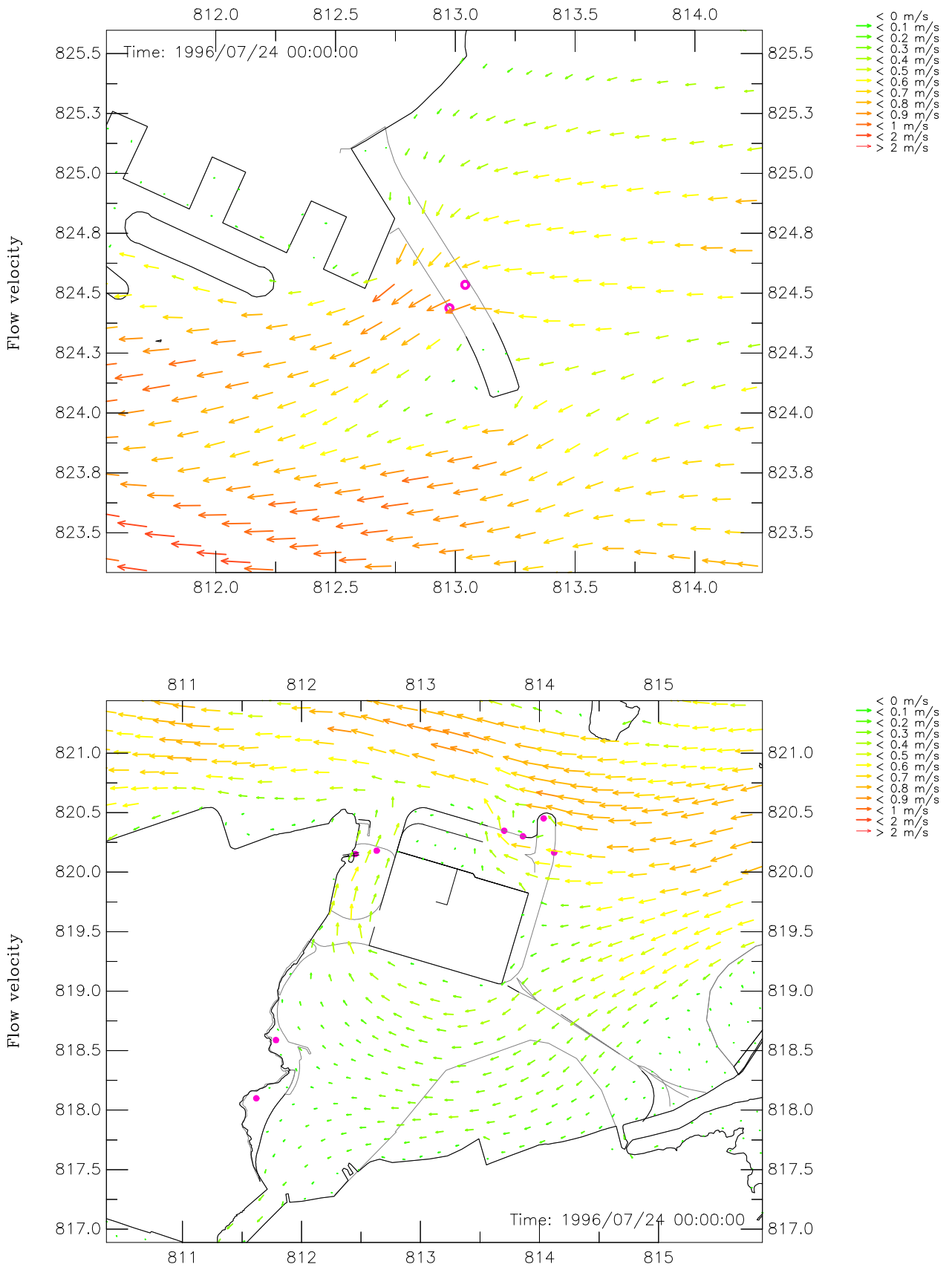


Year 2012
Wet Season Velocity Vector Plot at Flood Tide – Mid-Depth

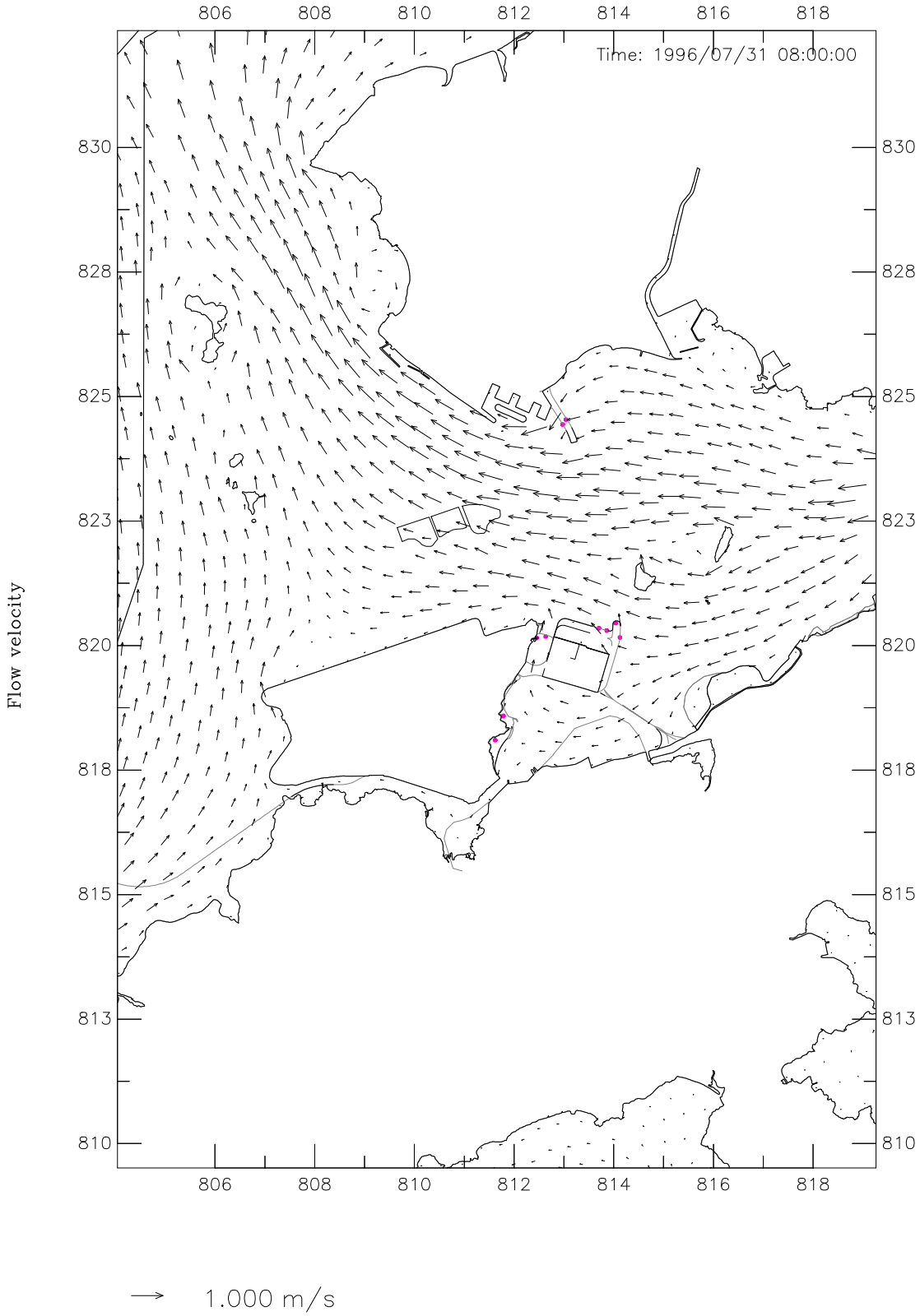
Apr 2009

Figure 031

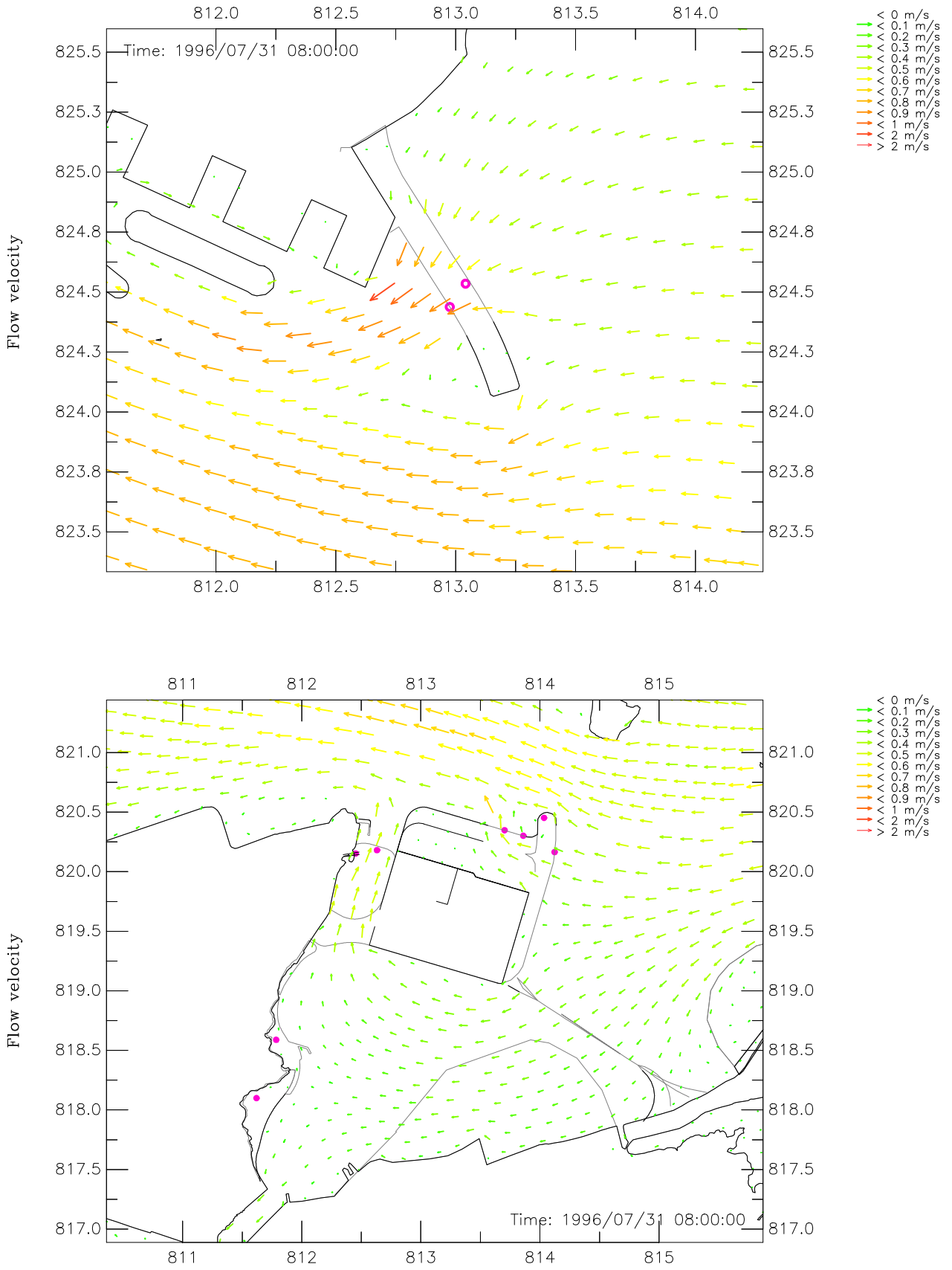
MAUNSELL | AECOM



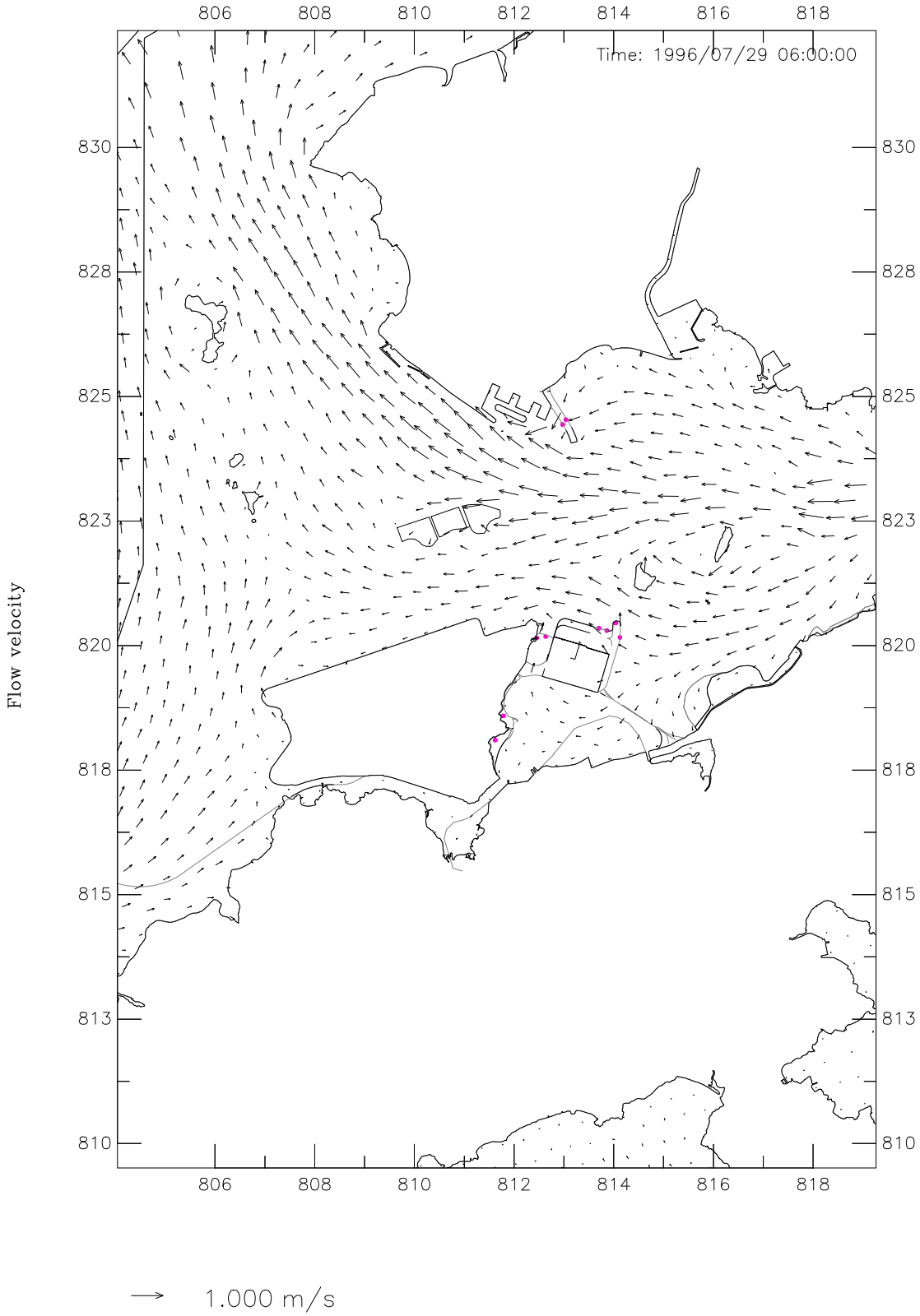
Year 2012 Wet Season Velocity Vector Plot at Flood Tide – Mid-Depth (Top: Northern Reclamation; Bottom: Southern Reclamation)	Apr 2009	Figure 032
MAUNSELL | AECOM		



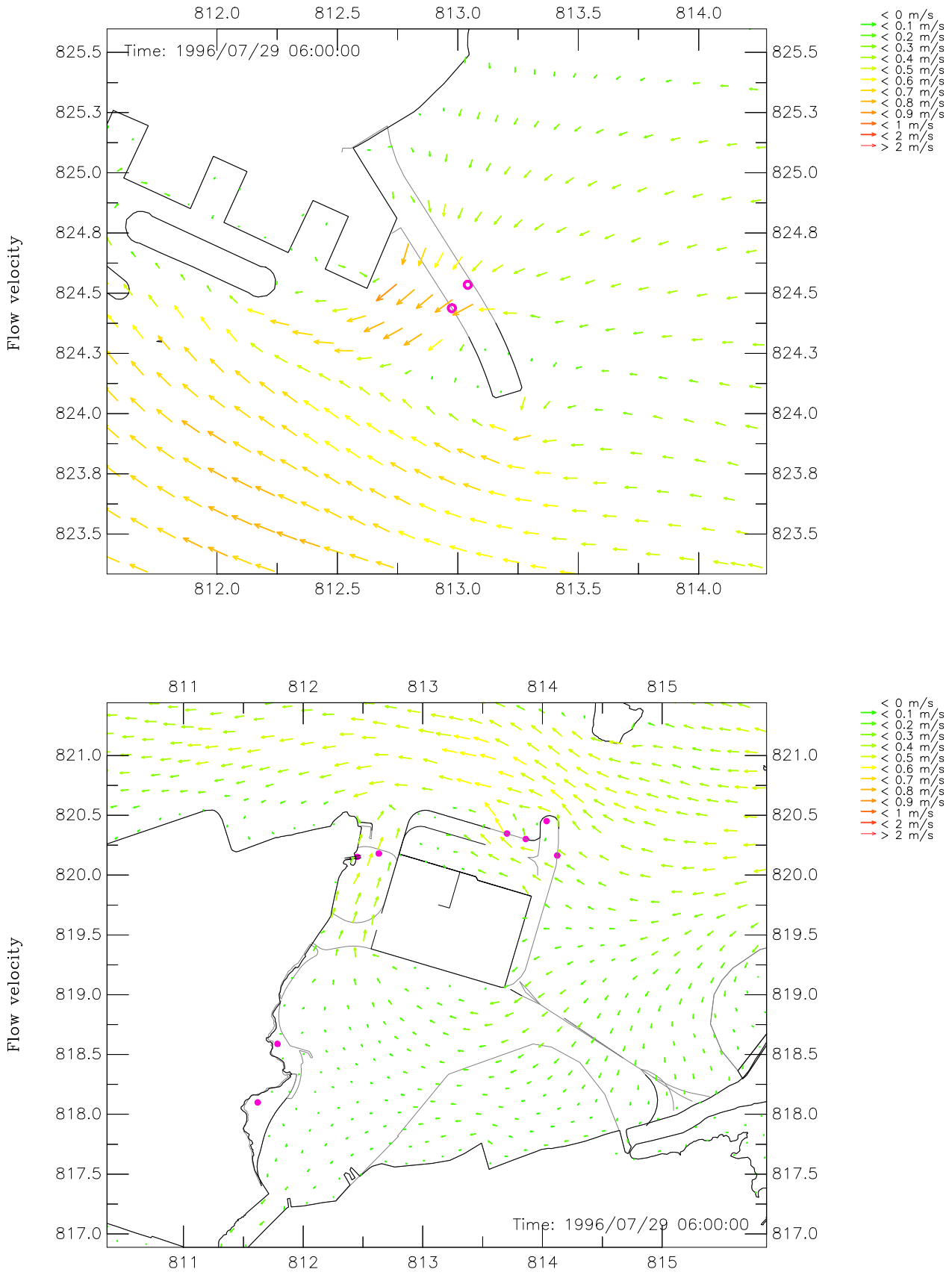
Year 2012 Dry Season Velocity Vector Plot at Flood Tide – Bottom Layer	Apr 2009	Figure 033
MAUNSELL | AECOM		



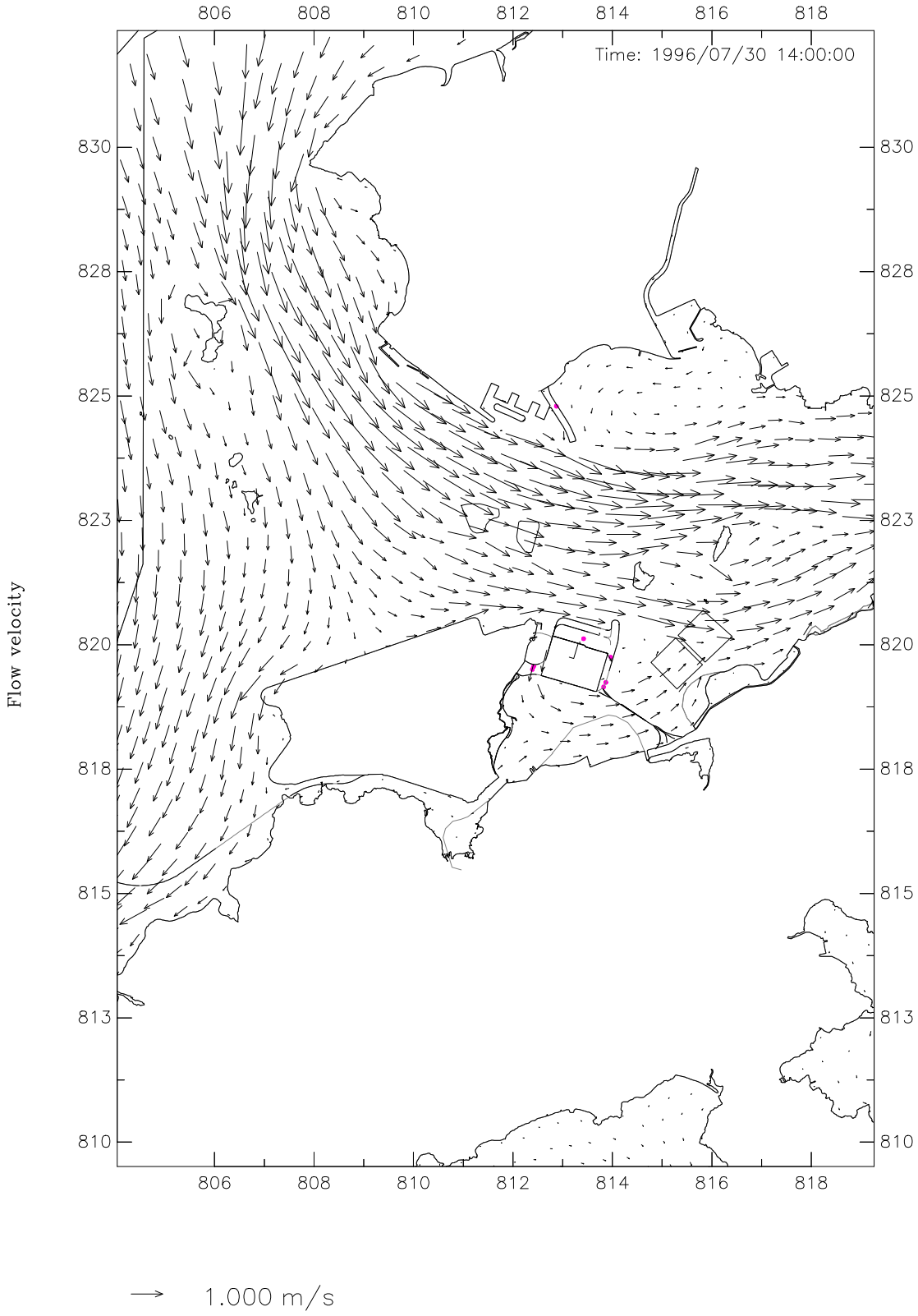
Year 2012 Dry Season Velocity Vector Plot at Flood Tide – Bottom Layer (Top: Northern Reclamation; Bottom: Southern Reclamation)	Apr 2009	Figure 034
MAUNSELL | AECOM		



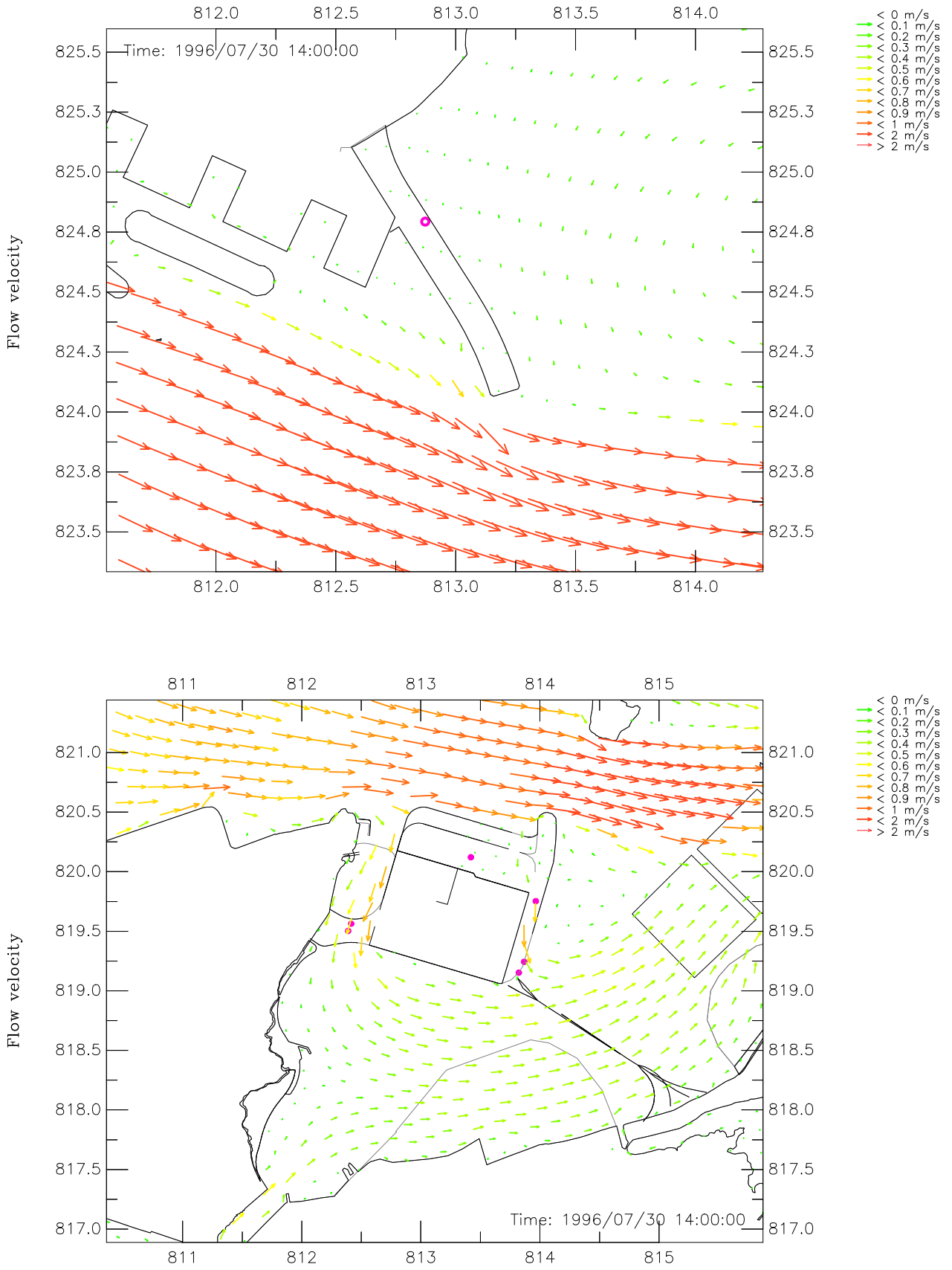
Year 2012 Wet Season Velocity Vector Plot at Flood Tide – Bottom Layer	Apr 2009	Figure 035
MAUNSELL | AECOM		



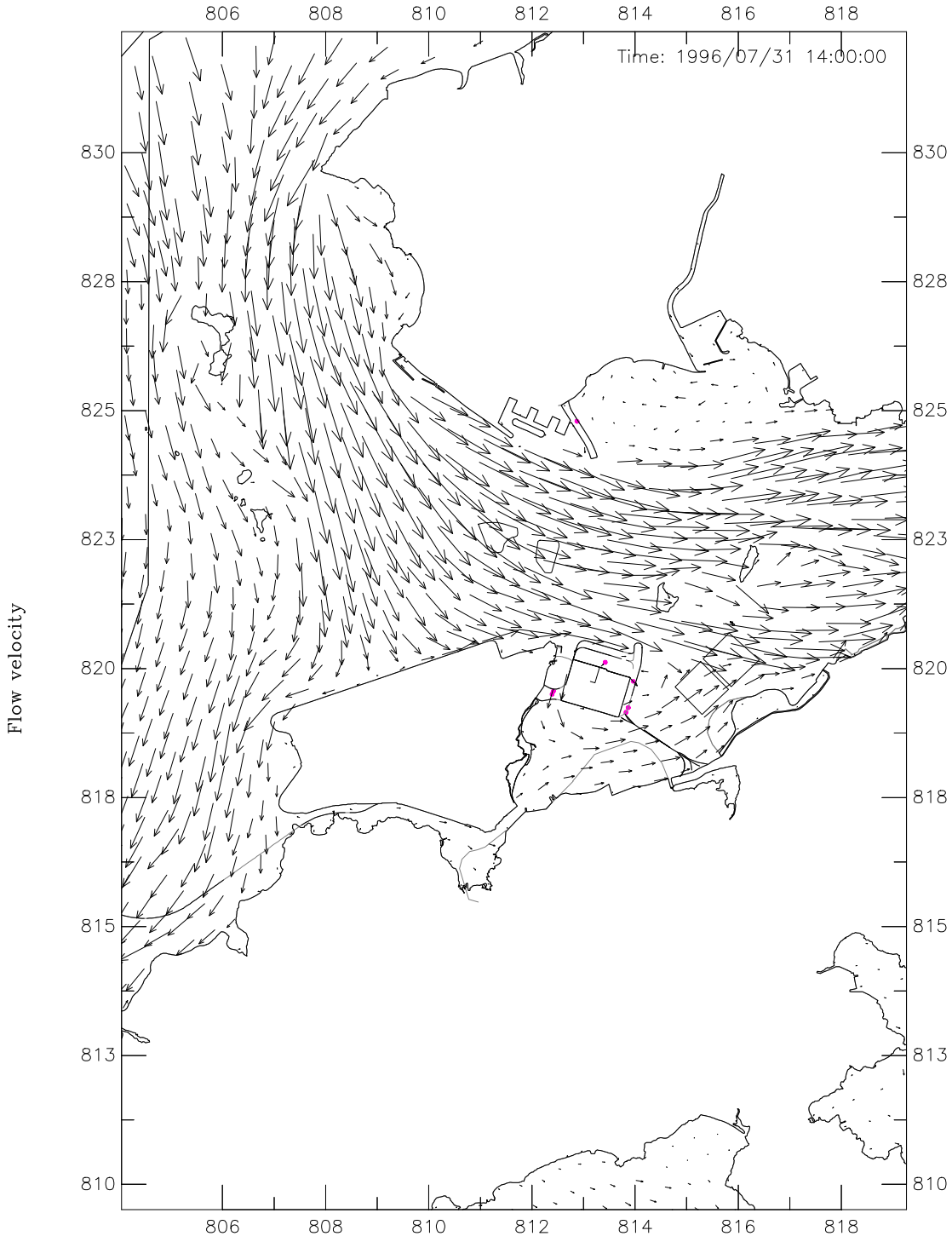
Year 2012 Wet Season Velocity Vector Plot at Flood Tide – Bottom Layer (Top: Northern Reclamation; Bottom: Southern Reclamation)	Apr 2009	Figure 036
MAUNSELL | AECOM		



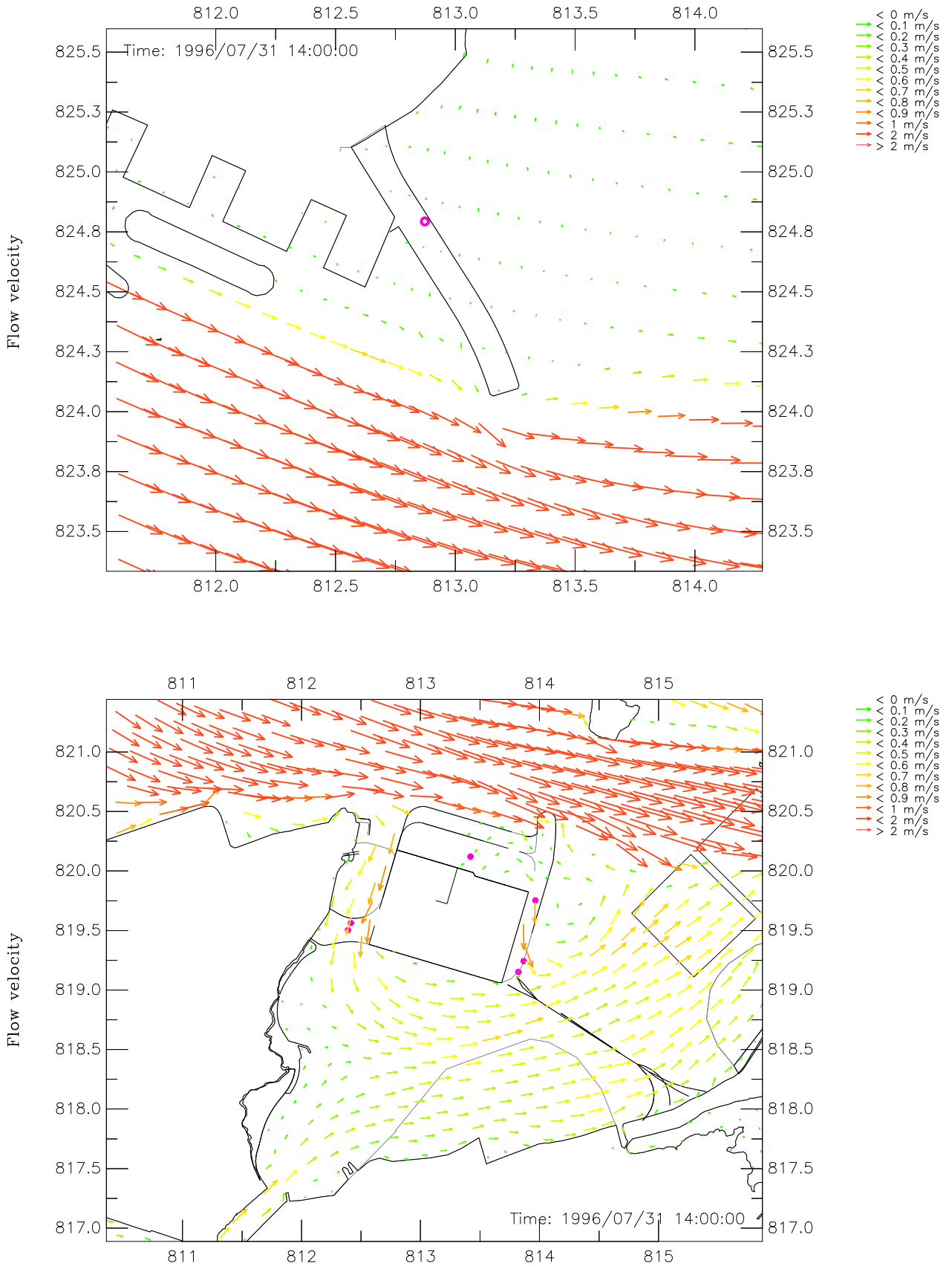
Year 2013 Dry Season Velocity Vector Plot at Ebb Tide – Surface Layer	Apr 2009	Figure 013
MAUNSELL | AECOM		



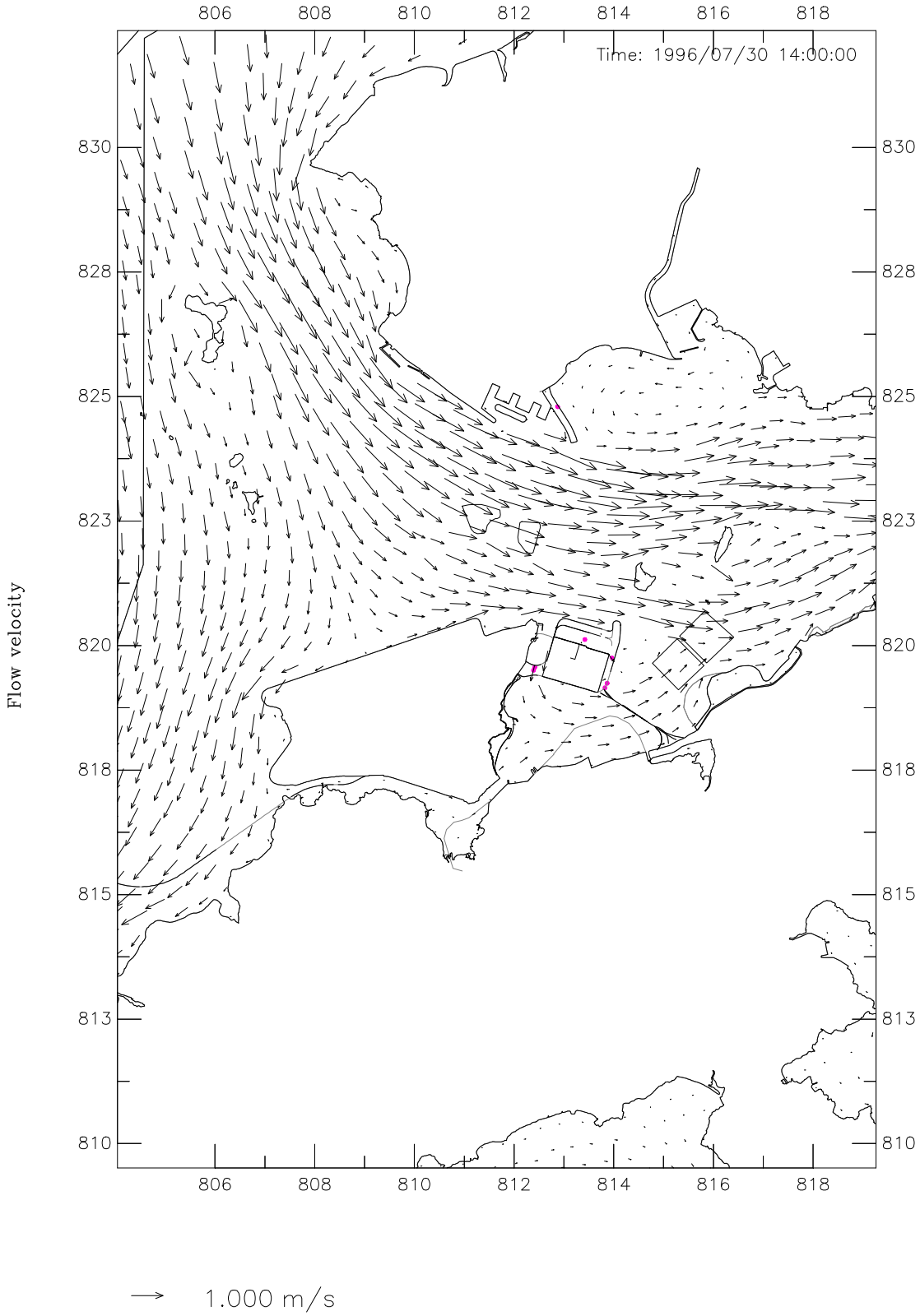
Year 2013 Dry Season Velocity Vector Plot at Ebb Tide – Surface Layer (Top: Northern Reclamation; Bottom: Southern Reclamation)	Apr 2009	Figure 014
MAUNSELL | AECOM		



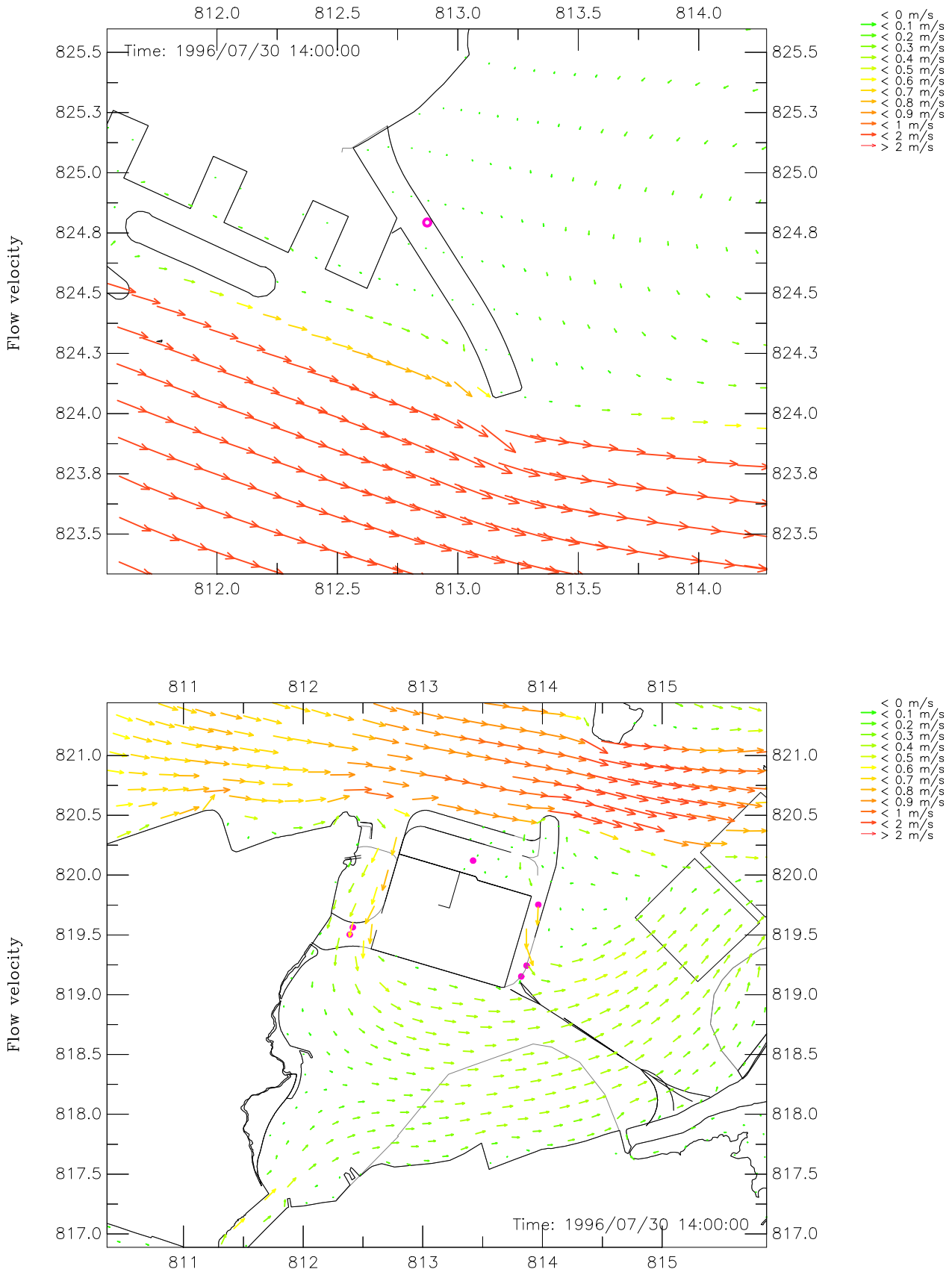
Year 2013 Wet Season Velocity Vector Plot at Ebb Tide – Surface Layer	Apr 2009	Figure 015
MAUNSELL | AECOM		



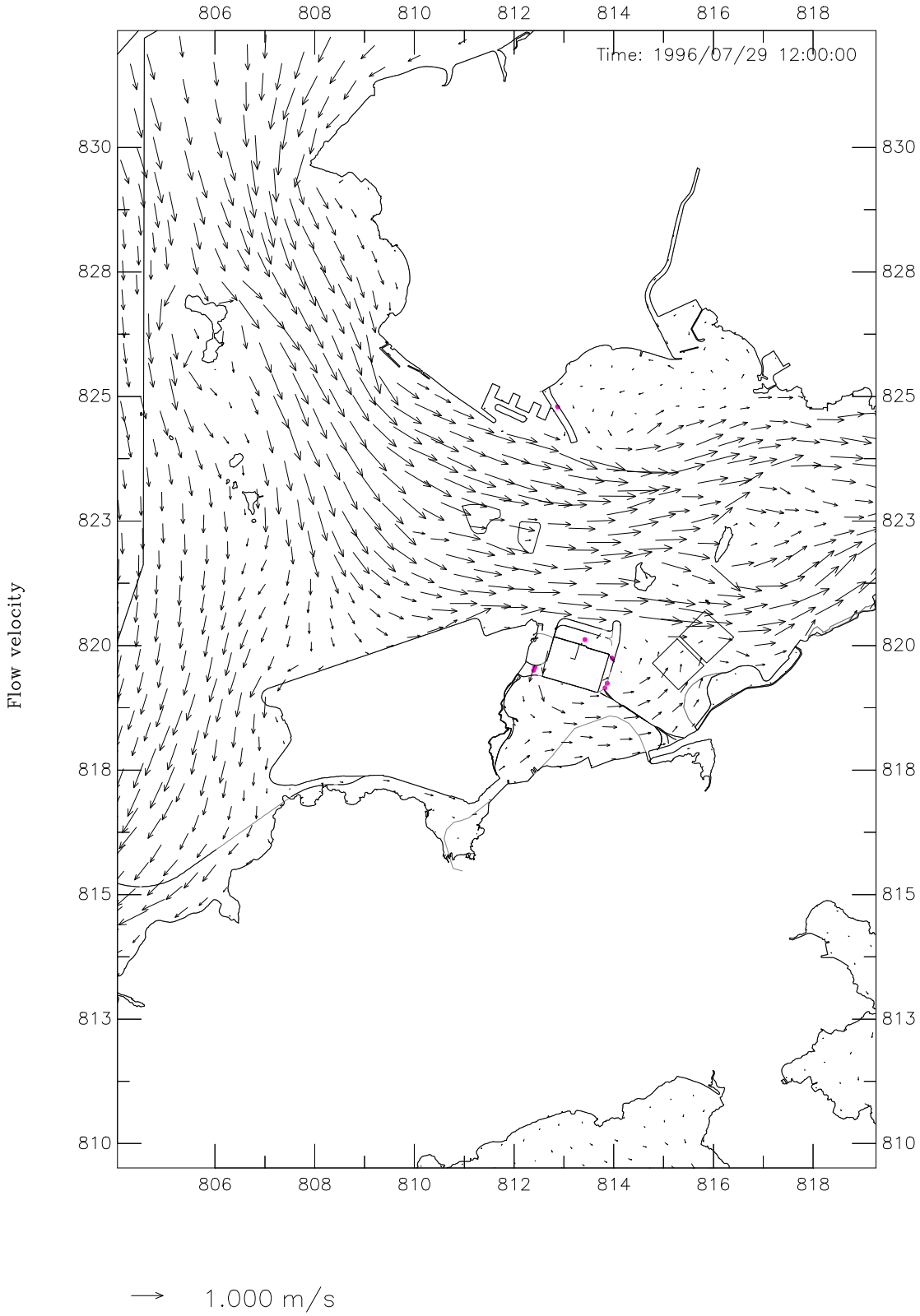
Year 2013 Wet Season Velocity Vector Plot at Ebb Tide – Surface Layer (Top: Northern Reclamation; Bottom: Southern Reclamation)	Apr 2009	Figure 016
MAUNSELL | AECOM		



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		

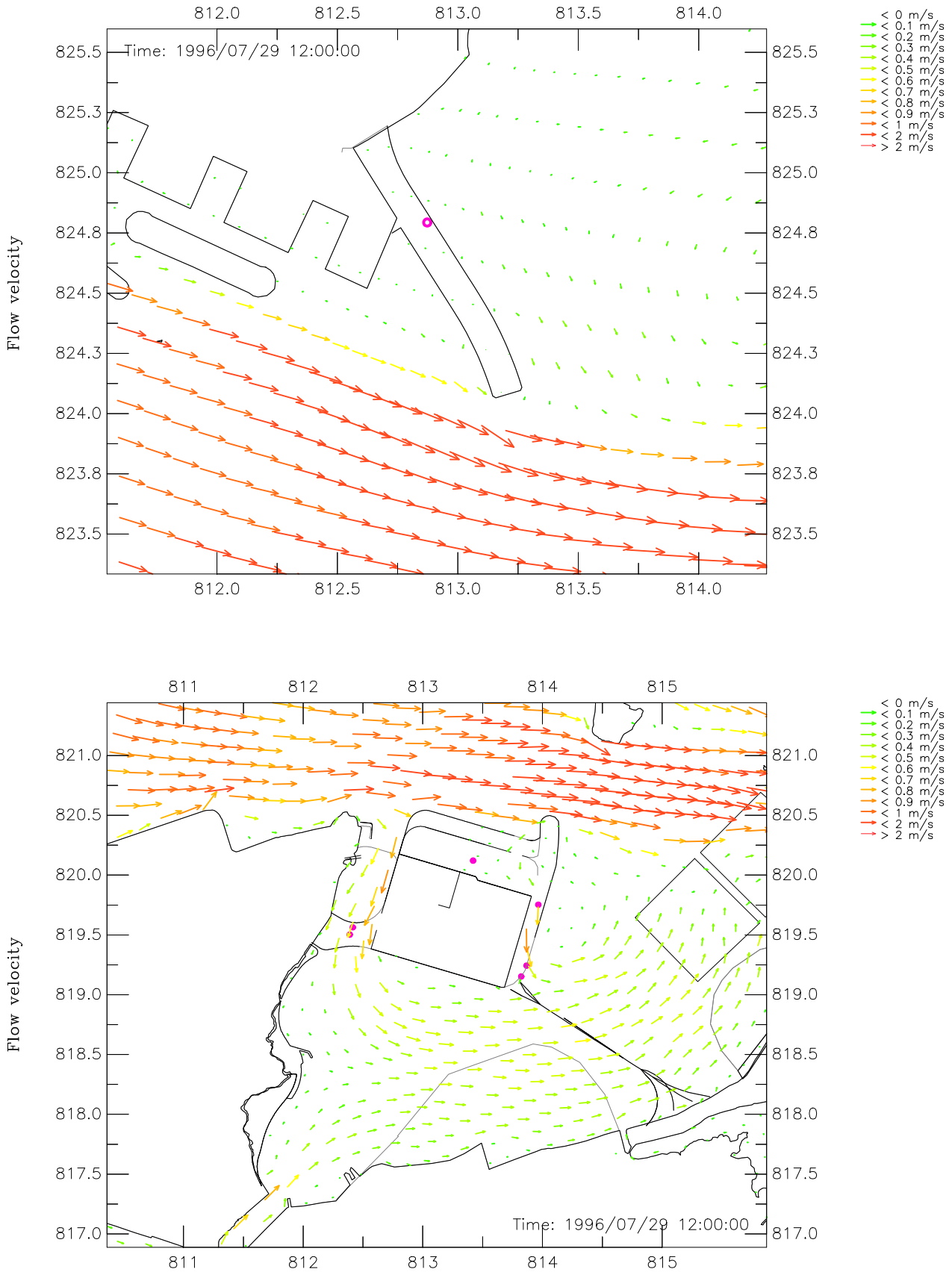


Year 2013
Wet Season Velocity Vector Plot at Ebb Tide – Mid–Depth

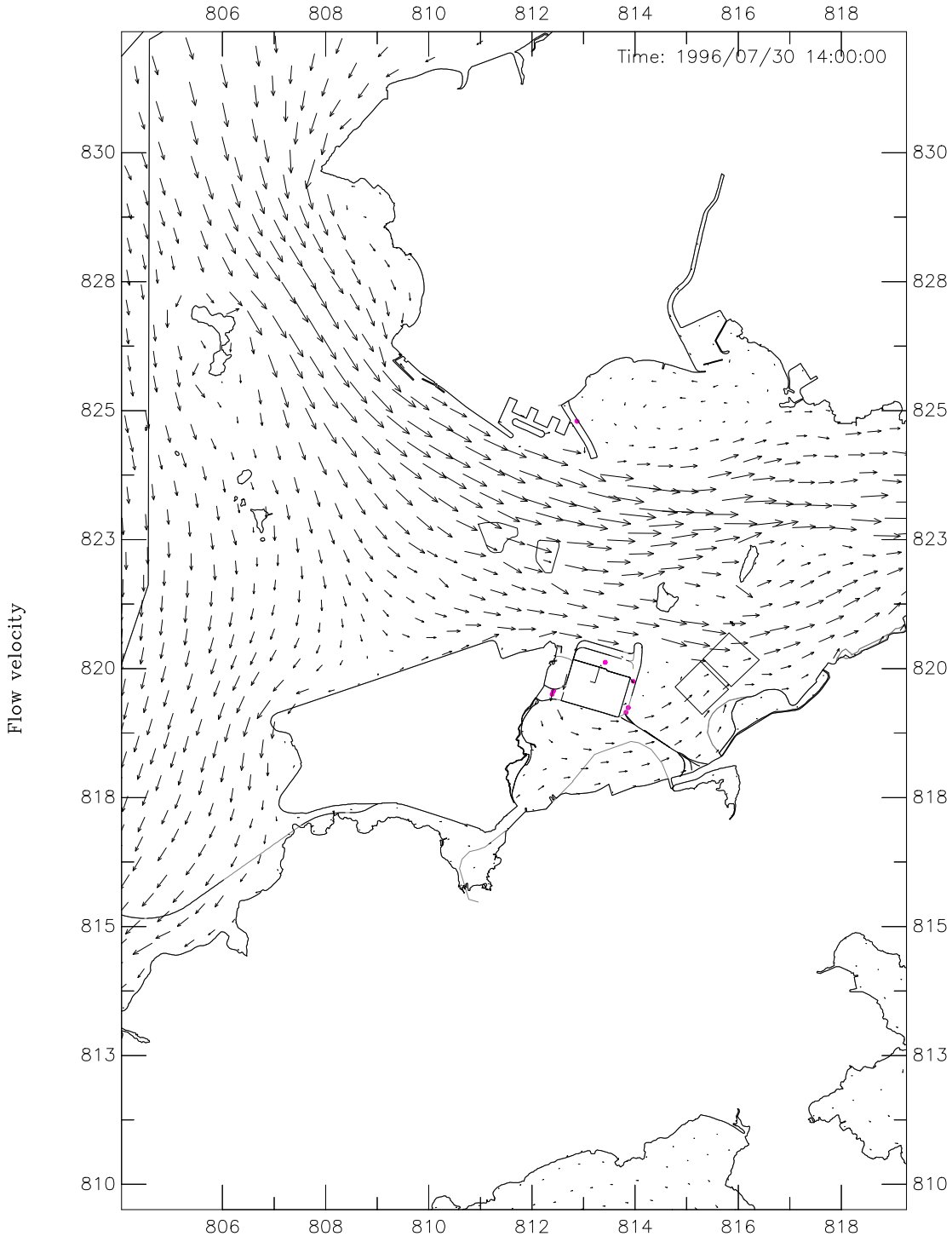
Apr 2009

Figure 019

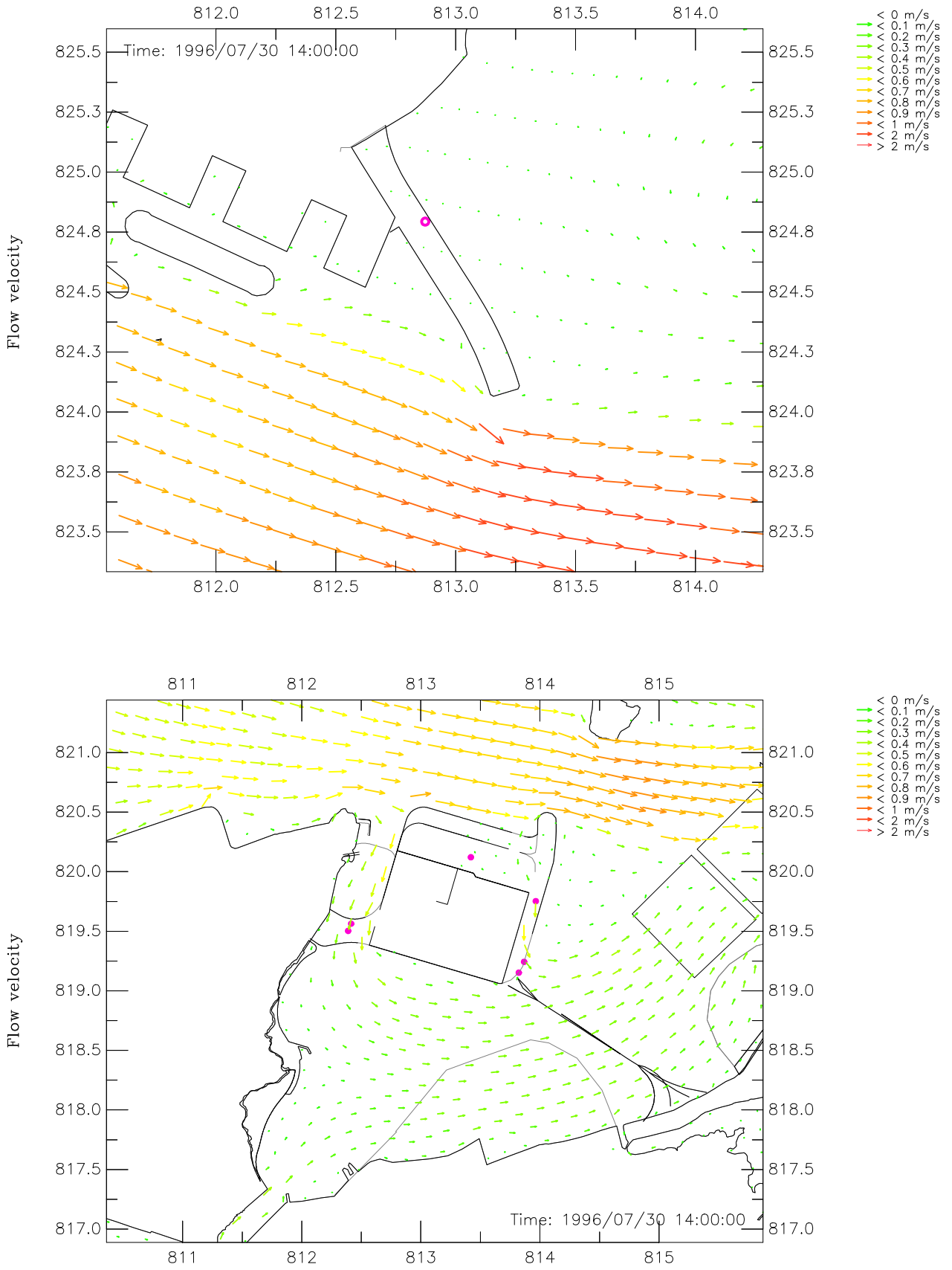
MAUNSELL | AECOM



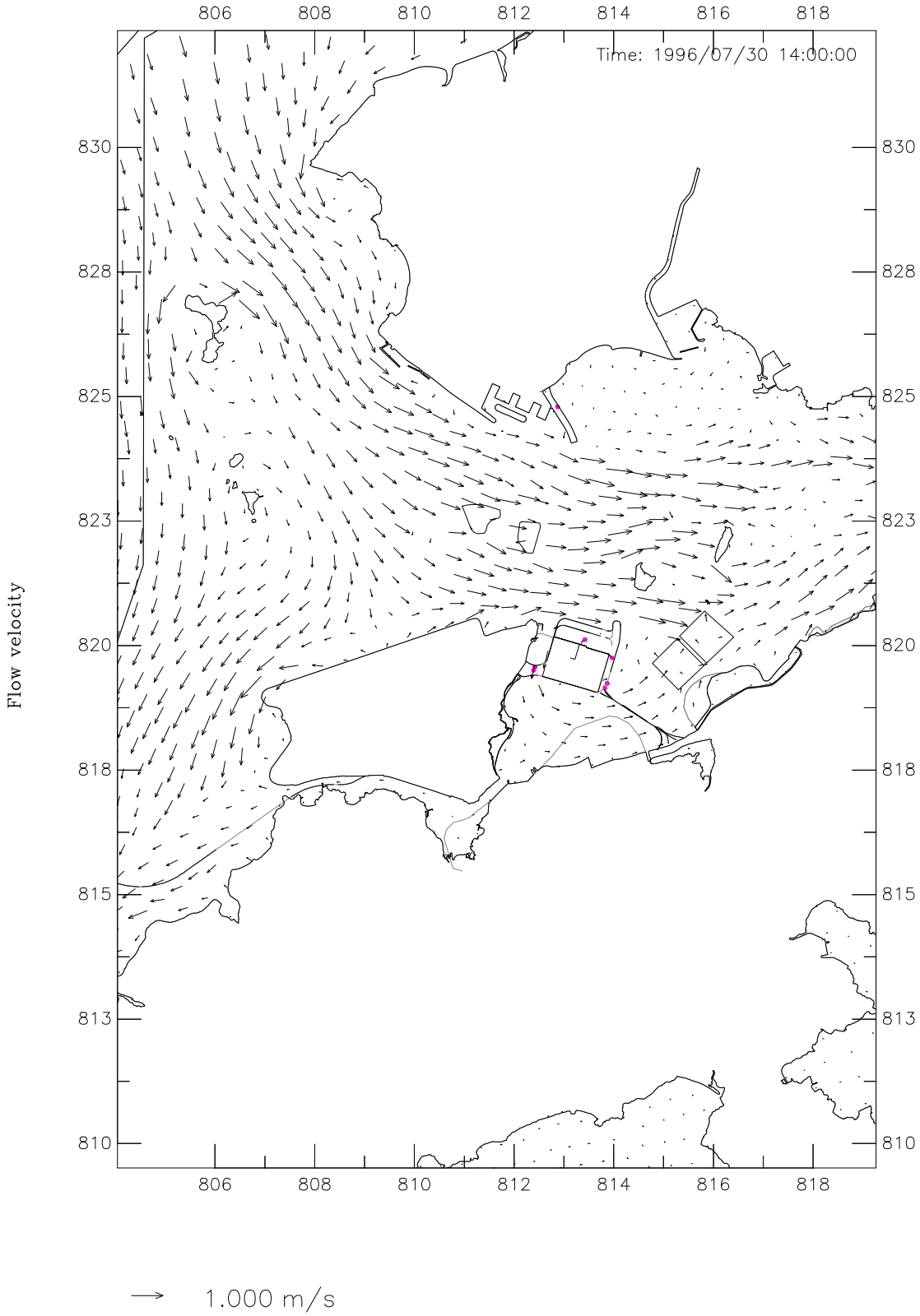
Year 2013 Wet Season Velocity Vector Plot at Ebb Tide – Mid-Depth (Top: Northern Reclamation; Bottom: Southern Reclamation)	Apr 2009	Figure 020
MAUNSELL | AECOM		



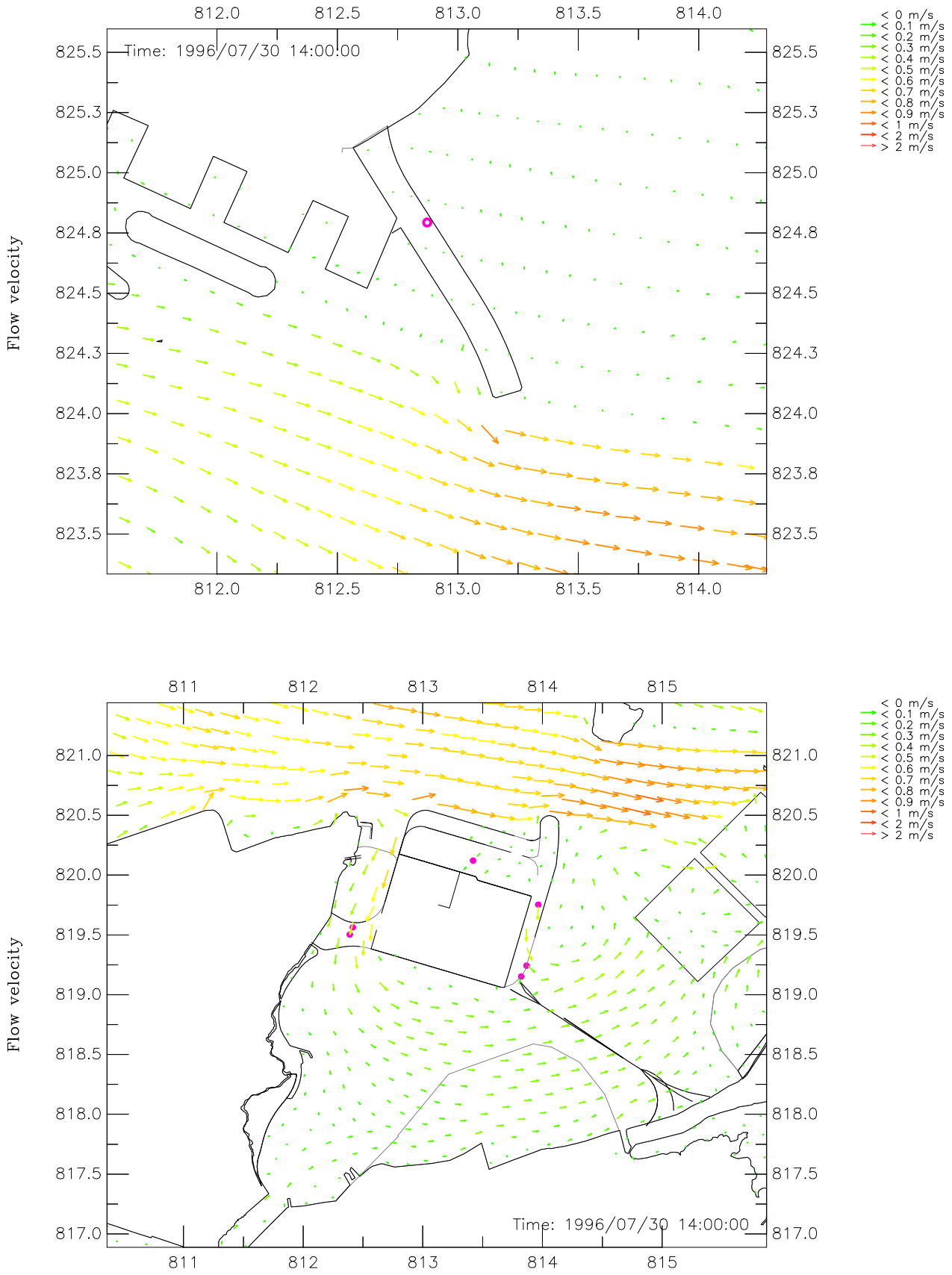
Year 2013 Dry Season Velocity Vector Plot at Ebb Tide – Bottom Layer	Apr 2009	Figure 021
MAUNSELL | AECOM		



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		

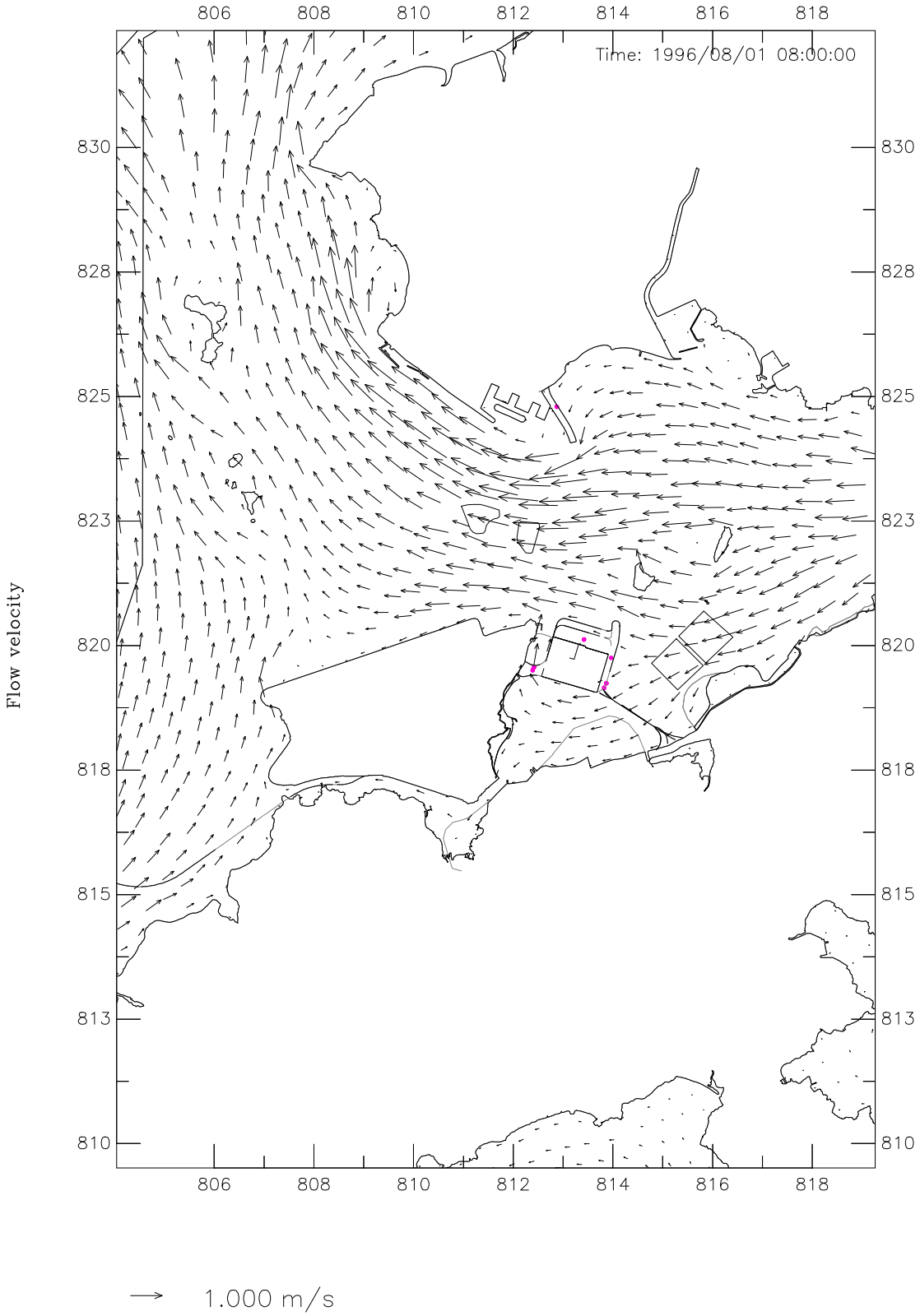


Year 2013
Wet Season Velocity Vector Plot at Ebb Tide – Bottom Layer
(Top: Northern Reclamation; Bottom: Southern Reclamation)

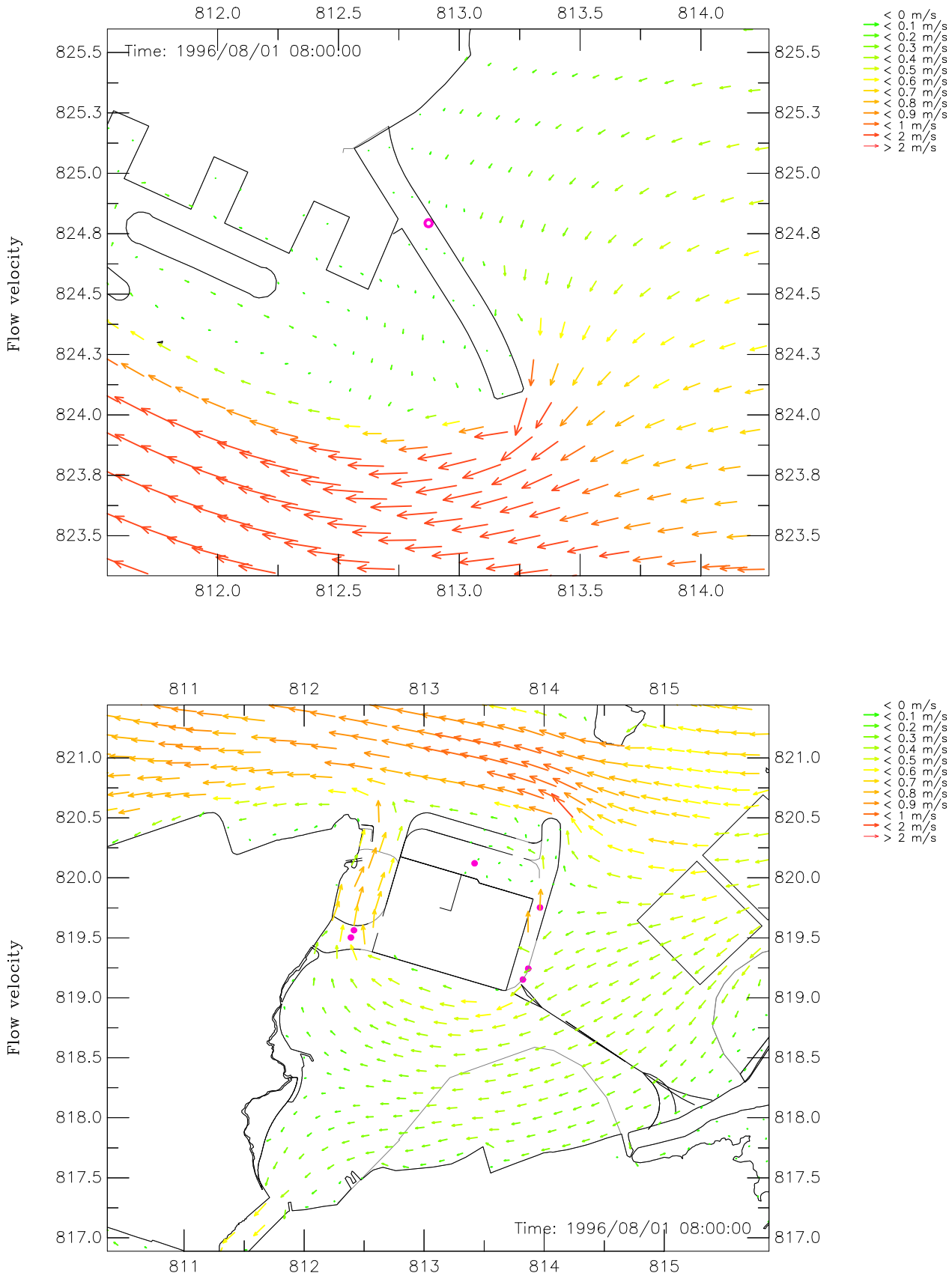
Apr 2009

Figure 024

MAUNSELL | AECOM



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

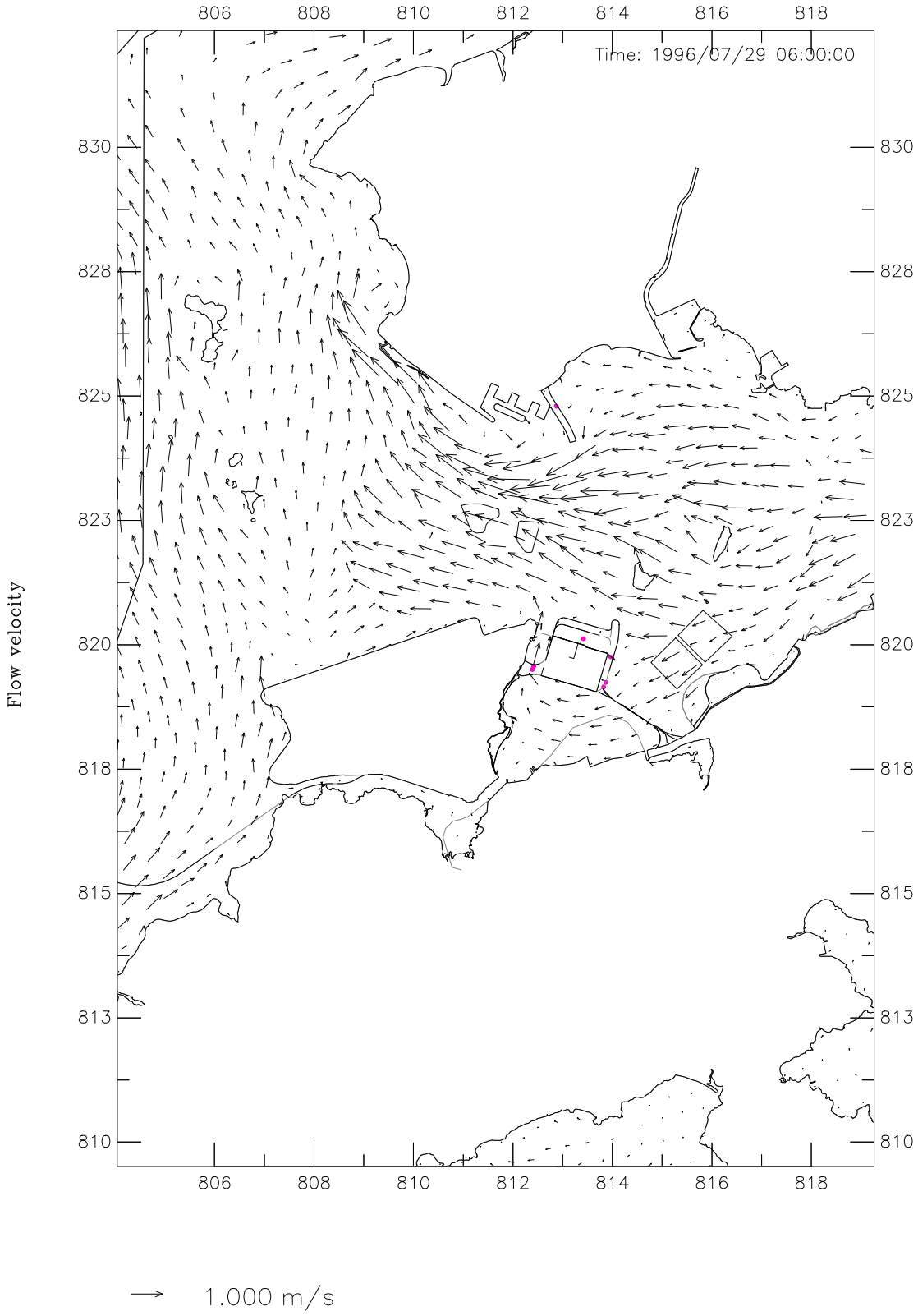


Year 2013
Dry Season Velocity Vector Plot at Flood Tide – Surface Layer
(Top: Northern Reclamation; Bottom: Southern Reclamation)

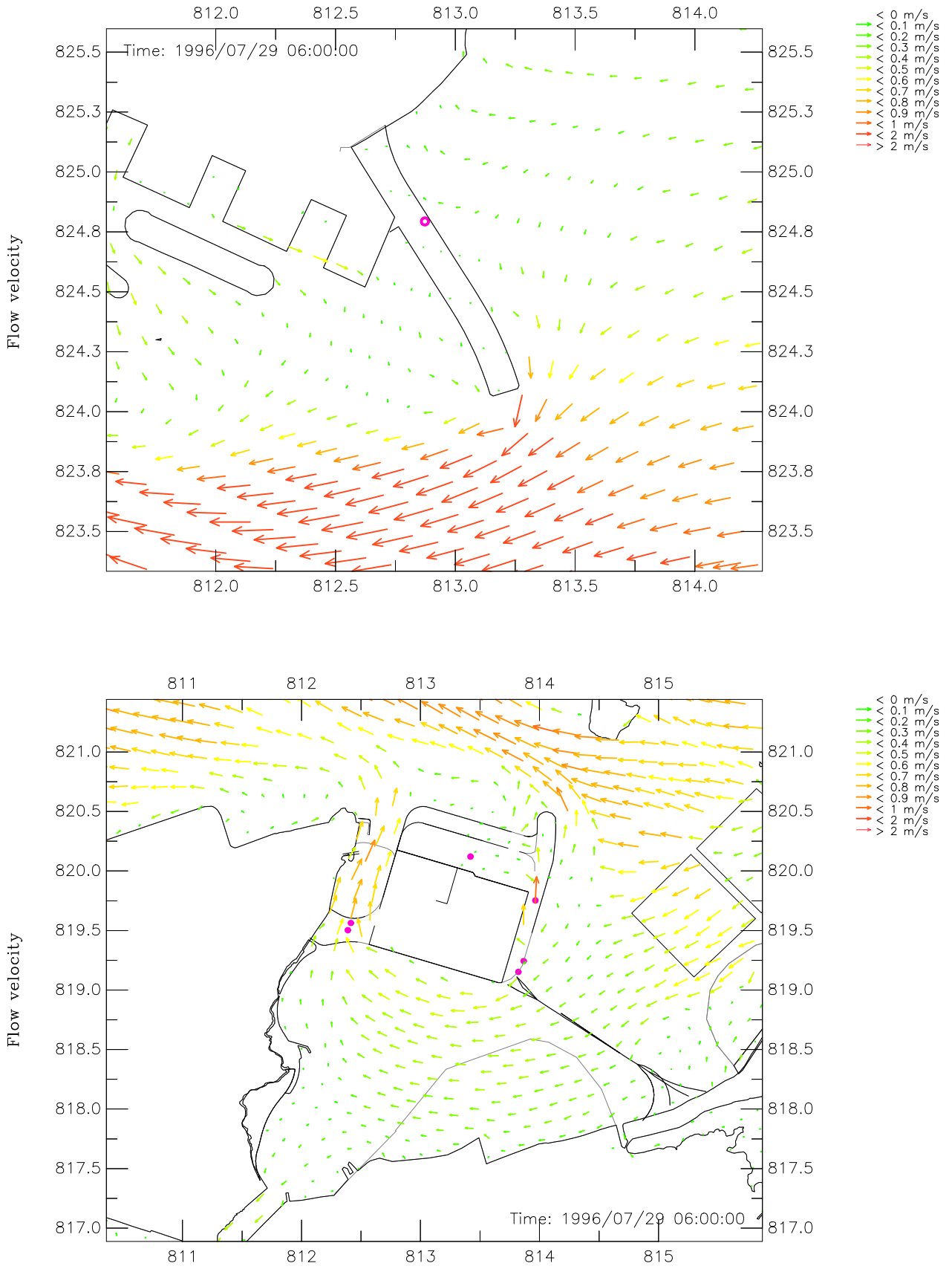
Apr 2009

Figure 026

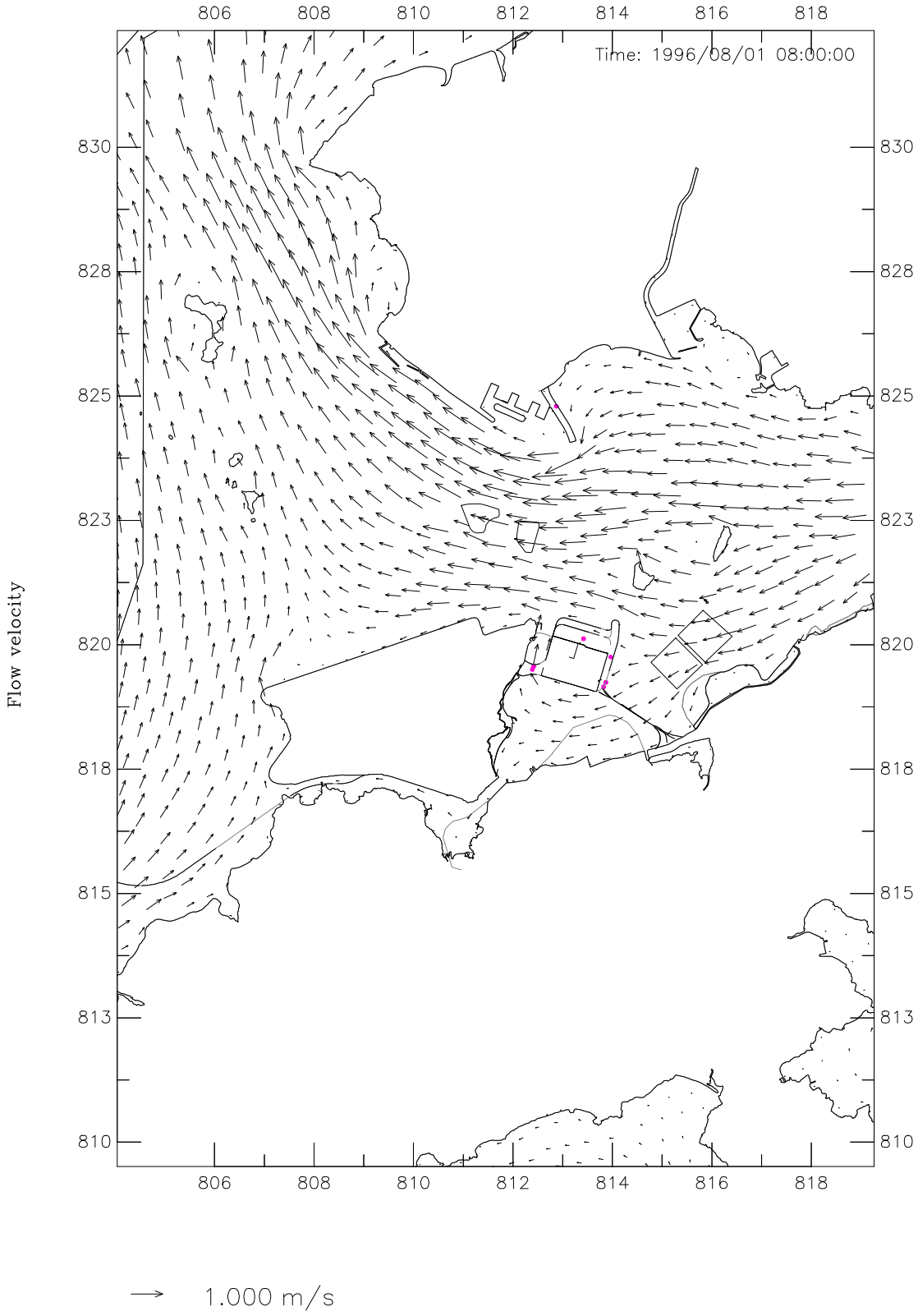
MAUNSELL | AECOM



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		

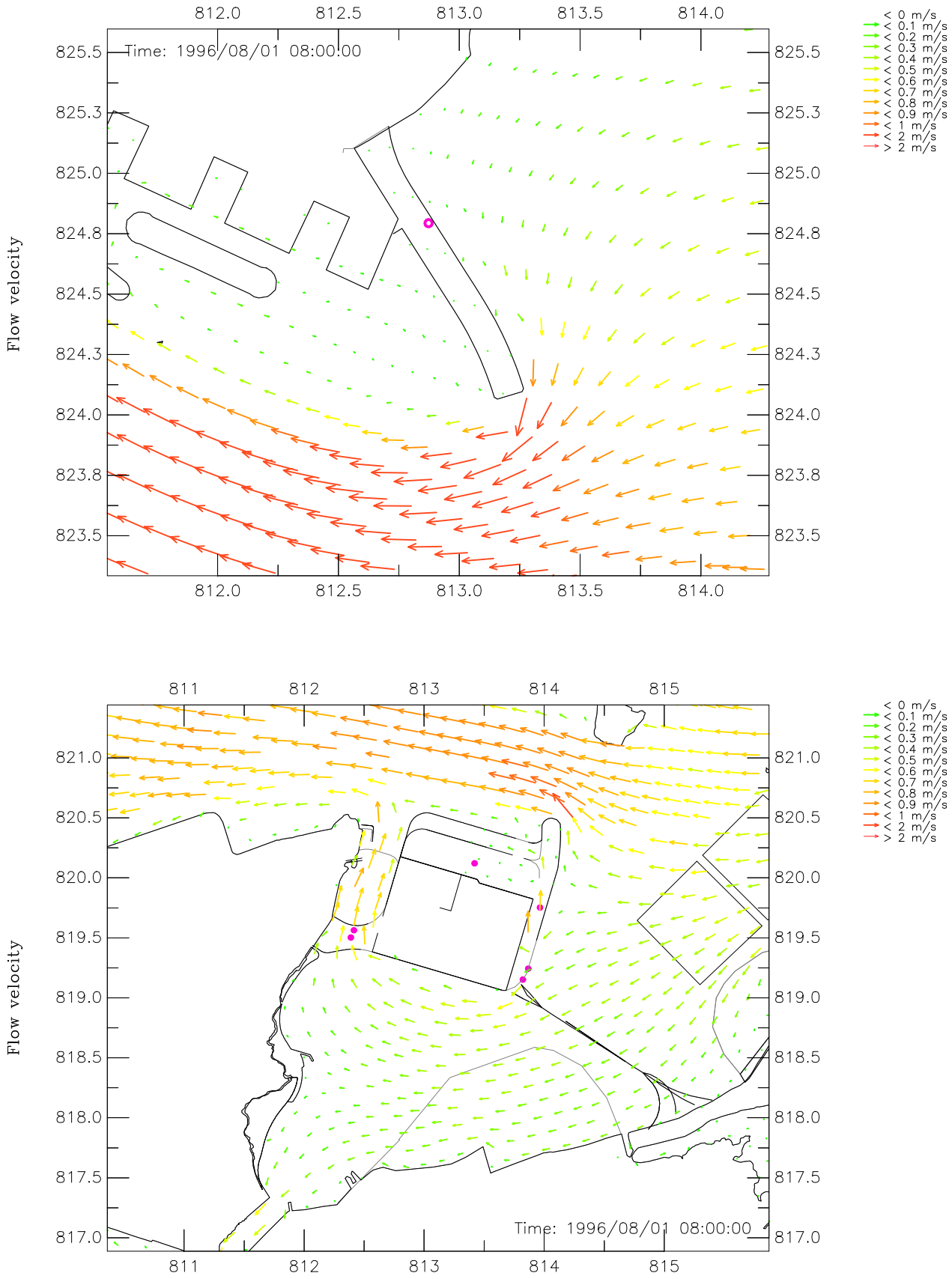


Year 2013
Dry Season Velocity Vector Plot at Flood Tide – Mid-Depth

Apr 2009

Figure 029

MAUNSELL | AECOM

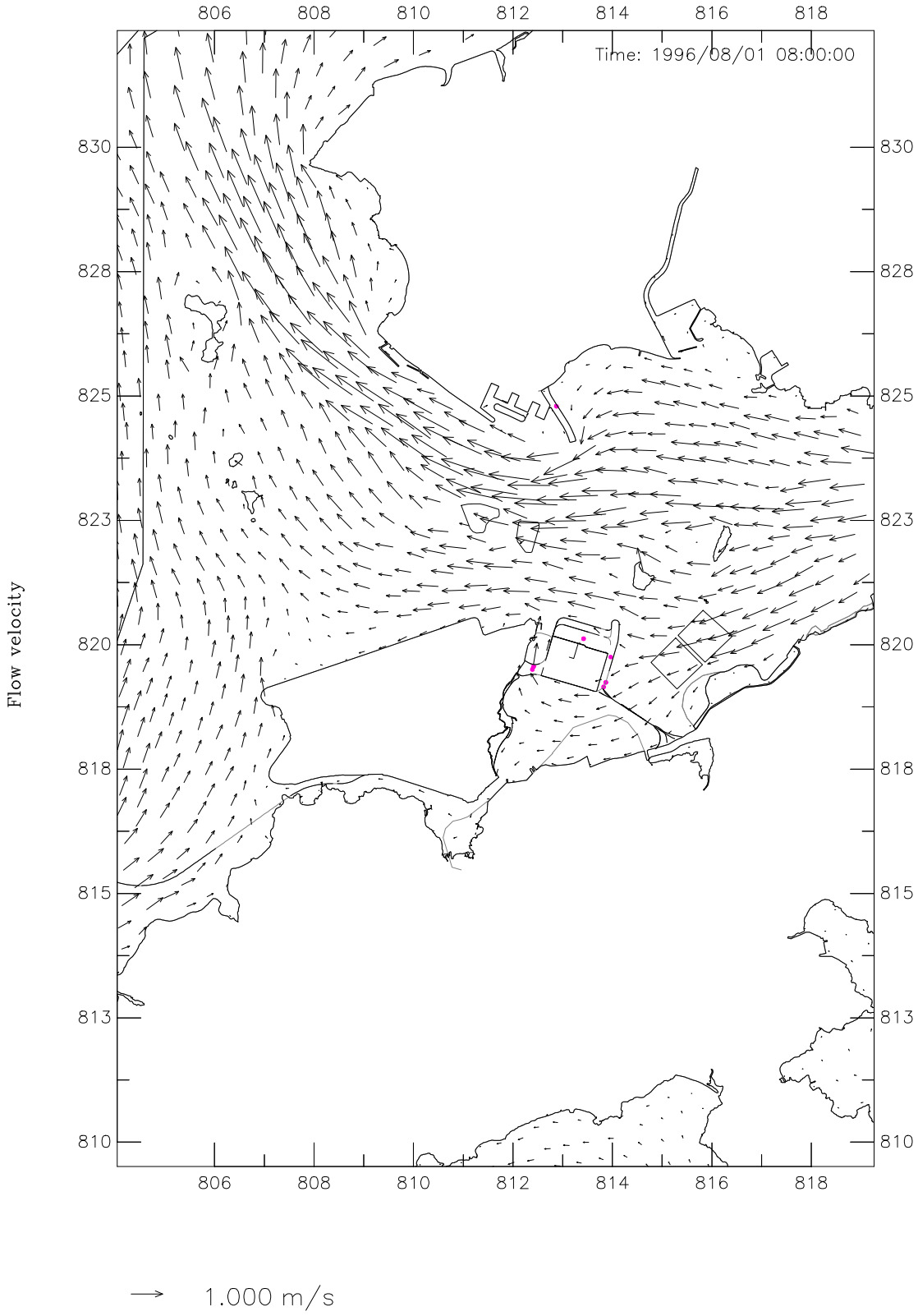


Year 2013
Dry Season Velocity Vector Plot at Flood Tide – Mid-Depth
(Top: Northern Reclamation; Bottom: Southern Reclamation)

Apr 2009

Figure 030

MAUNSELL | AECOM

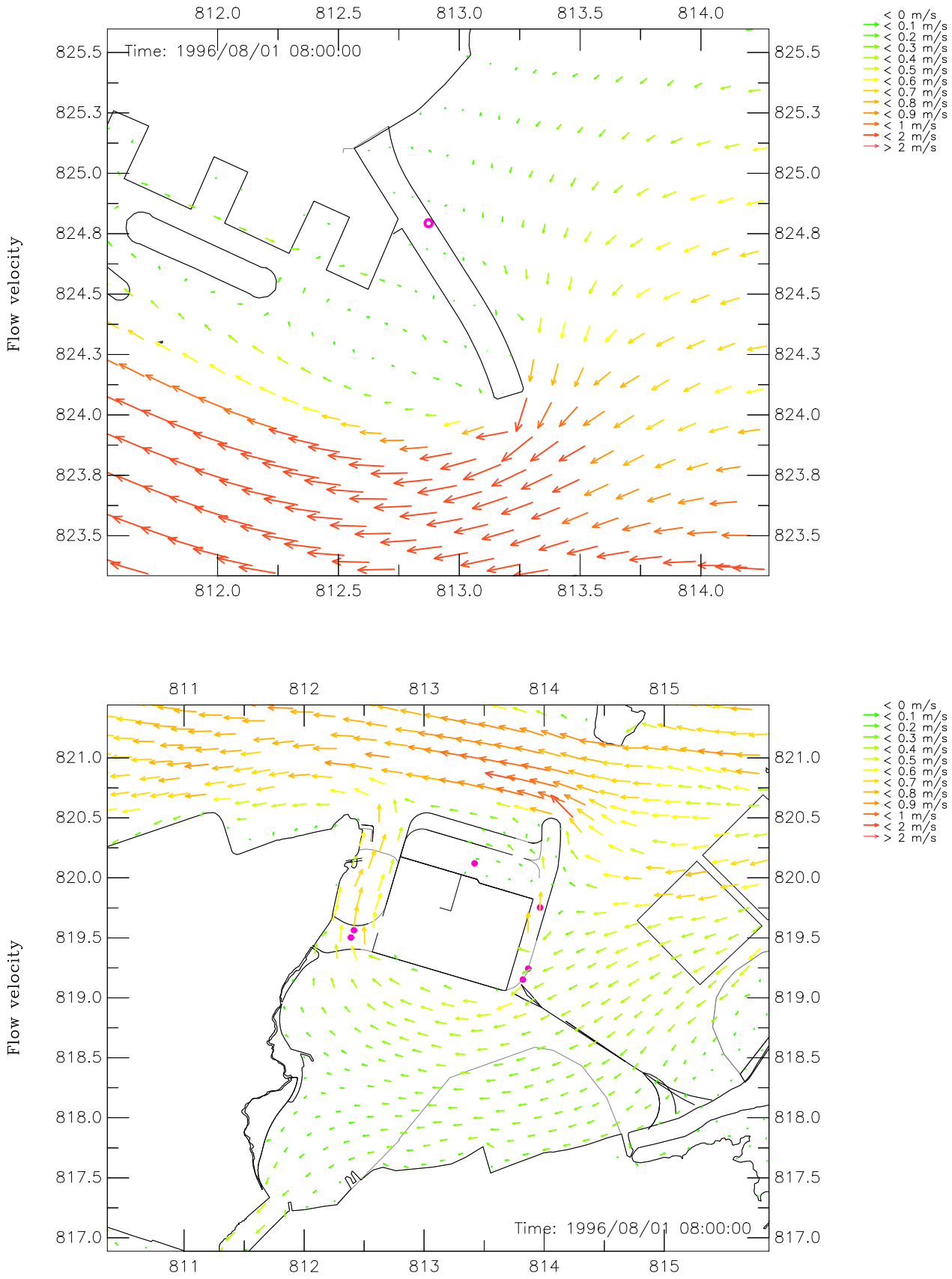


Year 2013
Wet Season Velocity Vector Plot at Flood Tide – Mid-Depth

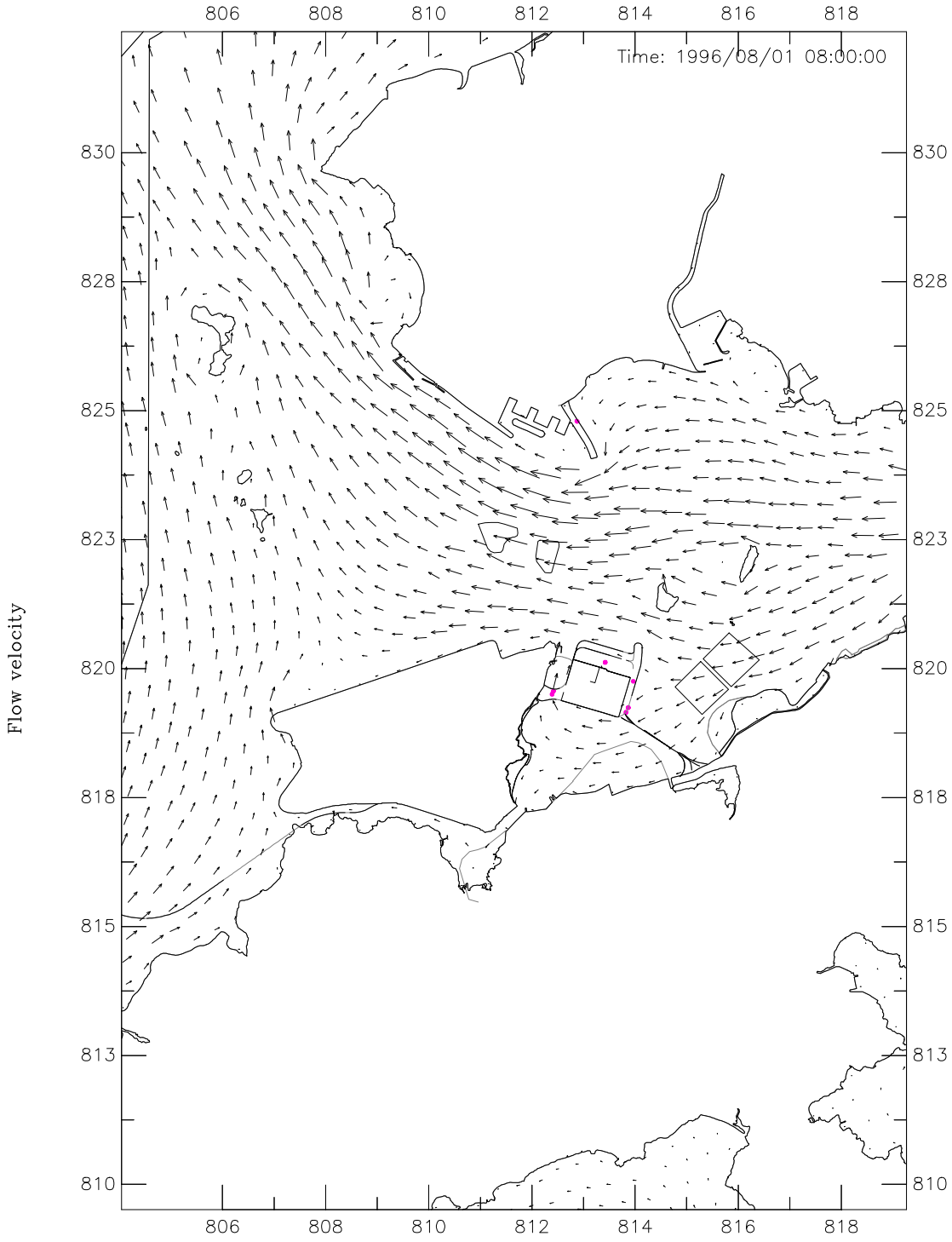
Apr 2009

Figure 031

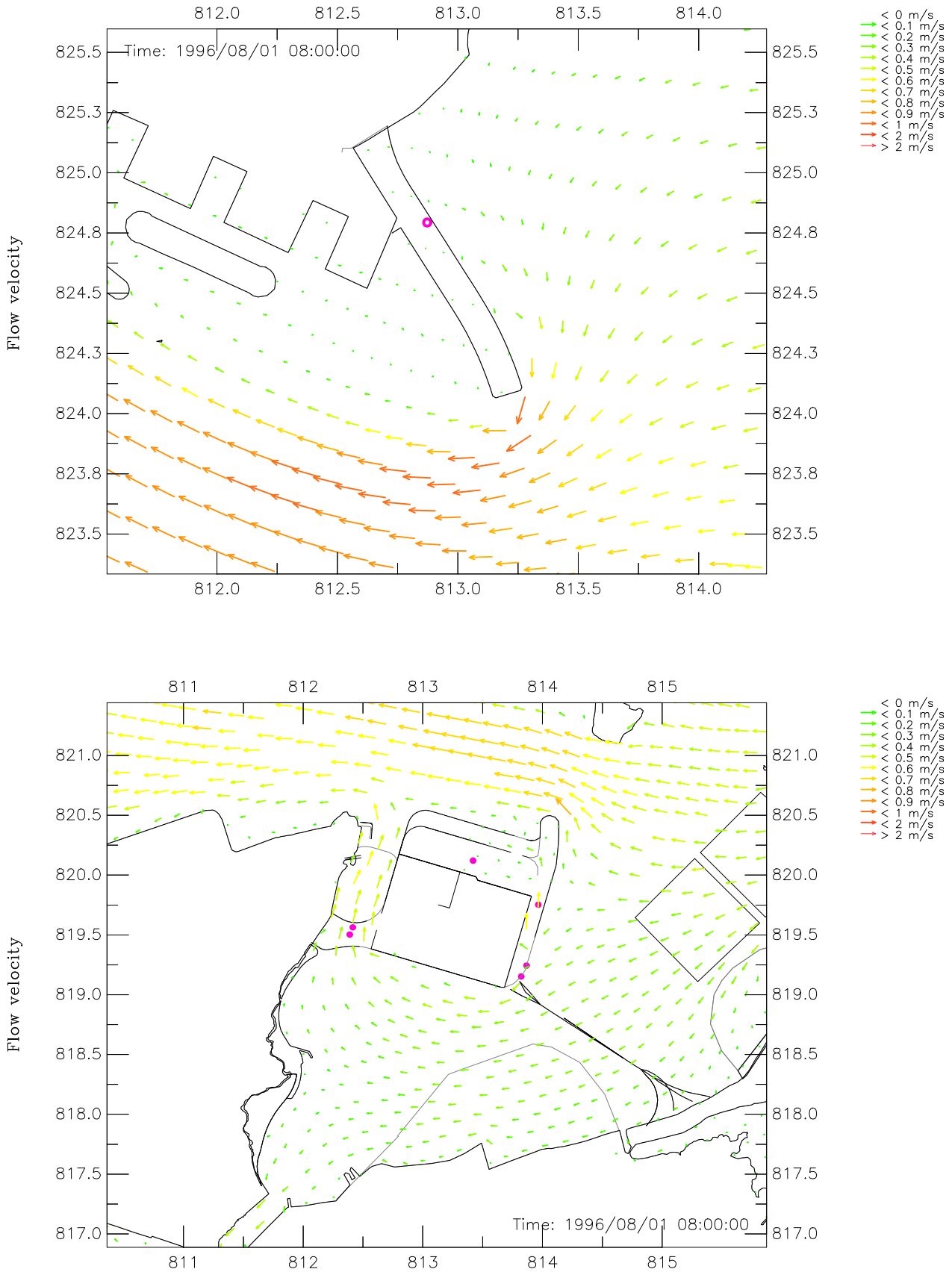
MAUNSELL | AECOM



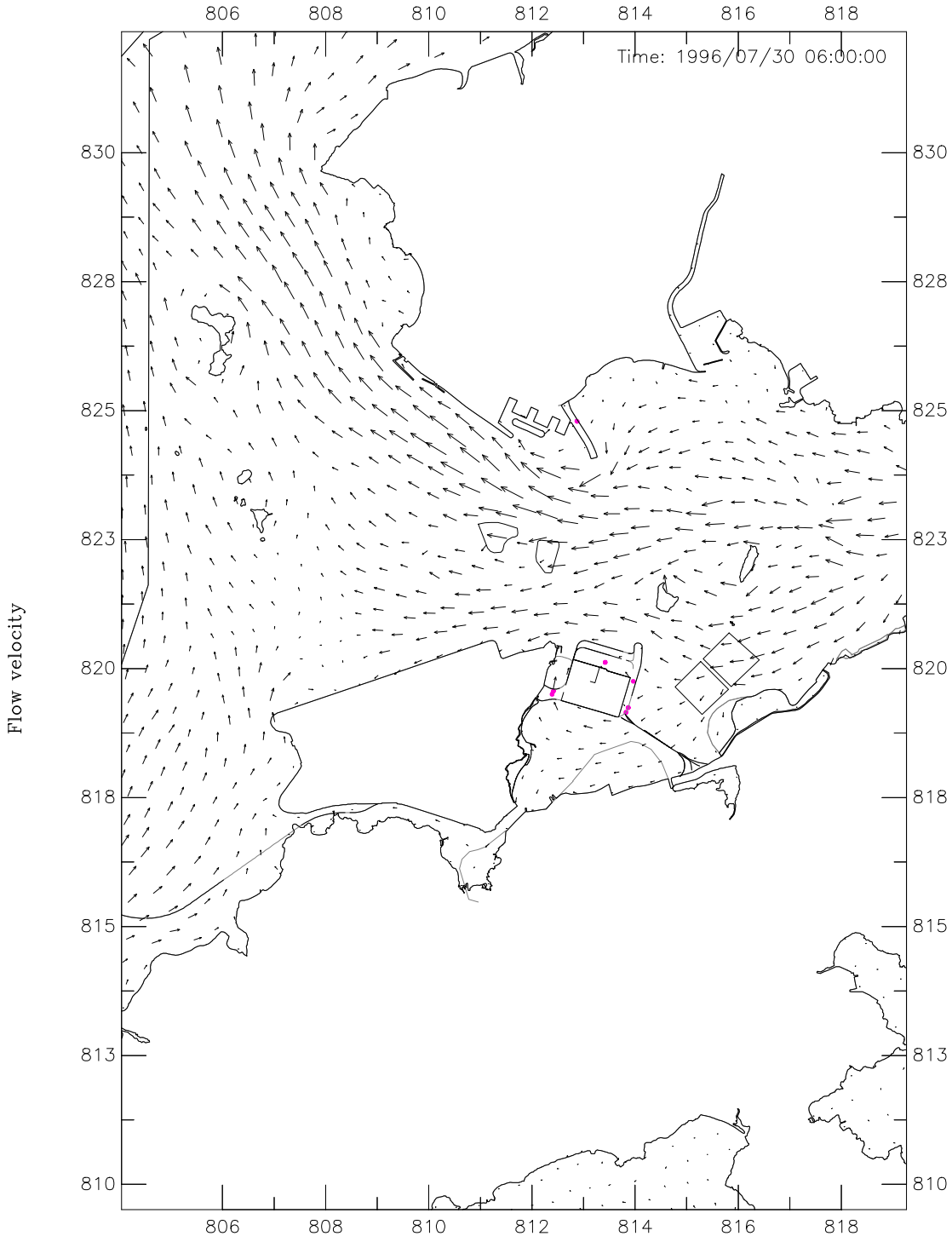
Year 2013 Wet Season Velocity Vector Plot at Flood Tide – Mid-Depth (Top: Northern Reclamation; Bottom: Southern Reclamation)	Apr 2009	Figure 032
MAUNSELL | AECOM		



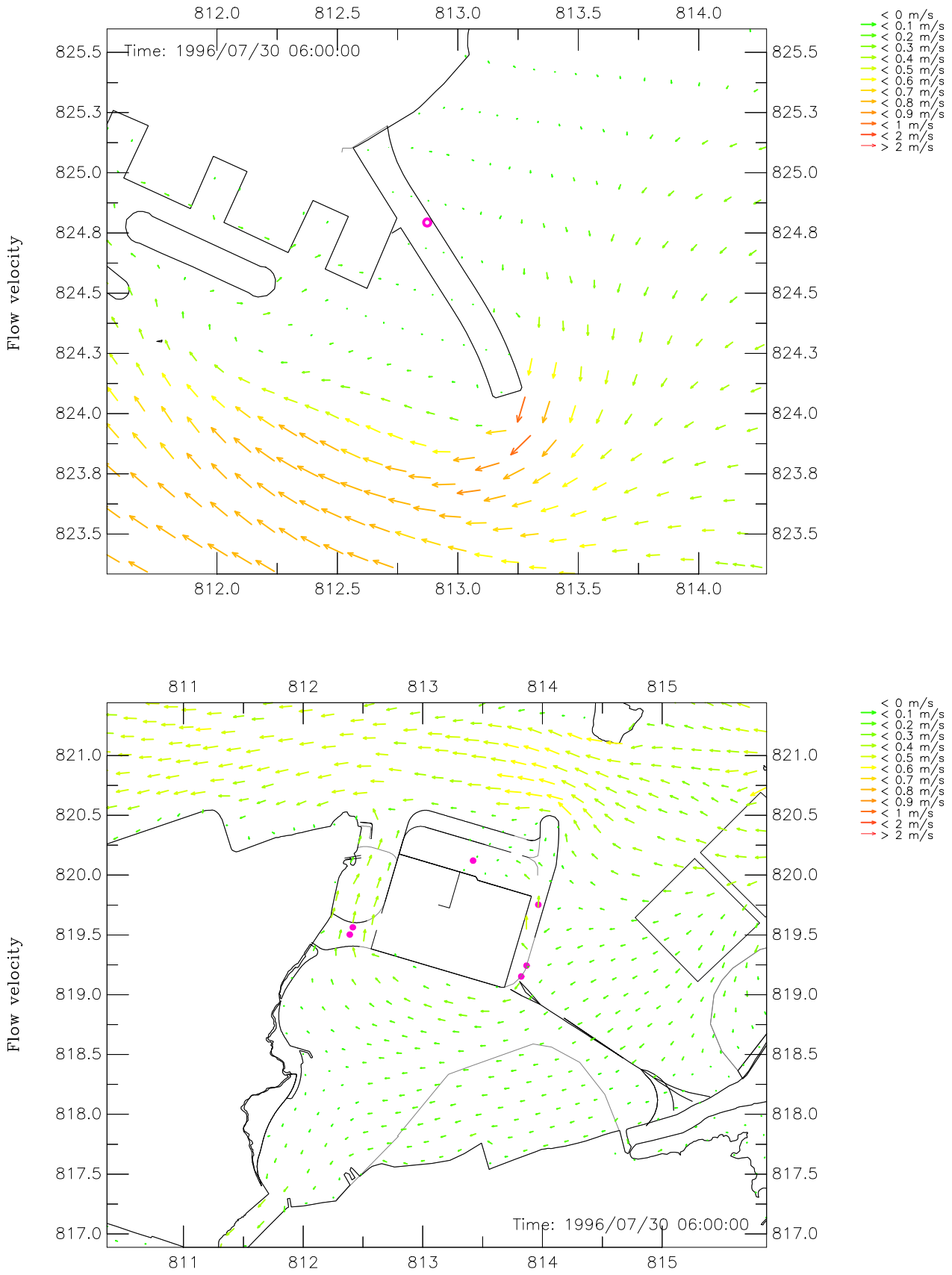
Year 2013 Dry Season Velocity Vector Plot at Flood Tide – Bottom Layer	Apr 2009	Figure 033
MAUNSELL | AECOM		



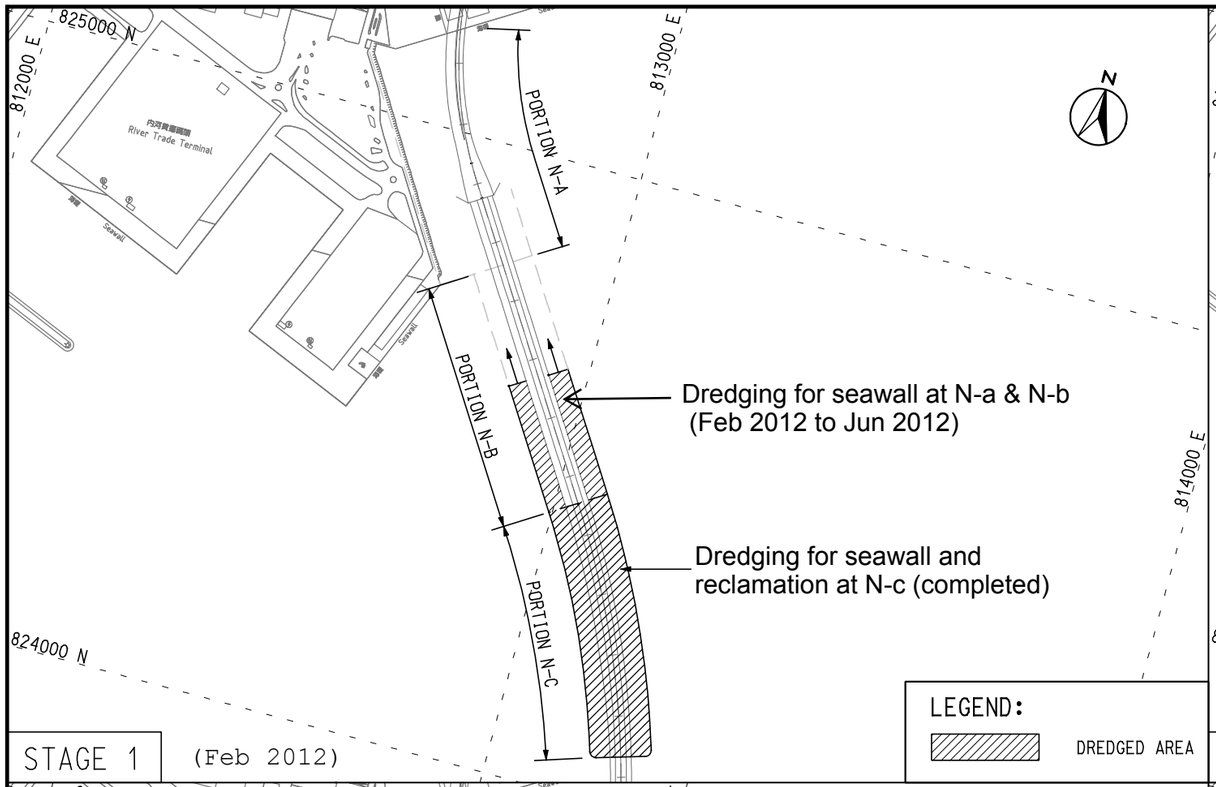
Year 2013 Dry Season Velocity Vector Plot at Flood Tide – Bottom Layer (Top: Northern Reclamation; Bottom: Southern Reclamation)	Apr 2009	Figure 034
MAUNSELL | AECOM		



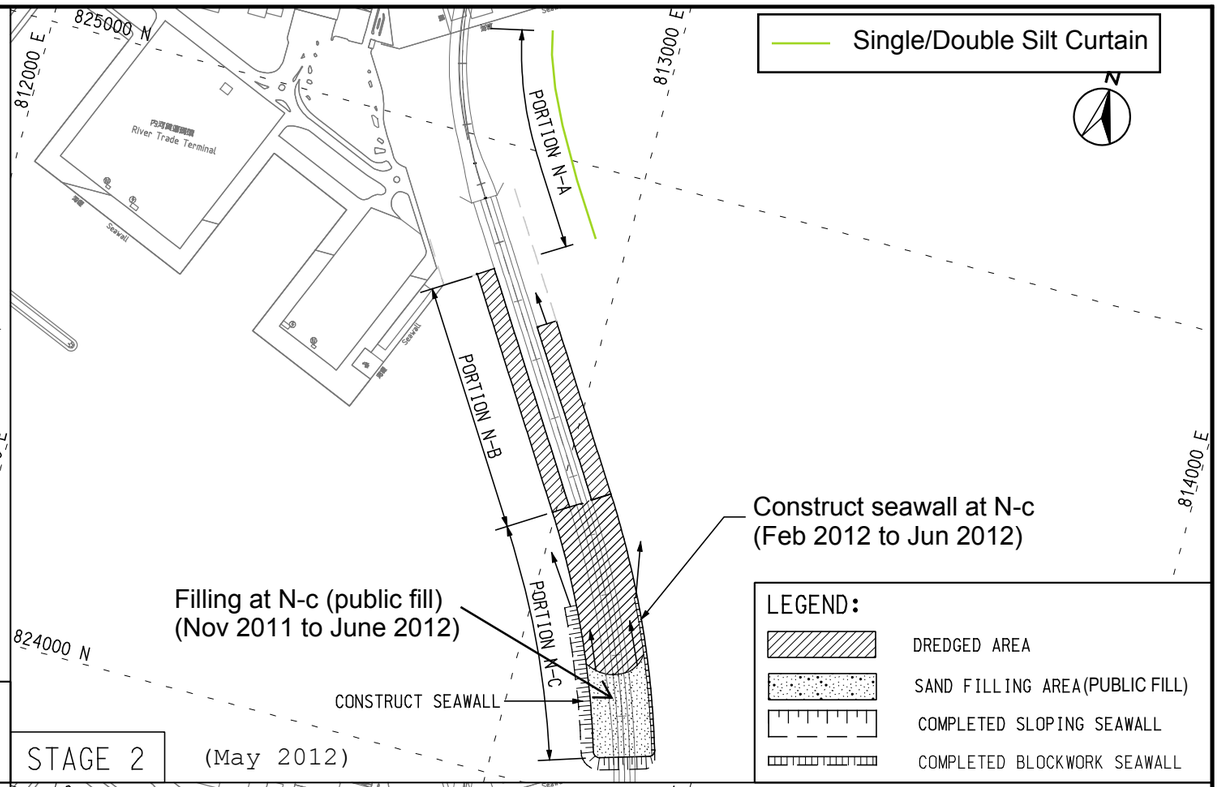
Year 2013 Wet Season Velocity Vector Plot at Flood Tide – Bottom Layer	Apr 2009	Figure 035
MAUNSELL | AECOM		



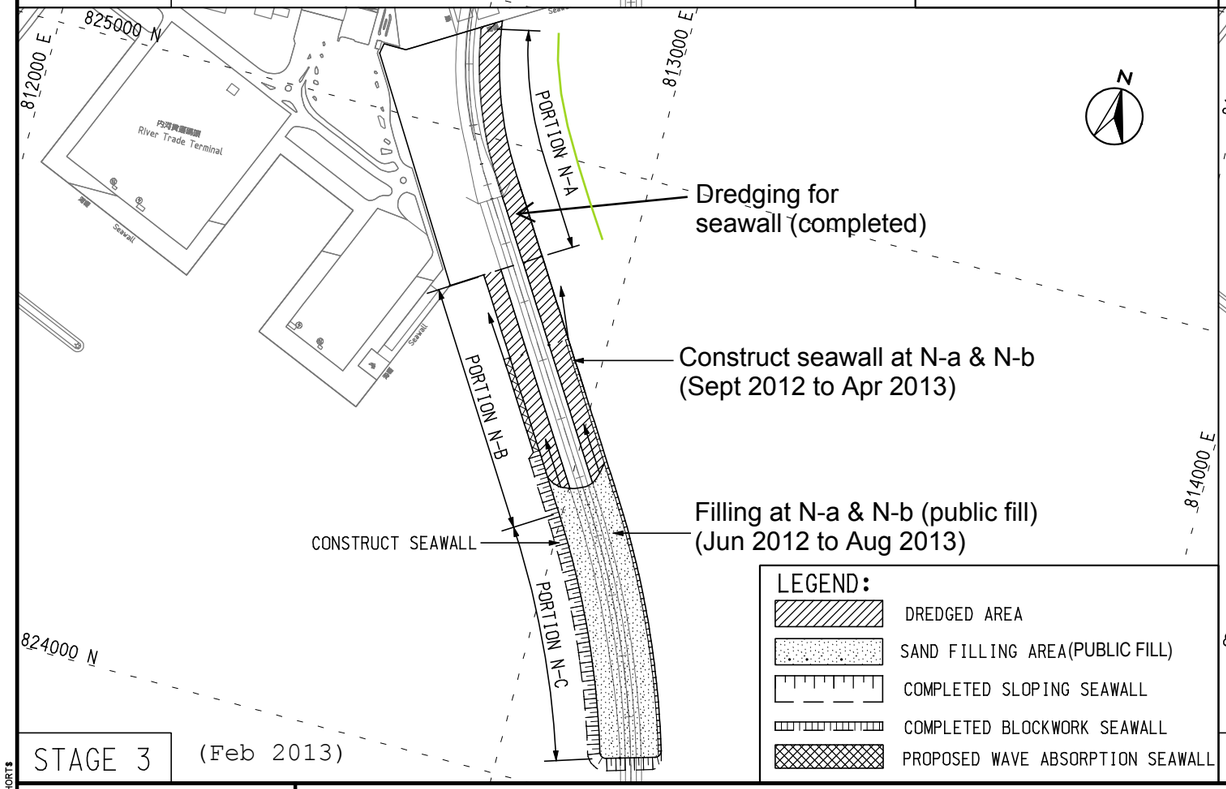
Year 2013 Wet Season Velocity Vector Plot at Flood Tide – Bottom Layer (Top: Northern Reclamation; Bottom: Southern Reclamation)	Apr 2009	Figure 036
MAUNSELL | AECOM		



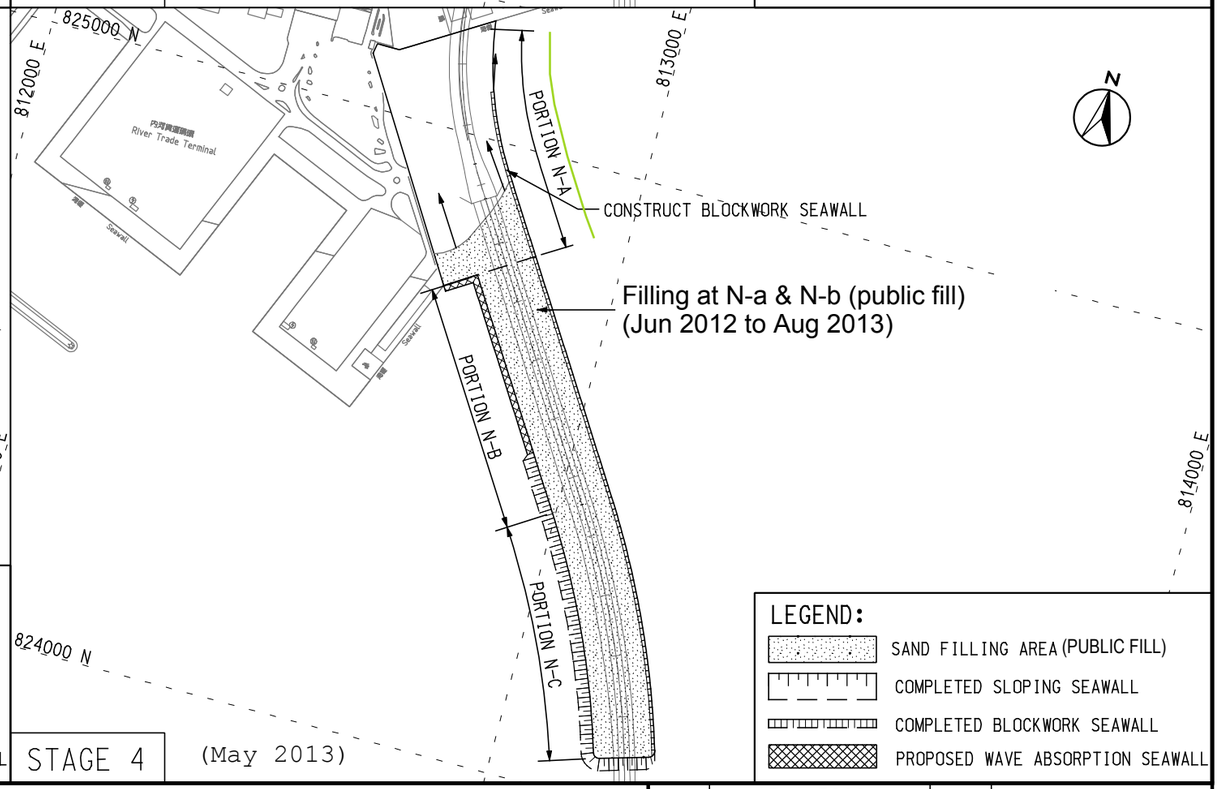
STAGE 1 (Feb 2012)



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

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

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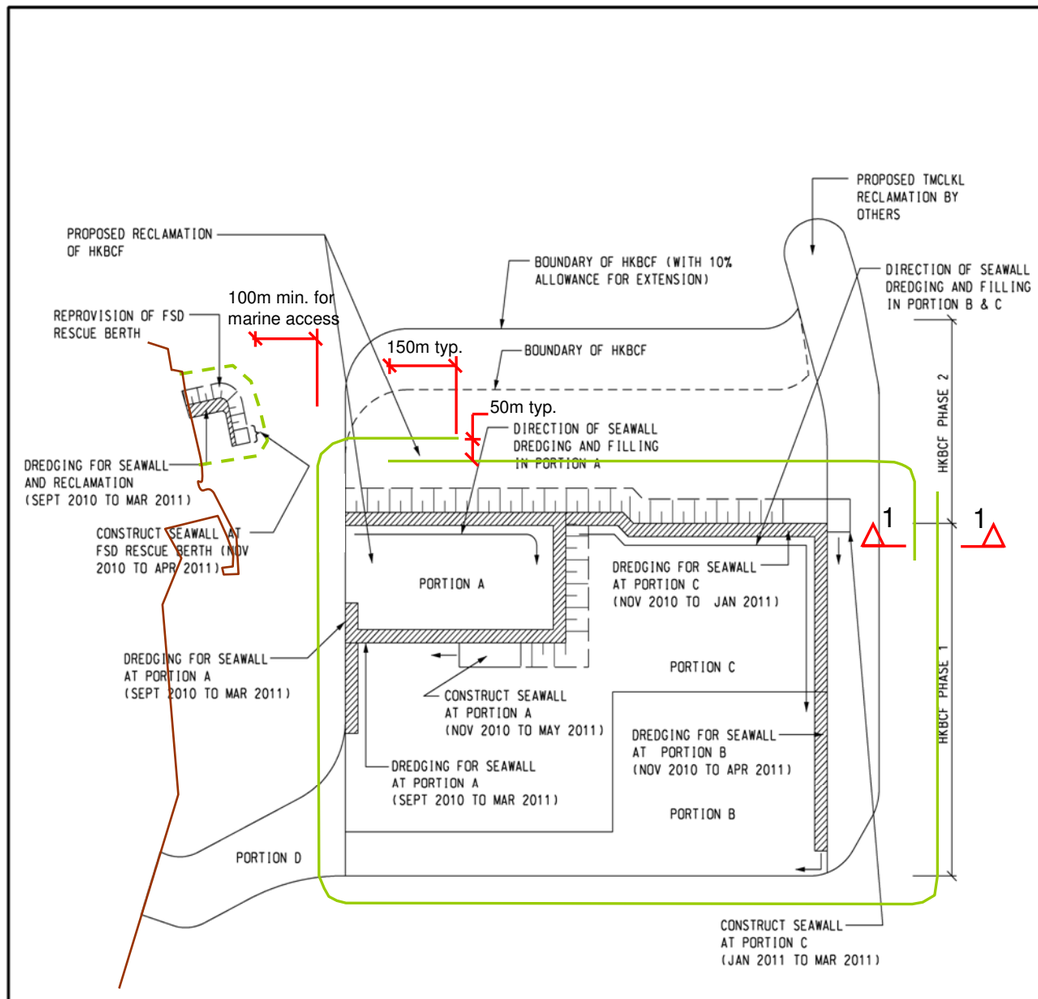


NOTE:

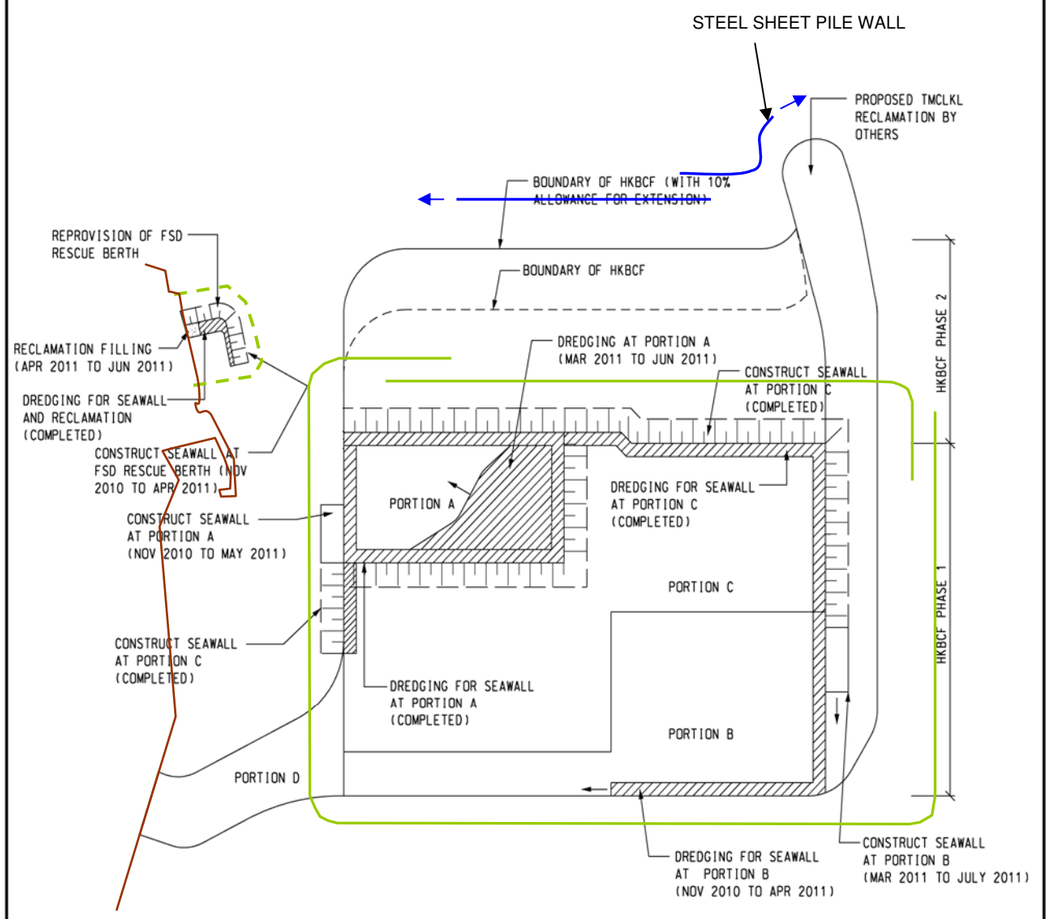
FIRST MEASURE: FRAME TYPE SILT CURTAIN FOR ALL GRAB DREDGERS (SEE TYPICAL SECTION ATTACHED)

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

LEGEND:

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

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 - 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

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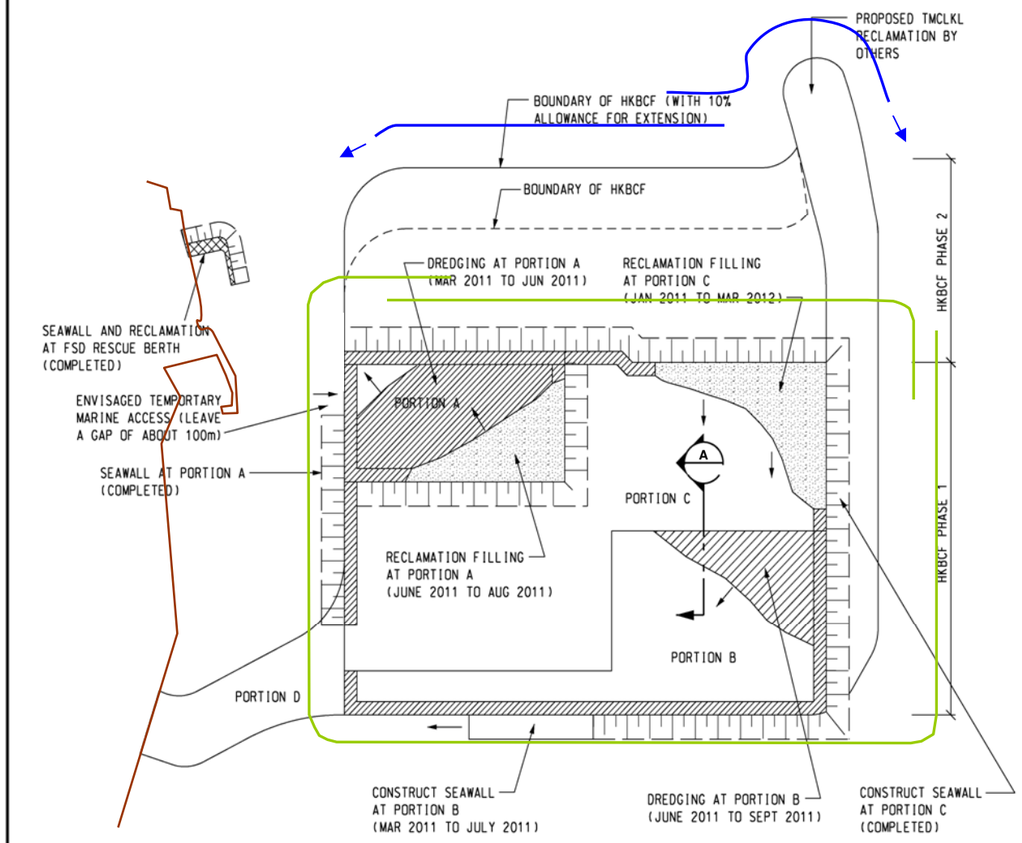
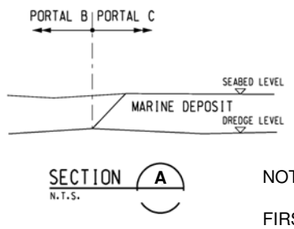
Scale: 1:12500 on A3	
Drawing No.: 25308/041/301	
Status: PRELIMINARY	Rev.: A





NOTE:

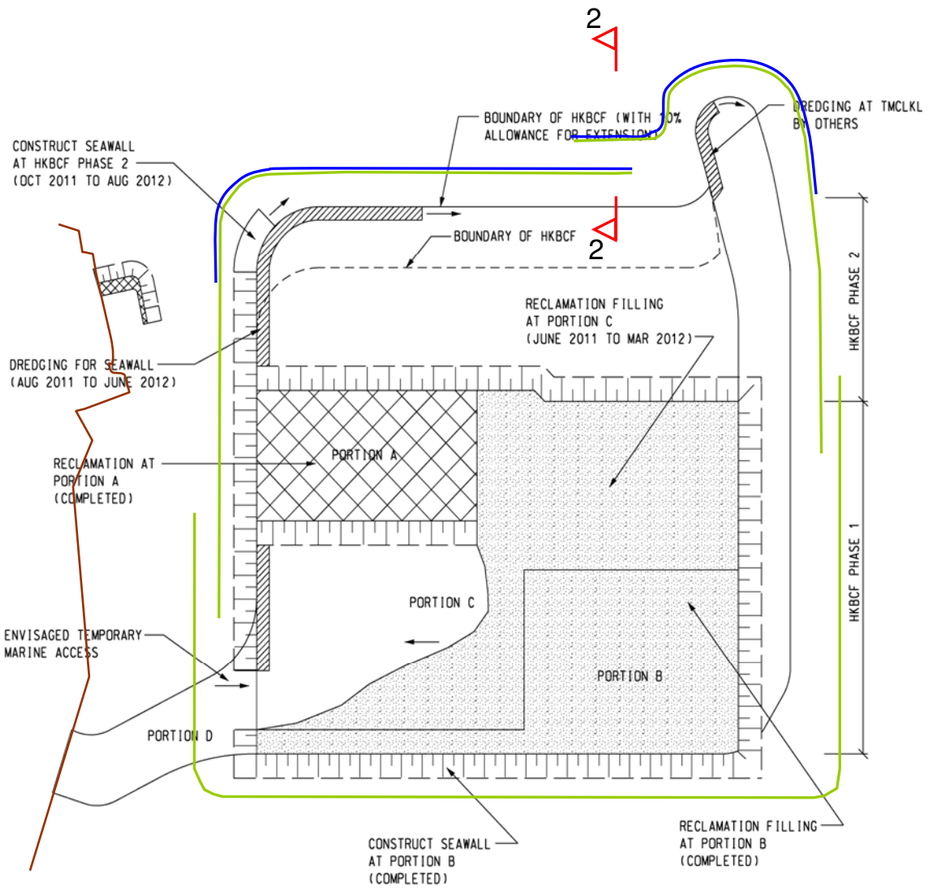
FIRST MEASURE: FRAME TYPE SILT CURTAIN FOR ALL GRAB DREDGERS (SEE TYPICAL SECTION ATTACHED)

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)



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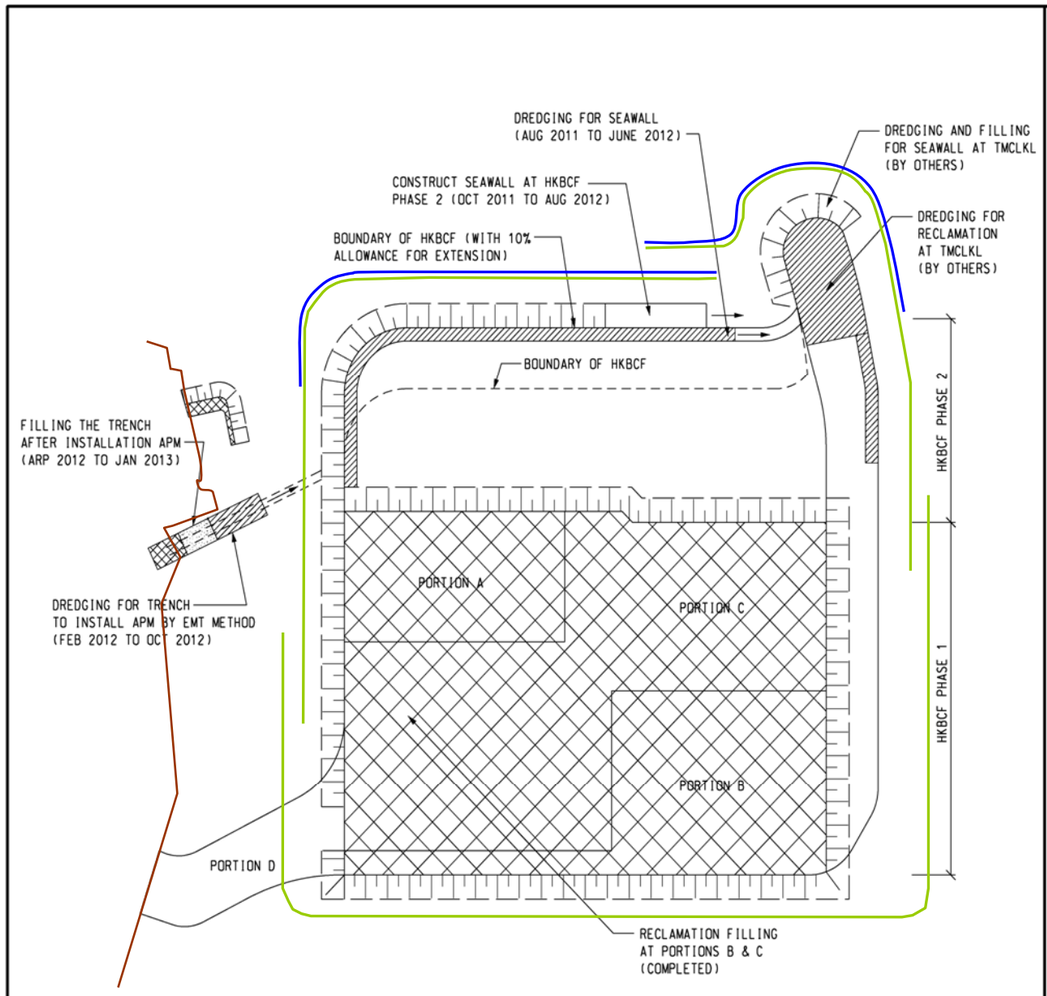
Drawn	Date	Drawing No.
CN	02/09	25308/041/302
Checked: SK	Approved: AK	
Scale: 1:12500 on A3	Status: PRELIMINARY	Rev. A



NOTE:

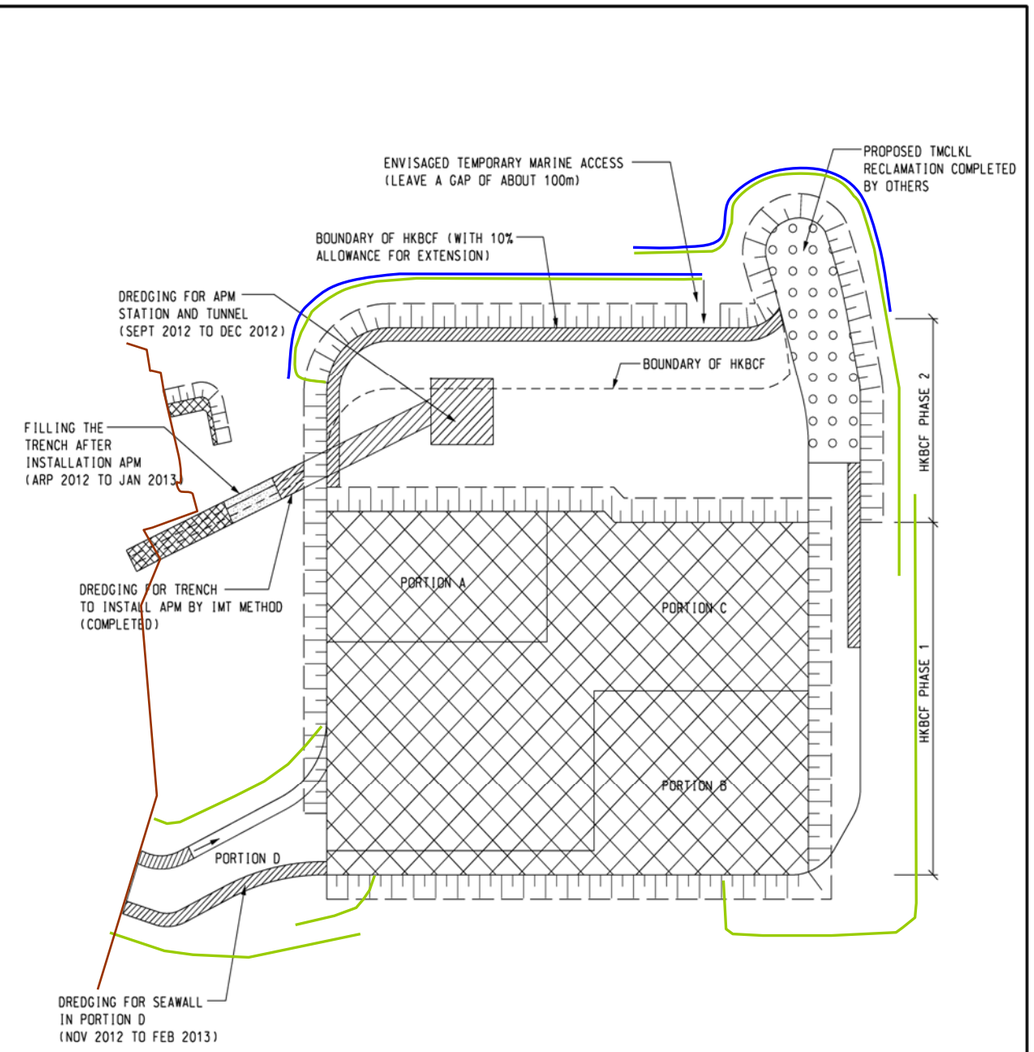
FIRST MEASURE: FRAME TYPE SILT CURTAIN FOR ALL GRAB DREDGERS (SEE TYPICAL SECTION ATTACHED)

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

LEGEND:

- 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)

Printed by : ramon yick 24/4/2009
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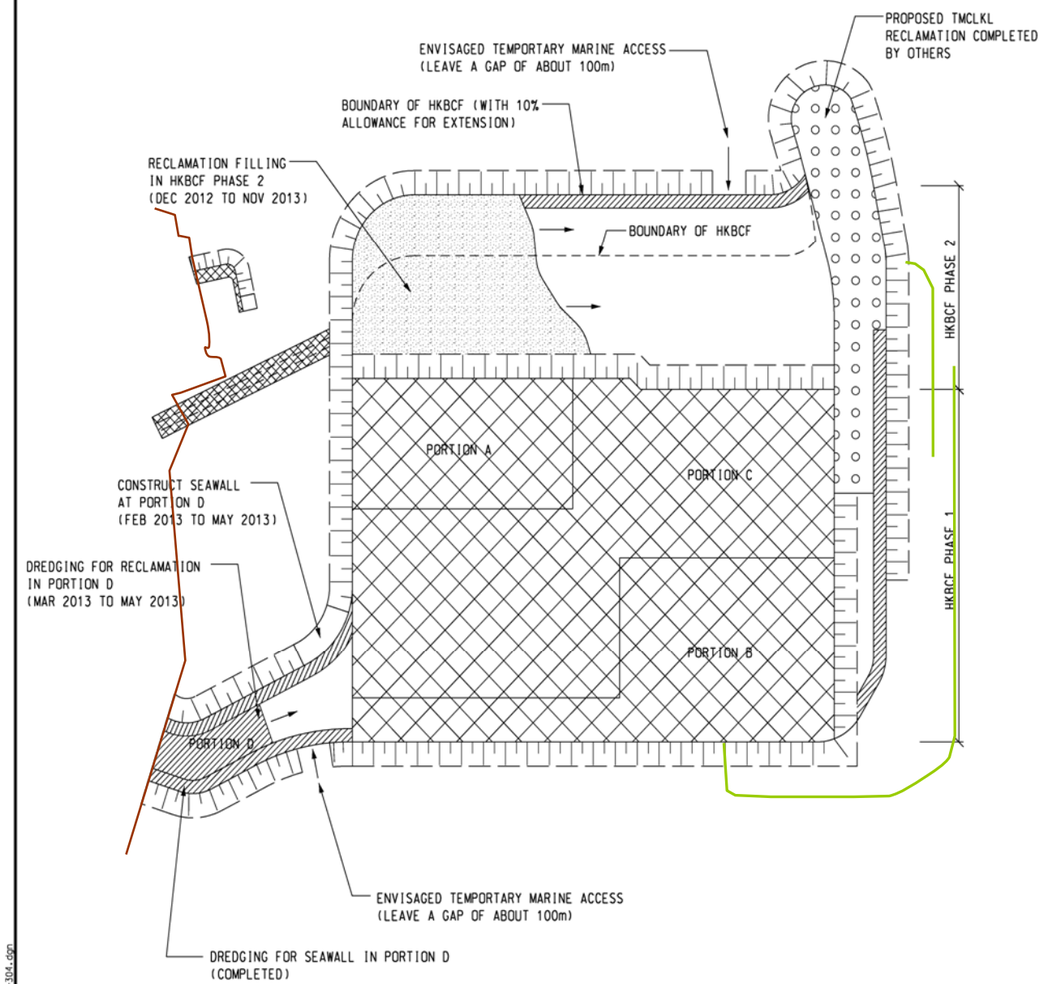

NOTE:

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)

Printed by : remon.yick 24/4/2009
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Rev.	Description	Date
A	FIRST ISSUE	02/09

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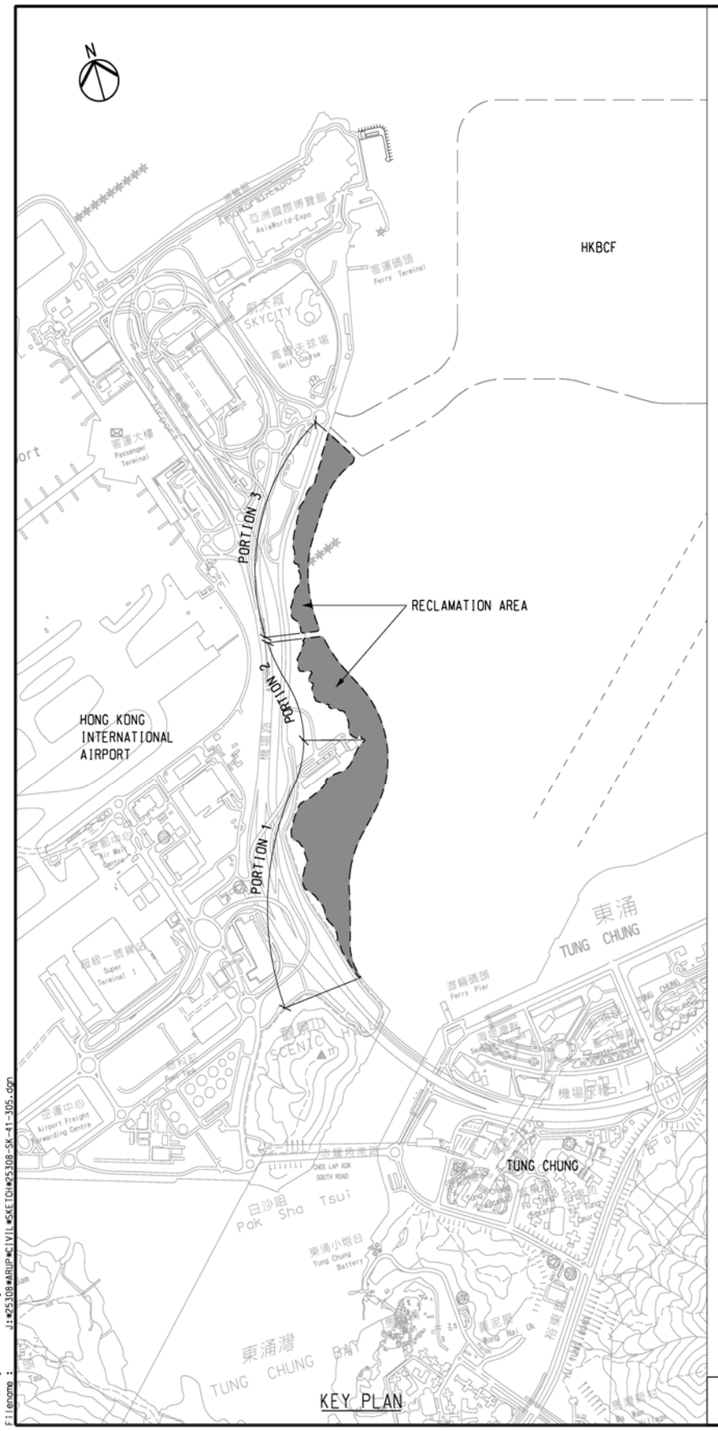
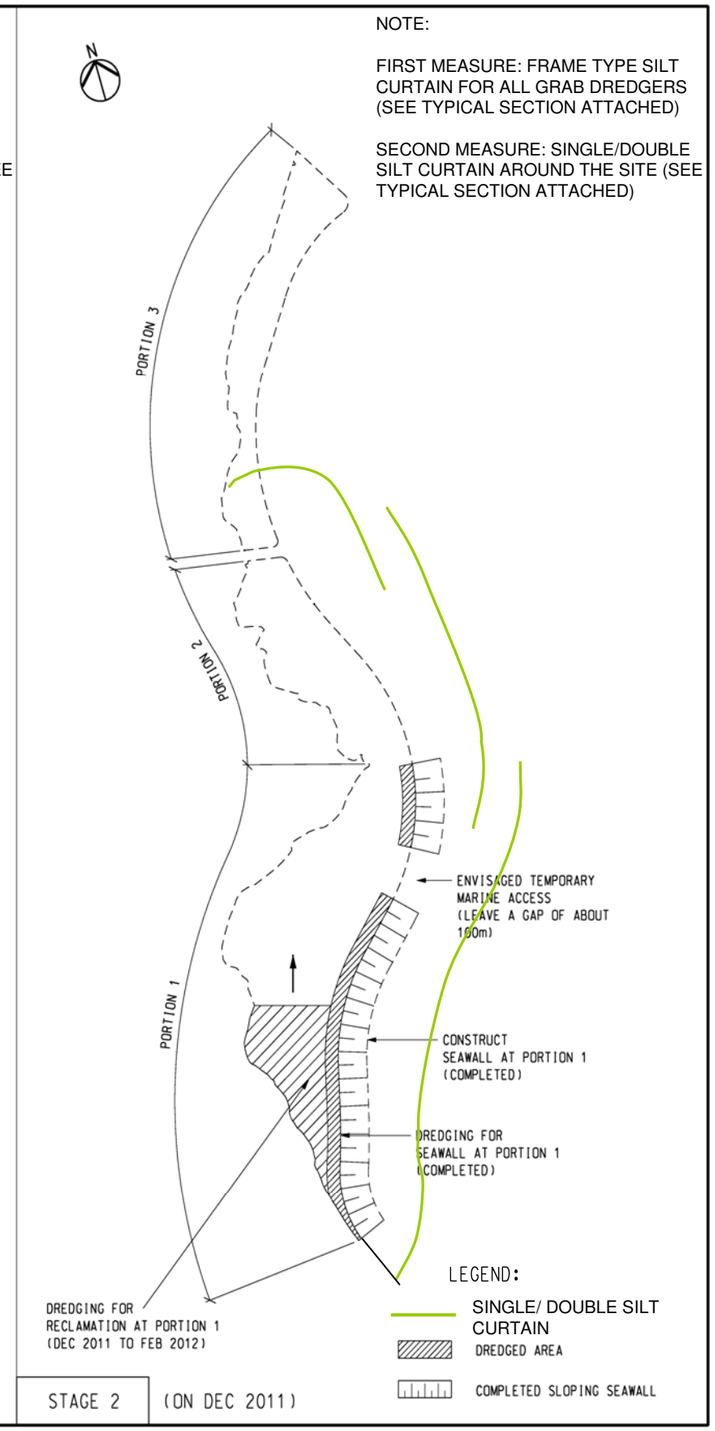
Scale: 1:12500 on A3
Drawing No.: 25308/041/304
Status: PRELIMINARY | Rev.: A





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Job Title
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Drawing Title
ANTICIPATED CONSTRUCTION SEQUENCE OF HKLR

Rev.	Description	Date
A	FIRST ISSUE	02/09

Drawn	AL
Date	02/09
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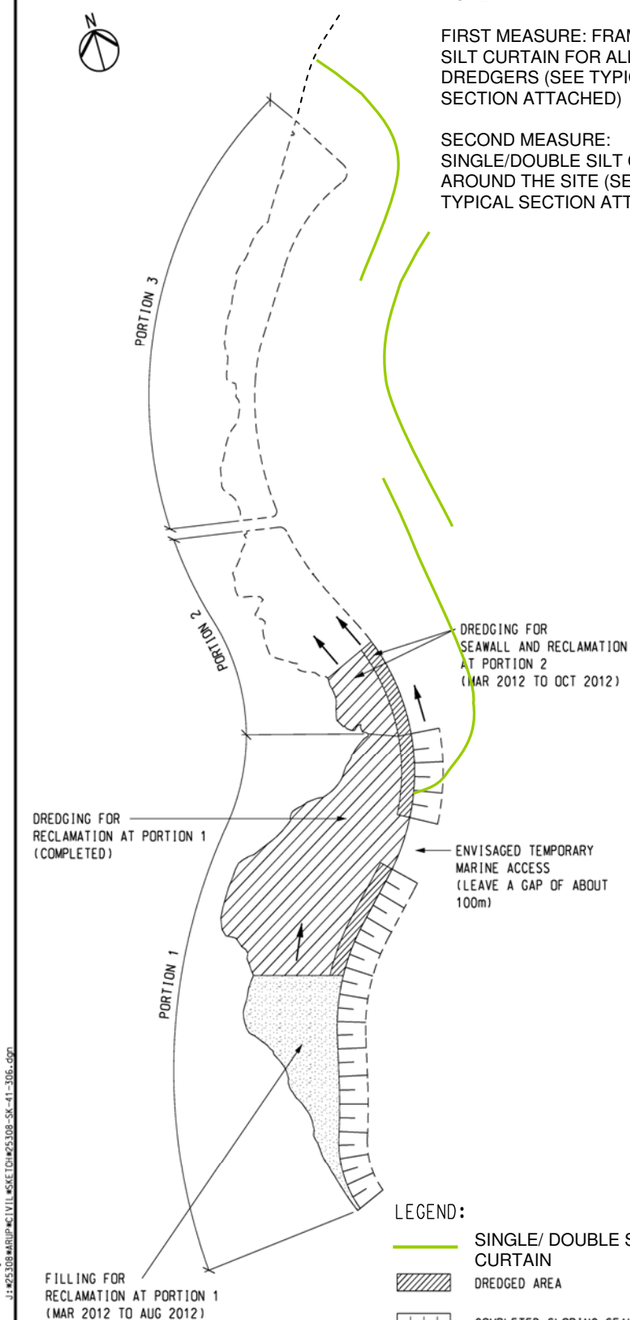
Approved	AK
Scale	1:10000 on A3
Drawing No.	25308/041/305
Status	PRELIMINARY
Rev.	A

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:

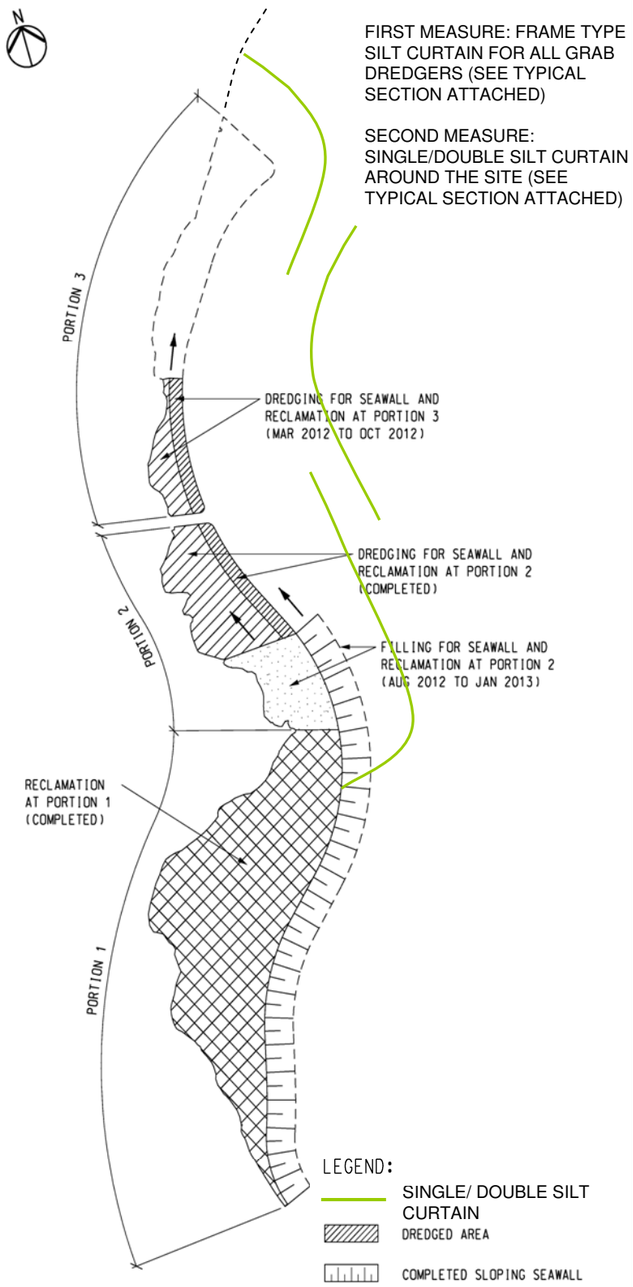
- SINGLE/ DOUBLE SILT CURTAIN
- DREDGED AREA
- COMPLETED SLOPING SEAWALL
- RECLAMATION FILLING AREA

STAGE 3 (ON APR 2012)

NOTE:

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

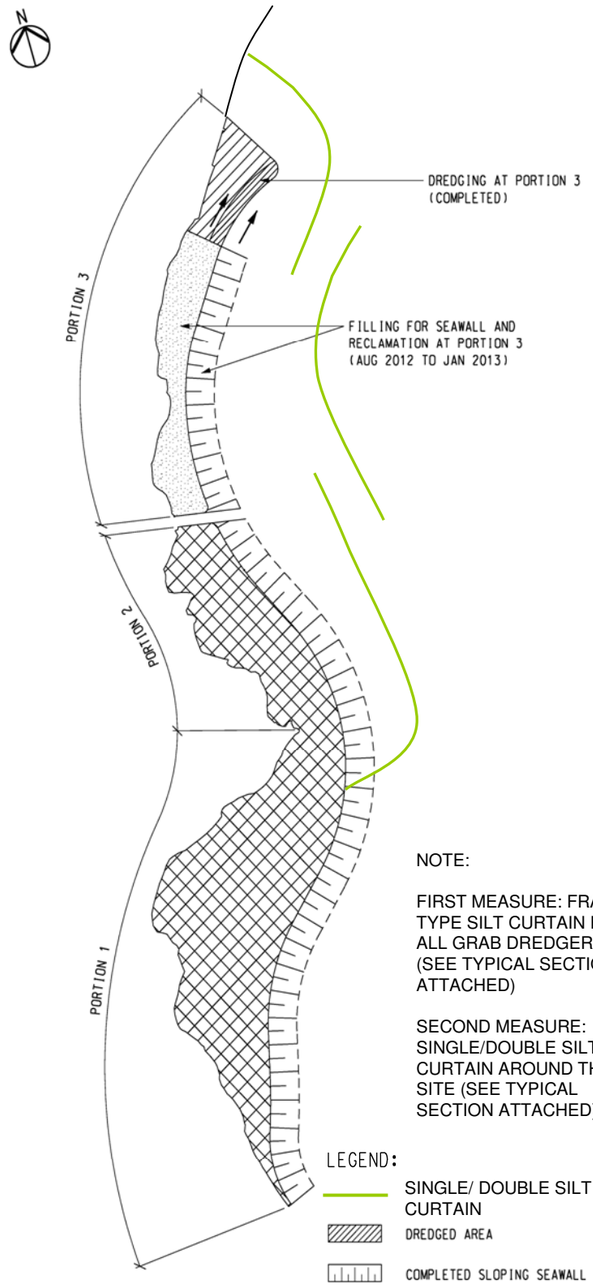
SECOND MEASURE: SINGLE/DOUBLE SILT CURTAIN AROUND THE SITE (SEE TYPICAL SECTION ATTACHED)



LEGEND:

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

STAGE 4 (ON AUG 2012)



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

STAGE 5 (ON DEC 2012)

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Hong Kong Project Management Office

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Drawing Title: ANTICIPATED CONSTRUCTION SEQUENCE OF HKLR

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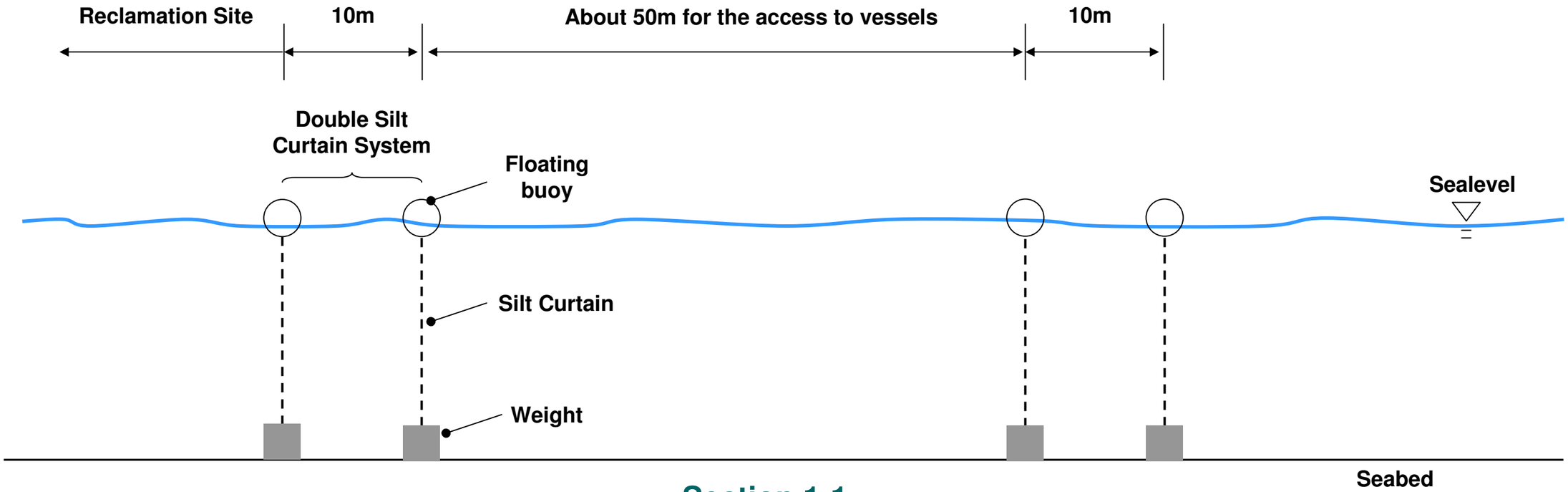

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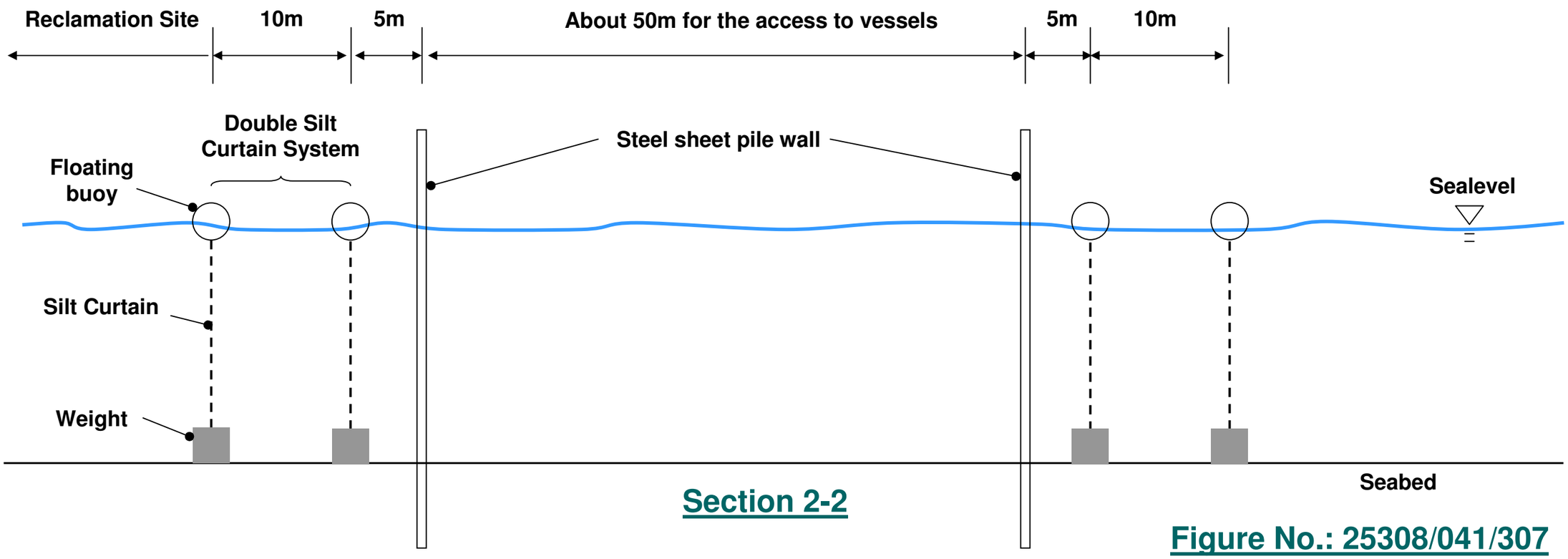
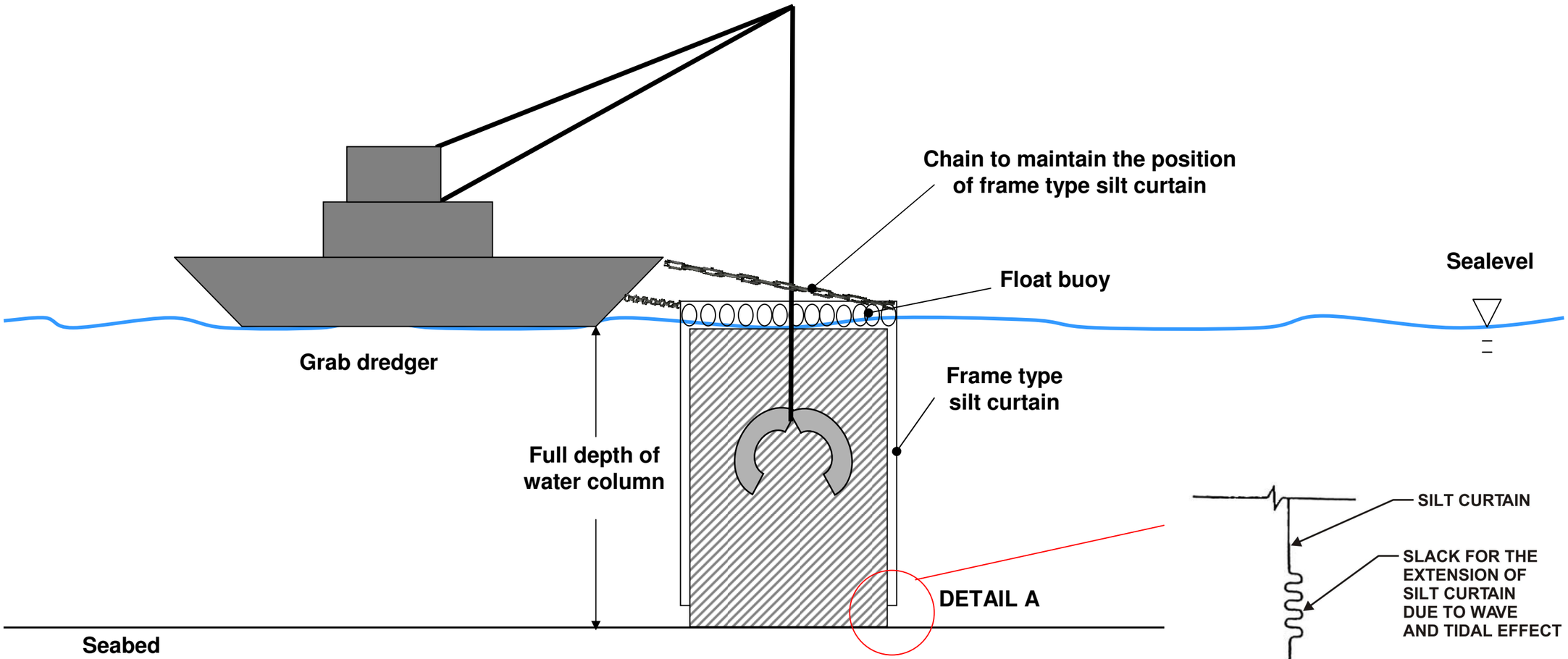


Section 2-2

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
Rm B, 13/F, CHEUNG LEE IND BLDG.,
9 CHEUNG LEE STREET,
CHAI WAN., HONG KONG.
Tel: 25080058 Fax: 25700089

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TOKYO OFFICE
3-22-1, Higashiyama, Meguro-ku, Tokyo 153-0043, Japan
Tel: +81-33714-3368 Fax: +81-33714-3326

Models and Features

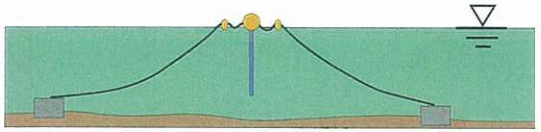
The Silt Protector consists of several types that are individually subdivided into some ranks so that the user is able to select units best suited to specific site conditions and work items. The Silt Protector can be used individually or separately, or by combining the units.

●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.

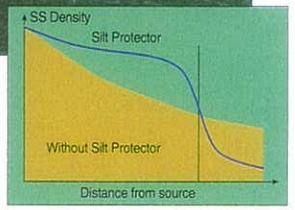
The fixed hanging type Silt Protector is classified into four ranks, A, B, C and D so that a type best suited to a specific application can be identified.

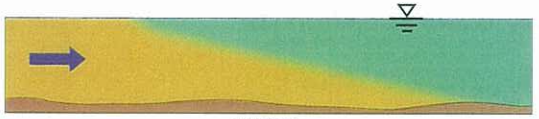


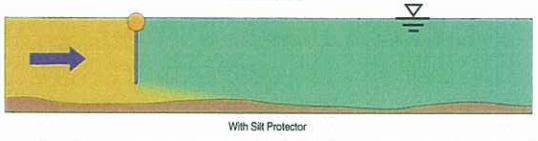
●General site condition for hanging fixed type

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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Mak/Max

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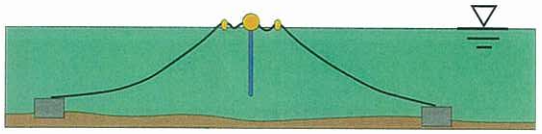

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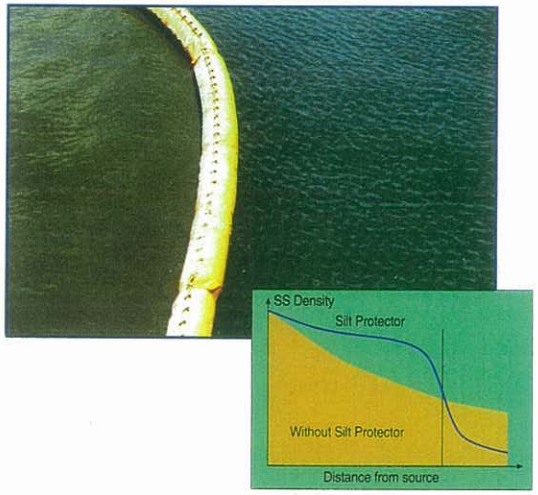
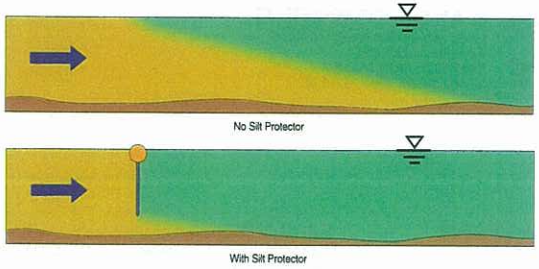
C	Area with medium extent inside of breakwater ◆Wave height : 0.8m or less ◆Velocity of current : 0.1m/sec or less	300	Unspaced	500 or 300	5
D	Lakes, or well sheltered area as calm as lakes ◆Wave height : 0.5m or less ◆Velocity of current : 0.05m/sec or less	300	Spaced	300	3

●Remarks ★Standard unit length is 20m.
★Anchor is not included in the unit.





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